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Energy and Sustainability Solutions
SAP Assessors ~ OCDEA ~ DEA ~ Code for Sustainable Homes Assessors
BREEAM Domestic Refurbishment Assessors

STROMA STRO005087 ~ NHER 003848 ~ BRE HISC AS43

Energy and Sustainability Statement

SITE: 28 Greville Street, London EC1N 8SU

CLIENT: M & R AISENTHAL & E * D SHEMTOV t/as Palmos Junior

PLANNING APPLICATION REFERENCE: Creation of 2 new upper floors (5 & 6) above the existing office block to create 3 new flats.

DATE: October 10 2013

Executive Summary

Acting on instruction from Ross Lakani of Homes Design Ltd, 40 Wise Lane Mill Hill, London, Andrew Simpson of Premier Assessors, an Accredited OCDEA and Code for Sustainable Homes Assessor, has prepared a report outlining the main features of the energy efficiency and sustainability strategy for the proposed new flats above the existing office block at 28 Greville Street, London. These are summarised below.

Energy Strategy

The development will be designed to be low carbon and exceed the minimum requirements of the building regulations This will be achieved through the adoption of a strategy that prioritises energy efficient measures which will provide sufficient carbon emission reductions to achieve Part L1A 2010 building regulations and meet a 10% reduction in the carbon dioxide emissions through renewable energy.

Introduction

This report has been prepared to support the planning application and provides an overview of the approach that is being proposed with regard to energy efficiency measures and the integration of sustainable features for the development at 28 Greville Street EC1N 8SU

National Regulations

Part L Building regulations, 2010

Part L of the building regulations, which covers the conservation of fuel and Power, was revised in October 2010. Carbon emissions in new buildings now have to be 25% lower than the previous 2006 Part L standards. The Government, proposes to amend the Part L regulations in 2013/14, reducing the carbon emissions from new dwellings by a further 6% .

Energy Statement

From the outset, the approach taken for this development has been to achieve Part L1A compliance 2010 using the energy hierarchy of 'Be Lean, Be Clean and Be Green'. Therefore reduced u-values and passive design measures have been incorporated in conjunction with the use of low - zero carbon technology to reduce the carbon emissions associated with heating, hot water and electricity use.

'Be Lean'(use less energy)

Heating will be provided to the property using gas fired condensing boilers that will be highly efficient (89%)

Time and Temperature zone controls will be provided to give automatic control of the heating and hot water.

Insulation will be provided to all distribution pipework to minimise heat losses.

The development will be constructed with materials that have u-values that exceed meet Part L1A 2010 of the building regulations

Wall	0.19
Roof	0.12
Windows/Doors/Rooflights	1.4
Exposed Floor	0.22/0.11(over office)

Unnecessary ventilation heat loss will be limited by providing building fabric which is air tight. The Air permeability will be set at $5m^3/hm^2$ @50 Pascals, but will also comply with Part F of the building regulations

All lighting both internal and external, will be low energy

'Be Clean' (supply energy efficiently)

A highly efficient Gas Condensing boiler unit will be used to heat the dwellings. Low energy lighting will be specified throughout the dwelling as well as external space lighting fitted with movement detectors

'Be Green' (use renewable energy)

A review of the currently available renewable technologies has been undertaken. Wind power, heat pumps and biomass were all discounted due to the incompatibility with dwellings of this type and in the middle of a town where the wind speed is insufficient.

However, due to the roof design, it is felt that Solar Photovoltaic panels would be suitable and the design will incorporate a total of 3.25 kWp which is enough to reduce the carbon dioxide emissions by 15% for each flat.

Achievement of Compliance with Part L1A 2010

The proposed development will comply with Part L1A of the Building Regulations.

<u>PART L1A 2010 CRITERION 1</u>

Under Criterion 1 the proposed dwellings CO2 emission rate (DER) must be less than the Target Carbon Emission rate (TER).

The proposed development will comply with Criterion 1 through the 'Block Compliance' method. Report Appended.

The Total Floor Area of the development is	234.51 m2
The Average TER is	17.84
The Average DER is	11.97

This shows a 32.9 percentage improvement over building regulations.

<u>PART L1A 2010 CRITERION 3</u>

Under Criterion 3 an overheating assessment is carried out with the outcome being a risk rating ranging from 'Not Significant' to 'High'. To pass Criterion 3 the dwelling must not have a 'High' risk of overheating. The calculations show that the risk is 'Slight' in 2 of the Flats and 'Medium' in 1(one) Flat.

SUSTAINABILITY STATEMENT

Energy

SAP calculations demonstrate the CO_2 emissions of each flat and the reduction of CO2 emissions from renewable energy is shown on the CSH report from SAP. Internal drying space will be provided in the bathroom of each flat, an Energy Display device displaying the current consumption and primary heating fuel data and low energy white goods will be specified as well as low energy internal and external space lighting. Space and services for a home office will be installed.

Water Consumption

The water consumed will meet the mandatory 105 litres/person/day for building regulations by restricting the flow rates to taps and showers, installing low volume dual flush toilets and baths. A water report will be issued to building control on completion.

Materials

All timber will be purchased from companies that supply timber from sustainable sources only.
Materials from local sources will be procured where possible
The BRE Green Guide will be used to calculate the score for this section

Surface Water Run-off & Flood Risk

A Hydrologist will be appointed to ensure that the Surface Water run of calculations will meet this mandatory requirement for the Code for Sustainable Homes. Furthermore, a Flood Risk Assessment will be completed for all types of flooding including localised flooding.

Waste

Accessibility has to be provided for refuse bins and recycling boxes etc and level access at door entry points. Site Waste management will, through a Site Waste Management Plan, ensure that 85% of site waste will be diverted from landfill.

Pollution

All insulation used in the development will have a Global Warming Potential (GWP) of less than 5. A condensing gas boiler will be selected with Nitrous Oxide (NOx) emissions below 40 mg/kWh

Health and Well-Being

The dwelling will have sufficient natural light from the windows to have a daylight factor of 1.5% in the living room, dining room and home office.
Sound testing will be undertaken at Post Construction stage and the scores must be 8dB higher for airborne and 8dB lower for impact
The flats will meet Lifetime Homes in full

Management

A Home User guide will be supplied to all dwellings for all Operational Issues in the Home and to describe the Site and Surroundings
The Constructor must be a member of the Considerate Constructors scheme or similar. A score reaching 'Best Practice' must be achieved.
Water usage through site activities will be monitored and targets set for reducing the water usage throughout the build
Best practice policies regarding air and water pollution will be operated for site activities.
Water consumption will be monitored during the build and targets set to reduce the use of water.
Police advice on security will also be incorporated into this dwelling.

Ecology

The site is of low ecological value an Ecologist will be appointed as it is proposed to have either a green roof or a brown roof to encourage ecology in the town centre.

6.0 Conclusion

The report demonstrates that high standards of environmental sustainability will be achieved. The project will be a low carbon development.

END OF REPORT

Attachments:

1 No Energy statement for total development CO2 Emissions

3 No SAP calculations

3 No CfSH Reports (SAP)

1 No Block Compliance Report

1 CSH pre-assessment

ENERGY STATEMENT for Development of 3 Flats above existing offices at 28 Greville Street, London EC1N 8SU

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

	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Building Regulations 2010 Part L Compliant Development	A 53.49	55.58
After energy demand reduction	B 53.68	55.58
After CHP	C 53.68	55.58
After renewable energy	D 34.73	55.58

Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy

	Regulated Carbon dioxide savings	
	(Tonnes CO2 per annum)	%
Savings from energy demand reduction	A - B 53.49- 53.68= -0.19	0%
Savings from CHP	B- C 0	(B – C)/B * 100
Savings from renewable energy	C - D 53.68 - 34.73=18.95	18.95/53.68*100=35.3%
Total Cumulative Savings	**A - D 53.49 - 34.73=18.76**	**18.76/53.49*100=35.07%**

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name:	Andrew Simpson	**Assessor Number:**	STRO005087
Property Address:	Flat 1 28 Greville Street London EC1N 8SU		

Buiding regulation assessment

	kg/m²/year
TER	20.05
DER	12.02

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		12.02	*(ZC1)*
TER		20.05	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		12.02	
% improvement DER/TER	40		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	12.02	*(ZC1)*
CO2 emissions from appliances, equation (L14)	16.65	*(ZC2)*
CO2 emissions from cooking, equation (L16)	2.48	*(ZC3)*
Net CO2 emissions	31.1	*(ZC8)*

Result:

Credits awarded for Ene 1 = 4.4

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 44.04

Credits awarded for Ene 2 = 4.5

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		37.76	
Standard DER		18.63	
Actual Case CO2 emissions		31.24	
Actual DER		12.11	
Reduction in CO2 emissions	17.27		

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

SAP Input

Property Details: Flat 1

Address:	Flat 1, 28 Greville Street, London, EC1N 8SU
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	10 October 2013
Date of certificate:	10 October 2013
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium

Dwelling designed to use less than 125 litres per Person per day: True

Property description:

Dwelling type:	Flat
Detachment:	Mid-terrace
Year Completed:	2013

Floor Location:	Floor area:	Storey height:
Floor 0	69.63 m²	2.56 m

Living area:	47.04 m² (fraction 0.676)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
d1	Manufacturer	Solid			Wood
w1	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w2	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w3	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w4	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w5	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
d1	mm	0.7	0	1.4	1.92	1
w1	16mm or more	0.7	0.63	1.4	3.04	1
w2	16mm or more	0.7	0.63	1.4	3.04	1
w3	16mm or more	0.7	0.63	1.4	1.53	1
w4	16mm or more	0.7	0.63	1.4	0.65	1
w5	16mm or more	0.7	0.63	1.4	1.55	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
d1		Stair wall	East	0.915	2.1
w1		Main wall	South	2.25	1.35
w2		Main wall	South	2.25	1.35
w3		Main wall	West	1.13	1.35
w4		Main wall	West	0.48	1.35
w5		Main wall	North	1.15	1.35

Overshading: Very Little

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
<u>External Elements</u>							
Main wall	38.425	9.81	28.61	0.19	0	False	N/A
Stair wall	24.678	1.92	22.76	0.18	0	False	N/A
Roof	9.272	0	9.27	0.16	0		N/A

SAP Input

Floor	69.63	0.11	N/A

<u>Internal Elements</u>

<u>Party Elements</u>

Party wall	40.704	N/A

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0746

	Length	**PSI-value**	
Approved source	8.16	0.5	Steel lintel with perforated steel base plate
Approved source	7.26	0.04	Sill
Approved source	17.7	0.05	Jamb
Approved source	24.5	0.07	Intermediate floor between dwellings
Approved source	7.62	0.28	Flat roof with parapet
Approved source	23.04	0.09	Corner (normal)
Approved source	10.24	-0.09	Corner (inverted)
Approved source	5.12	0.06	Party wall between dwellings
Approved source	6.25	0	Intermediate floor between dwellings (in blocks of flats)
Approved source	1.52	0.02	Roof (insulation at rafter level)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	2
Number of sides sheltered:	3
Pressure test:	5

Main heating system:

Main heating system:

