Flat 4, 14 West Cottages, West End Lane, NW6

Energy Statement for Planning

Job No: 4187

Issued: December 2021

Issue: 1

Contents

Document Control

Originator	Checker
Sam Westover	Bernice Waterman
Date	Date
20.12.21	20.12.21
Signature	Signature

1.0 Executive Summary

1.1 T16 Design has been appointed to produce this Energy Statement for the proposed development at Flat 4, 14 West Cottages, NW6.

1.2 The report assesses the impact on CO2 emissions of introducing a ASHP which provides heating and cooling for the proposed extension of Flat 4. 14 West Cottages, NW6.

1.3 The methodology used to demonstrate the effects of the proposed energy efficiency measures is the 3-stage Energy Hierarchy expounded by the London Plan 2021, Policy Sl2 'Minimising greenhouse gas emissions'.

1.4 Emissions reductions are shown for the proposed scheme at each of these stages and the strategy underpinning them is detailed in the relevant sections of the report.

1.5 The overall effect of these measures is a reduction in CO_2 emissions of at least 35%.

2.0 Project Summary

2.1 The site is located at Flat 4, 14 West Cottages, NW6.

2.2 Currently the site is occupied by a two bedroom top floor flat.

2.3 The proposal involves the refurbishment and extension of the existing flat to provide a one bedroom flat.

2.4 The proposal also involves updating the heating and cooling system to provide an ASHP which will provide heating and cooling.

Site Location as Existing

3.0 Policy Requirements and Drivers

3.1 The relevant planning policy documents for this site, relating to energy are:

- The London Plan (2021)

3.2 The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for developments in London over the coming decades.

3.3 The primary driver for this report is Policy SI 2 - "Minimizing greenhouse emissions".

3.4 This policy sets out that residential and non-residential developments are required to reduce emissions by at least 35% over Building Regulations.

3.5 In light of these policy requirements and through the developer and design team's commitment to reducing the impact of the development on the environment, this report sets out some of the measures that will be adopted to meet the policy targets.

4.0 Overheating Hierarchy

4.1 London Plan Policy 5.9 'Overheating and Cooling' states that major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy.

1) minimise internal heat generation through energy efficient design.
2) reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls.
3) manage the heat within the building through exposed internal thermal mass and high ceilings.
4) passive ventilation.
5) mechanical ventilation.
6) active cooling systems (ensuring they are the lowest carbon options).

4.2 The building has been designed to be energy efficient and this has been addressed elsewhere in this energy statement and demonstrated in the calculations.

4.3 The building contains relatively high ceilings in accordance with stage 3 of the cooling hierarchy.

4.4 An initial SAP assessment has shown that there would be a medium risk of overheating.

4.5 To avoid being uncomfortable on the hottest days of the year it is proposed that an ASHP will be installed to provide cooling as well as heating.

5.0 Energy Strategy and Approach

5.1 The London Plan document titled "Energy Assessment Guidance", updated in October 2018, provides the parameters by which Energy Statements should be formulated and the approach to be adopted.

5.2 The three stages of the hierarchy are referred to as Be Lean (Use Less Energy), Be Clean (Supply Energy Efficiently) and Be Green (Use Renewable Energy).

5.3 Essentially, this means the first step is to improve insulation and air tightness levels and to reduce thermal bridging.

5.4 Stage 2 is to supply energy cleanly, meaning consideration of the use of district heating networks, biomass and Combined Heat and Power.

5.5 The third stage is the addition, where required and sensible, of renewable technology such as heat pumps, solar panels, wind and hydroelectric.

5.6 The first stage of this process is to establish the baseline emissions on which the reductions will be based.

5.7 This is done using SAP (Standard Assessment Procedure) for residential developments.

6.0 Baseline Emissions

6.1 The baseline emissions on which reduction figures are based are calculated using SAP.

6.2 SAP calculates a notional building based on the minimum values for Part L1B of the building regulations.

6.3 The parameters used are defined by the methodology and represent a target upon which improvements can be measured.

6.4 The baseline emission have been taken from the GLA carbon emissions reporting tool.

6.5 The baseline emissions are as follows:

Element	Annual Emissions SAP10 (Kg) per Year
Flat 4, 14 West Cottages	1,683

7.0 Be Lean Strategy

7.1 The next stage, once the baseline has been established, is to make improvements within the "Be Lean" category. This includes improving the U Values and the reduction of thermal bridging.

7.2 A gas combi boiler with a 90% efficiency has been assumed at this stage.

7.3 Passive ventilation has been assumed at this stage.

7.4 Accredited Construction Details have been assumed for the thermal bridging.

7.5 The U value improvements for each element, with the relevant Part L notional values are shown below.

7.6 The reduction in emissions achieved from these improvements can be seen in Section 9.

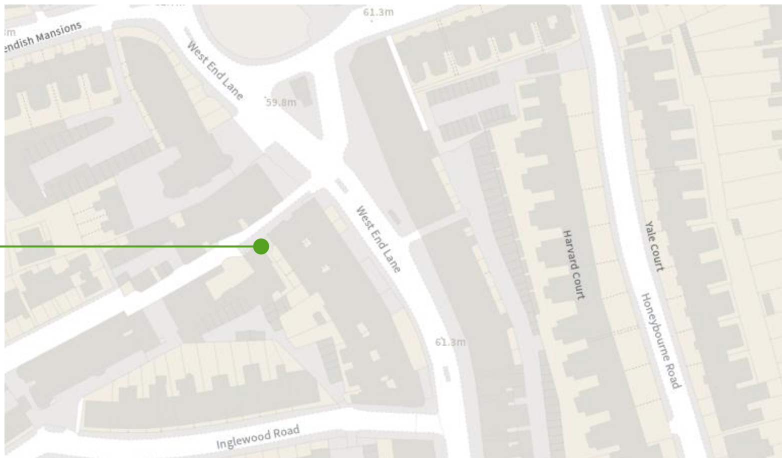
Element (Converted Units)	Value Used	Part L1B Backstop	Improvement
Existing wall	0.55 W/m²K	0.55 W/m²K	0%
New Walls	0.28 W/m²K	0.28 W/m²K	0%
Existing Roof	0.18 W m²K	0.18 W/m²K	0%
Proposed Roof	0.18 W m²K	0.18 W/m²K	0%
Windows	1.4 W/m²K	1.6 W/m²k	12.5%
Air Permeability	15	15	0%

8.0 Be Clean Strategy

8.1 The Be Clean element of the hierarchy refers to supplying energy in a clean manner. This encompasses decentralised energy and heat networks and the consideration of Combined Heat and Power.

8.2 The site is not near any existing or proposed decentralized energy or heating network (as shown on the map below).

Site Location



8.3 Due to the relatively small scale of the proposal, CHP is also not a viable solution. London Plan guidance suggests that CHP is most suitable for developments of at least 500 units.

9.0 Be Green Strategy

9.1 The Be Green element of the hierarchy requires the consideration of renewable technologies to reduce emissions still further beyond the savings made at the Be Lean and Be Clean stages.

9.2 The technologies that are considered here are wind power and solar panels (photovoltaic (PV) or Solar Thermal).

9.3 Wind power is not suitable in a location such as this. Wind turbines tend to perform poorly in built-up areas.

9.4 Any wind that is received on the site would be too intermittent and turbulent to provide any meaningful reduction in emissions.

9.5 Ground Source Heat pumps are also unlikely to be a viable proposition due to the ground disturbance required in their installation.

9.6 Air Source Heat Pumps (ASHP) that provides cooling will be used.

9.7 It is proposed that the ASHPs will have an efficiency of at least 170% and will provide heating, hot water and cooling to the development.

10.0 Summary of Results

10.1 The tables below give the percentage improvement in emissions at each stage of the hierarchy and the overall savings made over Part L of the Building Regulations.

10.2 The building will be provided with increased U values (as shown above) and ASHPs.

10.3 The figures below have been calculated using the GLA carbon emission reporting tool and show the total CO2 emissions expected under SAP 10 Carbon factors.

