Soane Point,
3- 10 Market Place,
Reading, RG1 2EG

Energy Statement for Planning

Job No: 4520

Issued: September, 2022

Issue No: 2

Contents

1.0 Introduction 3
2.0 Project Summary 4
3.0 Policy Requirements and Drivers 5
4.0 Energy Strategy and Approach 6
5.0 Baseline Emissions 7
6.0 Be Lean Strategy 8
7.0 Be Clean Strategy 9
8.0 Be Green Strategy 10
9.0 Summary Of Results 11
10.0 Conclusions 12

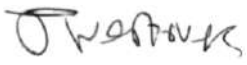
Document Prepared By:

Jim Westover

Dated:

14.09.22

Signed:



Document Authorised By:

Sam Westover

Dated:

14.09.22

Signed:



This report has been prepared for the exclusive use of the commissioning party and may not be reproduced without prior written permission from T16 Design.

All work has been carried out within the terms of the brief using all reasonable skill, care, and diligence. No liability is accepted by T16 Design for the accuracy of data or opinions provided by others in the preparation of this report, or for any use of this report other than for the purpose for which it was produced.

1.0 Introduction

1.1 T16 Design has been appointed to produce this Energy Statement for the proposed development at Soane Point, 3-10 Market Place, Reading.

1.2 The report assesses the predicted energy performance and carbon dioxide emissions of the proposed development in the context of local policy requirements and best practice methods.

1.3 The methodology used to demonstrate the effects of the proposed energy efficiency measures is a 3-stage Energy Hierarchy, showing a reduction in emissions over building regs.

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 Due to the changing fuel factors the SAP10 emission factors have been used to calculate the overall emissions.

1.6 SAP 2012 emissions have also been included. In accordance with Paragraph 3.34 of the Supplementary Planning Document.

1.7 The overall effect of these policies are:

- To achieve net zero carbon through on-site reduction and borough carbon offset payment
- At least a 35% reduction in onsite CO_2 Emissions

2.0 Project Summary

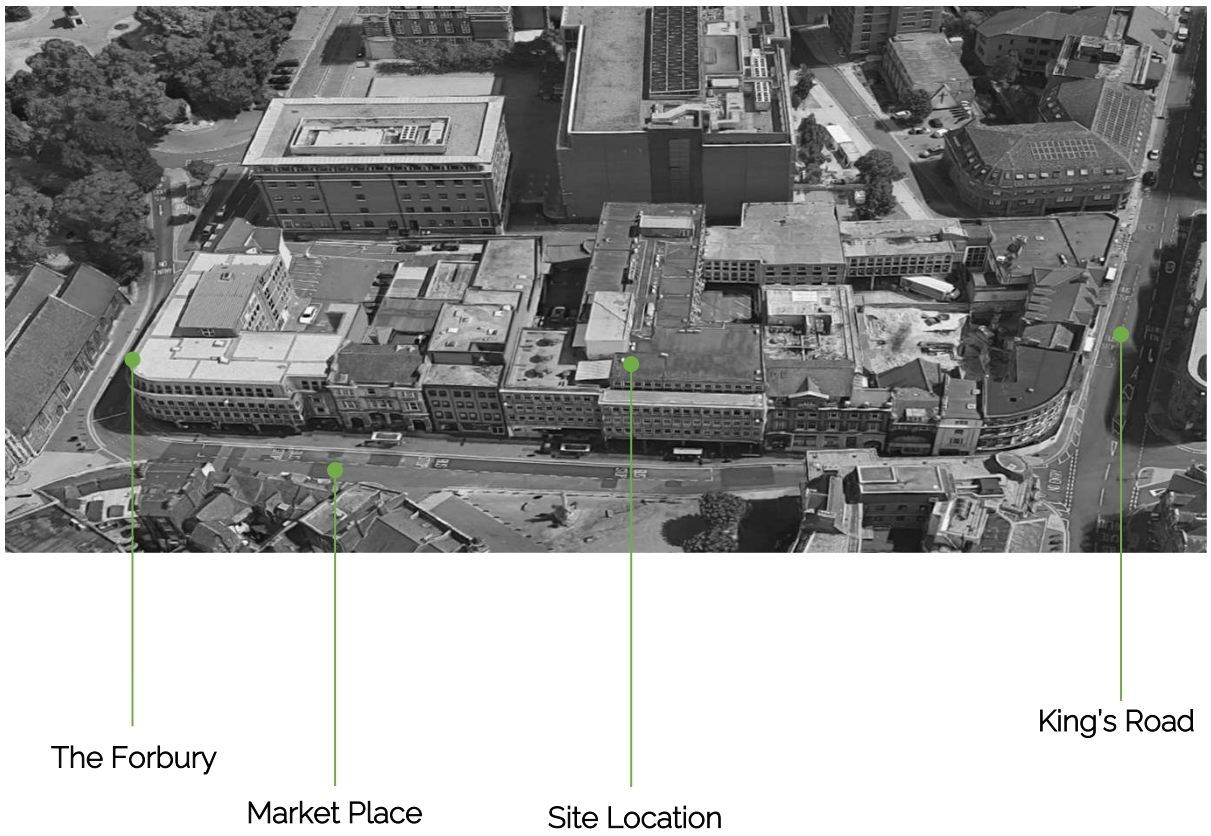
2.1 The site is located at Soane Point, 3-10 Market Place, Reading.

2.2 The proposal is for External works to existing building, including partial replacement of the existing façades fronting Market Place and Abbey Square alongside other external works to the building; set back single-storey extension above part of block fronting Market Place, part two, part three storey extensions above other blocks; and conversion and alterations to ground floor reception and car parking area.

2.3 Together the works will deliver 38 new homes and (internal and external) residential amenity areas with associated car parking"

2.4 The proposal also includes a rooftop extensions over parts of the building to construct thirty-eight new apartments.

2.5 The site location is shown below.



3.0 Policy Requirements and Drivers

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

- Reading Borough Local Plan (2019)

3.2 The primary driver for this report is Local Plan policy H5 "Standards for New Housing."

3.3 This policy sets out that major residential developments should be designed to achieve net-zero carbon

3.4 This is to be achieved by reducing on-site emissions by at least 35% over Building Regulations and the rest to be offset through the Boroughs carbon offset payment.

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 Energy Strategy and Approach

4.1 The three stages of the energy hierarchy used for this energy statement are referred to as Be Lean (Use Less Energy), Be Clean (Supply Energy Efficiently), Be Green (Use Renewable Energy).

4.2 The Be Lean stage of the hierarchy requires that developments must initially reduce the energy demand of the building through architectural and building fabric measures (passive design) and energy efficient services (active design).

4.3 The second part of the hierarchy (Be Clean), is concerned with how energy systems will exploit local energy resources and supply energy efficiently and cleanly to reduce CO_2.

4.4 The third stage is the addition, where feasible, to introduce renewable technology, which includes Heat pumps (Air and Ground), PV panels, Solar Hot Water panels and Wind Power.

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

4.6 This is done using SAP (Standard Assessment Procedure) for residential elements.

.

5.0 Baseline Emissions

5.1 The baseline emissions on which reduction figures are based are calculated using SAP for residential buildings.

5.2 SAP calculates a notional building using the baseline Building Regulations parameters and represents the minimum allowable standard for the energy performance of the building to meet Part L1A.

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

5.4 The TER figures are given in $kgCO_2/m^2/year$ (kilograms of CO_2 per square metre, per year).

5.5 Thus, to establish the actual baseline emissions per annum, it is necessary to multiply the TER by the floor area.

5.6 The baseline emissions are as follows

Element	Annual CO_2 Emissions (tonnes) per Year
Market Place	39

Table 1 – Baseline Emissions

6.0 Be Lean Strategy

6.1 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.

6.2 Gas combi boilers with an 89.5% efficiency have been assumed at this stage.

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

6.4 It has been assumed that the units will have an MVHR system with specific fan power of 0.57 and a heat exchange efficiency of 90%

6.5 The U value improvements for each element, with the relevant Part L backstop are shown below.

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

Element	Value Used	Part L1A backstop	Improvement (Residential)
Roofs	0.13 W/m²K	0.20 W/m²K	35%
External Walls	0.18 W/m²K	0.30 W/m²K	40%
Wall to unheated corridor	0.22 W/m²K	0.30 W/m²K	27%
Openings	1.4 W/m²K (G-Value 0.57)	2.0 W/m²K	30%
Air Permeability	3	10	66%

Table 2 – Proposed U-values

7.0 Be Clean Strategy

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

7.2 From the information available, the site is not near any existing or proposed decentralized energy or heating networks.

7.3 However, Reading Borough Council has commissioned a Heat Network Feasibility Study for the Town Centre as part of its commitment to a goal of 'Net-Zero Reading' by 2030.

7.4 It is therefore proposed that there will be a provision of heat exchangers within the development & pre-insulated pipework routed from this location to the boundary of the site for future DH network connections.

7.5 Due to the small scale of the proposal, CHP is also not a viable solution. CHP is most suitable for developments of at least 500 units.

8.0 Be Green Strategy

8.1 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.

8.2 The technologies that are considered here are wind power, solar panels (photovoltaic (PV) or Solar Thermal), Heat pumps (Air and Ground).

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

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

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

8.6 Air Source Heat Pumps (ASHP) however are a suitable solution in this instance and provide substantial improvements in CO_2 emissions when combined with a high-performing fabric such as proposed here.

8.7 It is proposed that electric panel heaters will provide the heating with ASHP hot water cylinders to provide the hot water for the development.

8.8 In addition to this the development will have 30.4kWp of PV using a 0.5kWp PV panel this will require 61 PV Panels, this will be facing south where feasible.

9.0 Summary Of Results

9.1 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.

9.2 The building will be provided with increased U values (as shown above), ASHP Hot Water Cylinders, MVHR and PV panels.

9.3 The figures show the total CO2 emissions expected under SAP 10 Carbon factors.

9.4 The SAP worksheets attached have been used for input data into the SAP 10 conversion spreadsheet.

Market Place	Carbon Dioxide Emissions (Tonnes CO2 per annum)
	Regulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	39
After energy demand reduction	33
After heat network / CHP	33
After renewable energy	19

Table 3 – SAP10 Emissions Market Place

Market Place	Carbon Dioxide Emissions (Tonnes CO2 per annum)
	Regulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	43
After energy demand reduction	39
After heat network / CHP	39
After renewable energy	43

Table 4 – SAP12 Emissions Market Place

	Domestic Regulated carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	5	13%
Savings from heat network / CHP	0	0%
Savings from renewable energy	14	37%
Cumulative on site savings	**19**	**50%**
Annual savings from off-set payment	19	-
Cash In Lieu Contribution – For residential developments		
Total Remaining Regulated Emissions	**19 Tonnes CO_2**	
Contribution	**£34,200**	

Table 5 – SAP10 Emissions reduction Market Place

10.0 Conclusions

10.1 This report has been set out to demonstrate how the proposed development at Market Place, Soane Place, Reading, will meet the policy requirement of achieving 35% reduction in onsite emissions through the Be Lean, Be Clean, Be Green hierarchy.

10.2 The remaining emissions will be offset through the boroughs carbon offset payment.

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

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

10.5 The measures proposed are detailed above and are summarised below:

- ASHP HWCs
- Significant fabric improvements
- Good air tightness.
- Accredited Construction Details
- Mechanical Ventilation With Heat Recovery
- **30.1 kWp** of Photovoltaic panels

10.6 ASHPs, improved thermal bridging and improved fabric U values are proposed to the energy performance of the dwelling and go a significant way towards achieving the zero-carbon target.

10.7 The results in Section 9 show that a **50%** site-wide improvement is achieved.

10.8 The total remaining regulated emissions are 15 tonnes.

10.9 The offset payment requires £60 per tonne over 30 years. Therefore the total offset payment is (19 x 30 x 60) = **£34,200.**

T16 Design Ltd.

T: 01206 572452

E: info@t16design.com

W: www.t16design.com

© 2022

Appendix 1 - SAP worksheets

Block Compliance WorkSheet: 6 - 8 Market Place - Be Lean

User Details

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.0.5.53

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
C101	18.01	19.78	52.5	58.4	76.6
C102	18.28	19.88	50.7	56	65.8
C103	21.43	23.63	58.6	63.2	42.6
C104	15.92	17.93	39.4	42.9	61.8
C105	18.11	19.81	50	54	61.3
C106	18.88	20.37	53.7	57.3	62.3
C243	14.94	16.66	38.7	42.2	73
C244	17.5	19.04	45.2	46.2	52.1
334	19.96	21.33	51.2	50.4	41.7
335	16.84	19.59	37.7	43.1	44
336	13.6	15.6	27.8	31.5	62.6
C334	18.74	20.45	55.4	61.4	73
C335	19.09	20.75	52.2	54.8	52.1
C336	14.05	15.8	33.3	36.8	74
337	18.45	19.97	47.1	47.5	47.3
424	19.96	21.33	51.2	50.4	41.7
425	16.84	19.59	37.7	43.1	44
426	12.28	14.19	25.8	30.6	78.9
427	13.47	15.19	31	35.1	74
428	18.45	19.97	47.1	47.5	47.3
429	15.86	17.04	40.4	41	63.2
430	14.6	16.65	33.4	37.3	64
501	21.35	23.96	56.8	63.2	42.8
502	14.96	17.17	34.7	38.8	61.7
503	14.8	17.02	34	38	61.7
504	15.15	16.59	42.1	45.4	85.7

Block Compliance WorkSheet: 6 - 8 Market Place - Be LeanCon

Dwelling	DER	TER	DFEE	TFEE	TFA
505	21.94	23.42	59.7	60.5	41.7
506	20.57	23.46	54.1	61.8	44
507	15.28	17.42	40.2	46.9	78.9
508	16.51	18.44	45.1	51.3	74
509	21.94	23.69	62.1	65.3	47.3
510	13.46	14.74	28	29.7	66
511	13.57	15.01	27.6	30.1	63.2
601	18.46	20.31	53.4	59.7	70.7
602	18.05	19.85	51.8	57.6	71.7
603	18.67	20.11	57.8	63.2	85.7
604	15.91	17.48	40.7	43.5	66
605	17.08	18.76	45.1	48.3	61.4

Calculation Summary

Total Floor Area	2325.80
Average TER	18.64
Average DER	16.85
Average DFEE	43.85
Average TFEE	47.73
Compliance	Pass
% Improvement DER|TER	9.6
% Improvement DFEE|TFEE	8.13

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:24:02

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76.6m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C101

Address :

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)	19.78 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.01 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	52.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: North	7m²
Windows facing: East	9m²
Ventilation rate:	2.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C101

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	76.6 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	7	1
E	16mm or more	0.7	0.57	1.4	9	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	53.19	16	37.19	0.18	0	False	N/A
Corridor	42.12	0	42.12	0.22	0.43	False	N/A
GF	76.7			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0632

	Length	**Psi-value**		
[Approved]	8.6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.7	0.04	E3	Sill
[Approved]	26.6	0.05	E4	Jamb

SAP Input

[Approved]	35.3	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	4.5	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 2 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

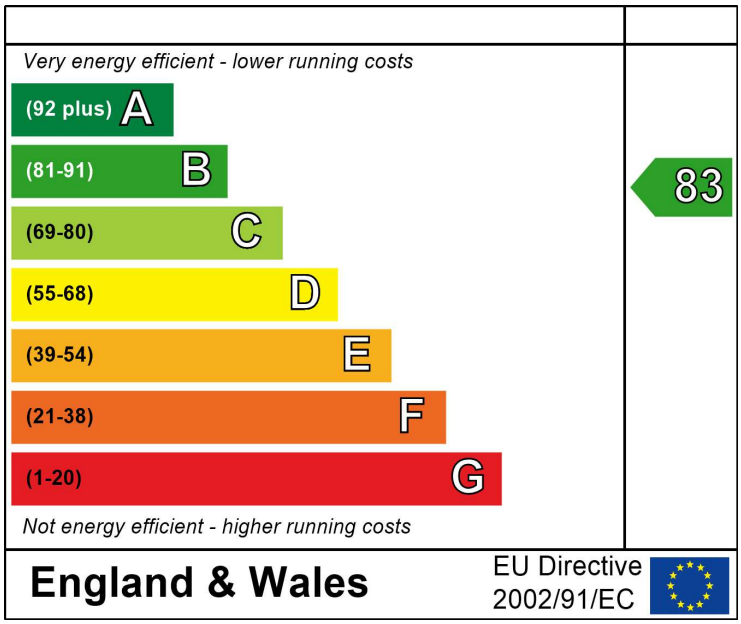
Predicted Energy Assessment

Dwelling type:	Ground floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	76.6 m²

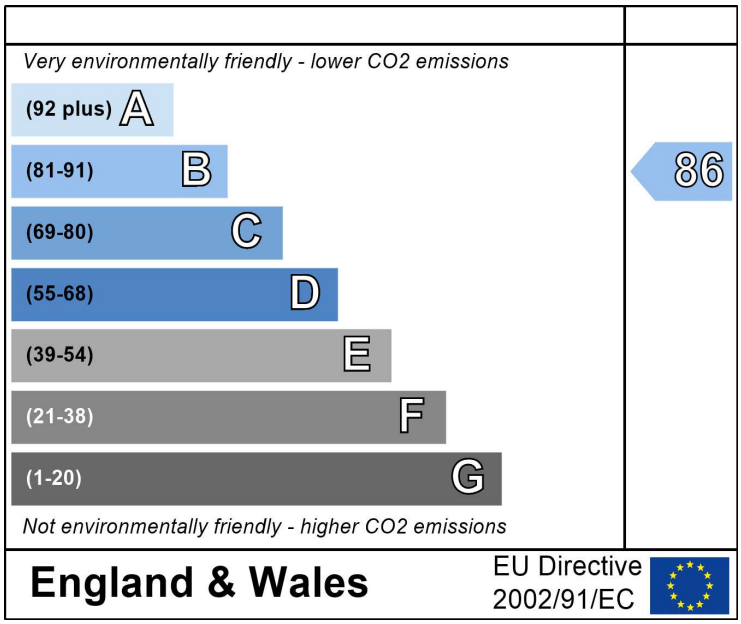
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C101

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76.6	(1a) x	2.7	(2a) =	206.82	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76.6	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		206.82	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			7	x1/[1/(1.4)+ 0.04] =	9.28			(27)
Windows Type 2			9	x1/[1/(1.4)+ 0.04] =	11.93			(27)
Floor			76.7	x 0.14 =	10.738			(28)
Walls Type1	53.19	16	37.19	x 0.18 =	6.69			(29)
Walls Type2	42.12	0	42.12	x 0.2 =	8.47			(29)
Total area of elements, m²			172.01					(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) = 47.11 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 16358.6 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 10.86 (36)

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

Total fabric heat loss (33) + (36) = 57.97 (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=	19.11	18.9	18.68	17.59	17.37	16.29	16.29	16.07	16.72	17.37	17.81	18.24	(38)

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

(39)m=	77.09	76.87	76.65	75.57	75.35	74.26	74.26	74.04	74.7	75.35	75.78	76.22	

Average = Sum(39)$_{1...12}$ /12= 75.51 (39)

SAP WorkSheet: New dwelling design stage

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

(40)m=	1.01	1	1	0.99	0.98	0.97	0.97	0.97	0.98	0.98	0.99	1

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

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

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.4 (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 91.09 (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=	100.19	96.55	92.91	89.26	85.62	81.98	81.98	85.62	89.26	92.91	96.55	100.19

Total = Sum(44)$_{1...12}$ = 1093.03 (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=	148.59	129.95	134.1	116.91	112.18	96.8	89.7	102.93	104.16	121.39	132.51	143.9

Total = Sum(45)$_{1...12}$ = 1433.13 (45)

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

(46)m=	22.29	19.49	20.12	17.54	16.83	14.52	13.46	15.44	15.62	18.21	19.88	21.58

(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 dwelling design stage

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

(61)m=	50.96	44.44	47.34	44.02	43.63	40.43	41.77	43.63	44.02	47.34	47.61	50.96	(61)

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

(62)m=	199.54	174.39	181.44	160.93	155.81	137.23	131.48	146.57	148.18	168.74	180.12	194.86	(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=	199.54	174.39	181.44	160.93	155.81	137.23	131.48	146.57	148.18	168.74	180.12	194.86	

Output from water heater (annual)$_{1...12}$ 1979.3 (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=	62.14	54.32	56.42	49.88	48.21	42.29	40.27	45.13	45.64	52.2	55.96	60.59	(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=	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	(66)

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

(67)m=	47.44	42.14	34.27	25.94	19.39	16.37	17.69	22.99	30.86	39.19	45.74	48.76	(67)

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

(68)m=	316.7	319.99	311.7	294.07	271.82	250.9	236.93	233.64	241.92	259.55	281.81	302.73	(68)

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

(69)m=	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	(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=	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	(71)

Water heating gains (Table 5)

(72)m=	83.53	80.83	75.84	69.28	64.8	58.74	54.13	60.66	63.39	70.16	77.73	81.43	(72)