Central heating systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Manufacturer Declaration
Manufacturer's data
Efficiency: 89.8% (SEDBUK2009)
Condensing combi with automatic ignition
Fuel Burning Type: Modulation
Systems with radiators
Pump in heat space: Yes

Main heating Control:

Main heating Control:

Time and temperature zone control
Control code: 2110
Boiler interlock: Yes

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:

From main heating system
Water code: 901
Fuel :mains gas
No hot water cylinder
Solar panel: False

Others:

Electricity tariff:	standard tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory

SAP Input

Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	Photovoltaic 1 Installed Peak power: 1 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Andrew Simpson	**Stroma Number:**	STRO005087
Software Name:	Stroma FSAP 2009	**Software Version:**	Version: 1.5.0.55

Property Address: Flat 1

Address : Flat 1, 28 Greville Street, London, EC1N 8SU

1. Overall dwelling dimensions:

	Area(m²)		Ave Height(m)		Volume(m³)	
Ground floor	69.63	(1a) x	2.56	(2a) =	178.2528	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	69.63	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	178.2528	(5)

2. Ventilation rate:

	main heating		Secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

				Air changes per hour	
Infiltration due to chimneys, flues and fans =	(6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.11	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction *if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35*		0	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.36	(18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides on which sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.78	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.28	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.4	5.1	5.1	4.5	4.1	3.9	3.7	3.7	4.2	4.5	4.8	5.1

Wind Factor (22a)m = (22)m ÷ 4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22a)m=	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.2	1.27

SAP WorkSheet: New dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.38	0.36	0.36	0.32	0.29	0.27	0.26	0.26	0.29	0.32	0.34	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.54	0.55	0.56	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.54	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.92	x	1.4	=	2.688			(26)
Windows Type 1			3.04	x1/[1/(1.4)+ 0.04]		=	4.03			(27)
Windows Type 2			3.04	x1/[1/(1.4)+ 0.04]		=	4.03			(27)
Windows Type 3			1.53	x1/[1/(1.4)+ 0.04]		=	2.03			(27)
Windows Type 4			0.65	x1/[1/(1.4)+ 0.04]		=	0.86			(27)
Windows Type 5			1.55	x1/[1/(1.4)+ 0.04]		=	2.05			(27)
Floor			69.63	x	0.11	=	7.6593			(28)
Walls Type1	38.42	9.81	28.61	x	0.19	=	5.44			(29)
Walls Type2	24.68	1.92	22.76	x	0.18	=	4.1			(29)
Roof	9.27	0	9.27	x	0.16	=	1.48			(30)
Total area of elements, m²			142.005							(31)
Party wall			40.7	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 34.37 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 15022.3535 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.59 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

SAP WorkSheet: New dwelling design stage

Total fabric heat loss (33) + (36) = 44.96 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	33.64	33.18	33.18	32.34	31.85	31.61	31.39	31.39	31.97	32.34	32.75	33.18	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	78.6	78.14	78.14	77.31	76.81	76.58	76.36	76.36	76.93	77.31	77.71	78.14	

Average = $Sum(39)_{1...12}$ /12= 77.37 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.13	1.12	1.12	1.11	1.1	1.1	1.1	1.1	1.1	1.11	1.12	1.12	

Average = $Sum(40)_{1...12}$ /12= 1.11 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.2371 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.3313 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	96.06	92.57	89.08	85.58	82.09	78.6	78.6	82.09	85.58	89.08	92.57	96.06	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = $Sum(44)_{1...12}$ = 1047.9759 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	142.8	124.9	128.88	112.36	107.81	93.03	86.21	98.93	100.11	116.67	127.35	138.3	

Total = $Sum(45)_{1...12}$ = 1377.3491 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.42	18.73	19.33	16.85	16.17	13.96	12.93	14.84	15.02	17.5	19.1	20.74	(46)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (47)

Temperature factor from Table 2b 0 (48)

Energy lost from water storage, kWh/year (47) x (48) = 0 (49)

If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same 0 (50)

If community heating and no tank in dwelling, enter 110 litres in box (50)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year ((50) x (51) x (52) x (53) = 0 (54)

Enter (49) or (54) in (55) 0 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	48.95	42.61	45.39	42.21	41.83	38.76	40.05	41.83	42.21	45.39	45.65	48.95	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	191.76	167.5	174.27	154.57	149.65	131.8	126.26	140.76	142.32	162.06	173	187.25	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	191.76	167.5	174.27	154.57	149.65	131.8	126.26	140.76	142.32	162.06	173	187.25

Output from water heater (annual)$_{1...12}$ | 1901.1935 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	59.72	52.18	54.2	47.91	46.31	40.62	38.68	43.35	43.84	50.14	53.76	58.22	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	45.17	40.12	32.62	24.7	18.46	15.59	16.84	21.89	29.38	37.31	43.55	46.42	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	293.18	296.22	288.56	272.24	251.63	232.27	219.33	216.29	223.96	240.28	260.88	280.25	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	(69)
Pumps and fans gains (Table 5a)													
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	(71)
Water heating gains (Table 5)													
(72)m=	80.27	77.65	72.85	66.54	62.24	56.42	51.99	58.27	60.89	67.39	74.66	78.26	(72)
Total internal gains =						(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m							
(73)m=	524.02	519.39	499.44	468.88	437.74	409.68	393.57	401.85	419.63	450.38	484.49	510.32	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	1	x	1.55	x	10.73	x	0.63	x	0.7	=	6.6	(74)
North	0.9x	1	x	1.55	x	20.36	x	0.63	x	0.7	=	12.52	(74)

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North	0.9x	1	x	1.55	x	33.31	x	0.63	x	0.7	=	20.49	(74)
North	0.9x	1	x	1.55	x	54.64	x	0.63	x	0.7	=	33.61	(74)
North	0.9x	1	x	1.55	x	75.22	x	0.63	x	0.7	=	46.27	(74)
North	0.9x	1	x	1.55	x	84.09	x	0.63	x	0.7	=	51.73	(74)
North	0.9x	1	x	1.55	x	79.12	x	0.63	x	0.7	=	48.67	(74)
North	0.9x	1	x	1.55	x	61.56	x	0.63	x	0.7	=	37.87	(74)
North	0.9x	1	x	1.55	x	41.09	x	0.63	x	0.7	=	25.28	(74)
North	0.9x	1	x	1.55	x	24.81	x	0.63	x	0.7	=	15.27	(74)
North	0.9x	1	x	1.55	x	13.22	x	0.63	x	0.7	=	8.13	(74)
North	0.9x	1	x	1.55	x	8.94	x	0.63	x	0.7	=	5.5	(74)
South	0.9x	1	x	3.04	x	47.32	x	0.63	x	0.7	=	57.1	(78)
South	0.9x	1	x	3.04	x	47.32	x	0.63	x	0.7	=	57.1	(78)
South	0.9x	1	x	3.04	x	77.18	x	0.63	x	0.7	=	93.13	(78)
South	0.9x	1	x	3.04	x	77.18	x	0.63	x	0.7	=	93.13	(78)
South	0.9x	1	x	3.04	x	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x	3.04	x	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x	3.04	x	105.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x	3.04	x	105.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x	3.04	x	108.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x	3.04	x	108.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x	3.04	x	108.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x	3.04	x	108.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x	3.04	x	107.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x	3.04	x	107.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x	3.04	x	103.88	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	1	x	3.04	x	103.88	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	1	x	3.04	x	99.99	x	0.63	x	0.7	=	120.65	(78)
South	0.9x	1	x	3.04	x	99.99	x	0.63	x	0.7	=	120.65	(78)
South	0.9x	1	x	3.04	x	85.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x	3.04	x	85.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x	3.04	x	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x	3.04	x	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x	3.04	x	40.89	x	0.63	x	0.7	=	49.34	(78)
South	0.9x	1	x	3.04	x	40.89	x	0.63	x	0.7	=	49.34	(78)
West	0.9x	1	x	1.53	x	19.87	x	0.63	x	0.7	=	12.07	(80)
West	0.9x	1	x	0.65	x	19.87	x	0.63	x	0.7	=	5.13	(80)
West	0.9x	1	x	1.53	x	38.52	x	0.63	x	0.7	=	23.39	(80)
West	0.9x	1	x	0.65	x	38.52	x	0.63	x	0.7	=	9.94	(80)
West	0.9x	1	x	1.53	x	61.57	x	0.63	x	0.7	=	37.39	(80)
West	0.9x	1	x	0.65	x	61.57	x	0.63	x	0.7	=	15.88	(80)
West	0.9x	1	x	1.53	x	91.41	x	0.63	x	0.7	=	55.51	(80)

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West	0.9x	1	x	0.65	x	91.41	x	0.63	x	0.7	=	23.58	(80)
West	0.9x	1	x	1.53	x	111.22	x	0.63	x	0.7	=	67.54	(80)
West	0.9x	1	x	0.65	x	111.22	x	0.63	x	0.7	=	28.69	(80)
West	0.9x	1	x	1.53	x	116.05	x	0.63	x	0.7	=	70.47	(80)
West	0.9x	1	x	0.65	x	116.05	x	0.63	x	0.7	=	29.94	(80)
West	0.9x	1	x	1.53	x	112.64	x	0.63	x	0.7	=	68.4	(80)
West	0.9x	1	x	0.65	x	112.64	x	0.63	x	0.7	=	29.06	(80)
West	0.9x	1	x	1.53	x	98.03	x	0.63	x	0.7	=	59.53	(80)
West	0.9x	1	x	0.65	x	98.03	x	0.63	x	0.7	=	25.29	(80)
West	0.9x	1	x	1.53	x	73.6	x	0.63	x	0.7	=	44.7	(80)
West	0.9x	1	x	0.65	x	73.6	x	0.63	x	0.7	=	18.99	(80)
West	0.9x	1	x	1.53	x	46.91	x	0.63	x	0.7	=	28.49	(80)
West	0.9x	1	x	0.65	x	46.91	x	0.63	x	0.7	=	12.1	(80)
West	0.9x	1	x	1.53	x	24.71	x	0.63	x	0.7	=	15	(80)
West	0.9x	1	x	0.65	x	24.71	x	0.63	x	0.7	=	6.37	(80)
West	0.9x	1	x	1.53	x	16.39	x	0.63	x	0.7	=	9.95	(80)
West	0.9x	1	x	0.65	x	16.39	x	0.63	x	0.7	=	4.23	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	137.99	232.11	301.19	366.36	404.45	414.93	404.68	373.38	330.25	261.68	164.81	118.36	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	662.01	751.5	800.63	835.24	842.19	824.61	798.24	775.24	749.88	712.06	649.31	628.69	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.97	0.94	0.89	0.76	0.58	0.39	0.4	0.65	0.88	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.13	20.29	20.52	20.71	20.9	20.98	21	21	20.97	20.78	20.38	20.13	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.98	19.98	19.98	19.99	20	20	20.01	20.01	20	19.99	19.99	19.98	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.96	0.92	0.86	0.7	0.49	0.3	0.31	0.57	0.84	0.96	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.85	19.09	19.41	19.68	19.91	19.99	20	20	19.98	19.77	19.22	18.87	(90)

fLA = Living area ÷ (4) = 0.68 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.71	19.9	20.16	20.38	20.58	20.66	20.68	20.68	20.64	20.45	20	19.72	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.71	19.9	20.16	20.38	20.58	20.66	20.68	20.68	20.64	20.45	20	19.72	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Utilisation factor for gains, hm:

(94)m=	0.98	0.96	0.93	0.87	0.74	0.55	0.36	0.37	0.62	0.86	0.96	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	647.13	721.2	740.94	725.58	622.68	453.63	287.41	287.27	468.34	610.07	623.82	615.84	(95)

Monthly average external temperature from Table 8

(96)m=	4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1195.7	1164.59	1043.62	902.88	682.13	464.08	288.32	288.3	488.07	745.99	1010.55	1158.38	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	408.14	297.96	225.19	127.66	44.24	0	0	0	0	101.12	278.45	403.64

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1886.4 (98)

Space heating requirement in kWh/m²/year 27.09 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		90.7	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	408.14	297.96	225.19	127.66	44.24	0	0	0	0	101.12	278.45	403.64	
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)	449.99	328.51	248.28	140.75	48.77	0	0	0	0	111.49	307	445.03	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2079.82 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] + (214) m } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10...12}$= 0 (215)

Water heating

Output from water heater (calculated above)

191.76	167.5	174.27	154.57	149.65	131.8	126.26	140.76	142.32	162.06	173	187.25

Efficiency of water heater 80.6 (216)

(217)m=	87.21	86.79	86	84.88	82.7	80.6	80.6	80.6	80.6	84.2	86.54	87.24	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	219.89	193.01	202.65	182.11	180.95	163.52	156.65	174.64	176.57	192.47	199.9	214.65

Total = Sum(219a)$_{1...12}$ = 2257 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2079.82
Water heating fuel used		2257
Electricity for pumps, fans and electric keep-hot		

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central heating pump:		130	(230c)
boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	175	(231)
Electricity for lighting		319.06	(232)
Electricity generated by PVs		-858.4	(233)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x	3.1	x 0.01 =	64.4745	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	0	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.1	x 0.01 =	69.97	(247)
Pumps, fans and electric keep-hot	(231)	11.46	x 0.01 =	20.06	(249)

(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a

Energy for lighting	(232)	11.46	x 0.01 =	36.56	(250)
Additional standing charges (Table 12)				106	(251)
	one of (233) to (235) x)	11.46	x 0.01 =	-98.37	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)…(254) =	198.6875	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.8146	(257)
SAP rating (Section 12)		88.6357	(258)

12a. CO_2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO_2/kWh		Emissions kg CO_2/year	
Space heating (main system 1)	(211) x	0.198	=	411.8	(261)
Space heating (secondary)	(215) x	0	=	0	(263)
Water heating	(219) x	0.198	=	446.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =			858.69	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.517	=	90.48	(267)
Electricity for lighting	(232) x	0.517	=	164.95	(268)
Energy saving/generation technologies					
Item 1		0.529	=	-454.09	(269)
Total CO_2, kg/year		sum of (265)…(271) =		660.02	(272)
CO_2 emissions per m²		(272) ÷ (4) =		9.48	(273)

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EI rating (section 14)				92	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	1.02	=	2121.42	(261)
Space heating (secondary)	(215) x	0	=	0	(263)
Energy for water heating	(219) x	1.02	=	2302.14	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4423.55	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	2.92	=	511	(267)
Electricity for lighting	(232) x	0	=	931.64	(268)
Energy saving/generation technologies					
Item 1		2.92	=	-2506.53	(269)
'Total Primary Energy		sum of (265)…(271) =		3359.67	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		48.25	(273)

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Andrew Simpson
Assessor Number: STRO005087
Property Address: Flat 2
28 Greville Street
London
EC1N 8SU

Buiding regulation assessment

	kg/m²/year
TER	17.53
DER	11.78

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		11.78	*(ZC1)*
TER		17.53	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		11.78	
% improvement DER/TER	32.8		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	11.78	*(ZC1)*
CO2 emissions from appliances, equation (L14)	17.22	*(ZC2)*
CO2 emissions from cooking, equation (L16)	3	*(ZC3)*
Net CO2 emissions	32	*(ZC8)*

Result:

Credits awarded for Ene 1 = 3.7

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 37.54
Credits awarded for Ene 2 = 7.4

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year
Standard Case CO2 emissions		38.96
Standard DER		18.75
Actual Case CO2 emissions		32.68
Actual DER		12.47
Reduction in CO2 emissions	16.12	

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.
It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

SAP Input

Property Details: Flat 2

Address:	Flat 2, 28 Greville Street, London, EC1N 8SU
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	10 October 2013
Date of certificate:	10 October 2013
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium

Dwelling designed to use less than 125 litres per Person per day: True

Property description:

Dwelling type:	Flat
Detachment:	Mid-terrace
Year Completed:	2013

Floor Location:	Floor area:	Storey height:
Floor 0	54.26 m²	2.4 m

Living area:	27.56 m² (fraction 0.508)
Front of dwelling faces:	North

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
d1	Manufacturer	Solid			Wood
w1	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w2	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w3	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
d1	mm	0.7	0	1.1	1.92	1
w1	16mm or more	0.7	0.63	1.4	3.04	1
w2	16mm or more	0.7	0.63	1.4	3.04	1
w3	16mm or more	0.7	0.63	1.4	4.58	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
d1		Stair wall	East	0.915	2.1
w1		Main wall	South	2.25	1.35
w2		Main wall	South	2.25	1.35
w3		Main wall	North	3.39	1.35

Overshading: Very Little

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
<u>External Elements</u>							
Main wall	34.765	10.66	24.1	0.19	0	False	N/A
Stair wall	12.57	1.92	10.65	0.18	0	False	N/A
Roof	9.272	0	9.27	0.16	0		N/A
<u>Internal Elements</u>							
<u>Party Elements</u>							
Party wall	16						N/A
Party wall 2	24.704						N/A

Thermal bridges:

SAP Input

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1653

	Length	PSI-value	
Approved source	8.79	0.5	Steel lintel with perforated steel base plate
Approved source	7.89	0.04	Sill
Approved source	12.3	0.05	Jamb
Approved source	15.67	0.07	Intermediate floor between dwellings
Approved source	7.62	0.28	Flat roof with parapet
Approved source	7.68	0.09	Corner (normal)
Approved source	2.56	-0.09	Corner (inverted)
Approved source	5.12	0.06	Party wall between dwellings
Approved source	6.25	0	Intermediate floor between dwellings (in blocks of flats)
Approved source	1.52	0.02	Roof (insulation at rafter level)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	2
Number of sides sheltered:	3
Pressure test:	5

Main heating system:

Main heating system:

Central heating systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Manufacturer Declaration
Manufacturer's data
Efficiency: 89.8% (SEDBUK2009)
Condensing combi with automatic ignition
Fuel Burning Type: Modulation
Systems with radiators
Pump in heat space: Yes

Main heating Control:

Main heating Control:

Time and temperature zone control
Control code: 2110
Boiler interlock: Yes

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:

From main heating system
Water code: 901
Fuel :mains gas
No hot water cylinder
Solar panel: False

Others:

Electricity tariff:	standard tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	Photovoltaic 1 Installed Peak power: 0.75 Tilt of collector: 30°

SAP Input

	Overshading: None or very little
	Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Andrew Simpson	**Stroma Number:**	STRO005087
Software Name:	Stroma FSAP 2009	**Software Version:**	Version: 1.5.0.55

Property Address: Flat 2

Address : Flat 2, 28 Greville Street, London, EC1N 8SU

1. Overall dwelling dimensions:

	Area(m²)		Ave Height(m)		Volume(m³)	
Ground floor	54.26	(1a) x	2.4	(2a) =	130.224	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	54.26	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		130.224	(5)

2. Ventilation rate:

	main heating		Secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.15	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides on which sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.78	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31	(21)

Infiltration rate modified for monthly wind speed

Monthly average wind speed from Table 7

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22)m=	5.4	5.1	5.1	4.5	4.1	3.9	3.7	3.7	4.2	4.5	4.8	5.1

Wind Factor (22a)m = (22)m ÷ 4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(22a)m=	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.2	1.27

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Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.42	0.4	0.4	0.35	0.32	0.3	0.29	0.29	0.33	0.35	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.58	0.58	0.56	0.55	0.55	0.54	0.54	0.55	0.56	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.58	0.58	0.56	0.55	0.55	0.54	0.54	0.55	0.56	0.57	0.58	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.92	x	1.1	=	2.112			(26)
Windows Type 1			3.04	x1/[1/(1.4)+ 0.04]		=	4.03			(27)
Windows Type 2			3.04	x1/[1/(1.4)+ 0.04]		=	4.03			(27)
Windows Type 3			4.58	x1/[1/(1.4)+ 0.04]		=	6.07			(27)
Walls Type1	34.76	10.66	24.1	x	0.19	=	4.58			(29)
Walls Type2	12.57	1.92	10.65	x	0.18	=	1.92			(29)
Roof	9.27	0	9.27	x	0.16	=	1.48			(30)
Total area of elements, m²			56.607							(31)
Party wall			16	x	0	=	0			(32)
Party wall			24.7	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 24.22 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7118.5681 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.36 (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = 33.58 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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(38)m=	25.32	24.9	24.9	24.15	23.7	23.49	23.29	23.29	23.8	24.15	24.51	24.9	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	58.9	58.48	58.48	57.73	57.28	57.07	56.87	56.87	57.38	57.73	58.09	58.48	

Average = $Sum(39)_{1...12}$ /12= 57.78 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.09	1.08	1.08	1.06	1.06	1.05	1.05	1.05	1.06	1.06	1.07	1.08	

Average = $Sum(40)_{1...12}$ /12= 1.06 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.8156 (42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)
if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 77.3216 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	85.05	81.96	78.87	75.78	72.68	69.59	69.59	72.68	75.78	78.87	81.96	85.05

Total = $Sum(44)_{1...12}$ = 927.859 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	126.43	110.58	114.11	99.48	95.46	82.37	76.33	87.59	88.63	103.3	112.75	122.44

Total = $Sum(45)_{1...12}$ = 1219.48 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.97	16.59	17.12	14.92	14.32	12.36	11.45	13.14	13.3	15.49	16.91	18.37	(46)

Water storage loss:

a) If manufacturer’s declared loss factor is known (kWh/day): 0 (47)

Temperature factor from Table 2b 0 (48)

Energy lost from water storage, kWh/year (47) x (48) = 0 (49)

If manufacturer’s declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same 0 (50)

If community heating and no tank in dwelling, enter 110 litres in box (50)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)

Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year ((50) x (51) x (52) x (53) = 0 (54)

Enter (49) or (54) in (55) 0 (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

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Primary circuit loss (annual) from Table 3	0	(58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	43.34	37.72	40.19	37.37	37.04	34.32	35.46	37.04	37.37	40.19	40.42	43.34	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	169.78	148.3	154.3	136.85	132.49	116.69	111.79	124.63	126	143.49	153.17	165.79	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	169.78	148.3	154.3	136.85	132.49	116.69	111.79	124.63	126	143.49	153.17	165.79	