10.4 The SAP worksheets attached have been used for input data into the spreadsheet.

Flat 4, 14 West Cottages, NW6	Carbon Dioxide Emissions for non-domestic buildings (KG CO2 per annum)
	Regulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	1683
After energy demand reduction	1648
After heat network / CHP	1648
After renewable energy	773

Table 1 – SAP10 Emissions Flat 4, 14 West Cottages, NW6

	Regulated domestic carbon dioxide savings	
	(KG CO_2 per annum)	(%)
Savings from energy demand reduction	35	2%
Savings from heat network / CHP	0	0%
Savings from renewable energy	875	53%
Cumulative on site savings	**910**	**54%**

Table 2 – Carbon savings

11.0 Conclusion

11.1 This report has been set out to demonstrate how the proposed development at 196 High Street, Hounslow, will meet the policy requirement of achieving 35% reduction in emissions through the Be Lean, Be Clean, Be Green hierarchy.

11.2 In doing so, preliminary SAP calculations have been undertaken using the information available and sensible assumptions on construction and M&E parameters.

11.3 The baseline figures have been calculated and improvements made to the fabric and plant proposed for the scheme.

11.4 The measures proposed are detailed above but summarise as:

- Air Source Heat Pumps

11.5 The results in Section 10 show that a 54% improvement is met using the GLA's carbon emission reporting spreadsheet. This mean that the introduction of the ASHP to provide cooling, heating and hot water will be a benefit to the occupants ensuring that overheating will not be an issue in the hottest parts of the summer.

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Appendix A – SAP Worksheets

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 20 December 2021 at 14:42:33

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW EXTENSION TO EXISTING DWELLING Total Floor Area: 54.3m²

Site Reference : 4, 14 West Cottages **Plot Reference:** Flat 4 - Backstop

Address : , London, NW6 1RJ

Client Details:

Name:

Address :

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

1a TER and DER

Fuel for main heating system: Mains gas		
Fuel factor: 1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	22.36 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	33.31 kg/m²	**Fail**
Excess emissions = 10.95 kg/m² (49 %)		

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	64.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	109.0 kWh/m²	
		Fail
Excess energy = 44.86 kg/m² (69.9 %)		

2 Fabric U-values

Element	Average	Highest	
External wall	0.48 (max. 0.30)	0.55 (max. 0.70)	**Fail**
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	**OK**
Openings	1.60 (max. 2.00)	1.60 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	15.00	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 90.0 % SEDBUK2009 Minimum 88.0 %	**OK**
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	
		N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	No cylinder thermostat	
	No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	9.7m²	
Windows facing: North East	3.4m²	
Windows facing: North East	1.2m²	
Windows facing: South East	4m²	
Ventilation rate:	3.00	

10 Key features

None

SAP Input

Property Details: Flat 4 - Backstop

Address:	, London, NW6 1RJ
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	20 December 2021
Date of certificate:	20 December 2021
Assessment type:	New extension to existing dwelling
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	486

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2021	
Floor Location:	Floor area:	Storey height:
Floor 0	54.3 m²	2.8 m
Living area:	25.4 m² (fraction 0.468)	
Front of dwelling faces:	North West	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
NW	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NE	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NE Proposed	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
SE Proposed	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
NW	16mm or more	0.7	0.76	1.6	9.7	1
NE	16mm or more	0.7	0.76	1.6	3.4	1
NE Proposed	16mm or more	0.7	0.76	1.6	1.2	1
SE Proposed	16mm or more	0.7	0.76	1.6	4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
NW		Existing	North West	0	0
NE		Existing	North East	0	0
NE Proposed		Proposed	North East	0	0
SE Proposed		Proposed	South East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
<u>External Elements</u>							
Existing	62.44	13.1	49.34	0.55	0	False	N/A
Proposed	23.8	5.2	18.6	0.28	0	False	N/A
Flat	54.3	0	54.3	0.18	0		N/A
<u>Internal Elements</u>							
<u>Party Elements</u>							

Thermal bridges:

SAP Input

Thermal bridges:	No information on thermal bridging (y=0.15) (y =0.15)
Ventilation:	
Pressure test:	No (Assumed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	2
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	15
Main heating system:	
Main heating system:	Boiler systems with radiators or underfloor heating Gas boilers and oil boilers Fuel: mains gas Info Source: Manufacturer Declaration Manufacturer's data Efficiency: 90.0% (SEDBUK2009) Condensing combi with automatic ignition Fuel Burning Type: Unknown Systems with radiators Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes Delayed start MCS Installation Certificate
Main heating Control:	
Main heating Control:	Time and temperature zone control by suitable arrangement of plumbing and electrical services Control code: 2110
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:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP WorkSheet: New extension to existing dwelling

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Flat 4 - Backstop

Address : , London, NW6 1RJ

1. Overall dwelling dimensions:

	Area(m²)			Av. Height(m)			Volume(m³)	
Ground floor	54.3	(1a)	x	2.8	(2a)	=	152.04	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	54.3	(4)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			152.04	(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) =	0.13	(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		15	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.88	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.75	(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=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

SAP WorkSheet: New extension to existing dwelling

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

0.96	0.94	0.92	0.82	0.81	0.71	0.71	0.69	0.75	0.81	0.84	0.88

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=	0.96	0.94	0.92	0.84	0.82	0.75	0.75	0.74	0.78	0.82	0.86	0.89	(24d)

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

(25)m=	0.96	0.94	0.92	0.84	0.82	0.75	0.75	0.74	0.78	0.82	0.86	0.89	(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	
Windows Type 1			9.7	x1/[1/(1.6)+ 0.04]	=	14.59			(27)
Windows Type 2			3.4	x1/[1/(1.6)+ 0.04]	=	5.11			(27)
Windows Type 3			1.2	x1/[1/(1.6)+ 0.04]	=	1.8			(27)
Windows Type 4			4	x1/[1/(1.6)+ 0.04]	=	6.02			(27)
Walls Type1	62.44	13.1	49.34	x 0.55	=	27.14			(29)
Walls Type2	23.8	5.2	18.6	x 0.28	=	5.21			(29)
Roof	54.3	0	54.3	x 0.18	=	9.77			(30)
Total area of elements, m²			140.54						(31)

** 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) = 69.64 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5244.5 (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 21.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 90.72 (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=	47.98	47.09	46.22	42.13	41.36	37.8	37.8	37.14	39.17	41.36	42.91	44.53	(38)

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

(39)m=	138.7	137.81	136.94	132.85	132.08	128.52	128.52	127.86	129.89	132.08	133.63	135.25	

Average = Sum(39)$_{1…12}$ /12= 132.85 (39)

SAP WorkSheet: New extension to existing dwelling

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

(40)m=	2.55	2.54	2.52	2.45	2.43	2.37	2.37	2.35	2.39	2.43	2.46	2.49

Average = Sum(40)$_{1…12}$ /12= 2.45 (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 1.82 (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 77.35 (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=	85.08	81.99	78.9	75.8	72.71	69.61	69.61	72.71	75.8	78.9	81.99	85.08

Total = Sum(44)$_{1…12}$ = 928.19 (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=	126.18	110.36	113.88	99.28	95.26	82.2	76.17	87.41	88.46	103.09	112.53	122.2

Total = Sum(45)$_{1…12}$ = 1217.01 (45)

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

(46)m=	18.93	16.55	17.08	14.89	14.29	12.33	11.43	13.11	13.27	15.46	16.88	18.33	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)

Temperature factor from Table 2b 0 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0 (50)

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

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

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) 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)

SAP WorkSheet: New extension to existing dwelling

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

(61)m=	43.36	37.74	40.2	37.38	37.05	34.33	35.47	37.05	37.38	40.2	40.43	43.36	(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=	169.54	148.09	154.08	136.66	132.31	116.53	111.65	124.46	125.84	143.29	152.96	165.55	(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=	169.54	148.09	154.08	136.66	132.31	116.53	111.65	124.46	125.84	143.29	152.96	165.55	

Output from water heater (annual)$_{1...12}$ 1680.98 (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=	52.79	46.13	47.92	42.36	40.94	35.92	34.2	38.33	38.76	44.33	47.52	51.47	(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=	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	(66)

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

(67)m=	35.3	31.35	25.5	19.3	14.43	12.18	13.16	17.11	22.96	29.16	34.03	36.28	(67)

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

(68)m=	236.39	238.84	232.66	219.5	202.89	187.28	176.85	174.39	180.57	193.73	210.35	225.96	(68)

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

(69)m=	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

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

(71)m=	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	(71)

Water heating gains (Table 5)

(72)m=	70.96	68.64	64.4	58.83	55.02	49.88	45.96	51.51	53.83	59.58	66	69.18	(72)