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

(73)m=	550.34	545.62	524.48	491.96	458.68	428.68	411.41	419.97	438.84	471.57	507.94	535.59	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	7	x	10.63	x	0.57	x	0.7	=	20.58	(74)
North	0.9x 0.77	x	7	x	20.32	x	0.57	x	0.7	=	39.33	(74)
North	0.9x 0.77	x	7	x	34.53	x	0.57	x	0.7	=	66.84	(74)
North	0.9x 0.77	x	7	x	55.46	x	0.57	x	0.7	=	107.35	(74)
North	0.9x 0.77	x	7	x	74.72	x	0.57	x	0.7	=	144.62	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	7	x	79.99	x	0.57	x	0.7	=	154.82	(74)
North	0.9x	0.77	x	7	x	74.68	x	0.57	x	0.7	=	144.54	(74)
North	0.9x	0.77	x	7	x	59.25	x	0.57	x	0.7	=	114.67	(74)
North	0.9x	0.77	x	7	x	41.52	x	0.57	x	0.7	=	80.36	(74)
North	0.9x	0.77	x	7	x	24.19	x	0.57	x	0.7	=	46.82	(74)
North	0.9x	0.77	x	7	x	13.12	x	0.57	x	0.7	=	25.39	(74)
North	0.9x	0.77	x	7	x	8.86	x	0.57	x	0.7	=	17.16	(74)
East	0.9x	0.77	x	9	x	19.64	x	0.57	x	0.7	=	48.88	(76)
East	0.9x	0.77	x	9	x	38.42	x	0.57	x	0.7	=	95.61	(76)
East	0.9x	0.77	x	9	x	63.27	x	0.57	x	0.7	=	157.46	(76)
East	0.9x	0.77	x	9	x	92.28	x	0.57	x	0.7	=	229.64	(76)
East	0.9x	0.77	x	9	x	113.09	x	0.57	x	0.7	=	281.44	(76)
East	0.9x	0.77	x	9	x	115.77	x	0.57	x	0.7	=	288.1	(76)
East	0.9x	0.77	x	9	x	110.22	x	0.57	x	0.7	=	274.29	(76)
East	0.9x	0.77	x	9	x	94.68	x	0.57	x	0.7	=	235.61	(76)
East	0.9x	0.77	x	9	x	73.59	x	0.57	x	0.7	=	183.13	(76)
East	0.9x	0.77	x	9	x	45.59	x	0.57	x	0.7	=	113.45	(76)
East	0.9x	0.77	x	9	x	24.49	x	0.57	x	0.7	=	60.94	(76)
East	0.9x	0.77	x	9	x	16.15	x	0.57	x	0.7	=	40.19	(76)

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

(83)m=	69.46	134.94	224.29	337	426.05	442.92	418.83	350.28	263.49	160.27	86.33	57.35	(83)

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

(84)m=	619.79	680.57	748.77	828.96	884.73	871.6	830.24	770.25	702.33	631.84	594.28	592.94	(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	0.89	0.74	0.54	0.39	0.44	0.7	0.93	0.98	0.99	(86)

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

(87)m=	20.15	20.28	20.51	20.78	20.94	20.99	21	21	20.97	20.75	20.41	20.13	(87)

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

(88)m=	20.08	20.08	20.08	20.09	20.1	20.11	20.11	20.11	20.1	20.1	20.09	20.09	(88)

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

(89)m=	0.99	0.98	0.95	0.86	0.68	0.47	0.31	0.36	0.62	0.9	0.98	0.99	(89)

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

(90)m=	18.97	19.16	19.47	19.85	20.04	20.1	20.11	20.11	20.08	19.82	19.34	18.94	(90)

fLA = Living area ÷ (4) = 0.38 (91)

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

(92)m=	19.42	19.59	19.87	20.2	20.38	20.44	20.45	20.45	20.42	20.17	19.75	19.39	(92)

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

SAP WorkSheet: New dwelling design stage

(93)m=	19.27	19.44	19.72	20.05	20.23	20.29	20.3	20.3	20.27	20.02	19.6	19.24	(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=	0.99	0.97	0.94	0.86	0.69	0.48	0.33	0.37	0.63	0.9	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	610.81	663.47	707.57	710.76	610.71	419.27	274.21	287.97	445.74	565.99	577.86	585.95	(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=	1153.74	1117.36	1013.12	842.55	642.91	422.62	274.52	288.59	460.64	710.14	947.16	1146.21	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	403.94	305.01	227.33	94.89	23.96	0	0	0	0	107.24	265.9	416.83	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1845.1 (98)

Space heating requirement in kWh/m²/year 24.09 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	403.94	305.01	227.33	94.89	23.96	0	0	0	0	107.24	265.9	416.83	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	447.33	337.78	251.75	105.08	26.53	0	0	0	0	118.77	294.46	461.6	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2043.3 (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

Output from water heater (calculated above)

	199.54	174.39	181.44	160.93	155.81	137.23	131.48	146.57	148.18	168.74	180.12	194.86

Efficiency of water heater 81 (216)

(217)m=	87	86.68	85.92	84.22	82.13	81	81	81	81	84.38	86.3	87.11	(217)

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

(219)m=	229.37	201.19	211.18	191.09	189.72	169.42	162.32	180.95	182.94	199.98	208.72	223.68	

Total = Sum(219a)$_{1...12}$ = 2350.55 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 2043.3

SAP WorkSheet: New dwelling design stage

Water heating fuel used		2350.55	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	179.78		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	209.78	(231)
Electricity for lighting		335.12	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4938.75	(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 =	71.11		(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 =	81.8		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	27.67		(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 =	44.2		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			344.78		(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] =	1.19	(257)
SAP rating (Section 12)		83.39	(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	=	441.35	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	507.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =				949.07	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	108.87	(267)
Electricity for lighting	(232) x		0.519	=	173.93	(268)
Total CO2, kg/year		sum of (265)…(271) =			1231.87	(272)
CO2 emissions per m²		(272) ÷ (4) =			16.08	(273)
EI rating (section 14)					86	(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	2492.82	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2867.68	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5360.5	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	644.02	(267)
Electricity for lighting	(232)	x	0	=	1028.82	(268)
'Total Primary Energy			sum of (265)…(271) =		7033.34	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		91.82	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C101

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	2 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	136.5	**(P1)**
Transmission heat loss coefficient:	58	
Summer heat loss coefficient:	194.48	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	7	81.19	0.57	0.7	0.9	183.67	
East (E)	0.9 x	9	117.51	0.57	0.7	0.9	341.79	
						Total	525.46	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	425.68	408.41	416.97	
Total summer gains	987.21	933.88	867	**(P5)**
Summer gain/loss ratio	5.08	4.8	4.46	**(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	22.95	22.51	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:23:40

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 65.8m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C102

Address :

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)	19.88 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.28 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: East	14.3m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C102

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	65.8 m²	2.7 m

Living area:	26.7 m² (fraction 0.406)
Front of dwelling faces:	East

Opening types:

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

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
E	16mm or more	0.7	0.57	1.4	14.3	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.43	14.3	15.13	0.18	0	False	N/A
Corridor	58.32	0	58.32	0.22	0.43	False	N/A
GF	65.8			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0572

	Length	**Psi-value**		
[Approved]	5.5	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4.4	0.04	E3	Sill
[Approved]	15.2	0.05	E4	Jamb
[Approved]	32.5	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

SAP Input

[Approved]	4.5	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

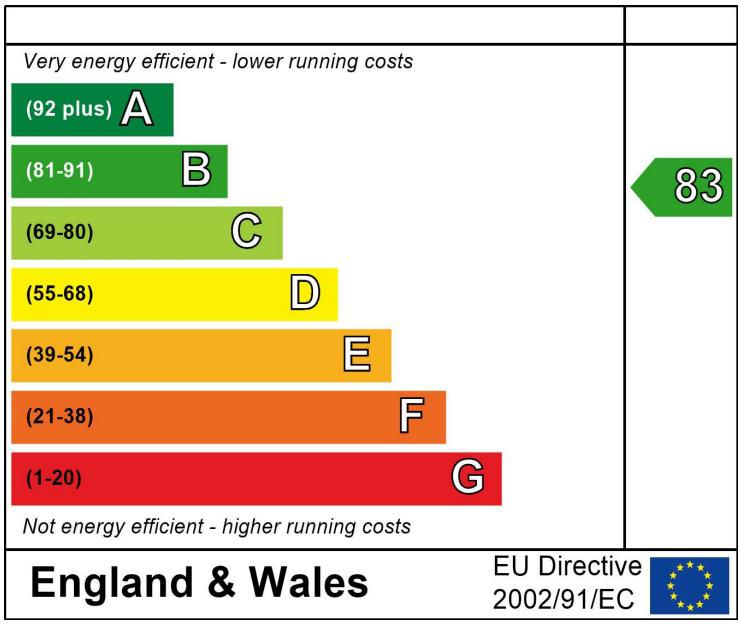
Predicted Energy Assessment

Dwelling type:	Ground floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	65.8 m²

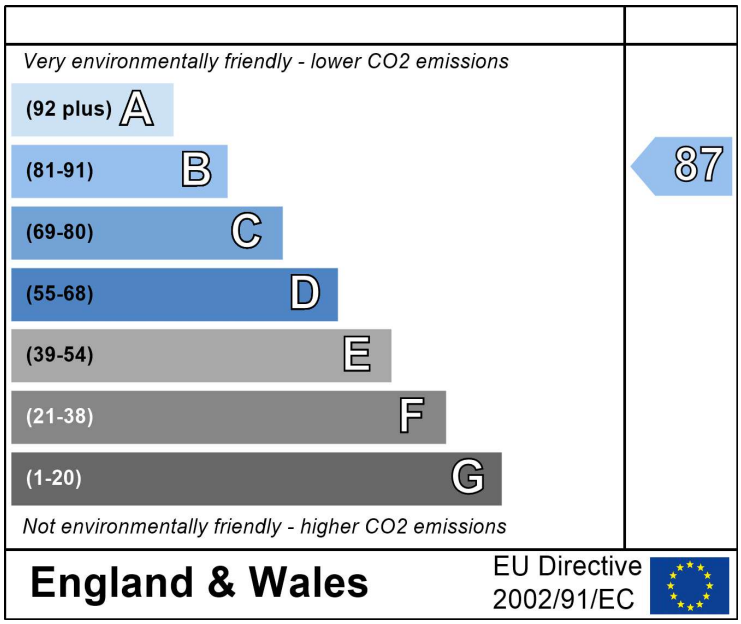
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C102

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	65.8	(1a) x	2.7	(2a) =	177.66	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	65.8	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		177.66	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			14.3	x 1/[1/(1.4)+ 0.04] =	18.96			(27)
Floor			65.8	x 0.14 =	9.212001			(28)
Walls Type1	29.43	14.3	15.13	x 0.18 =	2.72			(29)
Walls Type2	58.32	0	58.32	x 0.2 =	11.72			(29)
Total area of elements, m²			153.55					(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) = 42.62 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 17074.9 (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 8.78 (36)

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

Total fabric heat loss (33) + (36) = 51.4 (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=	16.42	16.23	16.05	15.11	14.92	13.99	13.99	13.8	14.36	14.92	15.3	15.67	(38)

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

(39)m=	67.82	67.63	67.45	66.51	66.32	65.39	65.39	65.2	65.76	66.32	66.7	67.07	

Average = Sum(39)$_{1...12}$ /12= 66.46 (39)

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

(40)m=	1.03	1.03	1.03	1.01	1.01	0.99	0.99	0.99	1	1.01	1.01	1.02	

Average = Sum(40)$_{1...12}$ /12= 1.01 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.14 (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 85.03 (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=	93.53	90.13	86.73	83.32	79.92	76.52	76.52	79.92	83.32	86.73	90.13	93.53	

Total = Sum(44)$_{1...12}$ = 1020.3 (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=	138.7	121.31	125.18	109.13	104.72	90.36	83.73	96.09	97.23	113.32	123.69	134.32	

Total = Sum(45)$_{1...12}$ = 1337.78 (45)

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

(46)m=	20.8	18.2	18.78	16.37	15.71	13.55	12.56	14.41	14.58	17	18.55	20.15	(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=	47.66	41.48	44.19	41.09	40.73	37.74	39	40.73	41.09	44.19	44.45	47.66	(61)

SAP WorkSheet: New dwelling design stage

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=	186.36	162.79	169.37	150.22	145.44	128.1	122.73	136.81	138.32	157.51	168.14	181.98	(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=	186.36	162.79	169.37	150.22	145.44	128.1	122.73	136.81	138.32	157.51	168.14	181.98	

Output from water heater (annual)$_{1...12}$ 1847.79 (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=	58.03	50.71	52.67	46.56	45	39.48	37.59	42.13	42.6	48.73	52.24	56.58	(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=	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	(66)

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

(67)m=	41.78	37.11	30.18	22.85	17.08	14.42	15.58	20.25	27.18	34.51	40.28	42.94	(67)

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

(68)m=	279.56	282.46	275.15	259.59	239.94	221.48	209.14	206.24	213.55	229.11	248.76	267.22	(68)

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

(69)m=	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	(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=	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	(71)

Water heating gains (Table 5)

(72)m=	78	75.45	70.79	64.67	60.48	54.83	50.52	56.63	59.17	65.49	72.55	76.04	(72)

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

(73)m=	495.12	490.8	471.9	442.88	413.28	386.51	371.03	378.9	395.68	424.9	457.37	481.99	(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)	
East	0.9x 0.77	x	14.3	x	19.64	x	0.57	x	0.7	=	77.66	(76)
East	0.9x 0.77	x	14.3	x	38.42	x	0.57	x	0.7	=	151.92	(76)
East	0.9x 0.77	x	14.3	x	63.27	x	0.57	x	0.7	=	250.19	(76)
East	0.9x 0.77	x	14.3	x	92.28	x	0.57	x	0.7	=	364.88	(76)
East	0.9x 0.77	x	14.3	x	113.09	x	0.57	x	0.7	=	447.17	(76)
East	0.9x 0.77	x	14.3	x	115.77	x	0.57	x	0.7	=	457.76	(76)
East	0.9x 0.77	x	14.3	x	110.22	x	0.57	x	0.7	=	435.81	(76)
East	0.9x 0.77	x	14.3	x	94.68	x	0.57	x	0.7	=	374.35	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	14.3	x	73.59	x	0.57	x	0.7	=	290.98	(76)
East	0.9x	0.77	x	14.3	x	45.59	x	0.57	x	0.7	=	180.26	(76)
East	0.9x	0.77	x	14.3	x	24.49	x	0.57	x	0.7	=	96.83	(76)
East	0.9x	0.77	x	14.3	x	16.15	x	0.57	x	0.7	=	63.86	(76)

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

(83)m=	77.66	151.92	250.19	364.88	447.17	457.76	435.81	374.35	290.98	180.26	96.83	63.86	(83)

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

(84)m=	572.78	642.72	722.08	807.76	860.46	844.27	806.83	753.25	686.66	605.16	554.21	545.85	(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	0.94	0.85	0.68	0.49	0.36	0.4	0.64	0.9	0.98	0.99	(86)

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

(87)m=	20.17	20.33	20.57	20.82	20.96	20.99	21	21	20.98	20.79	20.43	20.14	(87)

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

(88)m=	20.06	20.06	20.06	20.07	20.08	20.09	20.09	20.09	20.08	20.08	20.07	20.07	(88)

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

(89)m=	0.98	0.97	0.93	0.81	0.62	0.42	0.28	0.32	0.56	0.86	0.97	0.99	(89)

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

(90)m=	18.98	19.2	19.54	19.88	20.04	20.09	20.09	20.09	20.07	19.85	19.37	18.94	(90)

fLA = Living area ÷ (4) = 0.41 (91)

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

(92)m=	19.46	19.66	19.96	20.27	20.41	20.45	20.46	20.46	20.44	20.23	19.8	19.43	(92)

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

(93)m=	19.31	19.51	19.81	20.12	20.26	20.3	20.31	20.31	20.29	20.08	19.65	19.28	(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=	0.98	0.97	0.92	0.81	0.64	0.44	0.3	0.34	0.58	0.86	0.96	0.98	(94)

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

(95)m=	561.88	620.28	665.94	656.17	547.57	370.92	242.27	254.51	397.87	522.88	534.01	537.47	(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=	1018.23	987.97	897.39	745.95	567.75	372.98	242.46	254.87	406.85	628.72	837.11	1011.44	(97)

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

(98)m=	339.53	247.09	172.2	64.64	15.01	0	0	0	0	78.75	218.23	352.64	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1488.08 (98)

Space heating requirement in kWh/m²/year 22.62 (99)

SAP WorkSheet: New dwelling design stage

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

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)	339.53	247.09	172.2	64.64	15.01	0	0	0	0	78.75	218.23	352.64	
(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	376	273.63	190.7	71.58	16.62	0	0	0	0	87.2	241.67	390.52	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 1647.93 (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)	186.36	162.79	169.37	150.22	145.44	128.1	122.73	136.81	138.32	157.51	168.14	181.98

Efficiency of water heater 81 (216)

(217)m=	86.77	86.36	85.44	83.59	81.79	81	81	81	81	83.88	86	86.9

(217)

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

(219)m=	214.78	188.5	198.25	179.72	177.83	158.15	151.52	168.91	170.77	187.78	195.5	209.41

Total = Sum(219a)$_{1...12}$ = 2201.1 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1647.93
Water heating fuel used		2201.1
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	154.43	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	184.43 (231)
Electricity for lighting		295.13 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4328.6 (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 =	57.35 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	76.6	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	24.33	(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 =	38.93	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			317.2	(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] =	1.2	(257)
SAP rating (Section 12)		83.23	(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	=	355.95	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	475.44	(264)
Space and water heating	(261) + (262) + (263) + (264) =					831.39	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	95.72	(267)
Electricity for lighting	(232)	x		0.519	=	153.17	(268)
Total CO2, kg/year			sum of (265)…(271) =			1080.28	(272)
CO2 emissions per m²			(272) ÷ (4) =			16.42	(273)
EI rating (section 14)						87	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	2010.48	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2685.34	(264)
Space and water heating	(261) + (262) + (263) + (264) =					4695.82	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	566.2	(267)
Electricity for lighting	(232)	x		0	=	906.05	(268)
'Total Primary Energy			sum of (265)…(271) =			6168.08	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			93.74	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C102

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	175.88	**(P1)**
Transmission heat loss coefficient:	51.4	
Summer heat loss coefficient:	227.28	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
East (E)	0.9 x	14.3	117.51	0.57	0.7	0.9	543.07	
						Total	543.07	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	383.51	368.03	375.9	
Total summer gains	959.99	911.1	853.67	**(P5)**
Summer gain/loss ratio	4.22	4.01	3.76	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.47	22.16	21.81	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:23:19

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 42.6m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C103

Address :

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)	23.63 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.43 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	58.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C103

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	42.6 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.43	10.4	19.03	0.18	0	False	N/A
Corridor	29.43	0	29.43	0.22	0.43	False	N/A
GF	42.6			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0715

	Length	**Psi-value**		
[Approved]	5.2	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4.1	0.04	E3	Sill
[Approved]	16.8	0.05	E4	Jamb

SAP Input

[Approved]	21.8	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	7.9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

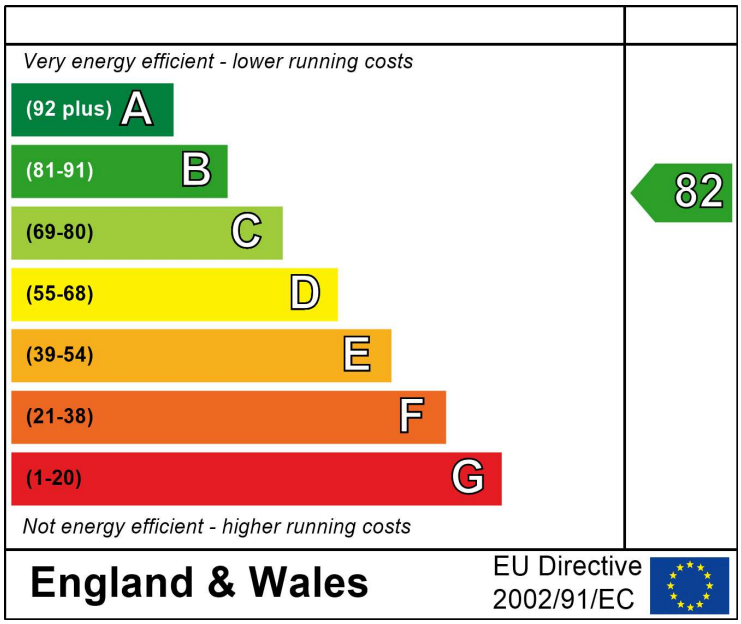
Predicted Energy Assessment

Dwelling type:	Ground floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	42.6 m²

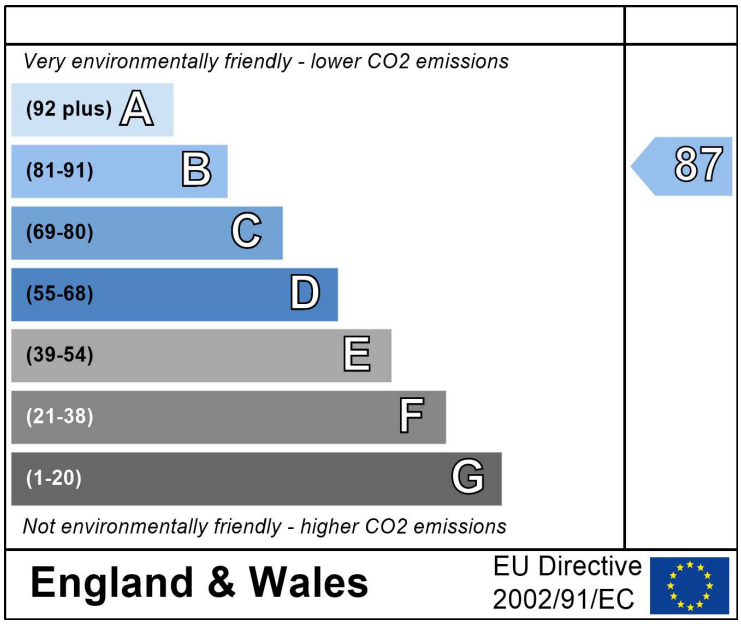
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C103

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	42.6 (1a)	x	2.7 (2a)	=	115.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	42.6 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	115.02	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Floor			42.6	x 0.14 =	5.964			(28)
Walls Type1	29.43	10.4	19.03	x 0.18 =	3.43			(29)
Walls Type2	29.43	0	29.43	x 0.2 =	5.92			(29)
Total area of elements, m²			101.46					(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) = 29.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10118.8 (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 7.26 (36)