Output from water heater (annual)$_{1…12}$	1683.2824	(64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	52.87	46.2	47.99	42.42	41	35.97	34.24	38.38	38.81	44.39	47.6	51.55	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m=	35.28	31.33	25.48	19.29	14.42	12.17	13.15	17.1	22.95	29.14	34.01	36.26	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m=	236.23	238.68	232.51	219.36	202.76	187.15	176.73	174.28	180.46	193.61	210.21	225.81	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
(69)m=	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	(69)
Pumps and fans gains (Table 5a)													
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10	(70)
Losses e.g. evaporation (negative values) (Table 5)													
(71)m=	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	(71)
Water heating gains (Table 5)													
(72)m=	71.07	68.75	64.5	58.92	55.11	49.96	46.03	51.59	53.91	59.67	66.11	69.29	(72)
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m=	436.6	432.79	416.51	391.59	366.3	343.31	329.94	336.99	351.34	376.44	404.35	425.37	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	1	x	4.58	x	10.73	x	0.63	x	0.7	=	19.5	(74)
North	0.9x	1	x	4.58	x	20.36	x	0.63	x	0.7	=	37.01	(74)

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North	0.9x	1	x	4.58	x	33.31	x	0.63	x	0.7	=	60.55	(74)
North	0.9x	1	x	4.58	x	54.64	x	0.63	x	0.7	=	99.32	(74)
North	0.9x	1	x	4.58	x	75.22	x	0.63	x	0.7	=	136.73	(74)
North	0.9x	1	x	4.58	x	84.09	x	0.63	x	0.7	=	152.86	(74)
North	0.9x	1	x	4.58	x	79.12	x	0.63	x	0.7	=	143.82	(74)
North	0.9x	1	x	4.58	x	61.56	x	0.63	x	0.7	=	111.91	(74)
North	0.9x	1	x	4.58	x	41.09	x	0.63	x	0.7	=	74.68	(74)
North	0.9x	1	x	4.58	x	24.81	x	0.63	x	0.7	=	45.11	(74)
North	0.9x	1	x	4.58	x	13.22	x	0.63	x	0.7	=	24.03	(74)
North	0.9x	1	x	4.58	x	8.94	x	0.63	x	0.7	=	16.26	(74)
South	0.9x	1	x	3.04	x	47.32	x	0.63	x	0.7	=	57.1	(78)
South	0.9x	1	x	3.04	x	47.32	x	0.63	x	0.7	=	57.1	(78)
South	0.9x	1	x	3.04	x	77.18	x	0.63	x	0.7	=	93.13	(78)
South	0.9x	1	x	3.04	x	77.18	x	0.63	x	0.7	=	93.13	(78)
South	0.9x	1	x	3.04	x	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x	3.04	x	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x	3.04	x	105.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x	3.04	x	105.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x	3.04	x	108.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x	3.04	x	108.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x	3.04	x	108.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x	3.04	x	108.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x	3.04	x	107.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x	3.04	x	107.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x	3.04	x	103.88	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	1	x	3.04	x	103.88	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	1	x	3.04	x	99.99	x	0.63	x	0.7	=	120.65	(78)
South	0.9x	1	x	3.04	x	99.99	x	0.63	x	0.7	=	120.65	(78)
South	0.9x	1	x	3.04	x	85.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x	3.04	x	85.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x	3.04	x	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x	3.04	x	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x	3.04	x	40.89	x	0.63	x	0.7	=	49.34	(78)
South	0.9x	1	x	3.04	x	40.89	x	0.63	x	0.7	=	49.34	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	133.7	223.26	287.98	352.98	398.68	415.64	402.36	362.6	315.98	250.93	159.33	114.93	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	570.3	656.05	704.49	744.57	764.98	758.95	732.3	699.59	667.31	627.37	563.68	540.31	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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(86)m=	0.97	0.95	0.9	0.82	0.66	0.48	0.32	0.33	0.56	0.81	0.95	0.98		(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.27	20.45	20.66	20.83	20.96	20.99	21	21	20.98	20.86	20.51	20.27		(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.01	20.02	20.02	20.03	20.04	20.04	20.05	20.05	20.04	20.03	20.03	20.02		(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.88	0.78	0.6	0.41	0.24	0.26	0.49	0.77	0.94	0.97		(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.09	19.34	19.62	19.85	20	20.04	20.05	20.05	20.03	19.9	19.44	19.1		(90)
									fLA = Living area ÷ (4) =				0.51	(91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.69	19.9	20.15	20.35	20.49	20.52	20.53	20.53	20.51	20.39	19.98	19.69		(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.69	19.9	20.15	20.35	20.49	20.52	20.53	20.53	20.51	20.39	19.98	19.69		(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:														
(94)m=	0.96	0.93	0.88	0.8	0.63	0.44	0.28	0.29	0.53	0.79	0.94	0.97		(94)
Useful gains, hmGm , W = (94)m x (84)m														
(95)m=	549.75	612.79	620.65	593.12	483.81	335.64	206.26	206.21	350.76	492.76	527.79	522.63		(95)
Monthly average external temperature from Table 8														
(96)m=	4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]														
(97)m=	894.51	871.7	780.66	672.31	503.19	338.03	206.41	206.41	356.58	553.52	754.34	865.23		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m														
(98)m=	256.5	173.99	119.05	57.02	14.41	0	0	0	0	45.21	163.11	254.89		
								Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ =					1084.19	(98)
Space heating requirement in kWh/m²/year													19.98	(99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		90.7	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	256.5	173.99	119.05	57.02	14.41	0	0	0	0	45.21	163.11	254.89		
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)														(211)
	282.8	191.83	131.26	62.86	15.89	0	0	0	0	49.84	179.84	281.03		
								Total (kWh/year) =Sum(211)$_{1...5,10...12}$=					1195.35	(211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] + (214) m } x 100 ÷ (208)

(215)m=	0	0	0	0	0	0	0	0	0	0	0	0

Total (kWh/year) =Sum(215)$_{1...5,10....12}$= 0 (215)

Water heating

Output from water heater (calculated above)

169.78	148.3	154.3	136.85	132.49	116.69	111.79	124.63	126	143.49	153.17	165.79

Efficiency of water heater 80.6 (216)

(217)m=	86.39	85.76	84.71	83.33	81.49	80.6	80.6	80.6	80.6	82.81	85.51	86.43	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	196.53	172.94	182.15	164.23	162.59	144.78	138.7	154.62	156.33	173.27	179.13	191.81

Total = Sum(219a)$_{1...12}$ = 2017.08 (219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1195.35	
Water heating fuel used			2017.08	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		130		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		175	(231)
Electricity for lighting			249.2	(232)
Electricity generated by PVs			-643.8	(233)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.1	x 0.01 =	37.056	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	0	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.1	x 0.01 =	62.53	(247)
Pumps, fans and electric keep-hot	(231)	11.46	x 0.01 =	20.06	(249)

(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a

Energy for lighting	(232)	11.46	x 0.01 =	28.56	(250)
Additional standing charges (Table 12)				106	(251)
	one of (233) to (235) x)	11.46	x 0.01 =	-73.78	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost (245)...(247) + (250)…(254) = 180.4188 (255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.8543	(257)

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SAP rating (Section 12)					
				88.0827	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year		**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211)	x	0.198	=	236.68	(261)
Space heating (secondary)	(215)	x	0	=	0	(263)
Water heating	(219)	x	0.198	=	399.38	(264)
Space and water heating	(261) + (262) + (263) + (264) =				636.06	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.517	=	90.48	(267)
Electricity for lighting	(232)	x	0.517	=	128.83	(268)
Energy saving/generation technologies Item 1			0.529	=	-340.57	(269)
Total CO2, kg/year			sum of (265)…(271) =		514.8	(272)
CO2 emissions per m²			(272) ÷ (4) =		9.49	(273)
EI rating (section 14)					93	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	1.02	=	1219.26	(261)
Space heating (secondary)	(215)	x	0	=	0	(263)
Energy for water heating	(219)	x	1.02	=	2057.42	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3276.68	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	2.92	=	511	(267)
Electricity for lighting	(232)	x	0	=	727.65	(268)
Energy saving/generation technologies Item 1			2.92	=	-1879.9	(269)
'Total Primary Energy			sum of (265)…(271) =		2635.44	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		48.57	(273)

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Andrew Simpson
Assessor Number: STRO005087
Property Address: Flat 3
28 Greville Street
London
EC1N 8SU

Buiding regulation assessment

	kg/m²/year
TER	16.6
DER	10.94

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		10.94	*(ZC1)*
TER		16.6	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		10.94	
% improvement DER/TER	34.1		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	10.94	*(ZC1)*
CO2 emissions from appliances, equation (L14)	14.54	*(ZC2)*
CO2 emissions from cooking, equation (L16)	1.69	*(ZC3)*
Net CO2 emissions	27.2	*(ZC8)*

Result:

Credits awarded for Ene 1 = 3.8

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 51.23
Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year
Standard Case CO2 emissions		33.26
Standard DER		17.03
Actual Case CO2 emissions		27.1
Actual DER		10.87
Reduction in CO2 emissions	18.52	

Credits awarded for Ene 7 = 2

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

SAP Input

Property Details: Flat 3

Address:	Flat 3, 28 Greville Street, London, EC1N 8SU
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	10 October 2013
Date of certificate:	10 October 2013
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium

Dwelling designed to use less than 125 litres per Person per day: True

Property description:

Dwelling type:	Flat
Detachment:	Mid-terrace
Year Completed:	2013

Floor Location:	Floor area:	Storey height:
Floor 0	110.62 m²	2.4 m

Living area:	28.56 m² (fraction 0.258)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
d1	Manufacturer	Solid			Wood
w1	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w2	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w3	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w4	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w5	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w6	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w7	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
w8	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
d1	mm	0.7	0	1.4	1.92	1
w1	16mm or more	0.7	0.63	1.4	3.04	1
w2	16mm or more	0.7	0.63	1.4	3.04	1
w3	16mm or more	0.7	0.63	1.4	3.04	1
w4	16mm or more	0.7	0.63	1.4	3.04	1
w5	16mm or more	0.7	0.63	1.4	1.55	1
w6	16mm or more	0.7	0.63	1.4	1.55	1
w7	16mm or more	0.7	0.63	1.4	0.65	1
w8	16mm or more	0.7	0.63	1.4	4.58	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
d1		Stair wall	East	0.915	2.1
w1		Main wall	South	2.25	1.35
w2		Main wall	South	2.25	1.35
w3		Main wall	South	2.25	1.35
w4		Main wall	South	2.25	1.35
w5		Main wall	North	1.15	1.35
w6		Main wall	West	1.15	1.35
w7		Main wall	West	0.48	1.35
w8		Main wall	North	3.39	1.35

SAP Input

Overshading: Very Little

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
Main wall	82.8	20.49	62.31	0.19	0	False	N/A
Stair wall	27.528	1.92	25.61	0.18	0	False	N/A
Roof	110.62	0	110.62	0.12	0		N/A
Internal Elements							
Party Elements							
Party wall	40.704						N/A

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1421

	Length	PSI-value	
Approved source	16.05	0.5	Steel lintel with perforated steel base plate
Approved source	15.15	0.04	Sill
Approved source	30	0.05	Jamb
Approved source	50.59	0.07	Intermediate floor between dwellings
Approved source	60.24	0.28	Flat roof with parapet
Approved source	21.6	0.09	Corner (normal)
Approved source	12	-0.09	Corner (inverted)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	2
Number of sides sheltered:	3
Pressure test:	5