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

(73)m=	429.7	425.89	409.61	384.69	359.4	336.39	323.03	330.07	344.42	369.53	397.44	418.47	(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)	
Northeast 0.9x	0.77	x	3.4	x	11.28	x	0.76	x	0.7	=	14.14	(75)
Northeast 0.9x	0.77	x	1.2	x	11.28	x	0.76	x	0.7	=	4.99	(75)
Northeast 0.9x	0.77	x	3.4	x	22.97	x	0.76	x	0.7	=	28.79	(75)
Northeast 0.9x	0.77	x	1.2	x	22.97	x	0.76	x	0.7	=	10.16	(75)
Northeast 0.9x	0.77	x	3.4	x	41.38	x	0.76	x	0.7	=	51.87	(75)

SAP WorkSheet: New extension to existing dwelling

Northeast 0.9x	0.77	x	1.2	x	41.38	x	0.76	x	0.7	=	18.31	(75)
Northeast 0.9x	0.77	x	3.4	x	67.96	x	0.76	x	0.7	=	85.18	(75)
Northeast 0.9x	0.77	x	1.2	x	67.96	x	0.76	x	0.7	=	30.06	(75)
Northeast 0.9x	0.77	x	3.4	x	91.35	x	0.76	x	0.7	=	114.5	(75)
Northeast 0.9x	0.77	x	1.2	x	91.35	x	0.76	x	0.7	=	40.41	(75)
Northeast 0.9x	0.77	x	3.4	x	97.38	x	0.76	x	0.7	=	122.07	(75)
Northeast 0.9x	0.77	x	1.2	x	97.38	x	0.76	x	0.7	=	43.08	(75)
Northeast 0.9x	0.77	x	3.4	x	91.1	x	0.76	x	0.7	=	114.2	(75)
Northeast 0.9x	0.77	x	1.2	x	91.1	x	0.76	x	0.7	=	40.3	(75)
Northeast 0.9x	0.77	x	3.4	x	72.63	x	0.76	x	0.7	=	91.04	(75)
Northeast 0.9x	0.77	x	1.2	x	72.63	x	0.76	x	0.7	=	32.13	(75)
Northeast 0.9x	0.77	x	3.4	x	50.42	x	0.76	x	0.7	=	63.2	(75)
Northeast 0.9x	0.77	x	1.2	x	50.42	x	0.76	x	0.7	=	22.31	(75)
Northeast 0.9x	0.77	x	3.4	x	28.07	x	0.76	x	0.7	=	35.18	(75)
Northeast 0.9x	0.77	x	1.2	x	28.07	x	0.76	x	0.7	=	12.42	(75)
Northeast 0.9x	0.77	x	3.4	x	14.2	x	0.76	x	0.7	=	17.8	(75)
Northeast 0.9x	0.77	x	1.2	x	14.2	x	0.76	x	0.7	=	6.28	(75)
Northeast 0.9x	0.77	x	3.4	x	9.21	x	0.76	x	0.7	=	11.55	(75)
Northeast 0.9x	0.77	x	1.2	x	9.21	x	0.76	x	0.7	=	4.08	(75)
Southeast 0.9x	0.77	x	4	x	36.79	x	0.76	x	0.7	=	54.26	(77)
Southeast 0.9x	0.77	x	4	x	62.67	x	0.76	x	0.7	=	92.42	(77)
Southeast 0.9x	0.77	x	4	x	85.75	x	0.76	x	0.7	=	126.46	(77)
Southeast 0.9x	0.77	x	4	x	106.25	x	0.76	x	0.7	=	156.69	(77)
Southeast 0.9x	0.77	x	4	x	119.01	x	0.76	x	0.7	=	175.51	(77)
Southeast 0.9x	0.77	x	4	x	118.15	x	0.76	x	0.7	=	174.24	(77)
Southeast 0.9x	0.77	x	4	x	113.91	x	0.76	x	0.7	=	167.98	(77)
Southeast 0.9x	0.77	x	4	x	104.39	x	0.76	x	0.7	=	153.94	(77)
Southeast 0.9x	0.77	x	4	x	92.85	x	0.76	x	0.7	=	136.93	(77)
Southeast 0.9x	0.77	x	4	x	69.27	x	0.76	x	0.7	=	102.15	(77)
Southeast 0.9x	0.77	x	4	x	44.07	x	0.76	x	0.7	=	64.99	(77)
Southeast 0.9x	0.77	x	4	x	31.49	x	0.76	x	0.7	=	46.44	(77)
Northwest 0.9x	0.77	x	9.7	x	11.28	x	0.76	x	0.7	=	40.35	(81)
Northwest 0.9x	0.77	x	9.7	x	22.97	x	0.76	x	0.7	=	82.13	(81)
Northwest 0.9x	0.77	x	9.7	x	41.38	x	0.76	x	0.7	=	147.98	(81)
Northwest 0.9x	0.77	x	9.7	x	67.96	x	0.76	x	0.7	=	243.02	(81)
Northwest 0.9x	0.77	x	9.7	x	91.35	x	0.76	x	0.7	=	326.67	(81)
Northwest 0.9x	0.77	x	9.7	x	97.38	x	0.76	x	0.7	=	348.26	(81)
Northwest 0.9x	0.77	x	9.7	x	91.1	x	0.76	x	0.7	=	325.79	(81)
Northwest 0.9x	0.77	x	9.7	x	72.63	x	0.76	x	0.7	=	259.73	(81)
Northwest 0.9x	0.77	x	9.7	x	50.42	x	0.76	x	0.7	=	180.31	(81)
Northwest 0.9x	0.77	x	9.7	x	28.07	x	0.76	x	0.7	=	100.37	(81)

SAP WorkSheet: New extension to existing dwelling

Northwest	0.9x	0.77	x	9.7	x	14.2	x	0.76	x	0.7	=	50.77	(81)
Northwest	0.9x	0.77	x	9.7	x	9.21	x	0.76	x	0.7	=	32.95	(81)

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

(83)m=	113.74	213.51	344.61	514.96	657.09	687.65	648.27	536.84	402.75	250.12	139.84	95.01	(83)

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

(84)m=	543.44	639.4	754.22	899.64	1016.48	1024.05	971.3	866.91	747.17	619.65	537.27	513.49	(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	0.81	0.66	0.53	0.59	0.81	0.94	0.98	0.99	(86)

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

(87)m=	18.55	18.8	19.25	19.89	20.43	20.79	20.92	20.89	20.59	19.89	19.14	18.55	(87)

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

(88)m=	18.99	19	19.01	19.05	19.06	19.1	19.1	19.11	19.08	19.06	19.04	19.03	(88)

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

(89)m=	0.98	0.97	0.94	0.87	0.73	0.51	0.32	0.38	0.69	0.91	0.97	0.98	(89)

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

(90)m=	15.96	16.32	16.98	17.89	18.58	18.99	19.08	19.08	18.81	17.92	16.85	15.97	(90)

fLA = Living area ÷ (4) = | 0.47 | (91)

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

(92)m=	17.17	17.48	18.04	18.83	19.45	19.83	19.94	19.93	19.64	18.85	17.92	17.18	(92)

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

(93)m=	17.02	17.33	17.89	18.68	19.3	19.68	19.79	19.78	19.49	18.7	17.77	17.03	(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=	0.97	0.96	0.93	0.86	0.74	0.56	0.4	0.46	0.72	0.9	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	529.58	614.04	701.37	773.99	751.16	578.05	391.25	402.48	539.01	558.98	516.69	502.25	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1764.11	1713.42	1560.08	1299.07	1003.42	653.48	410.46	431.73	700.56	1069.27	1425.87	1734.9	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	918.49	738.79	638.88	378.06	187.69	0	0	0	0	379.66	654.61	917.09	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = | 4813.26 | (98)

Space heating requirement in kWh/m²/year | 88.64 | (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system | 0 | (201)