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

Total fabric heat loss (33) + (36) = 36.35 (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=	10.63	10.51	10.39	9.78	9.66	9.06	9.06	8.94	9.3	9.66	9.9	10.15	(38)

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

(39)m=	46.98	46.86	46.74	46.13	46.01	45.4	45.4	45.28	45.65	46.01	46.25	46.49	

Average = Sum(39)$_{1...12}$ /12= 46.1 (39)

SAP WorkSheet: New dwelling design stage

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(40)m=	1.1	1.1	1.1	1.08	1.08	1.07	1.07	1.06	1.07	1.08	1.09	1.09	

Average = Sum(40)$_{1...12}$ /12= 1.08 (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 1.48 (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 69.28 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	76.21	73.44	70.66	67.89	65.12	62.35	62.35	65.12	67.89	70.66	73.44	76.21	

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

Total = Sum(44)$_{1...12}$ = 831.35 (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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(45)m=	113.01	98.84	102	88.92	85.32	73.63	68.23	78.29	79.23	92.33	100.79	109.45	

Total = Sum(45)$_{1...12}$ = 1090.03 (45)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(46)m=	16.95	14.83	15.3	13.34	12.8	11.04	10.23	11.74	11.88	13.85	15.12	16.42	(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

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

SAP WorkSheet: New dwelling design stage

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

(61)m=	38.83	33.8	36.01	33.48	33.19	30.75	31.77	33.19	33.48	36.01	36.22	38.83	(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=	151.85	132.64	138.01	122.4	118.51	104.38	100	111.48	112.71	128.34	137	148.28	(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=	151.85	132.64	138.01	122.4	118.51	104.38	100	111.48	112.71	128.34	137	148.28	

Output from water heater (annual)$_{1...12}$ 1505.6 (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=	47.29	41.32	42.92	37.94	36.67	32.17	30.63	34.33	34.71	39.7	42.57	46.1	(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=	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	(66)

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

(67)m=	28.56	25.36	20.63	15.62	11.67	9.85	10.65	13.84	18.58	23.59	27.53	29.35	(67)

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

(68)m=	191.23	193.21	188.21	177.57	164.13	151.5	143.06	141.08	146.08	156.72	170.16	182.79	(68)

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

(69)m=	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	(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=	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	(71)

Water heating gains (Table 5)

(72)m=	63.56	61.48	57.68	52.69	49.28	44.68	41.17	46.14	48.21	53.36	59.12	61.96	(72)

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

(73)m=	361.22	357.94	344.4	323.75	302.96	283.91	272.76	278.94	290.75	311.56	334.69	351.98	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x	0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x	0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)
North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x	0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x	0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x	0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x	0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x	0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x	0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x	0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)
East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)

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

(83)m=	43.53	84.46	140.63	212.43	270.04	281.46	265.85	221.31	165.5	100.33	54.07	35.97	(83)

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

(84)m=	404.75	442.4	485.03	536.19	573	565.38	538.61	500.25	456.25	411.89	388.76	387.95	(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=	0.98	0.97	0.94	0.86	0.7	0.51	0.37	0.41	0.66	0.9	0.97	0.99	(86)

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

(87)m=	20.14	20.28	20.51	20.78	20.94	20.99	21	21	20.97	20.76	20.41	20.11	(87)

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

(88)m=	20	20	20	20.01	20.02	20.03	20.03	20.03	20.02	20.02	20.01	20.01	(88)

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

(89)m=	0.98	0.97	0.93	0.82	0.64	0.43	0.29	0.33	0.58	0.86	0.96	0.98	(89)

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

(90)m=	18.89	19.09	19.41	19.78	19.96	20.02	20.03	20.03	20	19.76	19.28	18.85	(90)

fLA = Living area ÷ (4) = 0.68 (91)

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

(92)m=	19.74	19.9	20.16	20.46	20.63	20.68	20.69	20.69	20.66	20.44	20.05	19.71	(92)

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

SAP WorkSheet: New dwelling design stage

(93)m=	19.59	19.75	20.01	20.31	20.48	20.53	20.54	20.54	20.51	20.29	19.9	19.56	(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=	0.98	0.96	0.93	0.83	0.67	0.47	0.33	0.37	0.62	0.87	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	395.54	426.2	449.84	446.56	382.83	266.73	178.61	186.9	282.11	359.29	373.06	380.56	(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=	718.48	695.9	631.49	526.46	403.95	269.44	178.95	187.52	292.62	445.87	592.06	714.32	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	240.27	181.24	135.15	57.53	15.71	0	0	0	0	64.42	157.69	248.31	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1100.31 (98)

Space heating requirement in kWh/m²/year 25.83 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	240.27	181.24	135.15	57.53	15.71	0	0	0	0	64.42	157.69	248.31	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	266.08	200.71	149.67	63.71	17.4	0	0	0	0	71.34	174.62	274.99	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1218.51 (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

Output from water heater (calculated above)

	151.85	132.64	138.01	122.4	118.51	104.38	100	111.48	112.71	128.34	137	148.28	

Efficiency of water heater 81 (216)

(217)m=	86.46	86.12	85.35	83.76	81.99	81	81	81	81	83.89	85.72	86.58	(217)

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

(219)m=	175.64	154.02	161.7	146.14	144.54	128.86	123.46	137.63	139.15	152.99	159.82	171.26	

Total = Sum(219a)$_{1...12}$ = 1795.19 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1218.51

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1795.19	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	99.98		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	129.98	(231)
Electricity for lighting		201.72	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3345.4	(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 =	42.4		(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 =	62.47		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	17.14		(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 =	26.61		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			268.63		(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] =	1.29	(257)
SAP rating (Section 12)		82.03	(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	=	263.2		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	387.76		(264)
Space and water heating	(261) + (262) + (263) + (264) =			650.96		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	67.46		(267)
Electricity for lighting	(232) x	0.519	=	104.69		(268)
Total CO2, kg/year	sum of (265)…(271) =			823.11		(272)
CO2 emissions per m²	(272) ÷ (4) =			19.32		(273)
EI rating (section 14)				87		(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	1486.58	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2190.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3676.71	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	399.04	(267)
Electricity for lighting	(232)	x	0	=	619.28	(268)
'Total Primary Energy			sum of (265)…(271) =		4695.04	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		110.21	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C103

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	113.87	**(P1)**
Transmission heat loss coefficient:	36.3	
Summer heat loss coefficient:	150.22	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	333.92	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	280.91	269.76	275.94	
Total summer gains	638.15	603.68	560.61	**(P5)**
Summer gain/loss ratio	4.25	4.02	3.73	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.5	22.17	21.78	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:22:58

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.8m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C104

Address :

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)	17.93 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.92 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: South	4.8m²
Windows facing: East	4.8m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C104

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	61.8 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	4.8	1
E	16mm or more	0.7	0.57	1.4	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	28.62	9.6	19.02	0.18	0	False	N/A
Corridor	20.25	0	20.25	0.22	0.43	False	N/A
GF	61.8			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0566

	Length	**Psi-value**		
[Approved]	4.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4.1	0.04	E3	Sill
[Approved]	17.6	0.05	E4	Jamb

SAP Input

[Approved]	18.1	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	4.6	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

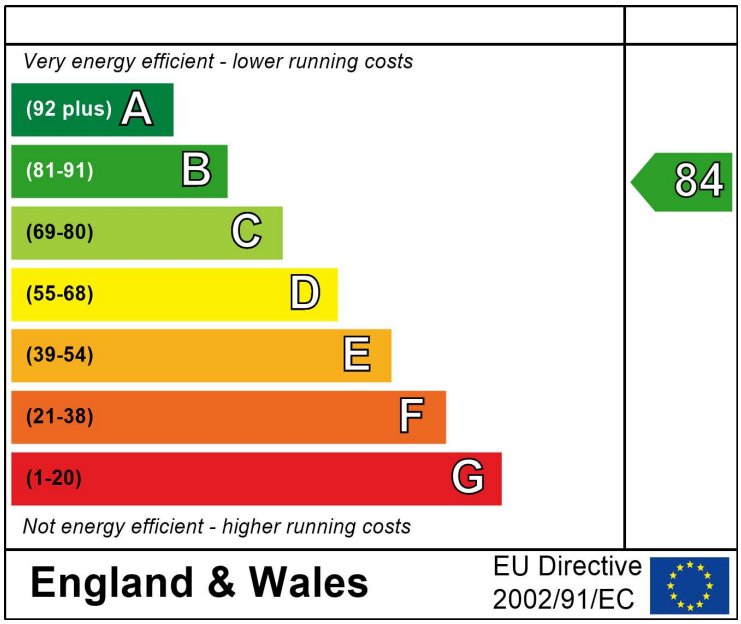
Predicted Energy Assessment

Dwelling type:	Ground floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	61.8 m²

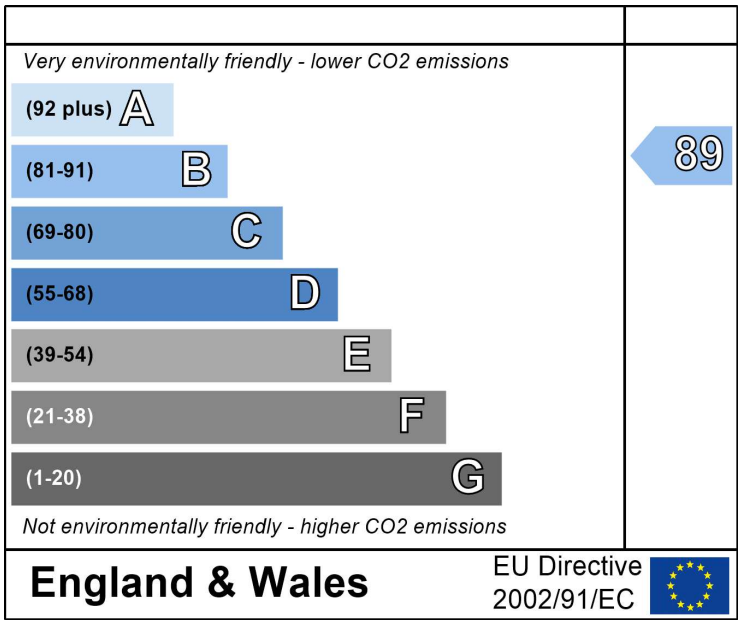
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C104

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.8 (1a)	x	2.7 (2a)	=	166.86	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.8 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	166.86	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.8	x1/[1/(1.4)+ 0.04] =	6.36			(27)
Windows Type 2			4.8	x1/[1/(1.4)+ 0.04] =	6.36			(27)
Floor			61.8	x 0.14 =	8.651999			(28)
Walls Type1	28.62	9.6	19.02	x 0.18 =	3.42			(29)
Walls Type2	20.25	0	20.25	x 0.2 =	4.07			(29)
Total area of elements, m²			110.67					(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) = 28.87 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9813.9 (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 6.26 (36)

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

Total fabric heat loss (33) + (36) = 35.14 (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=	15.42	15.25	15.07	14.19	14.02	13.14	13.14	12.96	13.49	14.02	14.37	14.72	(38)

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

(39)m=	50.56	50.38	50.21	49.33	49.16	48.28	48.28	48.1	48.63	49.16	49.51	49.86	

Average = Sum(39)$_{1...12}$ /12= 49.29 (39)

SAP WorkSheet: New dwelling design stage

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

(40)m=	0.82	0.82	0.81	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.8	0.81

Average = Sum(40)$_{1...12}$ /12= 0.8 (40)

Number of days in month (Table 1a)

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

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.03 (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 82.46 (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=	90.71	87.41	84.11	80.81	77.51	74.21	74.21	77.51	80.81	84.11	87.41	90.71

Total = Sum(44)$_{1...12}$ = 989.53 (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=	134.52	117.65	121.4	105.84	101.56	87.64	81.21	93.19	94.3	109.9	119.96	130.27

Total = Sum(45)$_{1...12}$ = 1297.43 (45)

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

(46)m=	20.18	17.65	18.21	15.88	15.23	13.15	12.18	13.98	14.15	16.48	17.99	19.54

(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 dwelling design stage

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

(61)m=	46.22	40.23	42.86	39.85	39.5	36.6	37.82	39.5	39.85	42.86	43.11	46.22	(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=	180.74	157.88	164.26	145.69	141.06	124.24	119.03	132.69	134.15	152.76	163.07	176.49	(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=	180.74	157.88	164.26	145.69	141.06	124.24	119.03	132.69	134.15	152.76	163.07	176.49	

Output from water heater (annual)$_{1...12}$ 1792.06 (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=	56.28	49.18	51.08	45.16	43.64	38.29	36.46	40.86	41.32	47.26	50.66	54.87	(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=	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	(66)

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

(67)m=	41.51	36.87	29.98	22.7	16.97	14.33	15.48	20.12	27	34.29	40.02	42.66	(67)

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

(68)m=	264.87	267.62	260.69	245.95	227.33	209.84	198.15	195.41	202.33	217.08	235.69	253.18	(68)

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

(69)m=	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	(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=	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	(71)

Water heating gains (Table 5)

(72)m=	75.65	73.18	68.66	62.72	58.66	53.18	49	54.92	57.39	63.52	70.37	73.75	(72)

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

(73)m=	474.89	470.53	452.2	424.23	395.83	370.21	355.5	363.31	379.59	407.75	438.94	462.46	(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)	
East	0.9x 0.77	x	4.8	x	19.64	x	0.57	x	0.7	=	26.07	(76)
East	0.9x 0.77	x	4.8	x	38.42	x	0.57	x	0.7	=	50.99	(76)
East	0.9x 0.77	x	4.8	x	63.27	x	0.57	x	0.7	=	83.98	(76)
East	0.9x 0.77	x	4.8	x	92.28	x	0.57	x	0.7	=	122.48	(76)
East	0.9x 0.77	x	4.8	x	113.09	x	0.57	x	0.7	=	150.1	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	4.8	x	115.77	x	0.57	x	0.7	=	153.65	(76)
East	0.9x	0.77	x	4.8	x	110.22	x	0.57	x	0.7	=	146.29	(76)
East	0.9x	0.77	x	4.8	x	94.68	x	0.57	x	0.7	=	125.66	(76)
East	0.9x	0.77	x	4.8	x	73.59	x	0.57	x	0.7	=	97.67	(76)
East	0.9x	0.77	x	4.8	x	45.59	x	0.57	x	0.7	=	60.51	(76)
East	0.9x	0.77	x	4.8	x	24.49	x	0.57	x	0.7	=	32.5	(76)
East	0.9x	0.77	x	4.8	x	16.15	x	0.57	x	0.7	=	21.44	(76)
South	0.9x	0.77	x	4.8	x	46.75	x	0.57	x	0.7	=	62.05	(78)
South	0.9x	0.77	x	4.8	x	76.57	x	0.57	x	0.7	=	101.62	(78)
South	0.9x	0.77	x	4.8	x	97.53	x	0.57	x	0.7	=	129.45	(78)
South	0.9x	0.77	x	4.8	x	110.23	x	0.57	x	0.7	=	146.31	(78)
South	0.9x	0.77	x	4.8	x	114.87	x	0.57	x	0.7	=	152.46	(78)
South	0.9x	0.77	x	4.8	x	110.55	x	0.57	x	0.7	=	146.72	(78)
South	0.9x	0.77	x	4.8	x	108.01	x	0.57	x	0.7	=	143.36	(78)
South	0.9x	0.77	x	4.8	x	104.89	x	0.57	x	0.7	=	139.22	(78)
South	0.9x	0.77	x	4.8	x	101.89	x	0.57	x	0.7	=	135.23	(78)
South	0.9x	0.77	x	4.8	x	82.59	x	0.57	x	0.7	=	109.61	(78)
South	0.9x	0.77	x	4.8	x	55.42	x	0.57	x	0.7	=	73.55	(78)
South	0.9x	0.77	x	4.8	x	40.4	x	0.57	x	0.7	=	53.62	(78)

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

(83)m=	88.12	152.62	213.43	268.78	302.56	300.38	289.64	264.88	232.9	170.12	106.05	75.05	(83)

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

(84)m=	563.01	623.15	665.63	693.01	698.39	670.59	645.14	628.19	612.48	577.87	545	537.52	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.95	0.91	0.8	0.64	0.46	0.33	0.35	0.54	0.81	0.95	0.98	(86)

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

(87)m=	20.52	20.65	20.8	20.93	20.99	21	21	21	21	20.93	20.72	20.5	(87)

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

(88)m=	20.24	20.24	20.24	20.25	20.26	20.27	20.27	20.27	20.26	20.26	20.25	20.25	(88)

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

(89)m=	0.97	0.94	0.89	0.76	0.59	0.41	0.27	0.3	0.49	0.77	0.93	0.98	(89)

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

(90)m=	19.62	19.8	20	20.18	20.24	20.27	20.27	20.27	20.26	20.19	19.92	19.59	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	20.05	20.2	20.38	20.53	20.59	20.61	20.61	20.61	20.61	20.54	20.3	20.02	(92)

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

(93)m=	19.9	20.05	20.23	20.38	20.44	20.46	20.46	20.46	20.46	20.39	20.15	19.87	(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	0.94	0.88	0.77	0.61	0.42	0.29	0.31	0.5	0.78	0.93	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	544.53	585.76	588.91	533.34	423.61	282.61	186.49	195.48	307.77	450.87	508.27	523.23	(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=	788.58	763.34	689.22	566.47	429.78	283.03	186.52	195.52	309.16	481.22	645.84	781.23	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	181.57	119.33	74.63	23.86	4.59	0	0	0	0	22.58	99.05	191.95	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 717.56 (98)

Space heating requirement in kWh/m²/year 11.61 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	181.57	119.33	74.63	23.86	4.59	0	0	0	0	22.58	99.05	191.95	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	201.08	132.15	82.65	26.42	5.08	0	0	0	0	25.01	109.69	212.57	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 794.64 (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

Output from water heater (calculated above)

	180.74	157.88	164.26	145.69	141.06	124.24	119.03	132.69	134.15	152.76	163.07	176.49

Efficiency of water heater 81 (216)

(217)m=	85.41	84.76	83.69	82.19	81.26	81	81	81	81	82.09	84.28	85.59	(217)

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

(219)m=	211.62	186.27	196.27	177.26	173.58	153.38	146.95	163.81	165.62	186.09	193.48	206.2	

Total = Sum(219a)$_{1...12}$ = 2160.54 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		794.64

SAP WorkSheet: New dwelling design stage

Water heating fuel used		2160.54	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	145.04		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	175.04	(231)
Electricity for lighting		293.23	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3423.45	(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 =	27.65		(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 =	75.19		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	23.09		(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 =	38.68		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			284.61		(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] =	1.12	(257)
SAP rating (Section 12)		84.39	(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	=	171.64		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	466.68		(264)
Space and water heating	(261) + (262) + (263) + (264) =			638.32		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	90.85		(267)
Electricity for lighting	(232) x	0.519	=	152.19		(268)
Total CO2, kg/year	sum of (265)…(271) =			881.35		(272)
CO2 emissions per m²	(272) ÷ (4) =			14.26		(273)
EI rating (section 14)				89		(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	969.46	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2635.86	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3605.32	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	537.38	(267)
Electricity for lighting	(232)	x	0	=	900.21	(268)
'Total Primary Energy			sum of (265)…(271) =		5042.91	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		81.6	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C104

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	165.19	**(P1)**
Transmission heat loss coefficient:	35.1	
Summer heat loss coefficient:	200.33	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	4.8	112.21	0.57	0.7	0.9	174.07	
East (E)	0.9 x	4.8	117.51	0.57	0.7	0.9	182.29	
						Total	356.36	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	367.21	352.5	360.31	
Total summer gains	741.15	708.86	692.42	**(P5)**
Summer gain/loss ratio	3.7	3.54	3.46	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.95	21.69	21.51	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:22:39

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.3m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C105

Address :

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)	19.81 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.11 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	11.8m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C105

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	61.3 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	11.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	39.69	16	23.69	0.18	0	False	N/A
Corridor	14.04	0	14.04	0.22	0.43	False	N/A
GF	61.3			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0768

	Length	**Psi-value**		
[Approved]	7.7	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6.1	0.04	E3	Sill
[Approved]	31.2	0.05	E4	Jamb

SAP Input

[Approved]	19.9	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	13.5	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

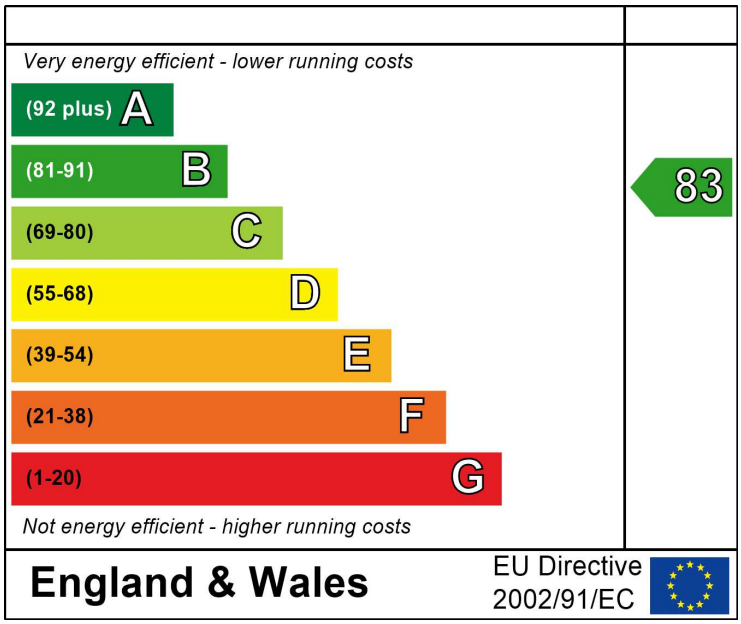
Predicted Energy Assessment

Dwelling type:	Ground floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	61.3 m²