Main heating system:

Main heating system:

Central heating systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Manufacturer Declaration
Manufacturer's data
Efficiency: 89.8% (SEDBUK2009)
Condensing combi with automatic ignition
Fuel Burning Type: Modulation
Systems with radiators
Pump in heat space: Yes

Main heating Control:

Main heating Control:

Time and temperature zone control
Control code: 2110
Boiler interlock: Yes

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating:

From main heating system
Water code: 901
Fuel :mains gas
No hot water cylinder

SAP Input

	Solar panel: False
Others:	
Electricity tariff:	standard tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	Photovoltaic 1 Installed Peak power: 1.5 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Andrew Simpson	**Stroma Number:**	STRO005087
Software Name:	Stroma FSAP 2009	**Software Version:**	Version: 1.5.0.55

Property Address: Flat 3

Address : Flat 3, 28 Greville Street, London, EC1N 8SU

1. Overall dwelling dimensions:

	Area(m^2)			Ave Height(m)			Volume(m^3)	
Ground floor	110.62	(1a)	x	2.4	(2a)	=	265.488	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	110.62	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			265.488	(5)

2. Ventilation rate:

	main heating		Secondary heating		other		total		m³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 40 =	0	(6a)
Number of open flues	0	+	0	+	0	=	0	x 20 =	0	(6b)
Number of intermittent fans							2	x 10 =	20	(7a)
Number of passive vents							0	x 10 =	0	(7b)
Number of flueless gas fires							0	x 40 =	0	(7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20	÷ (5) =	0.08	(8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.33	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides on which sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.78	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.25	(21)

Infiltration rate modified for monthly wind speed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly average wind speed from Table 7												
(22)m=	5.4	5.1	5.1	4.5	4.1	3.9	3.7	3.7	4.2	4.5	4.8	5.1
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.2	1.27

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.34	0.32	0.32	0.28	0.26	0.25	0.23	0.23	0.26	0.28	0.3	0.32

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside

if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.56	0.55	0.55	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.56	0.55	0.55	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	0.55	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			1.92	x	1.4	=	2.688			(26)
Windows Type 1			3.04	x1/[1/(1.4)+ 0.04]		=	4.03			(27)
Windows Type 2			3.04	x1/[1/(1.4)+ 0.04]		=	4.03			(27)
Windows Type 3			3.04	x1/[1/(1.4)+ 0.04]		=	4.03			(27)
Windows Type 4			3.04	x1/[1/(1.4)+ 0.04]		=	4.03			(27)
Windows Type 5			1.55	x1/[1/(1.4)+ 0.04]		=	2.05			(27)
Windows Type 6			1.55	x1/[1/(1.4)+ 0.04]		=	2.05			(27)
Windows Type 7			0.65	x1/[1/(1.4)+ 0.04]		=	0.86			(27)
Windows Type 8			4.58	x1/[1/(1.4)+ 0.04]		=	6.07			(27)
Walls Type1	82.8	20.49	62.31	x	0.19	=	11.84			(29)
Walls Type2	27.53	1.92	25.61	x	0.18	=	4.61			(29)
Roof	110.62	0	110.62	x	0.12	=	13.27			(30)
Total area of elements, m²			220.948							(31)
Party wall			40.7	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)…(30) + (32) = 59.58 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 13119.336 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f *can be used instead of a detailed calculation.*

Thermal bridges : S (L x Y) calculated using Appendix K | 31.4 | (36)

if details of thermal bridging are not known (36) = 0.15 x (31)

Total fabric heat loss (33) + (36) = | 90.98 | (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	48.88	48.33	48.33	47.33	46.73	46.45	46.19	46.19	46.88	47.33	47.82	48.33	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	139.86	139.31	139.31	138.31	137.71	137.43	137.17	137.17	137.86	138.31	138.8	139.31	

Average = Sum(39)1…12 /12= | 138.38 | (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.26	1.26	1.26	1.25	1.24	1.24	1.24	1.24	1.25	1.25	1.25	1.26

Average = Sum(40)1…12 /12= | 1.25 | (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N | 2.8185 | (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 | 101.1393 | (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

(44)m=	111.25	107.21	103.16	99.12	95.07	91.03	91.03	95.07	99.12	103.16	107.21	111.25

Total = Sum(44)1…12 = | 1213.6716 | (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)

(45)m=	165.38	144.64	149.26	130.13	124.86	107.74	99.84	114.57	115.94	135.11	147.49	160.16

Total = Sum(45)1…12 = | 1595.1219 | (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	24.81	21.7	22.39	19.52	18.73	16.16	14.98	17.19	17.39	20.27	22.12	24.02	(46)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): | 0 | (47)

Temperature factor from Table 2b | 0 | (48)

Energy lost from water storage, kWh/year (47) x (48) = | 0 | (49)

If manufacturer's declared cylinder loss factor is not known:

Cylinder volume (litres) including any solar storage within same | 0 | (50)

If community heating and no tank in dwelling, enter 110 litres in box (50)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)

Hot water storage loss factor from Table 2 (kWh/litre/day) | 0 | (51)

Volume factor from Table 2a | 0 | (52)

Temperature factor from Table 2b | 0 | (53)

Energy lost from water storage, kWh/year ((50) x (51) x (52) x (53) = | 0 | (54)

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Enter (49) or (54) in (55) | 0 | (55)

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	46.03	50.96	48.88	48.45	44.89	46.39	48.45	48.88	50.96	49.32	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	216.34	190.67	200.22	179.01	173.31	152.63	146.23	163.02	164.82	186.07	196.8	211.12	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	216.34	190.67	200.22	179.01	173.31	152.63	146.23	163.02	164.82	186.07	196.8	211.12

Output from water heater (annual)$_{1...12}$ | 2180.2277 | (64)

Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]

(65)m=	67.73	59.6	62.37	55.49	53.63	47.05	44.79	50.21	50.77	57.67	61.37	65.99	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	60.72	53.93	43.86	33.2	24.82	20.95	22.64	29.43	39.5	50.16	58.54	62.41	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	406.63	410.85	400.22	377.58	349.01	322.15	304.21	299.99	310.62	333.26	361.83	388.69	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	(69)

Pumps and fans gains (Table 5a)

(70)m=	10	10	10	10	10	10	10	10	10	10	10	10	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	(71)

Water heating gains (Table 5)

(72)m=	91.03	88.69	83.83	77.07	72.08	65.34	60.21	67.48	70.51	77.51	85.23	88.7	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	679.49	674.57	649.01	608.95	567.01	529.55	508.16	518	541.74	582.02	626.71	660.9	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	1	x	1.55	x	10.73	x	0.63	x	0.7	=	6.6	(74)
North	0.9x	1	x	4.58	x	10.73	x	0.63	x	0.7	=	19.5	(74)
North	0.9x	1	x	1.55	x	20.36	x	0.63	x	0.7	=	12.52	(74)
North	0.9x	1	x	4.58	x	20.36	x	0.63	x	0.7	=	37.01	(74)
North	0.9x	1	x	1.55	x	33.31	x	0.63	x	0.7	=	20.49	(74)
North	0.9x	1	x	4.58	x	33.31	x	0.63	x	0.7	=	60.55	(74)
North	0.9x	1	x	1.55	x	54.64	x	0.63	x	0.7	=	33.61	(74)
North	0.9x	1	x	4.58	x	54.64	x	0.63	x	0.7	=	99.32	(74)
North	0.9x	1	x	1.55	x	75.22	x	0.63	x	0.7	=	46.27	(74)
North	0.9x	1	x	4.58	x	75.22	x	0.63	x	0.7	=	136.73	(74)
North	0.9x	1	x	1.55	x	84.09	x	0.63	x	0.7	=	51.73	(74)
North	0.9x	1	x	4.58	x	84.09	x	0.63	x	0.7	=	152.86	(74)
North	0.9x	1	x	1.55	x	79.12	x	0.63	x	0.7	=	48.67	(74)
North	0.9x	1	x	4.58	x	79.12	x	0.63	x	0.7	=	143.82	(74)
North	0.9x	1	x	1.55	x	61.56	x	0.63	x	0.7	=	37.87	(74)
North	0.9x	1	x	4.58	x	61.56	x	0.63	x	0.7	=	111.91	(74)
North	0.9x	1	x	1.55	x	41.09	x	0.63	x	0.7	=	25.28	(74)
North	0.9x	1	x	4.58	x	41.09	x	0.63	x	0.7	=	74.68	(74)
North	0.9x	1	x	1.55	x	24.81	x	0.63	x	0.7	=	15.27	(74)
North	0.9x	1	x	4.58	x	24.81	x	0.63	x	0.7	=	45.11	(74)
North	0.9x	1	x	1.55	x	13.22	x	0.63	x	0.7	=	8.13	(74)
North	0.9x	1	x	4.58	x	13.22	x	0.63	x	0.7	=	24.03	(74)
North	0.9x	1	x	1.55	x	8.94	x	0.63	x	0.7	=	5.5	(74)
North	0.9x	1	x	4.58	x	8.94	x	0.63	x	0.7	=	16.26	(74)
South	0.9x	1	x	3.04	x	47.32	x	0.63	x	0.7	=	57.1	(78)
South	0.9x	1	x	3.04	x	47.32	x	0.63	x	0.7	=	57.1	(78)
South	0.9x	1	x	3.04	x	47.32	x	0.63	x	0.7	=	57.1	(78)
South	0.9x	1	x	3.04	x	47.32	x	0.63	x	0.7	=	57.1	(78)
South	0.9x	1	x	3.04	x	77.18	x	0.63	x	0.7	=	93.13	(78)
South	0.9x	1	x	3.04	x	77.18	x	0.63	x	0.7	=	93.13	(78)
South	0.9x	1	x	3.04	x	77.18	x	0.63	x	0.7	=	93.13	(78)
South	0.9x	1	x	3.04	x	77.18	x	0.63	x	0.7	=	93.13	(78)
South	0.9x	1	x	3.04	x	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x	3.04	x	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x	3.04	x	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x	3.04	x	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x	3.04	x	105.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x	3.04	x	105.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x	3.04	x	105.11	x	0.63	x	0.7	=	126.83	(78)