SAP WorkSheet: New extension to existing dwelling

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	(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)	918.49	738.79	638.88	378.06	187.69	0	0	0	0	379.66	654.61	917.09		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	1020.55	820.87	709.87	420.06	208.54	0	0	0	0	421.84	727.34	1018.99		(211)
Total (kWh/year) =Sum(211)$_{1...5,10....12}$=													5348.07	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)	169.54	148.09	154.08	136.66	132.31	116.53	111.65	124.46	125.84	143.29	152.96	165.55		
Efficiency of water heater													90	(216)
(217)m=	90	90	90	90	90	90	90	90	90	90	90	90		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	188.37	164.55	171.2	151.85	147.02	129.48	124.05	138.29	139.82	159.21	169.96	183.95		
Total = Sum(219a)$_{1...12}$ =													1867.75	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			5348.07	
Water heating fuel used			1867.75	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		30	(231)
Electricity for lighting			249.36	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			7495.18	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.48	x 0.01 =	186.11	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48	x 0.01 =	65	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	3.96	(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)	13.19	x 0.01 =	32.89	(250)

SAP WorkSheet: New extension to existing dwelling

Additional standing charges (Table 12)		120	(251)
Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost	(245)...(247) + (250)…(254) =	407.96	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.73	(257)
SAP rating (Section 12)		75.93	(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	0.216	=	1155.18	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	403.43	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1558.62	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	15.57	(267)
Electricity for lighting	(232)	x	0.519	=	129.42	(268)
Total CO2, kg/year			sum of (265)…(271) =		1703.6	(272)
CO2 emissions per m²			(272) ÷ (4) =		31.37	(273)
EI rating (section 14)					77	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	6524.64	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2278.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =				8803.3	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	92.1	(267)
Electricity for lighting	(232)	x	0	=	765.53	(268)
‘Total Primary Energy			sum of (265)…(271) =		9660.93	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		177.92	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 20 December 2021

Property Details: Flat 4 - Backstop

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	Yes
Number of storeys:	1
Front of dwelling faces:	North West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	150.52	**(P1)**
Transmission heat loss coefficient:	90.7	
Summer heat loss coefficient:	241.24	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North West (NW)	0	1
North East (NE)	0	1
North East (NE Proposed)	0	1
South East (SE Proposed)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North West (NW)	1	0.9	1	0.9	**(P8)**
North East (NE)	1	0.9	1	0.9	**(P8)**
North East (NE Proposed)	1	0.9	1	0.9	**(P8)**
South East (SE Proposed)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North West (NW)	0.9 x	9.7	98.85	0.76	0.7	0.9	413.17	
North East (NE)	0.9 x	3.4	98.85	0.76	0.7	0.9	144.82	
North East (NE Proposed)	0.9 x	1.2	98.85	0.76	0.7	0.9	51.11	
South East (SE Proposed)	0.9 x	4	119.92	0.76	0.7	0.9	206.71	
						Total	815.81	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	333.39	320.03	327.07	
Total summer gains	1207.94	1135.83	1018.22	**(P5)**
Summer gain/loss ratio	5.01	4.71	4.22	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.26	22.86	22.27	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 20 December 2021 at 14:42:33

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW EXTENSION TO EXISTING DWELLING Total Floor Area: $54.3m^2$

Site Reference : 4, 14 West Cottages **Plot Reference:** Flat 4 - Be Lean

Address : , London, NW6 1RJ

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	22.36 kg/m^2	
Dwelling Carbon Dioxide Emission Rate (DER)	32.66 kg/m^2	Fail

Excess emissions = 10.3 kg/m^2 (46.1 %)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	64.1 kWh/m^2	
Dwelling Fabric Energy Efficiency (DFEE)	106.1 kWh/m^2	
		Fail

Excess energy = 41.96 kg/m^2 (65.4 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.48 (max. 0.30)	0.55 (max. 0.70)	Fail
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	15.00	OK

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 90.0 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

N/A

Regulations Compliance Report

6 Controls

Space heating controls	TTZC by plumbing and electrical services	**OK**
Hot water controls:	No cylinder thermostat No cylinder	
Boiler interlock:	Yes	**OK**

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	9.7m²	
Windows facing: North East	3.4m²	
Windows facing: North East	1.2m²	
Windows facing: South East	4m²	
Ventilation rate:	3.00	

10 Key features

None

SAP Input

Property Details: Flat 4 - Be Lean

Address:	, London, NW6 1RJ
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	20 December 2021
Date of certificate:	20 December 2021
Assessment type:	New extension to existing dwelling
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	486

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2021

Floor Location:	Floor area:	Storey height:
Floor 0	54.3 m²	2.8 m

Living area:	25.4 m² (fraction 0.468)
Front of dwelling faces:	North West

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
NW	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NE	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NE Proposed	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
SE Proposed	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
NW	16mm or more	0.7	0.76	1.4	9.7	1
NE	16mm or more	0.7	0.76	1.4	3.4	1
NE Proposed	16mm or more	0.7	0.76	1.4	1.2	1
SE Proposed	16mm or more	0.7	0.76	1.4	4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
NW		Existing	North West	0	0
NE		Existing	North East	0	0
NE Proposed		Proposed	North East	0	0
SE Proposed		Proposed	South East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
<u>External Elements</u>							
Existing	62.44	13.1	49.34	0.55	0	False	N/A
Proposed	23.8	5.2	18.6	0.28	0	False	N/A
Flat	54.3	0	54.3	0.18	0		N/A
<u>Internal Elements</u>							
<u>Party Elements</u>							

Thermal bridges:

SAP Input

Thermal bridges:	No information on thermal bridging (y=0.15) (y =0.15)
Ventilation:	
Pressure test:	No (Assumed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	2
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	15
Main heating system:	
Main heating system:	Boiler systems with radiators or underfloor heating Gas boilers and oil boilers Fuel: mains gas Info Source: Manufacturer Declaration Manufacturer's data Efficiency: 90.0% (SEDBUK2009) Condensing combi with automatic ignition Fuel Burning Type: Unknown Systems with radiators Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes Delayed start MCS Installation Certificate
Main heating Control:	
Main heating Control:	Time and temperature zone control by suitable arrangement of plumbing and electrical services Control code: 2110
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:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP WorkSheet: New extension to existing dwelling

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Flat 4 - Be Lean

Address : , London, NW6 1RJ

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	54.3	(1a) x	2.8	(2a) =	152.04	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	54.3	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	152.04	(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) =	0.13	(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		15	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.88	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.75	(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=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7

Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

SAP WorkSheet: New extension to existing dwelling

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

0.96	0.94	0.92	0.82	0.81	0.71	0.71	0.69	0.75	0.81	0.84	0.88

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=	0.96	0.94	0.92	0.84	0.82	0.75	0.75	0.74	0.78	0.82	0.86	0.89	(24d)

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

(25)m=	0.96	0.94	0.92	0.84	0.82	0.75	0.75	0.74	0.78	0.82	0.86	0.89	(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	
Windows Type 1			9.7	x1/[1/(1.4)+ 0.04]	=	12.86			(27)
Windows Type 2			3.4	x1/[1/(1.4)+ 0.04]	=	4.51			(27)
Windows Type 3			1.2	x1/[1/(1.4)+ 0.04]	=	1.59			(27)
Windows Type 4			4	x1/[1/(1.4)+ 0.04]	=	5.3			(27)
Walls Type1	62.44	13.1	49.34	x 0.55	=	27.14			(29)
Walls Type2	23.8	5.2	18.6	x 0.28	=	5.21			(29)
Roof	54.3	0	54.3	x 0.18	=	9.77			(30)
Total area of elements, m²			140.54						(31)

** 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) = 66.38 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5244.5 (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 21.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 87.46 (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=	47.98	47.09	46.22	42.13	41.36	37.8	37.8	37.14	39.17	41.36	42.91	44.53	(38)

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

(39)m=	135.45	134.56	133.68	129.59	128.83	125.26	125.26	124.6	126.63	128.83	130.37	131.99	

Average = Sum(39)$_{1…12}$ /12= 129.59 (39)

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

(40)m=	2.49	2.48	2.46	2.39	2.37	2.31	2.31	2.29	2.33	2.37	2.4	2.43

Average = Sum(40)$_{1...12}$ /12= 2.39 (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 — 1.82 (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 — 77.35 (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=	85.08	81.99	78.9	75.8	72.71	69.61	69.61	72.71	75.8	78.9	81.99	85.08

Total = Sum(44)$_{1...12}$ = 928.19 (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=	126.18	110.36	113.88	99.28	95.26	82.2	76.17	87.41	88.46	103.09	112.53	122.2

Total = Sum(45)$_{1...12}$ = 1217.01 (45)