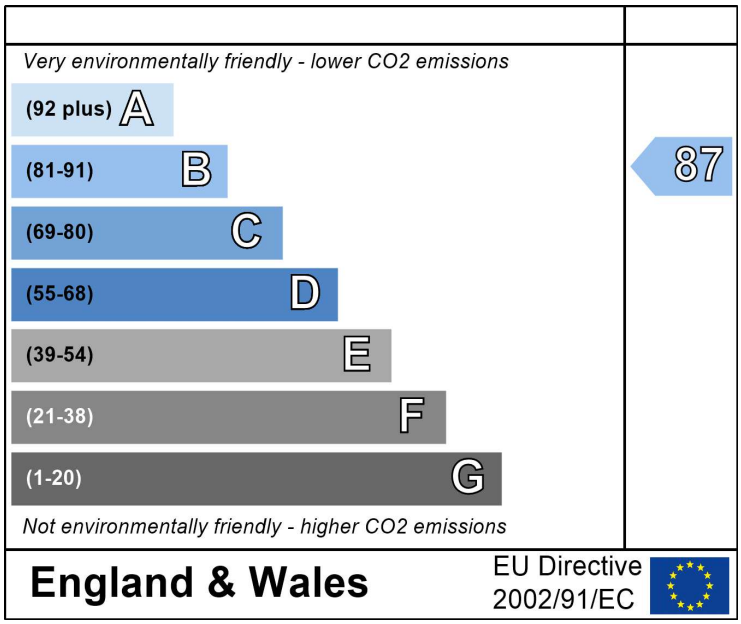
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C105

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.3 (1a)	x	2.7 (2a)	=	165.51	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	165.51	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			11.8	x1/[1/(1.4)+ 0.04] =	15.64			(27)
Floor			61.3	x 0.14 =	8.582			(28)
Walls Type1	39.69	16	23.69	x 0.18 =	4.26			(29)
Walls Type2	14.04	0	14.04	x 0.2 =	2.82			(29)
Total area of elements, m²			115.03					(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) = 36.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8923.4 (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 8.84 (36)

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

Total fabric heat loss (33) + (36) = 45.72 (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=	15.3	15.12	14.95	14.08	13.9	13.03	13.03	12.86	13.38	13.9	14.25	14.6	(38)

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

(39)m=	61.01	60.84	60.67	59.8	59.62	58.75	58.75	58.58	59.1	59.62	59.97	60.32	

Average = Sum(39)$_{1...12}$ /12= 59.75 (39)

SAP WorkSheet: New dwelling design stage

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

(40)m=	1	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.96	0.97	0.98	0.98

Average = Sum(40)$_{1...12}$ /12= 0.97 (40)

Number of days in month (Table 1a)

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

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.02 (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 82.13 (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=	90.34	87.06	83.77	80.49	77.2	73.92	73.92	77.2	80.49	83.77	87.06	90.34

Total = Sum(44)$_{1...12}$ = 985.57 (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=	133.98	117.18	120.92	105.42	101.15	87.29	80.88	92.81	93.92	109.46	119.48	129.75

Total = Sum(45)$_{1...12}$ = 1292.24 (45)

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

(46)m=	20.1	17.58	18.14	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46

(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 dwelling design stage

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

(61)m=	46.04	40.07	42.69	39.69	39.34	36.45	37.67	39.34	39.69	42.69	42.93	46.04	(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=	180.02	157.25	163.61	145.11	140.49	123.74	118.55	132.16	133.62	152.15	162.42	175.79	(62)

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

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

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

Output from water heater

(64)m=	180.02	157.25	163.61	145.11	140.49	123.74	118.55	132.16	133.62	152.15	162.42	175.79	

Output from water heater (annual)$_{1...12}$ 1784.89 (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=	56.06	48.98	50.88	44.97	43.47	38.14	36.31	40.7	41.15	47.07	50.46	54.65	(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=	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	(66)

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

(67)m=	39.27	34.88	28.37	21.48	16.05	13.55	14.65	19.04	25.55	32.44	37.86	40.37	(67)

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

(68)m=	263	265.73	258.86	244.22	225.73	208.36	196.76	194.03	200.91	215.55	234.03	251.4	(68)

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

(69)m=	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	(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=	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	(71)

Water heating gains (Table 5)

(72)m=	75.35	72.89	68.38	62.46	58.43	52.97	48.8	54.7	57.16	63.26	70.08	73.46	(72)

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

(73)m=	470.11	465.99	448.1	420.65	392.7	367.37	352.7	360.25	376.1	403.74	434.47	457.71	(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)	
East	0.9x 0.77	x	11.8	x	19.64	x	0.57	x	0.7	=	64.08	(76)
East	0.9x 0.77	x	11.8	x	38.42	x	0.57	x	0.7	=	125.36	(76)
East	0.9x 0.77	x	11.8	x	63.27	x	0.57	x	0.7	=	206.45	(76)
East	0.9x 0.77	x	11.8	x	92.28	x	0.57	x	0.7	=	301.09	(76)
East	0.9x 0.77	x	11.8	x	113.09	x	0.57	x	0.7	=	369	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	11.8	x	115.77	x	0.57	x	0.7	=	377.73	(76)
East	0.9x	0.77	x	11.8	x	110.22	x	0.57	x	0.7	=	359.62	(76)
East	0.9x	0.77	x	11.8	x	94.68	x	0.57	x	0.7	=	308.91	(76)
East	0.9x	0.77	x	11.8	x	73.59	x	0.57	x	0.7	=	240.11	(76)
East	0.9x	0.77	x	11.8	x	45.59	x	0.57	x	0.7	=	148.75	(76)
East	0.9x	0.77	x	11.8	x	24.49	x	0.57	x	0.7	=	79.9	(76)
East	0.9x	0.77	x	11.8	x	16.15	x	0.57	x	0.7	=	52.7	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

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

(83)m=	72.97	142.74	235.08	342.84	420.17	430.12	409.49	351.74	273.4	169.38	90.98	60.01

(83)

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

(84)m=	543.08	608.73	683.17	763.49	812.87	797.49	762.19	712	649.51	573.12	525.45	517.72

(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	0.97	0.93	0.83	0.66	0.47	0.34	0.38	0.61	0.88	0.97	0.99

(86)

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

(87)m=	20.24	20.39	20.62	20.86	20.97	21	21	21	20.98	20.82	20.49	20.21

(87)

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

(88)m=	20.09	20.09	20.09	20.1	20.11	20.12	20.12	20.12	20.11	20.11	20.1	20.1

(88)

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

(89)m=	0.98	0.97	0.92	0.79	0.6	0.41	0.27	0.31	0.54	0.85	0.96	0.99

(89)

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

(90)m=	19.1	19.31	19.64	19.95	20.08	20.12	20.12	20.12	20.1	19.92	19.47	19.06

(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.64	19.82	20.1	20.38	20.5	20.53	20.54	20.54	20.52	20.35	19.95	19.6

(92)

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

SAP WorkSheet: New dwelling design stage

(93)m=	19.49	19.67	19.95	20.23	20.35	20.38	20.39	20.39	20.37	20.2	19.8	19.45	(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=	0.98	0.96	0.91	0.8	0.62	0.42	0.29	0.33	0.56	0.85	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	531.79	585.39	624.82	608.1	501.33	338.44	222.34	233.34	364.29	487.92	504.33	509.02	(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=	926.66	898.84	816.1	677.49	515.7	339.79	222.46	233.57	370.56	572.13	761.8	920.12	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	293.79	210.64	142.31	49.96	10.69	0	0	0	0	62.66	185.38	305.86	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1261.28 (98)

Space heating requirement in kWh/m²/year 20.58 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	293.79	210.64	142.31	49.96	10.69	0	0	0	0	62.66	185.38	305.86	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	325.35	233.27	157.59	55.33	11.84	0	0	0	0	69.39	205.29	338.72	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1396.77 (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

Output from water heater (calculated above)

	180.02	157.25	163.61	145.11	140.49	123.74	118.55	132.16	133.62	152.15	162.42	175.79

Efficiency of water heater 81 (216)

(217)m=	86.53	86.08	85.08	83.19	81.59	81	81	81	81	83.51	85.7	86.67	(217)

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

(219)m=	208.05	182.69	192.31	174.42	172.18	152.76	146.36	163.16	164.96	182.19	189.51	202.83	

Total = Sum(219a)$_{1...12}$ = 2131.42 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1396.77

SAP WorkSheet: New dwelling design stage

Water heating fuel used		2131.42	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	143.87		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	173.87	(231)
Electricity for lighting		277.44	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3979.49	(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 =	48.61		(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 =	74.17		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	22.93		(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 =	36.59		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			302.31		(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] =	1.19	(257)
SAP rating (Section 12)		83.34	(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	=	301.7		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	460.39		(264)
Space and water heating	(261) + (262) + (263) + (264) =			762.09		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	90.24		(267)
Electricity for lighting	(232) x	0.519	=	143.99		(268)
Total CO2, kg/year	sum of (265)…(271) =			996.32		(272)
CO2 emissions per m²	(272) ÷ (4) =			16.25		(273)
EI rating (section 14)				87		(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	1704.06	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2600.33	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4304.39	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	533.78	(267)
Electricity for lighting	(232)	x	0	=	851.73	(268)
'Total Primary Energy			sum of (265)…(271) =		5689.89	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		92.82	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C105

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	163.85	**(P1)**
Transmission heat loss coefficient:	45.7	
Summer heat loss coefficient:	209.57	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	11.8	117.51	0.57	0.7	0.9	448.13	
						Total	536.74	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	364.37	349.7	357.25	
Total summer gains	934.14	886.44	829.46	**(P5)**
Summer gain/loss ratio	4.46	4.23	3.96	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.71	22.38	22.01	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:22:19

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.3m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C106

Address :

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)	20.37 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.88 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	53.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	14.1m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C106

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	62.3 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	14.1	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.75	18.3	42.45	0.18	0	False	N/A
Corridor	9.45	0	9.45	0.22	0.43	False	N/A
GF	62.3			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.072

	Length	**Psi-value**		
[Approved]	7.7	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6.1	0.04	E3	Sill
[Approved]	31.2	0.05	E4	Jamb

SAP Input

[Approved]	26	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

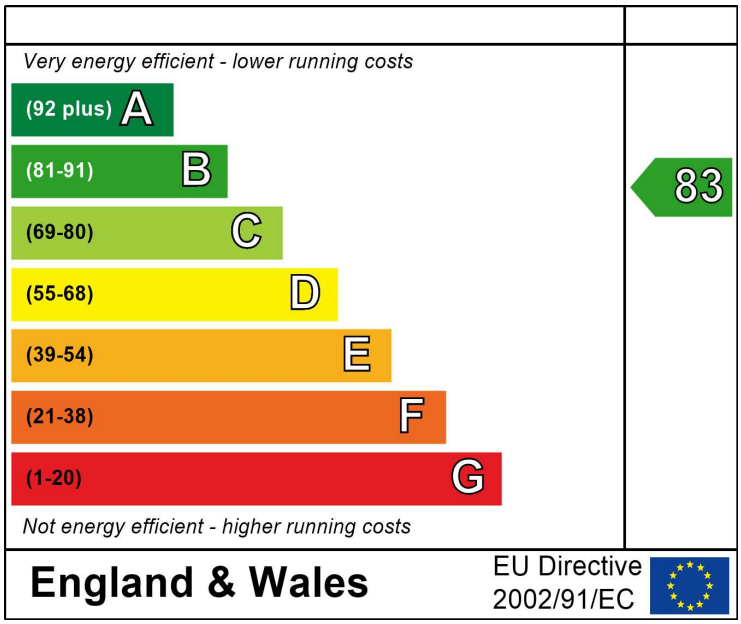
Predicted Energy Assessment

Dwelling type:	Ground floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	62.3 m²

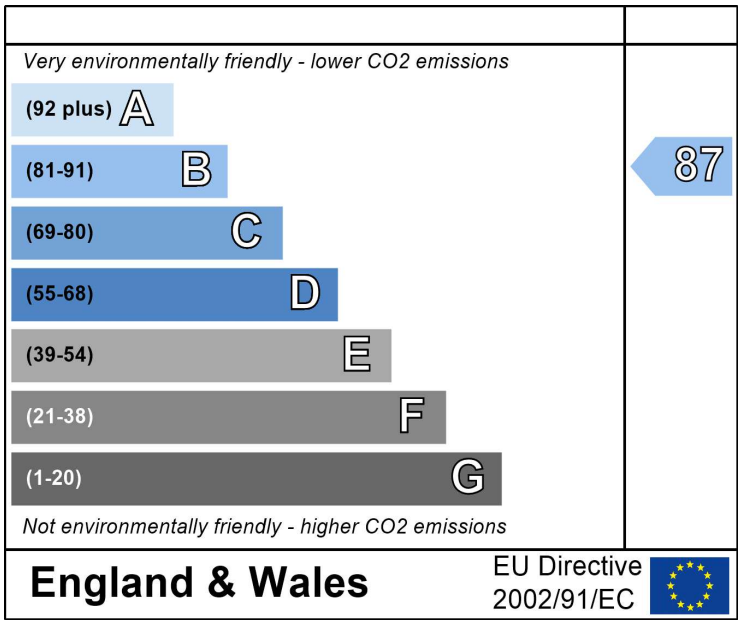
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C106

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.3	(1a) x	2.7	(2a) =	168.21	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		168.21	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			14.1	x1/[1/(1.4)+ 0.04] =	18.69			(27)
Floor			62.3	x 0.14 =	8.722			(28)
Walls Type1	60.75	18.3	42.45	x 0.18 =	7.64			(29)
Walls Type2	9.45	0	9.45	x 0.2 =	1.9			(29)
Total area of elements, m²			132.5					(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) = 42.52 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9439.5 (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 9.54 (36)

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

Total fabric heat loss (33) + (36) = 52.07 (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=	15.55	15.37	15.19	14.31	14.13	13.25	13.25	13.07	13.6	14.13	14.48	14.84	(38)

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

(39)m=	67.61	67.44	67.26	66.37	66.2	65.31	65.31	65.14	65.67	66.2	66.55	66.91	

Average = Sum(39)$_{1...12}$ /12= 66.33 (39)

SAP WorkSheet: New dwelling design stage

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

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

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

Number of days in month (Table 1a)

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

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.05 (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 82.79 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	91.07	87.76	84.44	81.13	77.82	74.51	74.51	77.82	81.13	84.44	87.76	91.07

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

Total = Sum(44)$_{1...12}$ = 993.47 (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=	135.05	118.12	121.89	106.26	101.96	87.99	81.53	93.56	94.68	110.34	120.44	130.79

Total = Sum(45)$_{1...12}$ = 1302.6 (45)

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

(46)m=	20.26	17.72	18.28	15.94	15.29	13.2	12.23	14.03	14.2	16.55	18.07	19.62

(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 dwelling design stage

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

(61)m=	46.41	40.39	43.03	40.01	39.66	36.74	37.97	39.66	40.01	43.03	43.28	46.41	(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=	181.46	158.51	164.92	146.27	141.62	124.73	119.5	133.22	134.69	153.37	163.72	177.2	(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=	181.46	158.51	164.92	146.27	141.62	124.73	119.5	133.22	134.69	153.37	163.72	177.2	

Output from water heater (annual)$_{1...12}$ 1799.2 (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=	56.51	49.37	51.29	45.34	43.82	38.44	36.6	41.02	41.48	47.44	50.87	55.09	(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=	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	(66)

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

(67)m=	39.83	35.38	28.77	21.78	16.28	13.75	14.85	19.31	25.91	32.9	38.4	40.94	(67)

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

(68)m=	266.73	269.5	262.52	247.67	228.93	211.31	199.54	196.78	203.75	218.6	237.34	254.96	(68)

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

(69)m=	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	(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=	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	(71)

Water heating gains (Table 5)

(72)m=	75.95	73.47	68.93	62.97	58.89	53.39	49.2	55.14	57.61	63.77	70.65	74.05	(72)

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

(73)m=	475.75	471.58	453.46	425.66	397.34	371.69	356.83	364.46	380.52	408.51	439.63	463.18	(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)	
East	0.9x 0.77	x	14.1	x	19.64	x	0.57	x	0.7	=	76.57	(76)
East	0.9x 0.77	x	14.1	x	38.42	x	0.57	x	0.7	=	149.79	(76)
East	0.9x 0.77	x	14.1	x	63.27	x	0.57	x	0.7	=	246.69	(76)
East	0.9x 0.77	x	14.1	x	92.28	x	0.57	x	0.7	=	359.78	(76)
East	0.9x 0.77	x	14.1	x	113.09	x	0.57	x	0.7	=	440.92	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	14.1	x	115.77	x	0.57	x	0.7	=	451.36	(76)
East	0.9x	0.77	x	14.1	x	110.22	x	0.57	x	0.7	=	429.71	(76)
East	0.9x	0.77	x	14.1	x	94.68	x	0.57	x	0.7	=	369.12	(76)
East	0.9x	0.77	x	14.1	x	73.59	x	0.57	x	0.7	=	286.91	(76)
East	0.9x	0.77	x	14.1	x	45.59	x	0.57	x	0.7	=	177.74	(76)
East	0.9x	0.77	x	14.1	x	24.49	x	0.57	x	0.7	=	95.48	(76)
East	0.9x	0.77	x	14.1	x	16.15	x	0.57	x	0.7	=	62.97	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

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

(83)m=	85.46	167.18	275.31	401.53	492.09	503.74	479.58	411.95	320.2	198.37	106.56	70.28

(83)

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

(84)m=	561.21	638.76	728.78	827.19	889.43	875.43	836.41	776.41	700.72	606.88	546.19	533.46

(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	0.97	0.94	0.83	0.66	0.47	0.34	0.38	0.62	0.89	0.97	0.99

(86)

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

(87)m=	20.12	20.29	20.55	20.82	20.96	20.99	21	21	20.98	20.77	20.4	20.09

(87)

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

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

(88)

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

(89)m=	0.98	0.97	0.92	0.79	0.6	0.4	0.27	0.31	0.55	0.85	0.97	0.99

(89)

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

(90)m=	18.87	19.12	19.48	19.84	19.99	20.04	20.04	20.04	20.02	19.79	19.28	18.83

(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	19.46	19.67	19.98	20.3	20.44	20.49	20.49	20.49	20.47	20.25	19.8	19.42

(92)

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

SAP WorkSheet: New dwelling design stage

(93)m=	19.31	19.52	19.83	20.15	20.29	20.34	20.34	20.34	20.32	20.1	19.65	19.27	(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=	0.98	0.96	0.91	0.8	0.62	0.43	0.29	0.33	0.57	0.86	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	549.83	614.37	666.19	658.66	548.95	372.42	244.02	256.23	398.69	520.32	525.16	524.75	(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=	1014.62	985.64	896.62	746.61	568.81	374.59	244.24	256.65	408.25	628.97	835.42	1008.15	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	345.8	249.49	171.44	63.32	14.77	0	0	0	0	80.84	223.39	359.65	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1508.71 (98)

Space heating requirement in kWh/m²/year 24.22 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	345.8	249.49	171.44	63.32	14.77	0	0	0	0	80.84	223.39	359.65	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	382.94	276.29	189.86	70.12	16.36	0	0	0	0	89.53	247.38	398.28	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1670.77 (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

Output from water heater (calculated above)

	181.46	158.51	164.92	146.27	141.62	124.73	119.5	133.22	134.69	153.37	163.72	177.2	

Efficiency of water heater 81 (216)

(217)m=	86.87	86.44	85.49	83.6	81.8	81	81	81	81	83.99	86.12	87	(217)

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

(219)m=	208.89	183.37	192.91	174.97	173.14	153.99	147.53	164.46	166.28	182.61	190.11	203.67	

Total = Sum(219a)$_{1...12}$ = 2141.93 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1670.77

SAP WorkSheet: New dwelling design stage

Water heating fuel used			2141.93	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		146.22		(230a)
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		176.22	(231)
Electricity for lighting			281.36	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4270.28	(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 =	58.14	(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 =	74.54	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	23.24	(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 =	37.11	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				313.04	(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] =	1.23	(257)
SAP rating (Section 12)	82.91	(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	=	360.89	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	462.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =				823.54	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	91.46	(267)
Electricity for lighting	(232)	x	0.519	=	146.03	(268)
Total CO2, kg/year	sum of (265)…(271) =				1061.03	(272)
CO2 emissions per m²	(272) ÷ (4) =				17.03	(273)
EI rating (section 14)					87	(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	2038.34	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2613.15	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4651.49	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	540.98	(267)
Electricity for lighting	(232)	x	0	=	863.79	(268)
'Total Primary Energy			sum of (265)…(271) =		6056.26	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		97.21	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C106

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	166.53	**(P1)**
Transmission heat loss coefficient:	52.1	
Summer heat loss coefficient:	218.59	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	14.1	117.51	0.57	0.7	0.9	535.48	
						Total	624.09	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	368.69	353.83	361.46	
Total summer gains	1031.18	977.92	910.51	**(P5)**
Summer gain/loss ratio	4.72	4.47	4.17	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.97	22.62	22.22	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:21:58

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 73m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C243

Address :

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)	16.66 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.94 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	16.8m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C243

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	73 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	16.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.75	21	39.75	0.18	0	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1057

	Length	**Psi-value**		
[Approved]	9.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	8.3	0.04	E3	Sill
[Approved]	40	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