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South	0.9x	1	x	3.04	x	105.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x	3.04	x	108.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x	3.04	x	108.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x	3.04	x	108.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x	3.04	x	108.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x	3.04	x	108.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x	3.04	x	108.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x	3.04	x	108.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x	3.04	x	108.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x	3.04	x	107.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x	3.04	x	107.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x	3.04	x	107.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x	3.04	x	107.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x	3.04	x	103.88	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	1	x	3.04	x	103.88	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	1	x	3.04	x	103.88	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	1	x	3.04	x	103.88	x	0.63	x	0.7	=	125.34	(78)
South	0.9x	1	x	3.04	x	99.99	x	0.63	x	0.7	=	120.65	(78)
South	0.9x	1	x	3.04	x	99.99	x	0.63	x	0.7	=	120.65	(78)
South	0.9x	1	x	3.04	x	99.99	x	0.63	x	0.7	=	120.65	(78)
South	0.9x	1	x	3.04	x	99.99	x	0.63	x	0.7	=	120.65	(78)
South	0.9x	1	x	3.04	x	85.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x	3.04	x	85.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x	3.04	x	85.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x	3.04	x	85.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x	3.04	x	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x	3.04	x	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x	3.04	x	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x	3.04	x	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x	3.04	x	40.89	x	0.63	x	0.7	=	49.34	(78)
South	0.9x	1	x	3.04	x	40.89	x	0.63	x	0.7	=	49.34	(78)
South	0.9x	1	x	3.04	x	40.89	x	0.63	x	0.7	=	49.34	(78)
South	0.9x	1	x	3.04	x	40.89	x	0.63	x	0.7	=	49.34	(78)
West	0.9x	1	x	1.55	x	19.87	x	0.63	x	0.7	=	12.23	(80)
West	0.9x	1	x	0.65	x	19.87	x	0.63	x	0.7	=	5.13	(80)
West	0.9x	1	x	1.55	x	38.52	x	0.63	x	0.7	=	23.7	(80)
West	0.9x	1	x	0.65	x	38.52	x	0.63	x	0.7	=	9.94	(80)
West	0.9x	1	x	1.55	x	61.57	x	0.63	x	0.7	=	37.87	(80)
West	0.9x	1	x	0.65	x	61.57	x	0.63	x	0.7	=	15.88	(80)
West	0.9x	1	x	1.55	x	91.41	x	0.63	x	0.7	=	56.23	(80)
West	0.9x	1	x	0.65	x	91.41	x	0.63	x	0.7	=	23.58	(80)

West	0.9x	1	x	1.55	x	111.22	x	0.63	x	0.7	=	68.42	(80)
West	0.9x	1	x	0.65	x	111.22	x	0.63	x	0.7	=	28.69	(80)
West	0.9x	1	x	1.55	x	116.05	x	0.63	x	0.7	=	71.39	(80)
West	0.9x	1	x	0.65	x	116.05	x	0.63	x	0.7	=	29.94	(80)
West	0.9x	1	x	1.55	x	112.64	x	0.63	x	0.7	=	69.3	(80)
West	0.9x	1	x	0.65	x	112.64	x	0.63	x	0.7	=	29.06	(80)
West	0.9x	1	x	1.55	x	98.03	x	0.63	x	0.7	=	60.31	(80)
West	0.9x	1	x	0.65	x	98.03	x	0.63	x	0.7	=	25.29	(80)
West	0.9x	1	x	1.55	x	73.6	x	0.63	x	0.7	=	45.28	(80)
West	0.9x	1	x	0.65	x	73.6	x	0.63	x	0.7	=	18.99	(80)
West	0.9x	1	x	1.55	x	46.91	x	0.63	x	0.7	=	28.86	(80)
West	0.9x	1	x	0.65	x	46.91	x	0.63	x	0.7	=	12.1	(80)
West	0.9x	1	x	1.55	x	24.71	x	0.63	x	0.7	=	15.2	(80)
West	0.9x	1	x	0.65	x	24.71	x	0.63	x	0.7	=	6.37	(80)
West	0.9x	1	x	1.55	x	16.39	x	0.63	x	0.7	=	10.08	(80)
West	0.9x	1	x	0.65	x	16.39	x	0.63	x	0.7	=	4.23	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	271.85	455.68	589.66	720.07	804.01	831.5	807.93	736.76	646.82	512.98	324.34	233.43	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	951.33	1130.25	1238.66	1329.02	1371.02	1361.05	1316.09	1254.76	1188.55	1095	951.05	894.32	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.91	0.8	0.61	0.42	0.44	0.71	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.86	20.07	20.34	20.59	20.84	20.96	21	20.99	20.93	20.66	20.16	19.87	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.87	19.88	19.88	19.88	19.89	19.89	19.89	19.89	19.89	19.88	19.88	19.88	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.97	0.94	0.88	0.74	0.52	0.31	0.33	0.62	0.88	0.98	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.4	18.69	19.08	19.42	19.74	19.87	19.89	19.89	19.84	19.52	18.83	18.41	(90)

fLA = Living area ÷ (4) = 0.26 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.78	19.04	19.4	19.72	20.03	20.15	20.17	20.17	20.12	19.81	19.17	18.79	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.78	19.04	19.4	19.72	20.03	20.15	20.17	20.17	20.12	19.81	19.17	18.79	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Utilisation factor for gains, hm:

(94)m=	0.98	0.97	0.93	0.88	0.74	0.54	0.34	0.36	0.64	0.87	0.97	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	935.38	1091.87	1155.81	1164.43	1020.49	740.23	447.37	446.9	756.72	956.53	921.86	881.13	(95)

Monthly average external temperature from Table 8

(96)m=	4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1996.63	1956.54	1755.49	1524.78	1146.61	762.77	449.2	449.13	802.47	1246.61	1689.51	1934.69	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	789.57	581.06	446.16	259.46	93.83	0	0	0	0	215.82	552.71	783.85

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3722.47 (98)

Space heating requirement in kWh/m²/year 33.65 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0	(201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1	(202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1	(204)
Efficiency of main space heating system 1		90.7	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	789.57	581.06	446.16	259.46	93.83	0	0	0	0	215.82	552.71	783.85		
(211)m = {[(98)m x (204)] + (210)m } x 100 ÷ (206)														(211)
	870.53	640.64	491.91	286.06	103.45	0	0	0	0	237.95	609.38	864.23		
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													4104.15	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] + (214) m } x 100 ÷ (208)														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
Total (kWh/year) =Sum(215)$_{1...5,10....12}$=													0	(215)

Water heating

Output from water heater (calculated above)														
	216.34	190.67	200.22	179.01	173.31	152.63	146.23	163.02	164.82	186.07	196.8	211.12		
Efficiency of water heater													80.6	(216)
(217)m=	88.32	87.98	87.31	86.29	83.88	80.6	80.6	80.6	80.6	85.73	87.81	88.35		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	244.95	216.73	229.31	207.46	206.61	189.37	181.42	202.25	204.49	217.05	224.12	238.96		
Total = Sum(219a)$_{1...12}$ =													2562.73	(219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		4104.15
Water heating fuel used		2562.73
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

central heating pump:		130		(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		175	(231)
Electricity for lighting			428.94	(232)
Electricity generated by PVs			-1287.6	(233)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.1	x 0.01 =	127.2288	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	0	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.1	x 0.01 =	79.44	(247)
Pumps, fans and electric keep-hot	(231)	11.46	x 0.01 =	20.06	(249)

(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a

Energy for lighting	(232)	11.46	x 0.01 =	49.16	(250)
Additional standing charges (Table 12)				106	(251)
	one of (233) to (235) x)	11.46	x 0.01 =	-147.56	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)…(254) =	234.3254	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.47	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	0.7077	(257)
SAP rating (Section 12)		90.1275	(258)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh		**Emissions** kg CO2/year	
Space heating (main system 1)	(211) x	0.198	=	812.62	(261)
Space heating (secondary)	(215) x	0	=	0	(263)
Water heating	(219) x	0.198	=	507.42	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1320.04	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.517	=	90.48	(267)
Electricity for lighting	(232) x	0.517	=	221.76	(268)
Energy saving/generation technologies Item 1		0.529	=	-681.14	(269)
Total CO2, kg/year		sum of (265)…(271) =		951.14	(272)
CO2 emissions per m²		(272) ÷ (4) =		8.6	(273)

SAP WorkSheet: New dwelling design stage

EI rating (section 14)				92	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	1.02	=	4186.24	(261)
Space heating (secondary)	(215) x	0	=	0	(263)
Energy for water heating	(219) x	1.02	=	2613.98	(264)
Space and water heating	(261) + (262) + (263) + (264) =			6800.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	2.92	=	511	(267)
Electricity for lighting	(232) x	0	=	1252.49	(268)
Energy saving/generation technologies					
Item 1		2.92	=	-3759.79	(269)
'Total Primary Energy		sum of (265)…(271) =		4803.92	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		43.43	(273)

Block Compliance WorkSheet: Block a

User Details

Assessor Name:	Andrew Simpson	**Stroma Number:**	STRO005087
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.5.0.55

Calculation Details

Dwelling	DER	TER	TFA
Flat 1	13.65	20.05	69.63
Flat 2	11.91	17.53	54.26
Flat 3	10.94	16.6	110.62

Calculation Summary

Total Floor Area	234.51
Average TER	17.84
Average DER	11.97
Compliance % Improvement	Pass 32.9

Code for Sustainable Homes
Technical Guide November 2010 - Full Technical Guide
Pre-Assessment Report

Report Reference:	
Site Registration:	
Site Name:	**28 Greville Street**
Assessor Number:	**STRO005087**
Company:	**Premier Assessors**
Assessor:	**Andrew Simpson**

Site Details	
Site Name:	28 Greville Street
Site Registration:	
Site Address:	Greville Street
City/Town:	Hillingdon
County:	Greater London
Postcode:	EC1N 8SU
No. of Dwellings:	3
No. of Dwelling Types:	1
Planning Authority:	Camden Council
Funding Body:	

Assessor Details	
Company:	Premier Assessors
Assessor Name:	Andrew Simpson
Cert Number:	STRO005087
Address:	24 Carriage Mews
City/Town:	Canterbury
County:	Kent
Postcode:	CT2 8AL
Tel:	01227 781335
Email:	premierassessors@gmail.com

Client Details	
Company:	M & R Aisenthal & E * D SHEMTOV t/as Palmos Junior
Contact Name:	M & R Aisenthal & E * D SHEMTOV t/as Palmos Junior
Job Title:	Client
Email:	
Tel:	
Address:	
City/Town:	
County:	
Postcode:	

Architect Details	
Company:	Homes Design Ltd
Contact Name:	Ross Lakani
Job Title:	Architect
Email:	rlakani@homesdesignltd.co.uk
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Address:	62 Bellamy Drive
City/Town:	Stanmore
County:	Middlesex
Postcode:	HA7 2DA

Developer Details	
Company:	M & R Aisenthal & E * D SHEMTOV t/as Palmos Junior
Contact Name:	M & R Aisenthal & E * D SHEMTOV t/as Palmos Junior
Job Title:	Developer
Email:	
Tel:	
Address:	
City/Town:	
County:	
Postcode:	

Dwelling ID	Plot No.	Address	Social Unit
1	1	Flat 1 28 Greville Street	No
2	2	Flat 2 Greville Street	No
3	3	Flat 3 Greville Street	No

Development Summary & Ratings

Dwelling ID	Dwelling Type	Description	Level	Score
1	Type 1		4	68.76
2	Type 1		4	68.76
3	Type 1		4	68.76

Deviations from Standard
No deviations from standard

Score Sheet for 28 Greville Street

	ENE									WAT		MAT			SUR		WAS			POL		HEA				MAN				ECO					Summary	
Dwelling ID	1	2	3	4	5	6	7	8	9	1	2	1	2	3	1	2	1	2	3	1	2	1	2	3	4	1	2	3	4	1	2	3	4	5	Score	Level
1	3.9	3.9	2	1	2	2	2	0	1	3	1	10	0	0	0	2	4	3	1	1	3	2	4	0	4	3	1	2	2	1	1	1	2	1	68.76	4
2	3.9	3.9	2	1	2	2	2	0	1	3	1	10	0	0	0	2	4	3	1	1	3	2	4	0	4	3	1	2	2	1	1	1	2	1	68.76	4
3	3.9	3.9	2	1	2	2	2	0	1	3	1	10	0	0	0	2	4	3	1	1	3	2	4	0	4	3	1	2	2	1	1	1	2	1	68.76	4