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

(46)m=	18.93	16.55	17.08	14.89	14.29	12.33	11.43	13.11	13.27	15.46	16.88	18.33	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 0 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): — 0 (48)

Temperature factor from Table 2b — 0 (49)

Energy lost from water storage, kWh/year — (48) x (49) = 0 (50)

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

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

If community heating see section 4.3

Volume factor from Table 2a — 0 (52)

Temperature factor from Table 2b — 0 (53)

Energy lost from water storage, kWh/year — (47) x (51) x (52) x (53) = 0 (54)

Enter (50) 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=	43.36	37.74	40.2	37.38	37.05	34.33	35.47	37.05	37.38	40.2	40.43	43.36	(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=	169.54	148.09	154.08	136.66	132.31	116.53	111.65	124.46	125.84	143.29	152.96	165.55	(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=	169.54	148.09	154.08	136.66	132.31	116.53	111.65	124.46	125.84	143.29	152.96	165.55	

Output from water heater (annual)$_{1…12}$ 1680.98 (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=	52.79	46.13	47.92	42.36	40.94	35.92	34.2	38.33	38.76	44.33	47.52	51.47	(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=	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	(66)

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

(67)m=	35.3	31.35	25.5	19.3	14.43	12.18	13.16	17.11	22.96	29.16	34.03	36.28	(67)

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

(68)m=	236.39	238.84	232.66	219.5	202.89	187.28	176.85	174.39	180.57	193.73	210.35	225.96	(68)

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

(69)m=	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

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

(71)m=	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	(71)

Water heating gains (Table 5)

(72)m=	70.96	68.64	64.4	58.83	55.02	49.88	45.96	51.51	53.83	59.58	66	69.18	(72)

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

(73)m=	429.7	425.89	409.61	384.69	359.4	336.39	323.03	330.07	344.42	369.53	397.44	418.47	(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)	
Northeast 0.9x	0.77	x	3.4	x	11.28	x	0.76	x	0.7	=	14.14	(75)
Northeast 0.9x	0.77	x	1.2	x	11.28	x	0.76	x	0.7	=	4.99	(75)
Northeast 0.9x	0.77	x	3.4	x	22.97	x	0.76	x	0.7	=	28.79	(75)
Northeast 0.9x	0.77	x	1.2	x	22.97	x	0.76	x	0.7	=	10.16	(75)
Northeast 0.9x	0.77	x	3.4	x	41.38	x	0.76	x	0.7	=	51.87	(75)

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Northeast	0.9x	0.77	x	1.2	x	41.38	x	0.76	x	0.7	=	18.31	(75)
Northeast	0.9x	0.77	x	3.4	x	67.96	x	0.76	x	0.7	=	85.18	(75)
Northeast	0.9x	0.77	x	1.2	x	67.96	x	0.76	x	0.7	=	30.06	(75)
Northeast	0.9x	0.77	x	3.4	x	91.35	x	0.76	x	0.7	=	114.5	(75)
Northeast	0.9x	0.77	x	1.2	x	91.35	x	0.76	x	0.7	=	40.41	(75)
Northeast	0.9x	0.77	x	3.4	x	97.38	x	0.76	x	0.7	=	122.07	(75)
Northeast	0.9x	0.77	x	1.2	x	97.38	x	0.76	x	0.7	=	43.08	(75)
Northeast	0.9x	0.77	x	3.4	x	91.1	x	0.76	x	0.7	=	114.2	(75)
Northeast	0.9x	0.77	x	1.2	x	91.1	x	0.76	x	0.7	=	40.3	(75)
Northeast	0.9x	0.77	x	3.4	x	72.63	x	0.76	x	0.7	=	91.04	(75)
Northeast	0.9x	0.77	x	1.2	x	72.63	x	0.76	x	0.7	=	32.13	(75)
Northeast	0.9x	0.77	x	3.4	x	50.42	x	0.76	x	0.7	=	63.2	(75)
Northeast	0.9x	0.77	x	1.2	x	50.42	x	0.76	x	0.7	=	22.31	(75)
Northeast	0.9x	0.77	x	3.4	x	28.07	x	0.76	x	0.7	=	35.18	(75)
Northeast	0.9x	0.77	x	1.2	x	28.07	x	0.76	x	0.7	=	12.42	(75)
Northeast	0.9x	0.77	x	3.4	x	14.2	x	0.76	x	0.7	=	17.8	(75)
Northeast	0.9x	0.77	x	1.2	x	14.2	x	0.76	x	0.7	=	6.28	(75)
Northeast	0.9x	0.77	x	3.4	x	9.21	x	0.76	x	0.7	=	11.55	(75)
Northeast	0.9x	0.77	x	1.2	x	9.21	x	0.76	x	0.7	=	4.08	(75)
Southeast	0.9x	0.77	x	4	x	36.79	x	0.76	x	0.7	=	54.26	(77)
Southeast	0.9x	0.77	x	4	x	62.67	x	0.76	x	0.7	=	92.42	(77)
Southeast	0.9x	0.77	x	4	x	85.75	x	0.76	x	0.7	=	126.46	(77)
Southeast	0.9x	0.77	x	4	x	106.25	x	0.76	x	0.7	=	156.69	(77)
Southeast	0.9x	0.77	x	4	x	119.01	x	0.76	x	0.7	=	175.51	(77)
Southeast	0.9x	0.77	x	4	x	118.15	x	0.76	x	0.7	=	174.24	(77)
Southeast	0.9x	0.77	x	4	x	113.91	x	0.76	x	0.7	=	167.98	(77)
Southeast	0.9x	0.77	x	4	x	104.39	x	0.76	x	0.7	=	153.94	(77)
Southeast	0.9x	0.77	x	4	x	92.85	x	0.76	x	0.7	=	136.93	(77)
Southeast	0.9x	0.77	x	4	x	69.27	x	0.76	x	0.7	=	102.15	(77)
Southeast	0.9x	0.77	x	4	x	44.07	x	0.76	x	0.7	=	64.99	(77)
Southeast	0.9x	0.77	x	4	x	31.49	x	0.76	x	0.7	=	46.44	(77)
Northwest	0.9x	0.77	x	9.7	x	11.28	x	0.76	x	0.7	=	40.35	(81)
Northwest	0.9x	0.77	x	9.7	x	22.97	x	0.76	x	0.7	=	82.13	(81)
Northwest	0.9x	0.77	x	9.7	x	41.38	x	0.76	x	0.7	=	147.98	(81)
Northwest	0.9x	0.77	x	9.7	x	67.96	x	0.76	x	0.7	=	243.02	(81)
Northwest	0.9x	0.77	x	9.7	x	91.35	x	0.76	x	0.7	=	326.67	(81)
Northwest	0.9x	0.77	x	9.7	x	97.38	x	0.76	x	0.7	=	348.26	(81)
Northwest	0.9x	0.77	x	9.7	x	91.1	x	0.76	x	0.7	=	325.79	(81)
Northwest	0.9x	0.77	x	9.7	x	72.63	x	0.76	x	0.7	=	259.73	(81)
Northwest	0.9x	0.77	x	9.7	x	50.42	x	0.76	x	0.7	=	180.31	(81)
Northwest	0.9x	0.77	x	9.7	x	28.07	x	0.76	x	0.7	=	100.37	(81)

Northwest	0.9x	0.77	x	9.7	x	14.2	x	0.76	x	0.7	=	50.77	(81)
Northwest	0.9x	0.77	x	9.7	x	9.21	x	0.76	x	0.7	=	32.95	(81)

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

(83)m=	113.74	213.51	344.61	514.96	657.09	687.65	648.27	536.84	402.75	250.12	139.84	95.01	(83)

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

(84)m=	543.44	639.4	754.22	899.64	1016.48	1024.05	971.3	866.91	747.17	619.65	537.27	513.49	(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	0.65	0.52	0.58	0.8	0.94	0.98	0.99	(86)

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

(87)m=	18.6	18.85	19.3	19.94	20.46	20.81	20.93	20.9	20.61	19.93	19.19	18.6	(87)

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

(88)m=	19.02	19.03	19.04	19.09	19.1	19.14	19.14	19.14	19.12	19.1	19.08	19.06	(88)

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

(89)m=	0.98	0.97	0.94	0.87	0.72	0.51	0.32	0.38	0.69	0.91	0.97	0.98	(89)