SAP Input

[Approved]	9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

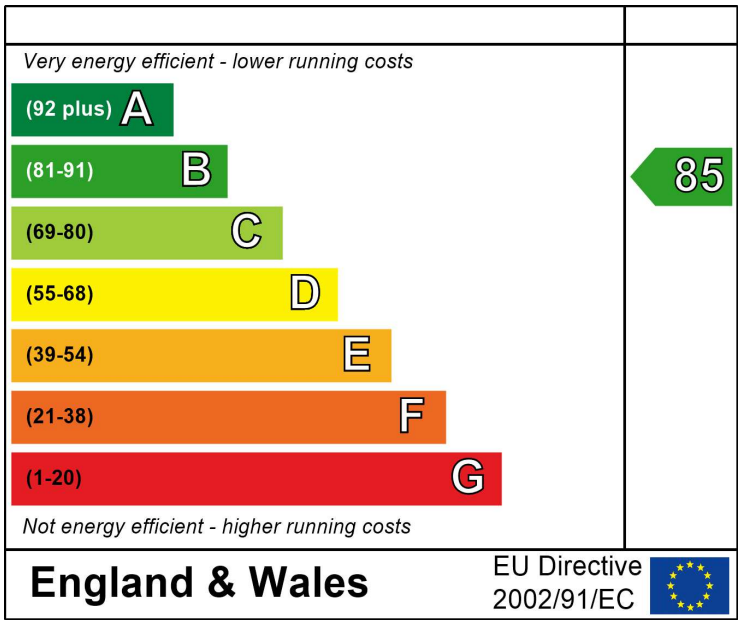
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	73 m²

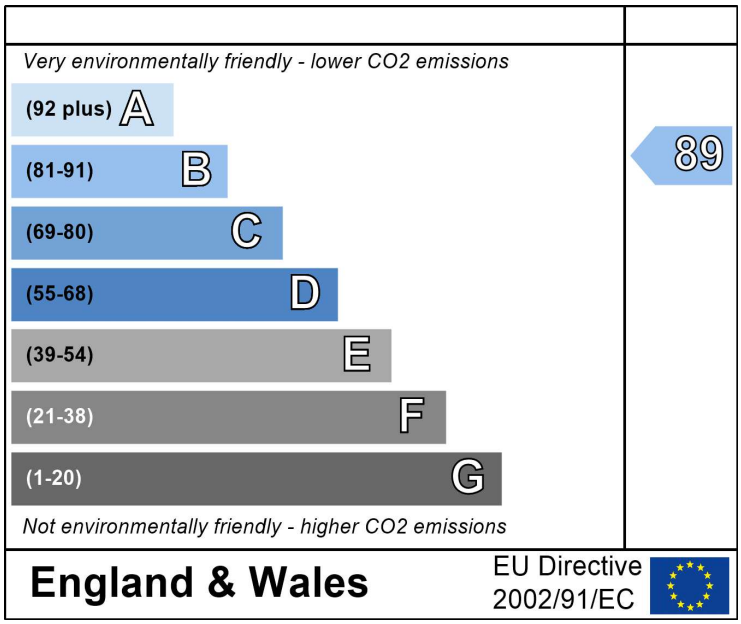
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C243

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73 (1a)	x	2.7 (2a)	=	197.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	197.1	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			16.8	x1/[1/(1.4)+ 0.04] =	22.27			(27)
Walls	60.75	21	39.75	x 0.18 =	7.16			(29)
Total area of elements, m²			60.75					(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) = 35 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 2782.5 (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 6.42 (36)

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

Total fabric heat loss (33) + (36) = 41.42 (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=	18.22	18.01	17.8	16.76	16.56	15.52	15.52	15.31	15.94	16.56	16.97	17.39	(38)

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

(39)m=	59.63	59.43	59.22	58.18	57.97	56.94	56.94	56.73	57.35	57.97	58.39	58.8	

Average = Sum(39)$_{1...12}$ /12= 58.13 (39)

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

(40)m=	0.82	0.81	0.81	0.8	0.79	0.78	0.78	0.78	0.79	0.79	0.8	0.81	

Average = Sum(40)$_{1...12}$ /12= 0.8 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.32 (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 89.22 (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=	98.14	94.57	91.01	87.44	83.87	80.3	80.3	83.87	87.44	91.01	94.57	98.14	

Total = Sum(44)$_{1...12}$ = 1070.66 (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=	145.54	127.29	131.36	114.52	109.88	94.82	87.87	100.83	102.03	118.91	129.8	140.95	

Total = Sum(45)$_{1...12}$ = 1403.8 (45)

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

(46)m=	21.83	19.09	19.7	17.18	16.48	14.22	13.18	15.12	15.3	17.84	19.47	21.14	(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=	50.01	43.53	46.38	43.12	42.74	39.6	40.92	42.74	43.12	46.38	46.64	50.01	(61)

SAP WorkSheet: New dwelling design stage

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=	195.56	170.82	177.73	157.64	152.62	134.42	128.79	143.57	145.15	165.28	176.44	190.96	(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=	195.56	170.82	177.73	157.64	152.62	134.42	128.79	143.57	145.15	165.28	176.44	190.96	

Output from water heater (annual)$_{1...12}$ 1938.99 (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=	60.9	53.21	55.27	48.86	47.22	41.43	39.45	44.21	44.71	51.13	54.82	59.37	(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=	139	139	139	139	139	139	139	139	139	139	139	139	(66)

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

(67)m=	45.51	40.42	32.87	24.89	18.6	15.71	16.97	22.06	29.61	37.59	43.88	46.78	(67)

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

(68)m=	304.77	307.93	299.96	283	261.58	241.45	228	224.84	232.81	249.78	271.19	291.32	(68)

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

(69)m=	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	(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=	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	(71)

Water heating gains (Table 5)

(72)m=	81.85	79.18	74.29	67.86	63.47	57.54	53.02	59.42	62.09	68.72	76.14	79.8	(72)

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

(73)m=	532.68	528.08	507.67	476.29	444.2	415.25	398.54	406.87	425.06	456.65	491.76	518.45	(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)	
East	0.9x 0.77	x	16.8	x	19.64	x	0.57	x	0.7	=	91.24	(76)
East	0.9x 0.77	x	16.8	x	38.42	x	0.57	x	0.7	=	178.48	(76)
East	0.9x 0.77	x	16.8	x	63.27	x	0.57	x	0.7	=	293.92	(76)
East	0.9x 0.77	x	16.8	x	92.28	x	0.57	x	0.7	=	428.67	(76)
East	0.9x 0.77	x	16.8	x	113.09	x	0.57	x	0.7	=	525.35	(76)
East	0.9x 0.77	x	16.8	x	115.77	x	0.57	x	0.7	=	537.79	(76)
East	0.9x 0.77	x	16.8	x	110.22	x	0.57	x	0.7	=	512	(76)
East	0.9x 0.77	x	16.8	x	94.68	x	0.57	x	0.7	=	439.8	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	16.8	x	73.59	x	0.57	x	0.7	=	341.85	(76)
East	0.9x	0.77	x	16.8	x	45.59	x	0.57	x	0.7	=	211.78	(76)
East	0.9x	0.77	x	16.8	x	24.49	x	0.57	x	0.7	=	113.76	(76)
East	0.9x	0.77	x	16.8	x	16.15	x	0.57	x	0.7	=	75.03	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

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

(83)m=	100.12	195.86	322.55	470.42	576.52	590.17	561.87	482.64	375.14	232.4	124.84	82.34	(83)

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

(84)m=	632.8	723.94	830.23	946.72	1020.72	1005.42	960.41	889.51	800.2	689.05	616.6	600.78	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.88	0.72	0.53	0.36	0.26	0.29	0.49	0.81	0.96	0.99	(86)

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

(87)m=	20.49	20.64	20.83	20.96	21	21	21	21	21	20.94	20.7	20.46	(87)

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

(88)m=	20.24	20.24	20.24	20.26	20.26	20.27	20.27	20.27	20.27	20.26	20.25	20.25	(88)

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

(89)m=	0.98	0.95	0.86	0.68	0.48	0.32	0.22	0.25	0.44	0.77	0.95	0.98	(89)

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

(90)m=	19.57	19.79	20.05	20.22	20.25	20.27	20.27	20.27	20.26	20.19	19.88	19.54	(90)

fLA = Living area ÷ (4) = 0.4 (91)

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

(92)m=	19.94	20.13	20.36	20.52	20.55	20.56	20.56	20.56	20.56	20.49	20.21	19.9	(92)

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

(93)m=	19.79	19.98	20.21	20.37	20.4	20.41	20.41	20.41	20.41	20.34	20.06	19.75	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.97	0.94	0.86	0.68	0.49	0.33	0.23	0.26	0.45	0.77	0.94	0.98	(94)

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

(95)m=	615.85	682.48	714.21	647.66	502.3	330.78	217.01	227.64	360.87	531.52	580.88	588.2	(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=	923.52	895.94	811.76	667.09	504.38	330.88	217.01	227.65	361.71	564.67	756.5	914.64	(97)

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

(98)m=	228.91	143.45	72.58	13.99	1.55	0	0	0	0	24.66	126.45	242.87	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 854.46 (98)

Space heating requirement in kWh/m²/year 11.7 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	228.91	143.45	72.58	13.99	1.55	0	0	0	0	24.66	126.45	242.87	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	253.5	158.86	80.38	15.5	1.71	0	0	0	0	27.31	140.04	268.96	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 946.24 (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

Output from water heater (calculated above)

	195.56	170.82	177.73	157.64	152.62	134.42	128.79	143.57	145.15	165.28	176.44	190.96	

Efficiency of water heater 81 (216)

(217)m=	85.76	85	83.49	81.69	81.08	81	81	81	81	82.1	84.64	85.96	(217)

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

(219)m=	228.02	200.98	212.87	192.98	188.23	165.95	158.99	177.24	179.2	201.33	208.46	222.17	

Total = Sum(219a)$_{1...12}$ = 2336.42 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		946.24
Water heating fuel used		2336.42
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	171.33		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	201.33	(231)
Electricity for lighting		321.49	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3805.48	(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 =	32.93	(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 =	81.31	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	26.56	(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 =	42.4	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				303.2	(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] =	1.08	(257)
SAP rating (Section 12)		84.95	(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	=	204.39	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	504.67	(264)
Space and water heating	(261) + (262) + (263) + (264) =				709.06	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	104.49	(267)
Electricity for lighting	(232) x		0.519	=	166.85	(268)
Total CO2, kg/year	sum of (265)…(271) =				980.4	(272)
CO2 emissions per m²	(272) ÷ (4) =				13.43	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	1154.42	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2850.43	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4004.85	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	618.08	(267)
Electricity for lighting	(232) x	0	=	986.98	(268)
‘Total Primary Energy	sum of (265)…(271) =			5609.91	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			76.85	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C243

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	195.13	**(P1)**
Transmission heat loss coefficient:	41.4	
Summer heat loss coefficient:	236.55	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	16.8	117.51	0.57	0.7	0.9	638.02	
						Total	726.63	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	412.25	395.54	403.87	
Total summer gains	1183.58	1122.17	1043.13	**(P5)**
Summer gain/loss ratio	5	4.74	4.41	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.25	22.89	22.46	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:21:38

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.1m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C244

Address :

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)	19.04 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.50 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	12m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C244

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	52.1 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	12	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	32.4	16.2	16.2	0.18	0	False	N/A
Corridor	28.89	0	28.89	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.085

	Length	**Psi-value**		
[Approved]	7.3	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6.2	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

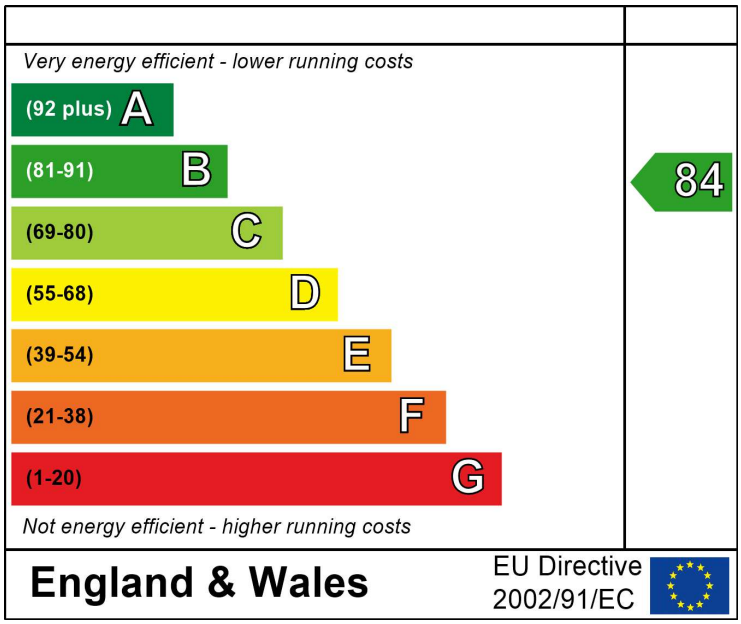
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	52.1 m²

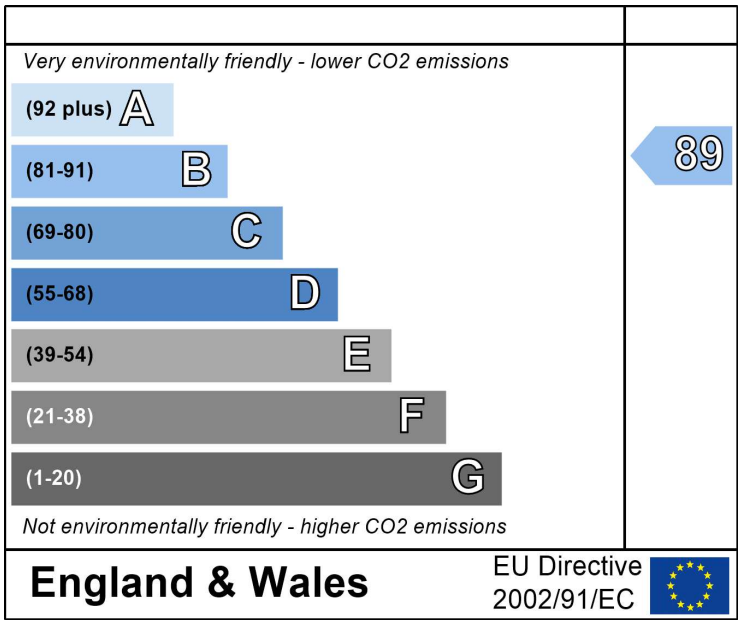
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C244

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.1 (1a)	x	2.7 (2a)	=	140.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	140.67	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			12	x1/[1/(1.4)+ 0.04] =	15.91			(27)
Walls Type1	32.4	16.2	16.2	x 0.18 =	2.92			(29)
Walls Type2	28.89	0	28.89	x 0.2 =	5.81			(29)
Total area of elements, m²			61.29					(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) = 30.2 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6623.1 (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 5.21 (36)

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

Total fabric heat loss (33) + (36) = 35.41 (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=	13	12.85	12.7	11.97	11.82	11.08	11.08	10.93	11.37	11.82	12.11	12.41	(38)

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

(39)m=	48.41	48.26	48.11	47.37	47.22	46.48	46.48	46.34	46.78	47.22	47.52	47.82	

Average = Sum(39)$_{1...12}$ /12= 47.33 (39)

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

(40)m=	0.93	0.93	0.92	0.91	0.91	0.89	0.89	0.89	0.9	0.91	0.91	0.92	

Average = Sum(40)$_{1...12}$ /12= 0.91 (40)

SAP WorkSheet: New dwelling design stage

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 1.75 (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 75.81 (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=	83.39	80.36	77.33	74.29	71.26	68.23	68.23	71.26	74.29	77.33	80.36	83.39	

Total = Sum(44)$_{1...12}$ = 909.73 (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=	123.67	108.16	111.61	97.31	93.37	80.57	74.66	85.67	86.7	101.03	110.29	119.77	

Total = Sum(45)$_{1...12}$ = 1192.79 (45)

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

(46)m=	18.55	16.22	16.74	14.6	14.01	12.09	11.2	12.85	13	15.16	16.54	17.96	(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=	42.5	36.99	39.4	36.64	36.31	33.65	34.77	36.31	36.64	39.4	39.63	42.5	(61)

SAP WorkSheet: New dwelling design stage

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=	166.16	145.15	151.02	133.94	129.68	114.22	109.43	121.99	123.33	140.44	149.92	162.26	(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=	166.16	145.15	151.02	133.94	129.68	114.22	109.43	121.99	123.33	140.44	149.92	162.26	

Output from water heater (annual)$_{1...12}$ 1647.53 (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=	51.74	45.21	46.96	41.51	40.12	35.2	33.52	37.56	37.99	43.45	46.58	50.45	(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=	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	(66)

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

(67)m=	34.03	30.23	24.58	18.61	13.91	11.74	12.69	16.49	22.14	28.11	32.81	34.98	(67)

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

(68)m=	227.89	230.25	224.29	211.61	195.59	180.54	170.49	168.12	174.08	186.77	202.78	217.83	(68)

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

(69)m=	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	(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=	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	(71)

Water heating gains (Table 5)

(72)m=	69.55	67.28	63.12	57.66	53.93	48.89	45.05	50.49	52.76	58.39	64.69	67.8	(72)

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

(73)m=	416.77	413.06	397.3	373.18	348.74	326.48	313.53	320.41	334.28	358.58	385.59	405.92	(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)	
East	0.9x 0.77	x	12	x	19.64	x	0.57	x	0.7	=	65.17	(76)
East	0.9x 0.77	x	12	x	38.42	x	0.57	x	0.7	=	127.48	(76)
East	0.9x 0.77	x	12	x	63.27	x	0.57	x	0.7	=	209.95	(76)
East	0.9x 0.77	x	12	x	92.28	x	0.57	x	0.7	=	306.19	(76)
East	0.9x 0.77	x	12	x	113.09	x	0.57	x	0.7	=	375.25	(76)
East	0.9x 0.77	x	12	x	115.77	x	0.57	x	0.7	=	384.14	(76)
East	0.9x 0.77	x	12	x	110.22	x	0.57	x	0.7	=	365.71	(76)
East	0.9x 0.77	x	12	x	94.68	x	0.57	x	0.7	=	314.14	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	12	x	73.59	x	0.57	x	0.7	=	244.18	(76)
East	0.9x	0.77	x	12	x	45.59	x	0.57	x	0.7	=	151.27	(76)
East	0.9x	0.77	x	12	x	24.49	x	0.57	x	0.7	=	81.26	(76)
East	0.9x	0.77	x	12	x	16.15	x	0.57	x	0.7	=	53.59	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

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

(83)m=	74.05	144.87	238.57	347.95	426.42	436.52	415.58	356.98	277.47	171.9	92.34	60.9	(83)

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

(84)m=	490.82	557.93	635.87	721.13	775.16	763	729.11	677.39	611.76	530.47	477.92	466.82	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.89	0.74	0.56	0.39	0.28	0.31	0.52	0.82	0.96	0.98	(86)

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

(87)m=	20.38	20.54	20.76	20.93	20.99	21	21	21	20.99	20.9	20.62	20.35	(87)

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

(88)m=	20.14	20.15	20.15	20.16	20.16	20.17	20.17	20.18	20.17	20.16	20.16	20.15	(88)

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

(89)m=	0.97	0.95	0.87	0.7	0.51	0.34	0.23	0.26	0.46	0.78	0.94	0.98	(89)

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

(90)m=	19.35	19.57	19.86	20.09	20.15	20.17	20.17	20.18	20.17	20.06	19.69	19.31	(90)

fLA = Living area ÷ (4) = 0.56 (91)

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

(92)m=	19.93	20.12	20.36	20.56	20.62	20.63	20.64	20.64	20.63	20.53	20.21	19.89	(92)

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

(93)m=	19.78	19.97	20.21	20.41	20.47	20.48	20.49	20.49	20.48	20.38	20.06	19.74	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.97	0.94	0.87	0.72	0.53	0.36	0.25	0.28	0.48	0.79	0.94	0.98	(94)

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

(95)m=	476.6	526.48	554.94	517.18	409.89	273.23	180.58	189.29	296.53	420.88	450.4	455.96	(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=	749.21	727.04	659.75	545.27	414.13	273.54	180.61	189.34	298.38	461.77	615.76	743.17	(97)

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

(98)m=	202.82	134.78	77.98	20.23	3.16	0	0	0	0	30.42	119.06	213.68	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 802.12 (98)

Space heating requirement in kWh/m²/year 15.4 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	202.82	134.78	77.98	20.23	3.16	0	0	0	0	30.42	119.06	213.68	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	224.6	149.25	86.36	22.4	3.49	0	0	0	0	33.69	131.85	236.63	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 888.28 (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

Output from water heater (calculated above)

	166.16	145.15	151.02	133.94	129.68	114.22	109.43	121.99	123.33	140.44	149.92	162.26	

Efficiency of water heater 81 (216)

(217)m=	85.86	85.23	83.94	82.11	81.2	81	81	81	81	82.51	84.87	86.04	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	193.53	170.31	179.9	163.13	159.71	141.01	135.1	150.6	152.26	170.2	176.64	188.6	

Total = Sum(219a)$_{1...12}$ = 1980.98 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		888.28
Water heating fuel used		1980.98
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	122.28		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	152.28	(231)
Electricity for lighting		240.39	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3261.93	(338)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x	3.48	x 0.01 =	30.91		(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 =	68.94		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	20.09		(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 =	31.71		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			271.64		(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] =	1.17	(257)
SAP rating (Section 12)		83.61	(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	=	191.87		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	427.89		(264)
Space and water heating	(261) + (262) + (263) + (264) =			619.76		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	79.03		(267)
Electricity for lighting	(232) x	0.519	=	124.76		(268)
Total CO2, kg/year	sum of (265)…(271) =			823.56		(272)
CO2 emissions per m²	(272) ÷ (4) =			15.81		(273)
EI rating (section 14)				89		(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	1083.7		(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2416.8	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3500.5	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	467.49	(267)
Electricity for lighting	(232) x	0	=	738	(268)
‘Total Primary Energy		sum of (265)…(271) =		4706	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		90.33	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C244

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	139.26	**(P1)**
Transmission heat loss coefficient:	35.4	
Summer heat loss coefficient:	174.67	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	12	117.51	0.57	0.7	0.9	455.73	
						Total	544.34	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	323.48	310.53	317.41	
Total summer gains	901.31	854.87	796.3	**(P5)**
Summer gain/loss ratio	5.16	4.89	4.56	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.41	23.04	22.61	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:21:21