Summary Score Sheet
Dwelling Type: Type 1

Dwelling IDs: 1 to 3

	Credit Score	Credits Available	Score Assessment Sub Total	Credits Available	%	Weighting Factor	Points Score
Energy & CO2 Emissions							
ENE 1 Dwelling Emission Rate	3.9	10	17.8	31	57.42	36.4	20.9
ENE 2 Fabric Energy Efficiency	3.9	9					
ENE 3 Energy Display Device	2	2					
ENE 4 Drying Space	1	1					
ENE 5 Energy Labelled White Goods	2	2					
ENE 6 External Lighting	2	2					
ENE 7 Low or Zero Carbon Energy Technologies	2	2					
ENE 8 Cycle Storage	0	2					
ENE 9 Home Office	1	1					
Water							
WAT 1 Internal Water Use	3	5	4	6	66.67	9	6
WAT 2 External Water Use	1	1					
Materials							
MAT 1 Environmental Impact of Materials	10	15	10	24	41.67	7.2	3
MAT 2 Responsible Sourcing (Basic Building Elements)	0	6					
MAT 3 Responsible Sourcing (Finishing Elements)	0	3					
Surface Water Run-off							
SUR 1 Management of Surface Water Run-Off from Site	0	2	2	4	50	2.2	1.1
SUR 2 Flood Risk	2	2					
Waste							
WAS 1 Household Waste Storage and Recycling Facilities	4	4	8	8	100	6.4	6.4
WAS 2 Construction Site Waste Management	3	3					
WAS 3 Composting	1	1					
Pollution							
POL 1 Global Warming Potential of Insulants	1	1	4	4	100	2.8	2.8
POL 2 NOx Emissions	3	3					
Health & Wellbeing							
HEA 1 Daylighting	2	3	10	12	83.33	14	11.67
HEA 2 Sound Insulation	4	4					
HEA 3 Private Space	0	1					
HEA 4 Lifetime Homes	4	4					
Management							
MAN 1 Home User Guide	3	3	8	9	88.89	10	8.89
MAN 2 Considerate Constructors Scheme	1	2					
MAN 3 Construction Site Impacts	2	2					
MAN 4 Security	2	2					
Ecology							
ECO 1 Ecological Value of Site	1	1	6	9	66.67	12	8
ECO 2 Ecological Enhancement	1	1					
ECO 3 Protection of Ecological Features	1	1					
ECO 4 Change of Ecological Value of Site	2	4					
ECO 5 Building Footprint	1	2					
	Level Achieved: 4		Total Points Scored: 68.76				

Evidence for ENE 1 (Dwelling Emission Rate) - Type 1
3.9 credits allocated
Assumptions for ENE 1

Evidence for ENE 2 (Fabric Energy Efficiency) - Type 1
Apartment Detached 3.9 credits allocated
ENERGY/ENE2/ Code for sustainable Homes Report & FEEs report
Assumptions for ENE 2

Evidence for ENE 3 (Energy Display Device) - Type 1
Correctly specified display device showing current primary heating fuel consumption data. Correctly specified display device showing current consumption data.
ENERGY/ENE3/ Letter of Intent
Assumptions for ENE 3

Evidence for ENE 4 (Drying Space) - Type 1
Compliant internal drying space
ENERGY/ENE4/ Letter of Intent
Assumptions for ENE 4

Evidence for ENE 5 (Energy Labelled White Goods) - Type 1
A+ rated fridge & freezers or fridge/freezer A rated washing machine and dishwasher, AND EITHER a tumble dryer (a washer-dryer would be an acceptable alternative to a standalone tumble dryer) with a B rating or where a tumble dryer is not provided, the EU Energy Efficiency Labelling Scheme Information will be provided.
ENERGY/ENE5/ Letter of Intent & EU Energy Efficiency Labelling Scheme Leaflet
Assumptions for ENE 5

Evidence for ENE 6 (External Lighting) - Type 1
Complaint space lighting, no security lighting installed
ENERGY/ENE6/ Letter of Intent
Assumptions for ENE 6

Evidence for ENE 7 (Low or Zero Carbon Energy Technologies) - Type 1
Contribution of low or zero carbon technologies greater than or equal to 15%
Assumptions for ENE 7

Evidence for ENE 8 (Cycle Storage) - Type 1
Credit(s) not sought or no compliant cycle storage
ENERGY/ENE8/ Letter of Intent
Assumptions for ENE 8

Evidence for ENE 9 (Home Office) - Type 1
Compliant home office
ENERGY/ENE9/ Letter of Intent Signing off daylighting

Assumptions for ENE 9

Evidence for WAT 1 (Internal Water Use) - Type 1
Internal water use less than or equal to 105 litres per person per day
WATER/WAT1/ Letter of Intent & Water Report
Assumptions for WAT 1

Evidence for WAT 2 (External Water Use) - Type 1
No individual garden space
WATER/WAT2/letter of intent
Assumptions for WAT 2

Evidence for MAT 1 (Environmental Impact of Materials) - Type 1
Mandatory requirements met: At least 3 elements rated A+ to D, 10 credits scored
MATERIALS/MAT1/Letter of intent & Construction methods of each element and green guide scores
Assumptions for MAT 1

Evidence for MAT 2 (Responsible Sourcing (Basic Building Elements)) - Type 1
Zero credits or credits not sought
Assumptions for MAT 2

Evidence for MAT 3 (Responsible Sourcing (Finishing Elements)) - Type 1
Zero credits or credits not sought
Assumptions for MAT 3

Evidence for SUR 1 (Management of Surface Water Run-Off from Site) - Type 1
Mandatory Met: Peak rate of run-off and annual volume of run-off is no greater for the developed than for the pre-development. The system has also been designed for local drainage system failure. Credits not sought, water quality criteria not met/sought.
SURFACE WATER RUN-OFF/SUR1/SUR1 report & Flood Risk Assessment & SUR1 Summary Report template
Assumptions for SUR 1

Evidence for SUR 2 (Flood Risk) - Type 1
Low flood risk - zone 1
SURFACE WATER RUN-OFF/SUR1/SUR1 report and Flood Risk Assessment & SUR1 Summary Report template
Assumptions for SUR 2

Evidence for WAS 1 (Household Waste Storage and Recycling Facilities) - Type 1
Mandatory requirements met: Adequate storage of household waste with accessibility in line with checklist WAS 1. Local authority collection: After collection sorting with appropriate internal storage of recyclable materials
WASTE/WAS1/Letter of Intent & Recycling information & Plan showing space for recycling & Checklist IDP
Assumptions for WAS 1

Evidence for WAS 2 (Construction Site Waste Management) - Type 1
Compliant site waste management plan containing benchmarks, procedures and commitments for the minimizing and diverting 80% waste from landfill in line with the criteria and with Checklist WAS 2a, 2b & 2c
WASTE/WAS2/letter of Intent & Site Waste Management Plan
Assumptions for WAS 2

Evidence for WAS 3 (Composting) - Type 1
Individual compositing facility/facilities Local authority kitchen waste collection scheme - No Garden
WASTE/WAS3/Letter of Intent & Checklist IDP
Assumptions for WAS 3

Evidence for POL 1 (Global Warming Potential of Insulants) - Type 1
All insulants have a GWP of less than 5
POLLUTION/POL1/letter of intent
Assumptions for POL 1

Evidence for POL 2 (NOx Emissions) - Type 1
NOx emissions less than or equal to 40mg/kWh
POLLUTION/POL2/letter of intent
Assumptions for POL 2

Evidence for HEA 1 (Daylighting) - Type 1
Kitchen: Average daylight factor of at least 2% Living room: Average daylight factor of at least 1.5% Dining room: Average daylight factor of at least 1.5% Home office: Average daylight factor of at least 1.5%
HEALTH & WELLBEING/HEA1/Plans showing site plan & elevations - see Master Documents Folder & Calculator tool completed
Assumptions for HEA 1

Evidence for HEA 2 (Sound Insulation) - Type 1
Robust details have been incorporated Airborne 8dB higher, impact 8dB lower
HEALTH & WELLBEING/HEA2/4 credits by default
Assumptions for HEA 2

Evidence for HEA 3 (Private Space) - Type 1
Credit not sought or no compliant space provided
HEALTH & WELLBEING/HEA3/letter of Intent & Checklist IDP & Plans showing private space
Assumptions for HEA 3

Evidence for HEA 4 (Lifetime Homes) - Type 1
All criteria of Lifetime Homes in line with all 16 principals of Lifetime Homes
HEALTH & WELLBEING/HEA4/ Letter of Intent & HEA4 Checklist
Assumptions for HEA 4

Evidence for MAN 1 (Home User Guide) - Type 1
All criteria inline with checklist MAN 1 Part 1 - Operational Issues will be met All criteria inline with checklist MAN 1 Part 2 - Site and Surroundings will be met
MANAGEMENT/MAN1/letter of Intent & Checklist MAN1 completed
Assumptions for MAN 1

Evidence for MAN 2 (Considerate Constructors Scheme) - Type 1
Considerate constructors scheme: Best practise only, a score of between 25 - 34, and at least a score of 5 in each section*
Assumptions for MAN 2

Evidence for MAN 3 (Construction Site Impacts) - Type 1
Monitor, report and set targets for water consumption from site activities Adopt best practise policies in respects to air (dust) pollution from site activities Adopt best practise policies in respects to water (ground and surface) pollution 80% of timer reclaimed, re-used or responsibly sourced
MANAGEMENT/ MAN3/Letter of Intent & Checklist MAN3 completed
Assumptions for MAN 3

Evidence for MAN 4 (Security) - Type 1
Secured by design section 1 & 2 compliant
MANAGEMENT/MAN4/Letter of Intent
Assumptions for MAN 4

Evidence for ECO 1 (Ecological Value of Site) - Type 1
Land of low ecological value, achieved through checklist ECO 1. Development site has been identified as low ecological value by a suitably qualified ecologist
ECOLOGY/ECO1/ECO1 Checklist
Assumptions for ECO 1

Evidence for ECO 2 (Ecological Enhancement) - Type 1
Key recommendations and 30% additional recommendations by a suitably qualified ecologist
Assumptions for ECO 2

Evidence for ECO 3 (Protection of Ecological Features) - Type 1
Land of low ecological value as identified under ECO 1
ECOLOGY/ECO3/ECO1 Checklist
Assumptions for ECO 3

Evidence for ECO 4 (Change of Ecological Value of Site) - Type 1
Neutral: Greater than -3 and less than or equal to +3
Assumptions for ECO 4

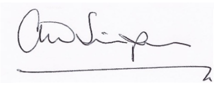
Evidence for ECO 5 (Building Footprint) - Type 1
Flats ratio of 3:1
Assumptions for ECO 5

Assessor Declaration

I Andrew Simpson, can confirm that I have compiled this report to the best of my ability, I have based all findings on the information that is referenced within this report, and that this report is appropriate for the registered site.