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

(90)m=	16.05	16.42	17.07	17.97	18.64	19.04	19.12	19.12	18.86	18	16.93	16.07	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	17.25	17.56	18.11	18.89	19.49	19.87	19.97	19.95	19.68	18.9	17.99	17.26	(92)

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

(93)m=	17.1	17.41	17.96	18.74	19.34	19.72	19.82	19.8	19.53	18.75	17.84	17.11	(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=	0.97	0.96	0.93	0.86	0.73	0.56	0.4	0.46	0.72	0.9	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	529.69	614.11	701.14	772.49	747.09	571.7	385.78	397.38	535.92	558.49	516.75	502.37	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1733.03	1683.13	1532.5	1275.37	984.78	640.85	403.03	423.88	687.81	1050.07	1400.01	1703.41	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	895.28	718.39	618.53	362.07	176.84	0	0	0	0	365.73	635.94	893.57	(98)

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 4666.36 (98)

Space heating requirement in kWh/m²/year 85.94 (99)

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

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

SAP WorkSheet: New extension to existing dwelling

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	(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)														
	895.28	718.39	618.53	362.07	176.84	0	0	0	0	365.73	635.94	893.57		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	994.76	798.21	687.26	402.3	196.49	0	0	0	0	406.37	706.6	992.86		
Total (kWh/year) =Sum(211)$_{1...5,10...12}$=													5184.85	(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } 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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)	169.54	148.09	154.08	136.66	132.31	116.53	111.65	124.46	125.84	143.29	152.96	165.55		
Efficiency of water heater													90	(216)
(217)m=	90	90	90	90	90	90	90	90	90	90	90	90		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m=	188.37	164.55	171.2	151.85	147.02	129.48	124.05	138.29	139.82	159.21	169.96	183.95		
Total = Sum(219a)$_{1...12}$ =													1867.75	(219)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			5184.85	
Water heating fuel used			1867.75	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		30	(231)
Electricity for lighting			249.36	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			7331.96	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.48	x 0.01 =	180.43	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48	x 0.01 =	65	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	3.96	(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)	13.19	x 0.01 =	32.89	(250)

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Additional standing charges (Table 12)		120	(251)
Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost	(245)...(247) + (250)…(254) =	402.28	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.7	(257)
SAP rating (Section 12)		76.26	(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	0.216	=	1119.93	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	403.43	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1523.36	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	15.57	(267)
Electricity for lighting	(232)	x	0.519	=	129.42	(268)
Total CO2, kg/year			sum of (265)…(271) =		1668.35	(272)
CO2 emissions per m²			(272) ÷ (4) =		30.72	(273)
EI rating (section 14)					77	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	6325.52	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2278.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =				8604.18	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	92.1	(267)
Electricity for lighting	(232)	x	0	=	765.53	(268)
‘Total Primary Energy			sum of (265)…(271) =		9461.8	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		174.25	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 20 December 2021

Property Details: Flat 4 - Be Lean

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	Yes
Number of storeys:	1
Front of dwelling faces:	North West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	150.52	**(P1)**
Transmission heat loss coefficient:	87.5	
Summer heat loss coefficient:	237.98	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North West (NW)	0	1
North East (NE)	0	1
North East (NE Proposed)	0	1
South East (SE Proposed)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North West (NW)	1	0.9	1	0.9	**(P8)**
North East (NE)	1	0.9	1	0.9	**(P8)**
North East (NE Proposed)	1	0.9	1	0.9	**(P8)**
South East (SE Proposed)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North West (NW)	0.9 x	9.7	98.85	0.76	0.7	0.9	413.17	
North East (NE)	0.9 x	3.4	98.85	0.76	0.7	0.9	144.82	
North East (NE Proposed)	0.9 x	1.2	98.85	0.76	0.7	0.9	51.11	
South East (SE Proposed)	0.9 x	4	119.92	0.76	0.7	0.9	206.71	
						Total	815.81	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	333.39	320.03	327.07	
Total summer gains	1207.94	1135.83	1018.22	**(P5)**
Summer gain/loss ratio	5.08	4.77	4.28	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.33	22.92	22.33	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 20 December 2021 at 14:42:32

Project Information:

Assessed By:	Samuel Westover (STRO012073)	**Building Type:**	Flat

Dwelling Details:

NEW EXTENSION TO EXISTING DWELLING		Total Floor Area: 54.3m²	
Site Reference :	4, 14 West Cottages	**Plot Reference:**	Flat 4 - Be Green
Address :	, London, NW6 1RJ		

Client Details:

Name:
Address :

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

1a TER and DER

Fuel for main heating system: Electricity		
Fuel factor: 1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	32.44 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	31.71 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	64.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	106.1 kWh/m²	
		Fail
Excess energy = 41.96 kg/m² (65.4 %)		

2 Fabric U-values

Element	Average	Highest	
External wall	0.48 (max. 0.30)	0.55 (max. 0.70)	Fail
Floor	(no floor)		
Roof	0.18 (max. 0.20)	0.18 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals	15.00	OK

4 Heating efficiency

Main Heating system:	Heat pumps with radiators or underfloor heating - electric Air source heat pump with flow temperature <= 35°C
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 0.89 kWh/day	
	Permitted by DBSCG: 1.58 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

Regulations Compliance Report

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

8 Mechanical ventilation		
Not applicable		

9 Summertime temperature		
Overheating risk (Thames valley):	Medium	**OK**
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	9.7m²	
Windows facing: North East	3.4m²	
Windows facing: North East	1.2m²	
Windows facing: South East	4m²	
Ventilation rate:	3.00	

10 Key features
Fixed cooling system

SAP Input

Property Details: Flat 4 - Be Green

Address:	, London, NW6 1RJ
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	20 December 2021
Date of certificate:	20 December 2021
Assessment type:	New extension to existing dwelling
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	486

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2021	
Floor Location:	Floor area:	Storey height:
Floor 0	54.3 m²	2.8 m
Living area:	25.4 m² (fraction 0.468)	
Front of dwelling faces:	North West	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
NW	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NE	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
NE Proposed	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
SE Proposed	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
NW	16mm or more	0.7	0.76	1.4	9.7	1
NE	16mm or more	0.7	0.76	1.4	3.4	1
NE Proposed	16mm or more	0.7	0.76	1.4	1.2	1
SE Proposed	16mm or more	0.7	0.76	1.4	4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
NW		Existing	North West	0	0
NE		Existing	North East	0	0
NE Proposed		Proposed	North East	0	0
SE Proposed		Proposed	South East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
Existing	62.44	13.1	49.34	0.55	0	False	N/A
Proposed	23.8	5.2	18.6	0.28	0	False	N/A
Flat	54.3	0	54.3	0.18	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

SAP Input

Thermal bridges:	No information on thermal bridging (y=0.15) (y =0.15)
Ventilation:	
Pressure test:	No (Assumed)
Ventilation:	Natural ventilation (extract fans)
Number of chimneys:	0
Number of open flues:	0
Number of fans:	2
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	15
Main heating system:	
Main heating system:	Heat pumps with radiators or underfloor heating Electric heat pumps Fuel: Electricity Info Source: SAP Tables SAP Table: 214 Air source heat pump with flow temperature <= 35°C Fan coil units Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate
Main heating Control:	
Main heating Control:	Time and temperature zone control by suitable arrangement of plumbing and electrical services Control code: 2207
Secondary heating system:	
Secondary heating system:	None
Space cooling system:	
Space cooling system:	Split/multiple systems Energy label class: A Compressor control: Systems with On/Off control Cooled area: 54.3 (fraction 1.000)
Water heating:	
Water heating:	From main heating system Water code: 901 Fuel :Electricity Hot water cylinder Cylinder volume: 110 litres Cylinder insulation: Measured loss, 0.89kWh/day Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Solar panel: False
Others:	
Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Dense urban
EPC language:	English
Wind turbine:	No
Photovoltaics:	None

SAP Input

Assess Zero Carbon Home: No

SAP WorkSheet: New extension to existing dwelling

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.50

Property Address: Flat 4 - Be Green

Address : , London, NW6 1RJ

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)			Volume(m³)	
Ground floor	54.3	(1a) x	2.8	(2a)	=	152.04	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	54.3	(4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =			152.04	(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) =	0.13	(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		15	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.88	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.75	(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=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18