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 41.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 334

Address :

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	21.33 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.96 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.2 kWh/m²	
		Fail

Excess energy = 0.83 kg/m² (01.6 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	11m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 334

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	41.7 m²	2.7 m

Living area:	36.7 m² (fraction 0.88)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	11	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	North	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	24.84	16.2	8.64	0.18	0	False	N/A
Corridor	33.75	0	33.75	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0729

	Length	**Psi-value**		
[Approved]	6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

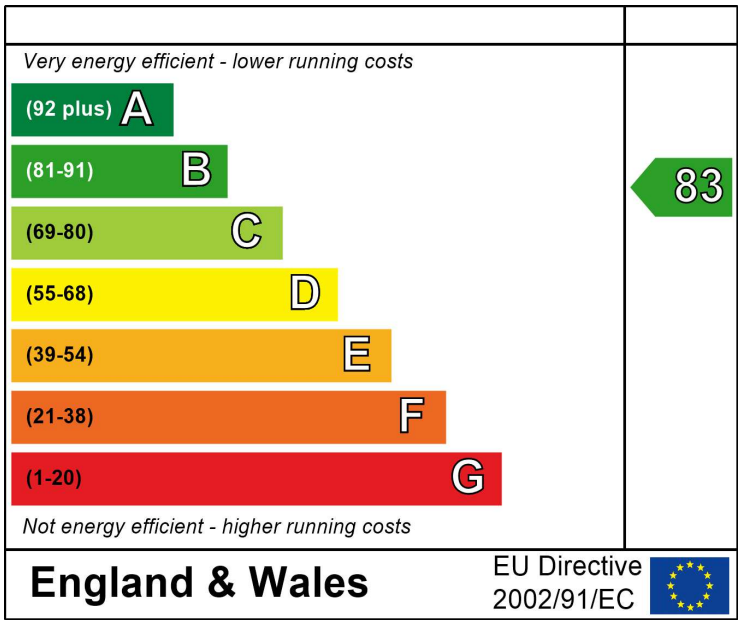
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	41.7 m²

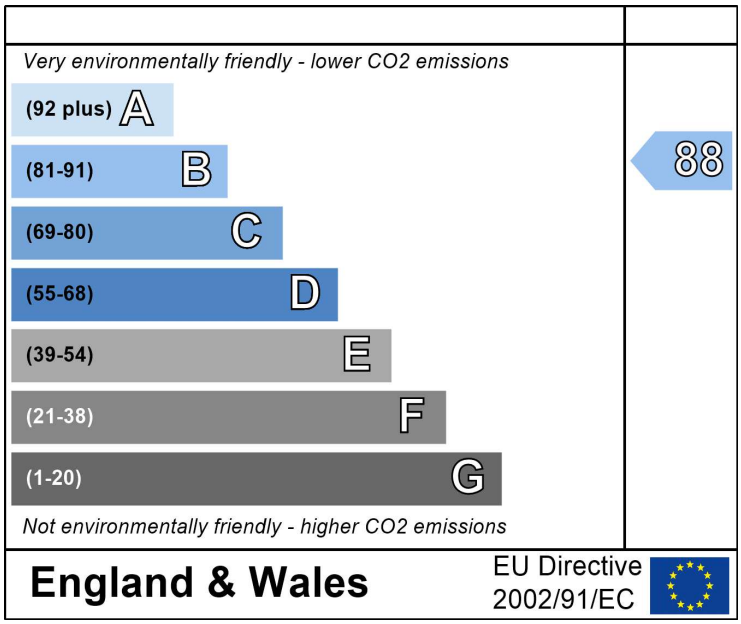
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 334

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	41.7	(1a) x	2.7	(2a) =	112.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	41.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		112.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			11	x1/[1/(1.4)+ 0.04] =	14.58			(27)
Walls Type1	24.84	16.2	8.64	x 0.18 =	1.56			(29)
Walls Type2	33.75	0	33.75	x 0.2 =	6.78			(29)
Total area of elements, m²			58.59					(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) = 29.82 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7017.3 (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 4.27 (36)

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

Total fabric heat loss (33) + (36) = 34.08 (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=	10.41	10.29	10.17	9.58	9.46	8.87	8.87	8.75	9.1	9.46	9.7	9.93	(38)

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

(39)m=	44.49	44.37	44.25	43.66	43.54	42.95	42.95	42.83	43.19	43.54	43.78	44.02	

Average = Sum(39)$_{1...12}$ /12= 43.63 (39)

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

(40)m=	1.07	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.06	

Average = Sum(40)$_{1...12}$ /12= 1.05 (40)

SAP WorkSheet: New dwelling design stage

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 1.45 (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 68.69 (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=	75.56	72.81	70.06	67.32	64.57	61.82	61.82	64.57	67.32	70.06	72.81	75.56	

Total = Sum(44)$_{1...12}$ = 824.28 (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=	112.05	98	101.13	88.17	84.6	73	67.65	77.63	78.55	91.55	99.93	108.52	

Total = Sum(45)$_{1...12}$ = 1080.76 (45)

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

(46)m=	16.81	14.7	15.17	13.22	12.69	10.95	10.15	11.64	11.78	13.73	14.99	16.28	(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=	38.5	33.51	35.7	33.2	32.9	30.49	31.5	32.9	33.2	35.7	35.91	38.5	(61)

SAP WorkSheet: New dwelling design stage

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=	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02	(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=	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02	

Output from water heater (annual)$_{1...12}$ 1492.79 (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=	46.88	40.96	42.55	37.61	36.35	31.89	30.37	34.04	34.42	39.36	42.2	45.71	(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=	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	(66)

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

(67)m=	28.04	24.91	20.26	15.34	11.46	9.68	10.46	13.59	18.25	23.17	27.04	28.82	(67)

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

(68)m=	187.81	189.76	184.85	174.39	161.19	148.79	140.5	138.55	143.46	153.92	167.12	179.52	(68)

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

(69)m=	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	(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=	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	(71)

Water heating gains (Table 5)

(72)m=	63.02	60.96	57.19	52.24	48.86	44.3	40.82	45.75	47.8	52.91	58.62	61.44	(72)

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

(73)m=	356.08	352.83	339.51	319.18	298.73	279.98	268.99	275.11	286.72	307.21	329.98	346.99	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)
North	0.9x 0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x 0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x 0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	11	x	19.64	x	0.57	x	0.7	=	59.74	(76)
East	0.9x	0.77	x	11	x	38.42	x	0.57	x	0.7	=	116.86	(76)
East	0.9x	0.77	x	11	x	63.27	x	0.57	x	0.7	=	192.45	(76)
East	0.9x	0.77	x	11	x	92.28	x	0.57	x	0.7	=	280.68	(76)
East	0.9x	0.77	x	11	x	113.09	x	0.57	x	0.7	=	343.98	(76)
East	0.9x	0.77	x	11	x	115.77	x	0.57	x	0.7	=	352.12	(76)
East	0.9x	0.77	x	11	x	110.22	x	0.57	x	0.7	=	335.24	(76)
East	0.9x	0.77	x	11	x	94.68	x	0.57	x	0.7	=	287.96	(76)
East	0.9x	0.77	x	11	x	73.59	x	0.57	x	0.7	=	223.83	(76)
East	0.9x	0.77	x	11	x	45.59	x	0.57	x	0.7	=	138.66	(76)
East	0.9x	0.77	x	11	x	24.49	x	0.57	x	0.7	=	74.49	(76)
East	0.9x	0.77	x	11	x	16.15	x	0.57	x	0.7	=	49.13	(76)

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

(83)m=	75.03	146.08	242.1	360.43	451.41	467.13	442.61	373.15	283.52	173.44	93.35	61.87	(83)

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

(84)m=	431.1	498.91	581.6	679.61	750.14	747.11	711.6	648.26	570.24	480.65	423.33	408.86	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.95	0.88	0.72	0.53	0.37	0.27	0.3	0.52	0.82	0.95	0.98	(86)

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

(87)m=	20.26	20.45	20.7	20.91	20.98	21	21	21	20.99	20.86	20.53	20.22	(87)

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

(88)m=	20.03	20.03	20.03	20.04	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04	(88)

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

(89)m=	0.97	0.94	0.85	0.68	0.48	0.31	0.21	0.24	0.45	0.77	0.94	0.98	(89)

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

(90)m=	19.08	19.35	19.69	19.96	20.03	20.06	20.06	20.06	20.05	19.91	19.47	19.04	(90)

fLA = Living area ÷ (4) = 0.88 (91)

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

(92)m=	20.12	20.32	20.58	20.8	20.87	20.89	20.89	20.89	20.88	20.75	20.4	20.08	(92)

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

(93)m=	19.97	20.17	20.43	20.65	20.72	20.74	20.74	20.74	20.73	20.6	20.25	19.93	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.97	0.94	0.87	0.71	0.52	0.35	0.25	0.29	0.5	0.8	0.94	0.98	(94)

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

(95)m=	417.84	469.05	503.88	480.24	387.14	262.97	177.62	185.63	282.9	384.51	398.67	398.71	(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=	697.26	677.5	616.58	513	392.79	263.53	177.68	185.76	286.22	435.39	575.81	692.48	(97)

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

(98)m=	207.88	140.08	83.85	23.58	4.2	0	0	0	0	37.86	127.54	218.57	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 843.57 (98)

Space heating requirement in kWh/m²/year 20.23 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	207.88	140.08	83.85	23.58	4.2	0	0	0	0	37.86	127.54	218.57	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	230.21	155.12	92.86	26.12	4.66	0	0	0	0	41.93	141.24	242.05	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 934.19 (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

Output from water heater (calculated above)

	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02	

Efficiency of water heater 81 (216)

(217)m=	86.15	85.54	84.3	82.38	81.29	81	81	81	81	82.96	85.25	86.31	(217)

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

(219)m=	174.77	153.74	162.32	147.32	144.55	127.76	122.41	136.46	137.96	153.39	159.34	170.33	

Total = Sum(219a)$_{1...12}$ = 1790.34 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		934.19
Water heating fuel used		1790.34
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	97.87		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	127.87	(231)
Electricity for lighting		198.11	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3050.51	(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 =	32.51	(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 =	62.3	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	16.87	(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 =	26.13	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				257.81	(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] =	1.25	(257)
SAP rating (Section 12)	82.58	(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	=	201.78	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	386.71	(264)
Space and water heating	(261) + (262) + (263) + (264) =				588.5	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	66.36	(267)
Electricity for lighting	(232) x		0.519	=	102.82	(268)
Total CO2, kg/year	sum of (265)…(271) =				757.68	(272)
CO2 emissions per m²	(272) ÷ (4) =				18.17	(273)
EI rating (section 14)					88	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	1139.71	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2184.21	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3323.92	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	392.56	(267)
Electricity for lighting	(232) x	0	=	608.21	(268)
‘Total Primary Energy	sum of (265)…(271) =			4324.69	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			103.71	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 334

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	130.04	**(P1)**
Transmission heat loss coefficient:	34.1	
Summer heat loss coefficient:	164.13	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (W)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (W)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	11	117.51	0.57	0.7	0.9	417.75	
						Total	554.19	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	276.98	265.99	272.11	
Total summer gains	868.04	820.18	750.56	**(P5)**
Summer gain/loss ratio	5.29	5	4.57	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.54	23.15	22.62	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:21:05

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 44m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 335

Address :

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)	19.59 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.84 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 335

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	44 m²	2.7 m

Living area:	36.7 m² (fraction 0.88)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.97	10.4	19.57	0.18	0	False	N/A
Corridor	10.26	0	10.26	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0768

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

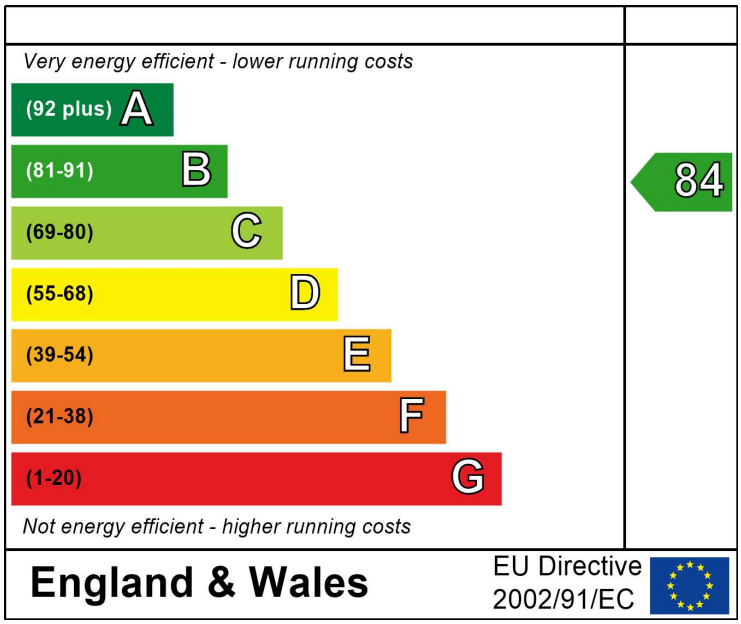
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	44 m²

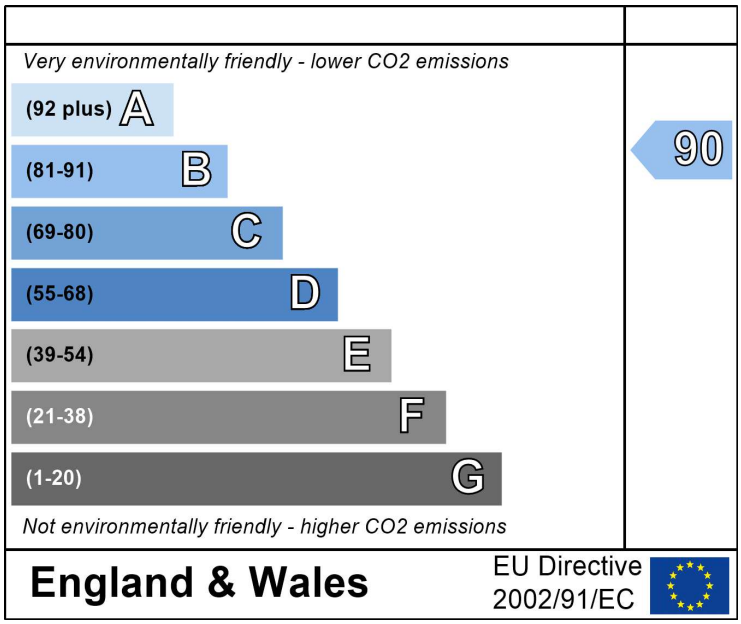
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 335

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	44	(1a) x	2.7	(2a) =	118.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	44	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		118.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Walls Type1	29.97	10.4	19.57	x 0.18 =	3.52			(29)
Walls Type2	10.26	0	10.26	x 0.2 =	2.06			(29)
Total area of elements, m²			40.23					(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) = 19.37 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3319.3 (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 3.09 (36)

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

Total fabric heat loss (33) + (36) = 22.46 (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=	10.98	10.85	10.73	10.1	9.98	9.36	9.36	9.23	9.6	9.98	10.23	10.48	(38)

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

(39)m=	33.44	33.32	33.19	32.57	32.44	31.82	31.82	31.69	32.07	32.44	32.69	32.94	

Average = Sum(39)$_{1...12}$ /12= 32.54 (39)

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

(40)m=	0.76	0.76	0.75	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74	0.75	

Average = Sum(40)$_{1...12}$ /12= 0.74 (40)

SAP WorkSheet: New dwelling design stage

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 1.52 (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 70.21 (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=	77.23	74.42	71.61	68.81	66	63.19	63.19	66	68.81	71.61	74.42	77.23	

Total = Sum(44)$_{1...12}$ = 842.53 (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=	114.53	100.17	103.37	90.12	86.47	74.62	69.14	79.34	80.29	93.57	102.14	110.92	

Total = Sum(45)$_{1...12}$ = 1104.69 (45)

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

(46)m=	17.18	15.03	15.51	13.52	12.97	11.19	10.37	11.9	12.04	14.04	15.32	16.64	(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=	39.36	34.26	36.49	33.93	33.63	31.16	32.2	33.63	33.93	36.49	36.7	39.36	(61)

SAP WorkSheet: New dwelling design stage

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=	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27	(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=	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27	

Output from water heater (annual)$_{1...12}$ 1525.84 (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=	47.92	41.87	43.49	38.45	37.16	32.6	31.04	34.79	35.18	40.24	43.14	46.72	(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=	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	(66)

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

(67)m=	29.35	26.07	21.2	16.05	12	10.13	10.95	14.23	19.1	24.25	28.3	30.17	(67)

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

(68)m=	196.58	198.62	193.48	182.54	168.72	155.74	147.06	145.02	150.17	161.11	174.92	187.91	(68)

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

(69)m=	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	(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=	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	(71)

Water heating gains (Table 5)

(72)m=	64.41	62.31	58.46	53.4	49.95	45.28	41.72	46.76	48.86	54.08	59.91	62.8	(72)

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

(73)m=	369.28	365.94	352.08	330.93	309.6	290.09	278.67	284.95	297.06	318.38	342.08	359.81	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)
North	0.9x 0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x 0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x 0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x	0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x	0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x	0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x	0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x	0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x	0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x	0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)
East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)

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

(83)m=	43.53	84.46	140.63	212.43	270.04	281.46	265.85	221.31	165.5	100.33	54.07	35.97	(83)

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

(84)m=	412.81	450.4	492.7	543.36	579.64	571.55	544.52	506.27	462.57	418.71	396.15	395.78	(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=	0.97	0.94	0.87	0.7	0.52	0.36	0.26	0.29	0.48	0.77	0.93	0.97	(86)

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

(87)m=	20.63	20.74	20.88	20.97	21	21	21	21	21	20.96	20.8	20.61	(87)

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

(88)m=	20.29	20.29	20.29	20.31	20.31	20.32	20.32	20.32	20.32	20.31	20.3	20.3	(88)

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

(89)m=	0.96	0.93	0.84	0.67	0.48	0.32	0.22	0.25	0.43	0.73	0.91	0.97	(89)

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

(90)m=	19.82	19.97	20.15	20.28	20.31	20.32	20.32	20.32	20.31	20.27	20.07	19.8	(90)

fLA = Living area ÷ (4) = 0.83 (91)

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

(92)m=	20.5	20.61	20.75	20.86	20.88	20.89	20.89	20.89	20.89	20.85	20.68	20.48	(92)

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

(93)m=	20.35	20.46	20.6	20.71	20.73	20.74	20.74	20.74	20.74	20.7	20.53	20.33	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.96	0.93	0.85	0.69	0.5	0.34	0.24	0.27	0.46	0.75	0.92	0.97	(94)

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

(95)m=	395.98	418.48	420.55	374.85	292.01	195.22	131.63	137.46	212.39	313.84	363.91	382.4	(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=	536.69	518.44	468.15	384.56	293.02	195.26	131.63	137.47	212.77	327.58	439.03	531.25	(97)

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

(98)m=	104.69	67.17	35.41	6.99	0.75	0	0	0	0	10.23	54.09	110.75	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 390.08 (98)

Space heating requirement in kWh/m²/year 8.87 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	104.69	67.17	35.41	6.99	0.75	0	0	0	0	10.23	54.09	110.75	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	115.93	74.39	39.22	7.75	0.84	0	0	0	0	11.33	59.89	122.64	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 431.98 (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

Output from water heater (calculated above)

	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27	

Efficiency of water heater 81 (216)

(217)m=	84.52	83.88	82.72	81.45	81.05	81	81	81	81	81.61	83.41	84.7	(217)

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

(219)m=	182.06	160.26	169.08	152.31	148.18	130.59	125.12	139.48	141.02	159.37	166.46	177.42	

Total = Sum(219a)$_{1...12}$ = 1851.34 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		431.98
Water heating fuel used		1851.34
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		103.27	(230a)
central heating pump:		30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	133.27	(231)
Electricity for lighting		207.37	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2623.95	(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 =	15.03	(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 =	64.43	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	17.58	(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 =	27.35	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				244.39	(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] =	1.15	(257)
SAP rating (Section 12)	83.91	(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	=	93.31	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	399.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =				493.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	69.17	(267)
Electricity for lighting	(232) x		0.519	=	107.62	(268)
Total CO2, kg/year	sum of (265)…(271) =				669.99	(272)
CO2 emissions per m²	(272) ÷ (4) =				15.23	(273)
EI rating (section 14)					90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	527.02	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2258.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2785.65	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	409.13	(267)
Electricity for lighting	(232) x	0	=	636.61	(268)
‘Total Primary Energy	sum of (265)…(271) =			3831.39	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			87.08	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 335

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	137.21	**(P1)**
Transmission heat loss coefficient:	22.5	
Summer heat loss coefficient:	159.68	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	333.92	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	287.09	275.67	281.95	
Total summer gains	644.33	609.59	566.62	**(P5)**
Summer gain/loss ratio	4.04	3.82	3.55	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.29	21.97	21.6	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:20:51

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.6m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 336

Address :

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)	15.6 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.60 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	31.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	27.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: South	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 336

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	62.6 m²	2.7 m
Living area:	36.7 m² (fraction 0.88)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	28.62	10.4	18.22	0.18	0	False	N/A
Corridor	20.52	0	20.52	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0629