To the best of my knowledge all the information contained within this report is correct and accurate. I have within my possession all the reference material that relates to this report, which is available for inspection by the client, the clients representative or Stroma Certification for Quality Assurance monitoring.

Signed:



Andrew Simpson
Premier Assessors
10 October 2013

Core 1.0.0.222

Information about Code for Sustainable Homes

The Code for Sustainable Homes (the Code) is an environmental assessment method for rating and certifying the performance of new homes. It is a national standard for use in the design and construction of new homes with a view to encouraging continuous improvement in sustainable home building. The Code is based on EcoHomes©.

It was launched in December 2006 with the publication of 'Code for Sustainable Homes: A stepchange in sustainable home building practice' (Communities and Local Government, 2006), and became operational in England from April 2007.

The Code for Sustainable Homes covers nine categories of sustainable design. Each category includes a number of environmental issues. Each issue is a source of impact on the environment which can be assessed against a performance target and awarded one or more credits. Performance targets are more demanding than the minimum standards needed to satisfy Building Regulations or other legislation. They represent good or best practice, are technically feasible, and can be delivered by the building industry. The issues and categories are as follows:

- Energy & CO_2 Emissions
  - Dwelling Emission Rate
  - Building Fabric
  - Internal Lighting
  - Drying Space
  - Energy Labelled White Goods
  - External Lighting
  - Low or Zero Carbon Technologies
  - Cycle Storage
  - Home Office
- Water
  - Internal Water Use
  - External Water Use
- Materials
  - Environmental Impact of Materials
  - Responsible Sourcing of Materials - Basic Building Elements
  - Responsible Sourcing of Materials - Finishing Elements
- Surface Water Run-off
  - Management of Surface Water Run-off from the Development
  - Flood Risk
- Waste
  - Storage of Non-Recyclable Waste and Recyclable Household Waste
  - Construction Site Waste Management
  - Composting
- Pollution
  - Global Warming Potential of Insulants
  - NOx Emissions

- Health & Wellbeing
    - Daylighting
    - Sound Insulation
    - Private Space
    - Lifetime Homes
- Management
    - Home User Guide
    - Considerate Constructors Scheme
    - Construction Site Impacts
    - Security
- Ecology
    - Ecological Value of Site
    - Ecological Enhancement
    - Protection of Ecological Features
    - Change in Ecological Value of Site
    - Building Footprint

The Code assigns one or more performance requirements (assessment criteria) to all of the above environmental issues. When each performance requirement is achieved a credit is awarded (with the exception of the four mandatory requirements which have no associated credits). The total number of credits available to a category is the sum of credits available for all the issues within it.

Mandatory minimum performance standards are set for some issues. For four of these, a single mandatory requirement is set which must be met, whatever Code level rating is sought. Credits are not awarded for these issues. Confirmation that the performance requirements are met for all four is a minimum entry requirement for achieving a level 1 rating. The four un-credited issues are:

- Environmental Impacts of Materials
- Management of Surface Water Run-off from Developments
- Storage of Non-Recyclable Waste and Recyclable Household Waste
- Construction Site Waste Management

If the mandatory minimum performance standard is met for the four un-credited issues, four further mandatory issues need to be considered. These are agreed to be such important issues that separate Government policies are being pursued to mitigate their effects. For two of these, credits are awarded for every level of achievement recognised within the Code, and minimum mandatory standards increase with increasing rating levels.

The two issues with increasing mandatory minimum standards are:

- Dwelling Emission Rate
- Indoor Water Use

For one issue a mandatory requirement at Level 5 or 6:

- Fabric Energy Efficiency

The final issue with a mandatory requirement for Level 6 of the Code is:

- Lifetime Homes

Further credits are available on a free-choice or tradable basis from other issues so that the developer may choose how to add performance credits (converted through weighting to percentage points) achieve the rating which they are aiming for.

The environmental impact categories within the Code are not of equal importance. Their relative value is conveyed by applying a consensus-based environmental weighting factor (see details below) to the sum of all the raw credit scores in a category, resulting in a score expressed as percentage points. The points for each category add up to 100.

The weighting factors used in the Code have been derived from extensive studies involving a wide range of stakeholders who were asked to rank (in order of importance) a range of environmental impacts. Stakeholders included international experts and industry representatives.

It is also important to note that achieving a high performance in one category of environmental impact can sometimes result in a lower level of performance for another. For instance, if biomass is used to meet heating demands, credits will be available for performance in respect of energy supplied from a renewable source, but credits cannot be awarded for low NOX emission. It is therefore impossible to achieve a total percentage points score of 100.

The Code uses a rating system of one to six stars. A star is awarded for each level achieved. Where an assessment has taken place by where no rating is achieved, the certificate states that zero stars have been awarded:

Code Levels	Total Points Score (Equal to or Greater Than)
Level 1 ★☆☆☆☆☆	**36 Points**
Level 2 ★★☆☆☆☆	**48 Points**
Level 3 ★★★☆☆☆	**57 Points**
Level 4 ★★★★☆☆	**68 Points**
Level 5 ★★★★★☆	**84 Points**
Level 6 ★★★★★★	**90 Points**

Formal assessment of dwellings using the Code for Sustainable Homes may only be carried out using Certified assessors, who are qualified ‘competent persons’ for the purpose of carrying out Code assessments.

Energy & CO2 Emissions
ENE 1: Dwelling Emission Rate **Available Credits:**10 **Aim:**To limit CO_2 emissions arising from the operation of a dwelling and its services in line with current policy on the future direction of regulations.
ENE 2: Fabric Energy Efficiency **Available Credits:**9 **Aim:**To improve fabric energy efficiency performance thus future-proofing reductions in CO_2 for the life of the dwelling.
ENE 3: Energy Display Device **Available Credits:**2 **Aim:**To promote the specification of equipment to display energy consumption data, thus empowering dwelling occupants to reduce energy use.
ENE 4: Drying Space **Available Credits:**1 **Aim:**To promote a reduced energy means of drying clothes.
ENE 5: Energy Labelled White Goods **Available Credits:**2 **Aim:**To promote the provision or purchase of energy efficient white goods, thus reducing the CO_2 emissions from appliance use in the dwelling.
ENE 6: External Lighting **Available Credits:**2 **Aim:**To promote the provision of energy efficient external lighting, thus reducing CO_2 emissions associated with the dwelling.
ENE 7: Low or Zero Carbon Technologies **Available Credits:**2 **Aim:**To limit CO_2 emissions and running costs arising from the operation of a dwelling and its services by encouraging the specification of low and zero carbon energy sources to supply a significant proportion of energy demand.
ENE 8: Cycle Storage **Available Credits:**2 **Aim:**To promote the wider use of bicycles as transport by providing adequate and secure cycle storage facilities, thus reducing the need for short car journeys and the associated CO_2 emissions.
ENE 9: Home Office **Available Credits:**1 **Aim:**To promote working from home by providing occupants with the necessary space and services thus reducing the need to commute.

Water
WAT 1: Indoor Water Use **Available Credits:**5 **Aim:**To reduce the consumption of potable water in the home from all sources, including borehole well water, through the use of water efficient fittings, appliances and water recycling systems.
WAT 2: External Water Use **Available Credits:**1 **Aim:**To promote the recycling of rainwater and reduce the amount of mains potable water used for external water uses.

Materials
MAT 1: Environmental Impact of Materials **Available Credits:**15 **Aim:**To specify materials with lower environmental impacts over their life-cycle.
MAT 2: Responsible Sourcing of Materials - Basic Building Elements **Available Credits:**6 **Aim:**To promote the specification of responsibly sourced materials for the basic building elements.
MAT 3: Responsible Sourcing of Materials - Finishing Elements **Available Credits:**3 **Aim:**To promote the specification of responsibly sourced materials for the finishing elements.

Surface Water Run-off
SUR 1: Management of Surface Water Run-off from developments **Available Credits:**2 **Aim:**To design surface water drainage for housing developments which avoid, reduce and delay the discharge of rainfall run-off to watercourses and public sewers using SuDS techniques. This will protect receiving waters from pollution and minimise the risk of flooding and other environmental damage in watercourses.
SUR 2: Flood Risk **Available Credits:**2 **Aim:**To promote housing development in low flood risk areas, or to take measures to reduce the impact of flooding on houses built in areas with a medium or high risk of flooding.

Waste
WAS 1: Storage of non-recyclable waste and recyclable household waste **Available Credits:**4 **Aim:**To promote resource efficiency via the effective and appropriate management of construction site waste.
WAS 2: Construction Site Waste Management **Available Credits:**3 **Aim:**To promote resource efficiency via the effective and appropriate management of construction site waste.
WAS 3: Composting **Available Credits:**1 **Aim:**To promote the provision of compost facilities to reduce the amount of household waste send to landfill.

Pollution
POL 1: Global Warming Potential of Insulants **Available Credits:**1 **Aim:**To promote the reduction of emissions of gases with high GWP associated with the manufacture, installation, use and disposal of foamed thermal and acoustic insulating materials.
POL 2:NOx Emissions **Available Credits:**3 **Aim:**To promote the reduction of nitrogen oxide (NOX) emissions into the atmosphere.

Health & Wellbeing
HEA 1: Daylighting **Available Credits:**3 **Aim:**To promote good daylighting and thereby improve quality of life and reduce the need for energy to light the home.
HEA 2: Sound Insulation **Available Credits:**4 **Aim:**To promote the provision of improved sound insulation to reduce the likelihood of noise complaints from neighbours.
HEA 3: Private Space **Available Credits:**1 **Aim:**To improve quality of life by promoting the provision of an inclusive outdoor space which is at least partially private.
HEA 4: Lifetime Homes **Available Credits:**4 **Aim:**To encourage the construction of homes that are accessible and easily adaptable to meet the changing needs of current and future occupants.

Management
MAN 1: Home User Guide **Available Credits:**3 **Aim:**To promote the provision of guidance enabling occupants to understand and operate their home efficiently and make the best use of local facilities.
MAN 2: Considerate Constructors Scheme **Available Credits:**3 **Aim:**To promote the environmentally and socially considerate, and accountable management of construction sites.
MAN 3: Construction Site Impacts **Available Credits:**2 **Aim:**To promote construction sites managed in a manner that mitigates environmental impacts.
MAN 4: Security **Available Credits:**2 **Aim:**To promote the design of developments where people feel safe and secure- where crime and disorder, or the fear of crime, does not undermine quality of life or community cohesion.

Ecology
ECO 1: Ecological value of site **Available Credits:**1 **Aim:**To promote development on land that already has a limited value to wildlife, and discourage the development of ecologically valuable sites.
ECO 2: Ecological enhancement **Available Credits:**1 **Aim:**To enhance the ecological value of a site.
ECO 3: Protection of ecological features **Available Credits:**1 **Aim:**To promote the protection of existing ecological features from substantial damage during the clearing of the site and the completion of construction works.
ECO 4: Change in ecological value of site **Available Credits:**4 **Aim:**To minimise reductions and promote an improvement in ecological value.
ECO 5: Building footprint **Available Credits:**2 **Aim:**To promote the most efficient use of a building’s footprint by ensuring that land and material use is optimised across the development.

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