SAP WorkSheet: New extension to existing dwelling

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

0.96	0.94	0.92	0.82	0.81	0.71	0.71	0.69	0.75	0.81	0.84	0.88

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=	0.96	0.94	0.92	0.84	0.82	0.75	0.75	0.74	0.78	0.82	0.86	0.89	(24d)

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

(25)m=	0.96	0.94	0.92	0.84	0.82	0.75	0.75	0.74	0.78	0.82	0.86	0.89	(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	
Windows Type 1			9.7	x1/[1/(1.4)+ 0.04] =	12.86			(27)
Windows Type 2			3.4	x1/[1/(1.4)+ 0.04] =	4.51			(27)
Windows Type 3			1.2	x1/[1/(1.4)+ 0.04] =	1.59			(27)
Windows Type 4			4	x1/[1/(1.4)+ 0.04] =	5.3			(27)
Walls Type1	62.44	13.1	49.34	x 0.55 =	27.14			(29)
Walls Type2	23.8	5.2	18.6	x 0.28 =	5.21			(29)
Roof	54.3	0	54.3	x 0.18 =	9.77			(30)
Total area of elements, m²			140.54					(31)

** 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) = 66.38 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5244.5 (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 21.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 87.46 (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=	47.98	47.09	46.22	42.13	41.36	37.8	37.8	37.14	39.17	41.36	42.91	44.53	(38)

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

(39)m=	135.45	134.56	133.68	129.59	128.83	125.26	125.26	124.6	126.63	128.83	130.37	131.99	

Average = Sum(39)$_{1…12}$ /12= 129.59 (39)

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

(40)m=	2.49	2.48	2.46	2.39	2.37	2.31	2.31	2.29	2.33	2.37	2.4	2.43

Average = Sum(40)$_{1…12}$ /12= 2.39 (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 1.82 (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 77.35 (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=	85.08	81.99	78.9	75.8	72.71	69.61	69.61	72.71	75.8	78.9	81.99	85.08	
										Total = Sum(44)$_{1…12}$ =		928.19	(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=	126.18	110.36	113.88	99.28	95.26	82.2	76.17	87.41	88.46	103.09	112.53	122.2	
										Total = Sum(45)$_{1…12}$ =		1217.01	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	18.93	16.55	17.08	14.89	14.29	12.33	11.43	13.11	13.27	15.46	16.88	18.33	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 110 (47)

If community heating and no tank in dwelling, enter 110 litres in (47)

Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)

Water storage loss:

a) If manufacturer's declared loss factor is known (kWh/day): 0.89 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.48 (50)

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

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

If community heating see section 4.3

Volume factor from Table 2a 0 (52)

Temperature factor from Table 2b 0 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)

Enter (50) or (54) in (55) 0.48 (55)

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

(56)m=	14.9	13.46	14.9	14.42	14.9	14.42	14.9	14.9	14.42	14.9	14.42	14.9	(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=	14.9	13.46	14.9	14.42	14.9	14.42	14.9	14.9	14.42	14.9	14.42	14.9	(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=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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

(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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=	164.34	144.82	152.04	136.21	133.42	119.13	114.34	125.57	125.39	141.25	149.46	160.36	(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=	164.34	144.82	152.04	136.21	133.42	119.13	114.34	125.57	125.39	141.25	149.46	160.36	

Output from water heater (annual)$_{1\ldots12}$ 1666.32 (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=	72.48	64.27	68.39	62.55	62.2	56.88	55.86	59.59	58.96	64.8	66.96	71.16	(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=	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	109.01	(66)

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

(67)m=	35.3	31.35	25.5	19.3	14.43	12.18	13.16	17.11	22.96	29.16	34.03	36.28	(67)

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

(68)m=	236.39	238.84	232.66	219.5	202.89	187.28	176.85	174.39	180.57	193.73	210.35	225.96	(68)

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

(69)m=	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	47.72	(69)

Pumps and fans gains (Table 5a)

(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)

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

(71)m=	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	-72.67	(71)

Water heating gains (Table 5)

(72)m=	97.42	95.64	91.93	86.88	83.61	79	75.08	80.1	81.88	87.1	93	95.64	(72)

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

(73)m=	456.16	452.88	437.14	412.74	387.98	365.51	352.14	358.66	372.48	397.05	424.43	444.94	(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)	
Northeast 0.9x	0.77	x	3.4	x	11.28	x	0.76	x	0.7	=	14.14	(75)
Northeast 0.9x	0.77	x	1.2	x	11.28	x	0.76	x	0.7	=	4.99	(75)
Northeast 0.9x	0.77	x	3.4	x	22.97	x	0.76	x	0.7	=	28.79	(75)
Northeast 0.9x	0.77	x	1.2	x	22.97	x	0.76	x	0.7	=	10.16	(75)
Northeast 0.9x	0.77	x	3.4	x	41.38	x	0.76	x	0.7	=	51.87	(75)

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Northeast 0.9x	0.77	x	1.2	x	41.38	x	0.76	x	0.7	=	18.31	(75)
Northeast 0.9x	0.77	x	3.4	x	67.96	x	0.76	x	0.7	=	85.18	(75)
Northeast 0.9x	0.77	x	1.2	x	67.96	x	0.76	x	0.7	=	30.06	(75)
Northeast 0.9x	0.77	x	3.4	x	91.35	x	0.76	x	0.7	=	114.5	(75)
Northeast 0.9x	0.77	x	1.2	x	91.35	x	0.76	x	0.7	=	40.41	(75)
Northeast 0.9x	0.77	x	3.4	x	97.38	x	0.76	x	0.7	=	122.07	(75)
Northeast 0.9x	0.77	x	1.2	x	97.38	x	0.76	x	0.7	=	43.08	(75)
Northeast 0.9x	0.77	x	3.4	x	91.1	x	0.76	x	0.7	=	114.2	(75)
Northeast 0.9x	0.77	x	1.2	x	91.1	x	0.76	x	0.7	=	40.3	(75)
Northeast 0.9x	0.77	x	3.4	x	72.63	x	0.76	x	0.7	=	91.04	(75)
Northeast 0.9x	0.77	x	1.2	x	72.63	x	0.76	x	0.7	=	32.13	(75)
Northeast 0.9x	0.77	x	3.4	x	50.42	x	0.76	x	0.7	=	63.2	(75)
Northeast 0.9x	0.77	x	1.2	x	50.42	x	0.76	x	0.7	=	22.31	(75)
Northeast 0.9x	0.77	x	3.4	x	28.07	x	0.76	x	0.7	=	35.18	(75)
Northeast 0.9x	0.77	x	1.2	x	28.07	x	0.76	x	0.7	=	12.42	(75)
Northeast 0.9x	0.77	x	3.4	x	14.2	x	0.76	x	0.7	=	17.8	(75)
Northeast 0.9x	0.77	x	1.2	x	14.2	x	0.76	x	0.7	=	6.28	(75)
Northeast 0.9x	0.77	x	3.4	x	9.21	x	0.76	x	0.7	=	11.55	(75)
Northeast 0.9x	0.77	x	1.2	x	9.21	x	0.76	x	0.7	=	4.08	(75)
Southeast 0.9x	0.77	x	4	x	36.79	x	0.76	x	0.7	=	54.26	(77)
Southeast 0.9x	0.77	x	4	x	62.67	x	0.76	x	0.7	=	92.42	(77)
Southeast 0.9x	0.77	x	4	x	85.75	x	0.76	x	0.7	=	126.46	(77)
Southeast 0.9x	0.77	x	4	x	106.25	x	0.76	x	0.7	=	156.69	(77)
Southeast 0.9x	0.77	x	4	x	119.01	x	0.76	x	0.7	=	175.51	(77)
Southeast 0.9x	0.77	x	4	x	118.15	x	0.76	x	0.7	=	174.24	(77)
Southeast 0.9x	0.77	x	4	x	113.91	x	0.76	x	0.7	=	167.98	(77)
Southeast 0.9x	0.77	x	4	x	104.39	x	0.76	x	0.7	=	153.94	(77)
Southeast 0.9x	0.77	x	4	x	92.85	x	0.76	x	0.7	=	136.93	(77)
Southeast 0.9x	0.77	x	4	x	69.27	x	0.76	x	0.7	=	102.15	(77)
Southeast 0.9x	0.77	x	4	x	44.07	x	0.76	x	0.7	=	64.99	(77)
Southeast 0.9x	0.77	x	4	x	31.49	x	0.76	x	0.7	=	46.44	(77)
Northwest 0.9x	0.77	x	9.7	x	11.28	x	0.76	x	0.7	=	40.35	(81)
Northwest 0.9x	0.77	x	9.7	x	22.97	x	0.76	x	0.7	=	82.13	(81)
Northwest 0.9x	0.77	x	9.7	x	41.38	x	0.76	x	0.7	=	147.98	(81)
Northwest 0.9x	0.77	x	9.7	x	67.96	x	0.76	x	0.7	=	243.02	(81)
Northwest 0.9x	0.77	x	9.7	x	91.35	x	0.76	x	0.7	=	326.67	(81)
Northwest 0.9x	0.77	x	9.7	x	97.38	x	0.76	x	0.7	=	348.26	(81)
Northwest 0.9x	0.77	x	9.7	x	91.1	x	0.76	x	0.7	=	325.79	(81)
Northwest 0.9x	0.77	x	9.7	x	72.63	x	0.76	x	0.7	=	259.73	(81)
Northwest 0.9x	0.77	x	9.7	x	50.42	x	0.76	x	0.7	=	180.31	(81)
Northwest 0.9x	0.77	x	9.7	x	28.07	x	0.76	x	0.7	=	100.37	(81)