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

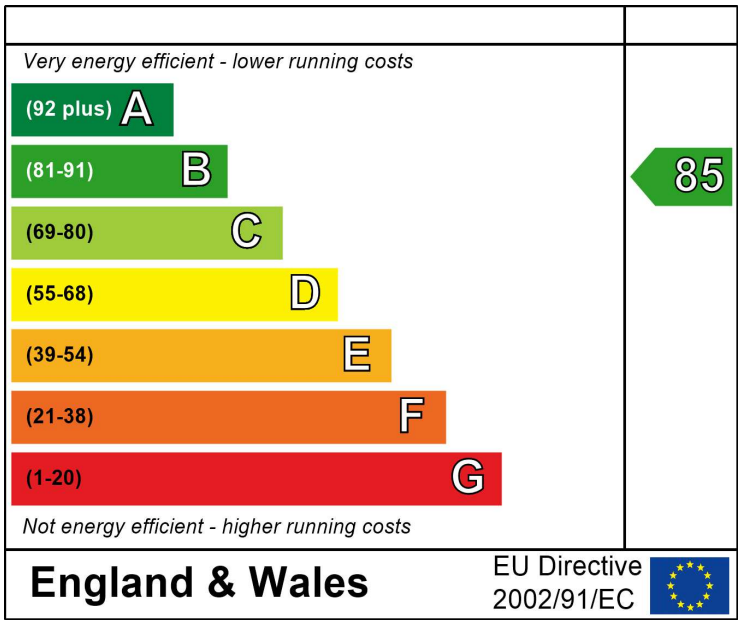
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	62.6 m²

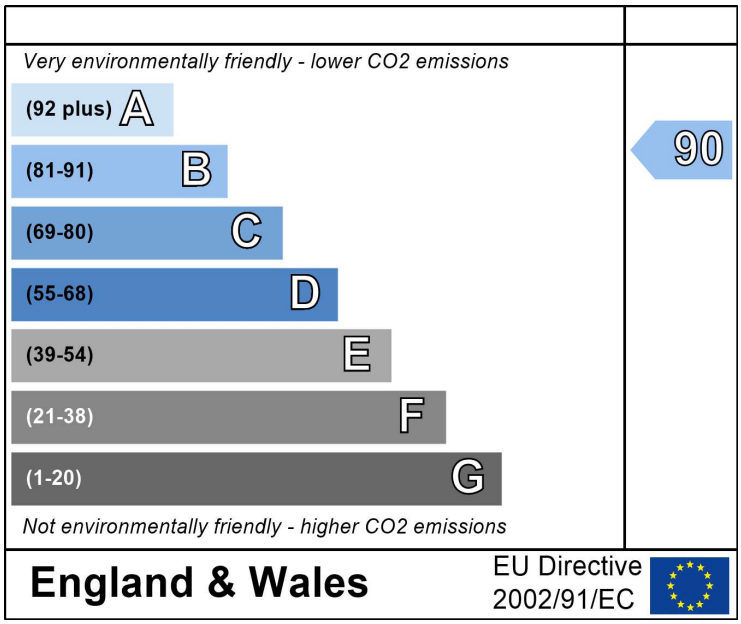
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 336

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.6	(1a) x	2.7	(2a) =	169.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.6	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		169.02	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Walls Type1	28.62	10.4	18.22	x 0.18 =	3.28			(29)
Walls Type2	20.52	0	20.52	x 0.2 =	4.12			(29)
Total area of elements, m²			49.14					(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) = 21.19 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5174.2 (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 3.09 (36)

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

Total fabric heat loss (33) + (36) = 24.28 (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=	15.62	15.44	15.27	14.38	14.2	13.31	13.31	13.13	13.67	14.2	14.55	14.91	(38)

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

(39)m=	39.9	39.72	39.55	38.66	38.48	37.59	37.59	37.41	37.95	38.48	38.83	39.19	

Average = Sum(39)$_{1...12}$ /12= 38.61 (39)

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

(40)m=	0.64	0.63	0.63	0.62	0.61	0.6	0.6	0.6	0.61	0.61	0.62	0.63	

Average = Sum(40)$_{1...12}$ /12= 0.62 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.05 (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 82.99 (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=	91.28	87.96	84.64	81.33	78.01	74.69	74.69	78.01	81.33	84.64	87.96	91.28	

Total = Sum(44)$_{1...12}$ = 995.82 (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=	135.37	118.4	122.17	106.51	102.2	88.19	81.72	93.78	94.9	110.6	120.73	131.1	

Total = Sum(45)$_{1...12}$ = 1305.68 (45)

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

(46)m=	20.31	17.76	18.33	15.98	15.33	13.23	12.26	14.07	14.24	16.59	18.11	19.66	(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=	46.52	40.49	43.13	40.11	39.75	36.83	38.06	39.75	40.11	43.13	43.38	46.52	(61)

SAP WorkSheet: New dwelling design stage

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=	181.89	158.88	165.31	146.62	141.95	125.03	119.78	133.53	135.01	153.73	164.1	177.62	(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=	181.89	158.88	165.31	146.62	141.95	125.03	119.78	133.53	135.01	153.73	164.1	177.62	

Output from water heater (annual)$_{1...12}$ 1803.45 (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=	56.64	49.49	51.41	45.44	43.92	38.53	36.69	41.12	41.58	47.56	50.99	55.22	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	(66)

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

(67)m=	41.43	36.79	29.92	22.65	16.93	14.3	15.45	20.08	26.95	34.22	39.94	42.58	(67)

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

(68)m=	267.84	270.62	263.62	248.71	229.88	212.19	200.38	197.6	204.6	219.51	238.33	256.02	(68)

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

(69)m=	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	(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=	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	(71)

Water heating gains (Table 5)

(72)m=	76.13	73.64	69.09	63.11	59.03	53.52	49.31	55.27	57.75	63.92	70.81	74.22	(72)

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

(73)m=	478.86	474.52	456.09	427.94	399.31	373.47	358.6	366.41	382.76	411.11	442.55	466.28	(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)	
East	0.9x 0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x 0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x 0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x 0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x 0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x 0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x 0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x 0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)
South	0.9x	0.77	x	5.2	x	46.75	x	0.57	x	0.7	=	67.22	(78)
South	0.9x	0.77	x	5.2	x	76.57	x	0.57	x	0.7	=	110.09	(78)
South	0.9x	0.77	x	5.2	x	97.53	x	0.57	x	0.7	=	140.24	(78)
South	0.9x	0.77	x	5.2	x	110.23	x	0.57	x	0.7	=	158.5	(78)
South	0.9x	0.77	x	5.2	x	114.87	x	0.57	x	0.7	=	165.17	(78)
South	0.9x	0.77	x	5.2	x	110.55	x	0.57	x	0.7	=	158.95	(78)
South	0.9x	0.77	x	5.2	x	108.01	x	0.57	x	0.7	=	155.3	(78)
South	0.9x	0.77	x	5.2	x	104.89	x	0.57	x	0.7	=	150.82	(78)
South	0.9x	0.77	x	5.2	x	101.89	x	0.57	x	0.7	=	146.49	(78)
South	0.9x	0.77	x	5.2	x	82.59	x	0.57	x	0.7	=	118.74	(78)
South	0.9x	0.77	x	5.2	x	55.42	x	0.57	x	0.7	=	79.68	(78)
South	0.9x	0.77	x	5.2	x	40.4	x	0.57	x	0.7	=	58.09	(78)

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

(83)m=	95.46	165.33	231.21	291.18	327.77	325.41	313.78	286.95	252.3	184.29	114.89	81.31	(83)

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

(84)m=	574.32	639.85	687.31	719.12	727.09	698.88	672.38	653.36	635.07	595.41	557.44	547.59	(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=	0.95	0.89	0.8	0.64	0.49	0.34	0.25	0.26	0.41	0.66	0.88	0.96	(86)

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

(87)m=	20.8	20.89	20.96	20.99	21	21	21	21	21	20.99	20.92	20.78	(87)

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

(88)m=	20.4	20.4	20.4	20.41	20.42	20.43	20.43	20.43	20.42	20.42	20.41	20.41	(88)

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

(89)m=	0.93	0.87	0.77	0.61	0.46	0.31	0.21	0.23	0.38	0.63	0.86	0.95	(89)

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

(90)m=	20.14	20.26	20.35	20.41	20.42	20.43	20.43	20.43	20.42	20.41	20.32	20.12	(90)

fLA = Living area ÷ (4) = 0.59 (91)

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

(92)m=	20.53	20.63	20.71	20.75	20.76	20.76	20.76	20.77	20.76	20.75	20.67	20.51	(92)

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

(93)m=	20.38	20.48	20.56	20.6	20.61	20.61	20.61	20.62	20.61	20.6	20.52	20.36	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.93	0.88	0.78	0.62	0.47	0.32	0.22	0.24	0.39	0.64	0.86	0.95	(94)

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

(95)m=	536.69	561.1	534.86	449	342.48	226.06	150.89	157.7	247.05	381.51	480.4	518.21	(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=	641.43	618.83	555.93	452.31	342.78	226.07	150.89	157.7	247.1	384.85	521.13	633.18	(97)

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

(98)m=	77.93	38.79	15.68	2.38	0.22	0	0	0	0	2.48	29.33	85.54	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 252.34 (98)

Space heating requirement in kWh/m²/year 4.03 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	77.93	38.79	15.68	2.38	0.22	0	0	0	0	2.48	29.33	85.54	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	86.3	42.96	17.36	2.64	0.24	0	0	0	0	2.75	32.48	94.73	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 279.45 (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

Output from water heater (calculated above)

	181.89	158.88	165.31	146.62	141.95	125.03	119.78	133.53	135.01	153.73	164.1	177.62	

Efficiency of water heater 81 (216)

(217)m=	83.58	82.67	81.73	81.13	81.01	81	81	81	81	81.13	82.28	83.81	(217)

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

(219)m=	217.62	192.19	202.26	180.72	175.22	154.35	147.88	164.85	166.67	189.48	199.43	211.94	

Total = Sum(219a)$_{1...12}$ = 2202.62 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		279.45
Water heating fuel used		2202.62
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		146.92	(230a)
central heating pump:		30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	176.92	(231)
Electricity for lighting		292.64	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2951.63	(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 =	9.72	(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 =	76.65	(247)
Pumps, fans and electric keep-hot	(231)			13.19	x 0.01 =	23.34	(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 =	38.6	(250)
Additional standing charges (Table 12)						120	(251)
Appendix Q items: repeat lines (253) and (254) as needed							
Total energy cost	(245)...(247) + (250)…(254) =					268.31	(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] =	1.05 (257)
SAP rating (Section 12)		85.39 (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	=	60.36	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	475.77	(264)
Space and water heating	(261) + (262) + (263) + (264) =					536.13	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	91.82	(267)
Electricity for lighting	(232)	x		0.519	=	151.88	(268)
Total CO2, kg/year	sum of (265)…(271) =					779.83	(272)
CO2 emissions per m²	(272) ÷ (4) =					12.46	(273)
EI rating (section 14)						90	(274)

13a. Primary Energy

		Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	340.93	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2687.2	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3028.13	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	543.15	(267)
Electricity for lighting	(232) x	0	=	898.39	(268)
‘Total Primary Energy	sum of (265)…(271) =			4469.67	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			71.4	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 336

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	195.22	**(P1)**
Transmission heat loss coefficient:	24.3	
Summer heat loss coefficient:	219.5	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	5.2	112.21	0.57	0.7	0.9	188.57	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	386.05	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	370.47	355.6	363.41	
Total summer gains	775.57	741.65	723.19	**(P5)**
Summer gain/loss ratio	3.53	3.38	3.29	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.78	21.53	21.34	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:20:36

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 73m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C334

Address :

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)	20.45 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.74 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	55.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	16.8m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C334

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	73 m²	2.7 m
Living area:	29.1 m² (fraction 0.399)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	16.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.75	21	39.75	0.18	0	False	N/A
Flat Roof	73	0	73	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1422

	Length	**Psi-value**		
[Approved]	9.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	8.3	0.04	E3	Sill
[Approved]	40	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	9	0.06	E18	Party wall between dwellings
	22.5	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

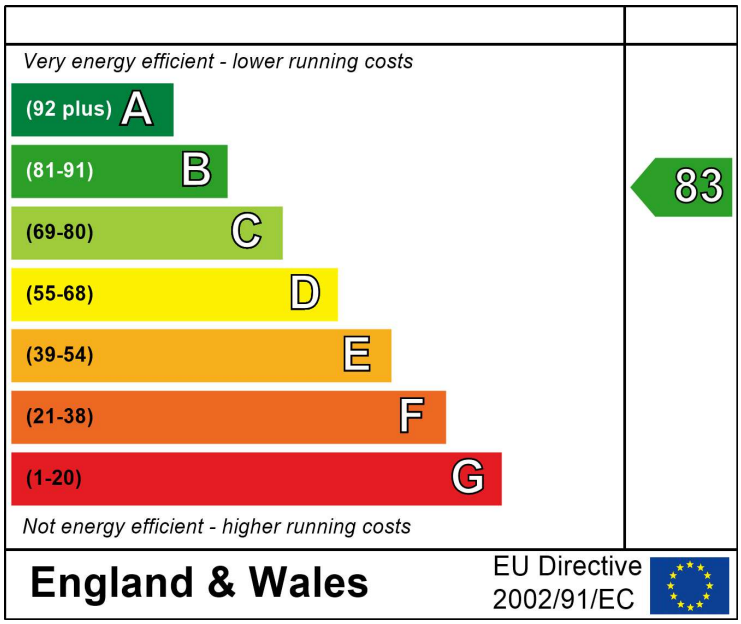
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	73 m²

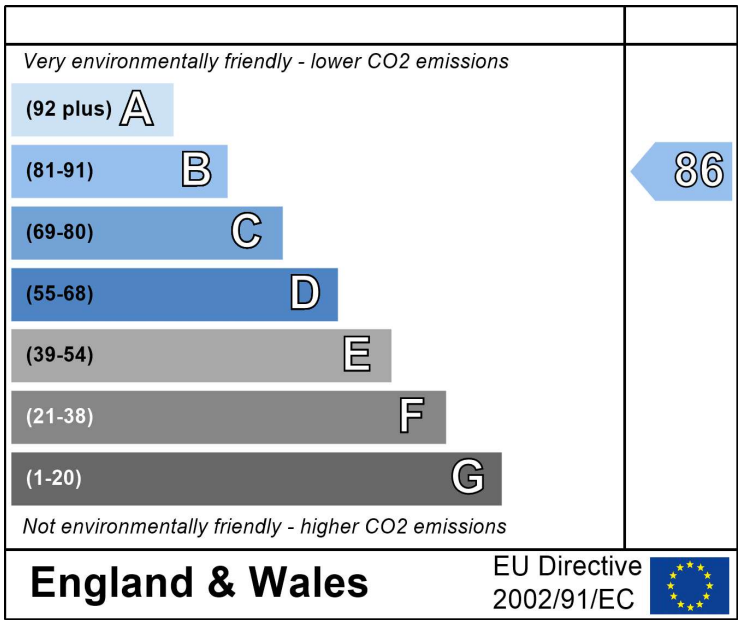
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C334

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73 (1a)	x	2.7 (2a)	=	197.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	197.1	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			16.8	x1/[1/(1.4)+ 0.04] =	22.27			(27)
Walls	60.75	21	39.75	x 0.18 =	7.16			(29)
Roof	73	0	73	x 0.13 =	9.49			(30)
Total area of elements, m²			133.75					(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) = 44.49 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3439.5 (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 19.02 (36)

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

Total fabric heat loss (33) + (36) = 63.51 (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=	18.22	18.01	17.8	16.76	16.56	15.52	15.52	15.31	15.94	16.56	16.97	17.39	(38)

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

(39)m=	81.72	81.52	81.31	80.27	80.06	79.03	79.03	78.82	79.44	80.06	80.48	80.89	

Average = Sum(39)$_{1...12}$ /12= 80.22 (39)

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

(40)m=	1.12	1.12	1.11	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.1	1.11	

Average = Sum(40)$_{1...12}$ /12= 1.1 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.32 (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 89.22 (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=	98.14	94.57	91.01	87.44	83.87	80.3	80.3	83.87	87.44	91.01	94.57	98.14	

Total = Sum(44)$_{1...12}$ = 1070.66 (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=	145.54	127.29	131.36	114.52	109.88	94.82	87.87	100.83	102.03	118.91	129.8	140.95	

Total = Sum(45)$_{1...12}$ = 1403.8 (45)

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

(46)m=	21.83	19.09	19.7	17.18	16.48	14.22	13.18	15.12	15.3	17.84	19.47	21.14	(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=	50.01	43.53	46.38	43.12	42.74	39.6	40.92	42.74	43.12	46.38	46.64	50.01	(61)

SAP WorkSheet: New dwelling design stage

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=	195.56	170.82	177.73	157.64	152.62	134.42	128.79	143.57	145.15	165.28	176.44	190.96	(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=	195.56	170.82	177.73	157.64	152.62	134.42	128.79	143.57	145.15	165.28	176.44	190.96	

Output from water heater (annual)$_{1...12}$ 1938.99 (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=	60.9	53.21	55.27	48.86	47.22	41.43	39.45	44.21	44.71	51.13	54.82	59.37	(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=	139	139	139	139	139	139	139	139	139	139	139	139	(66)

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

(67)m=	45.51	40.42	32.87	24.89	18.6	15.71	16.97	22.06	29.61	37.59	43.88	46.78	(67)

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

(68)m=	304.77	307.93	299.96	283	261.58	241.45	228	224.84	232.81	249.78	271.19	291.32	(68)

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

(69)m=	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	(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=	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	(71)

Water heating gains (Table 5)

(72)m=	81.85	79.18	74.29	67.86	63.47	57.54	53.02	59.42	62.09	68.72	76.14	79.8	(72)

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

(73)m=	532.68	528.08	507.67	476.29	444.2	415.25	398.54	406.87	425.06	456.65	491.76	518.45	(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)	
East	0.9x 0.77	x	16.8	x	19.64	x	0.57	x	0.7	=	91.24	(76)
East	0.9x 0.77	x	16.8	x	38.42	x	0.57	x	0.7	=	178.48	(76)
East	0.9x 0.77	x	16.8	x	63.27	x	0.57	x	0.7	=	293.92	(76)
East	0.9x 0.77	x	16.8	x	92.28	x	0.57	x	0.7	=	428.67	(76)
East	0.9x 0.77	x	16.8	x	113.09	x	0.57	x	0.7	=	525.35	(76)
East	0.9x 0.77	x	16.8	x	115.77	x	0.57	x	0.7	=	537.79	(76)
East	0.9x 0.77	x	16.8	x	110.22	x	0.57	x	0.7	=	512	(76)
East	0.9x 0.77	x	16.8	x	94.68	x	0.57	x	0.7	=	439.8	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	16.8	x	73.59	x	0.57	x	0.7	=	341.85	(76)
East	0.9x	0.77	x	16.8	x	45.59	x	0.57	x	0.7	=	211.78	(76)
East	0.9x	0.77	x	16.8	x	24.49	x	0.57	x	0.7	=	113.76	(76)
East	0.9x	0.77	x	16.8	x	16.15	x	0.57	x	0.7	=	75.03	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

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

(83)m=	100.12	195.86	322.55	470.42	576.52	590.17	561.87	482.64	375.14	232.4	124.84	82.34	(83)

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

(84)m=	632.8	723.94	830.23	946.72	1020.72	1005.42	960.41	889.51	800.2	689.05	616.6	600.78	(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	0.95	0.85	0.69	0.5	0.36	0.41	0.65	0.91	0.98	0.99	(86)

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

(87)m=	20.04	20.22	20.49	20.78	20.94	20.99	21	21	20.97	20.73	20.33	20.01	(87)

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

(88)m=	19.98	19.99	19.99	20	20	20.02	20.02	20.02	20.01	20	20	19.99	(88)

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

(89)m=	0.99	0.97	0.93	0.81	0.63	0.42	0.28	0.32	0.57	0.87	0.97	0.99	(89)

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

(90)m=	18.74	18.99	19.37	19.77	19.95	20.01	20.01	20.02	19.99	19.72	19.16	18.7	(90)

fLA = Living area ÷ (4) = 0.4 (91)

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

(92)m=	19.26	19.48	19.82	20.17	20.35	20.4	20.41	20.41	20.38	20.12	19.63	19.22	(92)

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

(93)m=	19.11	19.33	19.67	20.02	20.2	20.25	20.26	20.26	20.23	19.97	19.48	19.07	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.98	0.97	0.92	0.81	0.64	0.44	0.3	0.34	0.59	0.87	0.97	0.99	(94)

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

(95)m=	621.79	699.82	766.73	770.11	650.65	443.14	288.64	303.37	472.12	601.36	596.17	592.41	(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=	1210.26	1176.22	1070.66	892.9	680.3	446.59	289	304.06	486.77	750.27	996.32	1202.93	(97)

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

(98)m=	437.82	320.15	226.13	88.41	22.06	0	0	0	0	110.79	288.11	454.23	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1947.7 (98)

Space heating requirement in kWh/m²/year 26.68 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	437.82	320.15	226.13	88.41	22.06	0	0	0	0	110.79	288.11	454.23	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	484.85	354.54	250.42	97.91	24.43	0	0	0	0	122.69	319.06	503.02	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 2156.92 (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

Output from water heater (calculated above)

	195.56	170.82	177.73	157.64	152.62	134.42	128.79	143.57	145.15	165.28	176.44	190.96	

Efficiency of water heater 81 (216)

(217)m=	87.21	86.83	85.96	84.11	82.07	81	81	81	81	84.49	86.53	87.33	(217)

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

(219)m=	224.24	196.73	206.77	187.41	185.97	165.95	158.99	177.24	179.2	195.62	203.91	218.67	

Total = Sum(219a)$_{1...12}$ = 2300.71 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2156.92
Water heating fuel used		2300.71
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	171.33		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	201.33	(231)
Electricity for lighting		321.49	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4980.45	(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 =	75.06		(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 =	80.06		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	26.56		(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 =	42.4		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			344.09		(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] =	1.22	(257)
SAP rating (Section 12)		82.92	(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	=	465.89		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	496.95		(264)
Space and water heating	(261) + (262) + (263) + (264) =			962.85		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	104.49		(267)
Electricity for lighting	(232) x	0.519	=	166.85		(268)
Total CO2, kg/year	sum of (265)…(271) =			1234.19		(272)
CO2 emissions per m²	(272) ÷ (4) =			16.91		(273)
EI rating (section 14)				86		(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	2631.44		(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2806.87	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5438.31	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	618.08	(267)
Electricity for lighting	(232) x	0	=	986.98	(268)
‘Total Primary Energy	sum of (265)…(271) =			7043.37	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			96.48	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C334