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Northwest	0.9x	0.77	x	9.7	x	14.2	x	0.76	x	0.7	=	50.77	(81)
Northwest	0.9x	0.77	x	9.7	x	9.21	x	0.76	x	0.7	=	32.95	(81)

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

(83)m=	113.74	213.51	344.61	514.96	657.09	687.65	648.27	536.84	402.75	250.12	139.84	95.01	(83)

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

(84)m=	569.91	666.39	781.75	927.7	1045.07	1053.16	1000.41	895.49	775.23	647.17	564.27	539.95	(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	0.9	0.8	0.64	0.51	0.57	0.79	0.94	0.98	0.99	(86)

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

(87)m=	18.64	18.89	19.34	19.97	20.48	20.82	20.94	20.91	20.63	19.96	19.22	18.64	(87)

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

(88)m=	19.02	19.03	19.04	19.09	19.1	19.14	19.14	19.14	19.12	19.1	19.08	19.06	(88)

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

(89)m=	0.98	0.97	0.94	0.86	0.71	0.5	0.31	0.37	0.67	0.9	0.97	0.98	(89)

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

(90)m=	16.1	16.47	17.11	18.01	18.66	19.04	19.12	19.12	18.88	18.04	16.98	16.12	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	17.29	17.6	18.15	18.92	19.51	19.87	19.97	19.96	19.7	18.94	18.03	17.3	(92)

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

(93)m=	17.29	17.6	18.15	18.92	19.51	19.87	19.97	19.96	19.7	18.94	18.03	17.3	(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=	0.97	0.96	0.93	0.86	0.73	0.56	0.4	0.46	0.71	0.9	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	554.3	638.37	724.35	793.5	765.76	588.97	403.33	414.61	554.04	580.49	541.05	527.18	(95)
Monthly average external temperature from Table 8													
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1759.19	1709.02	1557.84	1298.91	1006.57	660.59	422.15	443.07	708.96	1074.04	1425.16	1729	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	896.44	719.48	620.11	363.9	179.16	0	0	0	0	367.2	636.56	894.16	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 4676.99 (98)

Space heating requirement in kWh/m²/year 86.13 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1177.44	926.92	946.96	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.75	0.81	0.76	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	879.36	753.2	724.41	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1166.26	1106.86	983.13	0	0	0	0	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m set (104)m to zero if (104)m < 3 × (98)m													
(104)m=	0	0	0	0	0	206.57	263.12	192.49	0	0	0	0	

Total = Sum(104)$_{6...8}$ = 662.17 (104)

Cooled fraction — f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104)$_{6...8}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(107)m=	0	0	0	0	0	51.64	65.78	48.12	0	0	0	0

Total = Sum(107)$_{6...8}$ = 165.54 (107)

Space cooling requirement in kWh/m²/year — (107) ÷ (4) = 3.05 (108)

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		249.9	(206)
Efficiency of secondary/supplementary heating system, %		0	(208)
Cooling System Energy Efficiency Ratio		4	(209)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	896.44	719.48	620.11	363.9	179.16	0	0	0	0	367.2	636.56	894.16	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	358.72	287.91	248.14	145.62	71.69	0	0	0	0	146.94	254.73	357.81	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1871.55 (211)

Space heating fuel (secondary), kWh/month
= {[(98)m x (201)] } x 100 ÷ (208)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	164.34	144.82	152.04	136.21	133.42	119.13	114.34	125.57	125.39	141.25	149.46	160.36	
Efficiency of water heater												175.1	(216)
(217)m=	175.1	175.1	175.1	175.1	175.1	175.1	175.1	175.1	175.1	175.1	175.1	175.1	(217)

SAP WorkSheet: New extension to existing dwelling

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	93.85	82.71	86.83	77.79	76.2	68.04	65.3	71.71	71.61	80.67	85.35	91.58

Total = $Sum(219a)_{1...12}$ = 951.64 (219)

Space cooling fuel, kWh/month.
(221)m = (107)m÷ (209)

(221)m=	0	0	0	0	0	12.91	16.45	12.03	0	0	0	0

Total = $Sum(221)_{6...8}$ = 41.39 (221)

Annual totals		**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1			1871.55	
Water heating fuel used			951.64	
Space cooling fuel used			41.39	
Electricity for pumps, fans and electric keep-hot				
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		30	(231)
Electricity for lighting			249.36	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			3143.93	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	13.19	x 0.01 =	246.86	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	13.19	x 0.01 =	125.52	(247)
Space cooling	(221)	13.19	x 0.01 =	5.46	(248)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	3.96	(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)	13.19	x 0.01 =	32.89	(250)
Additional standing charges (Table 12)				0	(251)

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

Total energy cost	(245)...(247) + (250)…(254) =	414.68	(255)

11a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.75	(257)
SAP rating (Section 12)		75.53	(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	0.519	=	971.33 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.519	=	493.9 (264)
Space and water heating	(261) + (262) + (263) + (264) =			1465.23 (265)
Space cooling	(221) x	0.519	=	21.48 (266)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57 (267)
Electricity for lighting	(232) x	0.519	=	129.42 (268)
Total CO2, kg/year		sum of (265)…(271) =		1631.7 (272)
CO2 emissions per m²		(272) ÷ (4) =		30.05 (273)
EI rating (section 14)				78 (274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year
Space heating (main system 1)	(211) x	3.07	=	5745.65 (261)
Space heating (secondary)	(215) x	3.07	=	0 (263)
Energy for water heating	(219) x	3.07	=	2921.54 (264)
Space and water heating	(261) + (262) + (263) + (264) =			8667.19 (265)
Space cooling	(221) x	3.07	=	127.05 (266)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	92.1 (267)
Electricity for lighting	(232) x	0	=	765.53 (268)
‘Total Primary Energy		sum of (265)…(271) =		9651.87 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =		177.75 (273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 20 December 2021

Property Details: Flat 4 - Be Green

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	Yes
Number of storeys:	1
Front of dwelling faces:	North West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	150.52	**(P1)**
Transmission heat loss coefficient:	87.5	
Summer heat loss coefficient:	237.98	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North West (NW)	0	1
North East (NE)	0	1
North East (NE Proposed)	0	1
South East (SE Proposed)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North West (NW)	1	0.9	1	0.9	**(P8)**
North East (NE)	1	0.9	1	0.9	**(P8)**
North East (NE Proposed)	1	0.9	1	0.9	**(P8)**
South East (SE Proposed)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North West (NW)	0.9 x	9.7	98.85	0.76	0.7	0.9	413.17	
North East (NE)	0.9 x	3.4	98.85	0.76	0.7	0.9	144.82	
North East (NE Proposed)	0.9 x	1.2	98.85	0.76	0.7	0.9	51.11	
South East (SE Proposed)	0.9 x	4	119.92	0.76	0.7	0.9	206.71	
						Total	815.81	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	362.51	349.14	355.66	
Total summer gains	1237.05	1164.95	1046.81	**(P5)**
Summer gain/loss ratio	5.2	4.9	4.4	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.45	23.05	22.45	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Medium