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	195.13	**(P1)**
Transmission heat loss coefficient:	63.5	
Summer heat loss coefficient:	258.64	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	16.8	117.51	0.57	0.7	0.9	638.02	
						Total	726.63	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	412.25	395.54	403.87	
Total summer gains	1183.58	1122.17	1043.13	**(P5)**
Summer gain/loss ratio	4.58	4.34	4.03	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.83	22.49	22.08	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:20:21

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.1m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C335

Address :

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)	20.75 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.09 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	52.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	12m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C335

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	52.1 m²	2.7 m
Living area:	29.1 m² (fraction 0.399)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	12	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	52.11	16.2	35.91	0.18	0	False	N/A
Corridor	9.72	0	9.72	0.22	0.43	False	N/A
Flat	52.1	0	52.1	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0457

	Length	**Psi-value**		
[Approved]	7.3	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6.2	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

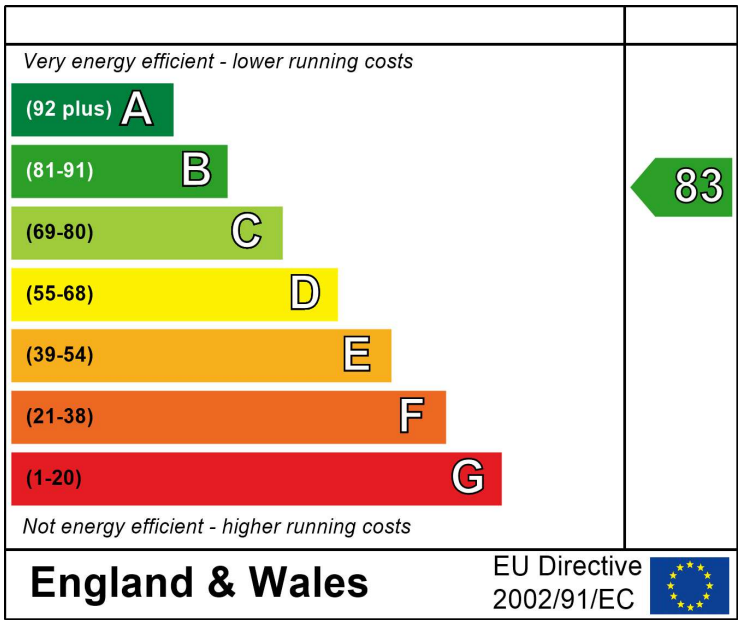
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	52.1 m²

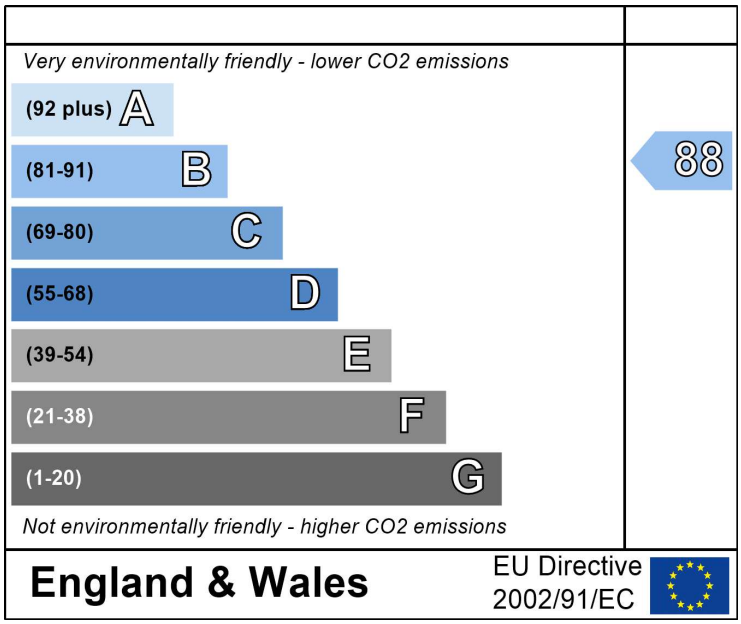
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C335

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.1	(1a) x	2.7	(2a) =	140.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.1	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		140.67	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			12	x1/[1/(1.4)+ 0.04] =	15.91			(27)
Walls Type1	52.11	16.2	35.91	x 0.18 =	6.46			(29)
Walls Type2	9.72	0	9.72	x 0.2 =	1.95			(29)
Roof	52.1	0	52.1	x 0.13 =	6.77			(30)
Total area of elements, m²			113.93					(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) = 36.67 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4829.4 (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 5.21 (36)

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

Total fabric heat loss (33) + (36) = 41.87 (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=	13	12.85	12.7	11.97	11.82	11.08	11.08	10.93	11.37	11.82	12.11	12.41	(38)

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

(39)m=	54.88	54.73	54.58	53.84	53.69	52.95	52.95	52.8	53.25	53.69	53.99	54.28	

Average = Sum(39)$_{1...12}$ /12= 53.8 (39)

SAP WorkSheet: New dwelling design stage

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

(40)m=	1.05	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.04	1.04

Average = Sum(40)$_{1...12}$ /12= 1.03 (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 1.75 (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 75.81 (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=	83.39	80.36	77.33	74.29	71.26	68.23	68.23	71.26	74.29	77.33	80.36	83.39

Total = Sum(44)$_{1...12}$ = 909.73 (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=	123.67	108.16	111.61	97.31	93.37	80.57	74.66	85.67	86.7	101.03	110.29	119.77

Total = Sum(45)$_{1...12}$ = 1192.79 (45)

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

(46)m=	18.55	16.22	16.74	14.6	14.01	12.09	11.2	12.85	13	15.16	16.54	17.96

(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 dwelling design stage

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

(61)m=	42.5	36.99	39.4	36.64	36.31	33.65	34.77	36.31	36.64	39.4	39.63	42.5	(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=	166.16	145.15	151.02	133.94	129.68	114.22	109.43	121.99	123.33	140.44	149.92	162.26	(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=	166.16	145.15	151.02	133.94	129.68	114.22	109.43	121.99	123.33	140.44	149.92	162.26	

Output from water heater (annual)$_{1...12}$ 1647.53 (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=	51.74	45.21	46.96	41.51	40.12	35.2	33.52	37.56	37.99	43.45	46.58	50.45	(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=	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	(66)

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

(67)m=	34.03	30.23	24.58	18.61	13.91	11.74	12.69	16.49	22.14	28.11	32.81	34.98	(67)

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

(68)m=	227.89	230.25	224.29	211.61	195.59	180.54	170.49	168.12	174.08	186.77	202.78	217.83	(68)

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

(69)m=	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	(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=	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	(71)

Water heating gains (Table 5)

(72)m=	69.55	67.28	63.12	57.66	53.93	48.89	45.05	50.49	52.76	58.39	64.69	67.8	(72)

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

(73)m=	416.77	413.06	397.3	373.18	348.74	326.48	313.53	320.41	334.28	358.58	385.59	405.92	(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)	
East	0.9x 0.77	x	12	x	19.64	x	0.57	x	0.7	=	65.17	(76)
East	0.9x 0.77	x	12	x	38.42	x	0.57	x	0.7	=	127.48	(76)
East	0.9x 0.77	x	12	x	63.27	x	0.57	x	0.7	=	209.95	(76)
East	0.9x 0.77	x	12	x	92.28	x	0.57	x	0.7	=	306.19	(76)
East	0.9x 0.77	x	12	x	113.09	x	0.57	x	0.7	=	375.25	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	12	x	115.77	x	0.57	x	0.7	=	384.14	(76)
East	0.9x	0.77	x	12	x	110.22	x	0.57	x	0.7	=	365.71	(76)
East	0.9x	0.77	x	12	x	94.68	x	0.57	x	0.7	=	314.14	(76)
East	0.9x	0.77	x	12	x	73.59	x	0.57	x	0.7	=	244.18	(76)
East	0.9x	0.77	x	12	x	45.59	x	0.57	x	0.7	=	151.27	(76)
East	0.9x	0.77	x	12	x	24.49	x	0.57	x	0.7	=	81.26	(76)
East	0.9x	0.77	x	12	x	16.15	x	0.57	x	0.7	=	53.59	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

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

(83)m=	74.05	144.87	238.57	347.95	426.42	436.52	415.58	356.98	277.47	171.9	92.34	60.9

(83)

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

(84)m=	490.82	557.93	635.87	721.13	775.16	763	729.11	677.39	611.76	530.47	477.92	466.82

(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(86)m=	0.98	0.97	0.92	0.8	0.62	0.44	0.32	0.36	0.59	0.87	0.97	0.99

(86)

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

(87)m=	20.2	20.37	20.62	20.86	20.97	21	21	21	20.98	20.82	20.47	20.17

(87)

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

(88)m=	20.04	20.04	20.04	20.06	20.06	20.07	20.07	20.07	20.07	20.06	20.05	20.05

(88)

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

(89)m=	0.98	0.96	0.9	0.76	0.57	0.38	0.25	0.29	0.51	0.83	0.96	0.98

(89)

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

(90)m=	19.01	19.25	19.6	19.91	20.03	20.07	20.07	20.07	20.05	19.87	19.4	18.97

(90)

fLA = Living area ÷ (4) = 0.56 (91)

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

(92)m=	19.68	19.88	20.17	20.44	20.56	20.59	20.59	20.59	20.57	20.4	20	19.64

(92)

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

SAP WorkSheet: New dwelling design stage

(93)m=	19.53	19.73	20.02	20.29	20.41	20.44	20.44	20.44	20.42	20.25	19.85	19.49	(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=	0.98	0.95	0.9	0.77	0.59	0.4	0.28	0.31	0.54	0.84	0.95	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	478.95	532.64	572.06	555.27	455.42	307.82	203.16	213.08	331	443.4	455.96	457.68	(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=	835.58	811.48	737.83	613.39	467.4	309.04	203.28	213.31	336.68	518.14	688.22	829.97	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	265.33	187.38	123.33	41.85	8.91	0	0	0	0	55.61	167.23	276.98	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1126.62 (98)

Space heating requirement in kWh/m²/year 21.62 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	265.33	187.38	123.33	41.85	8.91	0	0	0	0	55.61	167.23	276.98	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	293.83	207.51	136.58	46.35	9.87	0	0	0	0	61.58	185.19	306.73	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1247.64 (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

Output from water heater (calculated above)

	166.16	145.15	151.02	133.94	129.68	114.22	109.43	121.99	123.33	140.44	149.92	162.26	

Efficiency of water heater 81 (216)

(217)m=	86.48	85.99	84.93	83.04	81.54	81	81	81	81	83.44	85.65	86.63	(217)

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

(219)m=	192.15	168.79	177.81	161.31	159.04	141.01	135.1	150.6	152.26	168.32	175.03	187.31	

Total = Sum(219a)$_{1...12}$ = 1968.73 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1247.64

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1968.73	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	122.28		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	152.28	(231)
Electricity for lighting		240.39	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3609.04	(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 =	43.42		(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 =	68.51		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	20.09		(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 =	31.71		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			283.72		(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] =	1.23	(257)
SAP rating (Section 12)		82.88	(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	=	269.49		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	425.25		(264)
Space and water heating	(261) + (262) + (263) + (264) =			694.74		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	79.03		(267)
Electricity for lighting	(232) x	0.519	=	124.76		(268)
Total CO2, kg/year	sum of (265)…(271) =			898.53		(272)
CO2 emissions per m²	(272) ÷ (4) =			17.25		(273)
EI rating (section 14)				88		(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	1522.12	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2401.85	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3923.97	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	467.49	(267)
Electricity for lighting	(232)	x	0	=	738	(268)
'Total Primary Energy			sum of (265)…(271) =		5129.46	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		98.45	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C335

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	139.26	**(P1)**
Transmission heat loss coefficient:	41.9	
Summer heat loss coefficient:	181.14	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	12	117.51	0.57	0.7	0.9	455.73	
						Total	544.34	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	323.48	310.53	317.41	
Total summer gains	901.31	854.87	796.3	**(P5)**
Summer gain/loss ratio	4.98	4.72	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	21.23	22.87	22.45	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:20:06

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** C336

Address :

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)	15.8 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.05 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	36.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: South	7.5m²
Windows facing: West	6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: C336

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	74 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	7.5	1
W	16mm or more	0.7	0.57	1.4	6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	47.52	13.5	34.02	0.18	0	False	N/A
Corridor	34.83	0	34.83	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0725

	Length	**Psi-value**		
[Approved]	12.6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	11.6	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

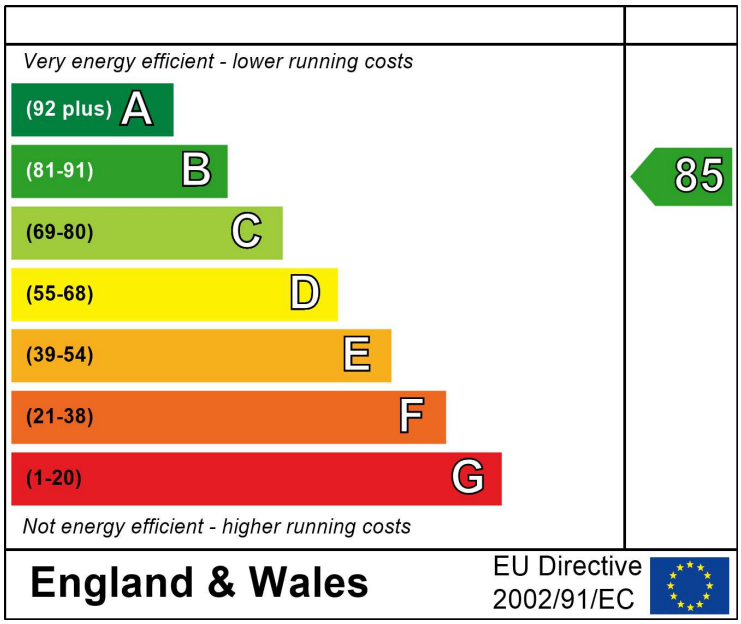
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	74 m²

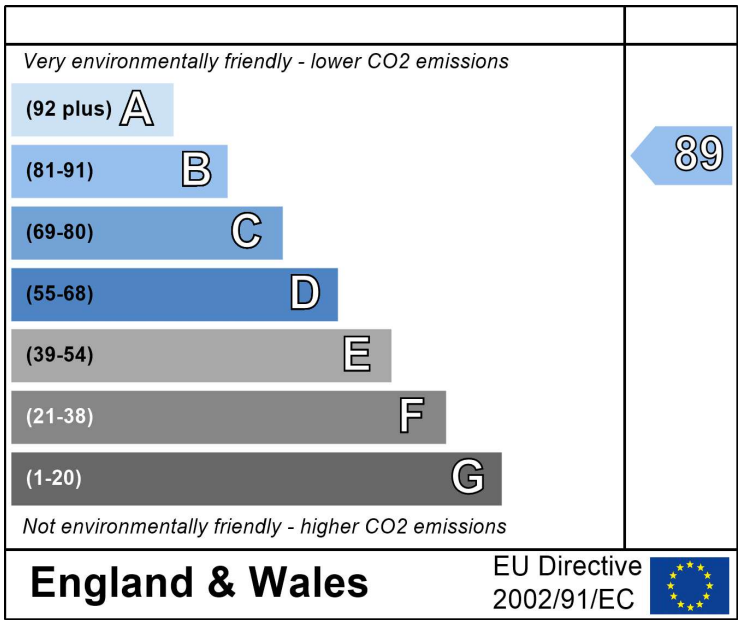
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C336

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74 (1a)	x	2.7 (2a)	=	199.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	199.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			7.5	x1/[1/(1.4)+ 0.04] =	9.94			(27)
Windows Type 2			6	x1/[1/(1.4)+ 0.04] =	7.95			(27)
Walls Type1	47.52	13.5	34.02	x 0.18 =	6.12			(29)
Walls Type2	34.83	0	34.83	x 0.2 =	7			(29)
Total area of elements, m²			82.35					(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) = 31.02 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8999.1 (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 5.97 (36)

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

Total fabric heat loss (33) + (36) = 36.99 (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=	18.47	18.26	18.05	16.99	16.78	15.73	15.73	15.52	16.15	16.78	17.2	17.62	(38)

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

(39)m=	55.46	55.25	55.04	53.99	53.78	52.73	52.73	52.52	53.15	53.78	54.2	54.62	

Average = Sum(39)$_{1...12}$ /12= 53.94 (39)

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

(40)m=	0.75	0.75	0.74	0.73	0.73	0.71	0.71	0.71	0.72	0.73	0.73	0.74	

Average = Sum(40)$_{1...12}$ /12= 0.73 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.34 (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 89.76 (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=	98.73	95.14	91.55	87.96	84.37	80.78	80.78	84.37	87.96	91.55	95.14	98.73	

Total = Sum(44)$_{1...12}$ = 1077.07 (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=	146.42	128.06	132.14	115.21	110.54	95.39	88.39	101.43	102.64	119.62	130.57	141.8	

Total = Sum(45)$_{1...12}$ = 1412.21 (45)

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

(46)m=	21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.21	15.4	17.94	19.59	21.27	(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=	50.31	43.79	46.65	43.38	42.99	39.84	41.16	42.99	43.38	46.65	46.92	50.31	(61)

SAP WorkSheet: New dwelling design stage

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=	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11	(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=	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11	

Output from water heater (annual)$_{1...12}$ 1950.6 (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=	61.26	53.53	55.6	49.15	47.5	41.68	39.68	44.47	44.97	51.44	55.15	59.73	(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=	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	(66)

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

(67)m=	46.9	41.65	33.87	25.65	19.17	16.18	17.49	22.73	30.51	38.74	45.21	48.2	(67)

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

(68)m=	308.13	311.33	303.27	286.12	264.46	244.11	230.52	227.32	235.38	252.53	274.18	294.53	(68)

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

(69)m=	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	(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=	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	(71)

Water heating gains (Table 5)

(72)m=	82.34	79.65	74.73	68.26	63.85	57.88	53.34	59.78	62.46	69.14	76.59	80.28	(72)

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

(73)m=	538.53	533.79	513.03	481.18	448.64	419.34	402.5	410.99	429.51	461.56	497.15	524.17	(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)	
South	0.9x 0.77	x	7.5	x	46.75	x	0.57	x	0.7	=	96.95	(78)
South	0.9x 0.77	x	7.5	x	76.57	x	0.57	x	0.7	=	158.79	(78)
South	0.9x 0.77	x	7.5	x	97.53	x	0.57	x	0.7	=	202.27	(78)
South	0.9x 0.77	x	7.5	x	110.23	x	0.57	x	0.7	=	228.6	(78)
South	0.9x 0.77	x	7.5	x	114.87	x	0.57	x	0.7	=	238.22	(78)
South	0.9x 0.77	x	7.5	x	110.55	x	0.57	x	0.7	=	229.25	(78)
South	0.9x 0.77	x	7.5	x	108.01	x	0.57	x	0.7	=	224	(78)
South	0.9x 0.77	x	7.5	x	104.89	x	0.57	x	0.7	=	217.53	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	7.5	x	101.89	x	0.57	x	0.7	=	211.29	(78)
South	0.9x	0.77	x	7.5	x	82.59	x	0.57	x	0.7	=	171.27	(78)
South	0.9x	0.77	x	7.5	x	55.42	x	0.57	x	0.7	=	114.92	(78)
South	0.9x	0.77	x	7.5	x	40.4	x	0.57	x	0.7	=	83.78	(78)
West	0.9x	0.77	x	6	x	19.64	x	0.57	x	0.7	=	32.58	(80)
West	0.9x	0.77	x	6	x	38.42	x	0.57	x	0.7	=	63.74	(80)
West	0.9x	0.77	x	6	x	63.27	x	0.57	x	0.7	=	104.97	(80)
West	0.9x	0.77	x	6	x	92.28	x	0.57	x	0.7	=	153.1	(80)
West	0.9x	0.77	x	6	x	113.09	x	0.57	x	0.7	=	187.63	(80)
West	0.9x	0.77	x	6	x	115.77	x	0.57	x	0.7	=	192.07	(80)
West	0.9x	0.77	x	6	x	110.22	x	0.57	x	0.7	=	182.86	(80)
West	0.9x	0.77	x	6	x	94.68	x	0.57	x	0.7	=	157.07	(80)
West	0.9x	0.77	x	6	x	73.59	x	0.57	x	0.7	=	122.09	(80)
West	0.9x	0.77	x	6	x	45.59	x	0.57	x	0.7	=	75.63	(80)
West	0.9x	0.77	x	6	x	24.49	x	0.57	x	0.7	=	40.63	(80)
West	0.9x	0.77	x	6	x	16.15	x	0.57	x	0.7	=	26.8	(80)

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

(83)m=	129.54	222.53	307.24	381.7	425.85	421.32	406.85	374.6	333.38	246.9	155.55	110.57	(83)

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

(84)m=	668.06	756.32	820.27	862.89	874.49	840.66	809.35	785.59	762.89	708.46	652.7	634.74	(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=	0.97	0.94	0.87	0.73	0.57	0.4	0.29	0.31	0.48	0.76	0.93	0.98	(86)

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

(87)m=	20.62	20.75	20.88	20.97	21	21	21	21	21	20.97	20.8	20.59	(87)

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

(88)m=	20.3	20.3	20.3	20.31	20.32	20.33	20.33	20.33	20.32	20.32	20.31	20.31	(88)

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

(89)m=	0.96	0.92	0.84	0.7	0.53	0.36	0.24	0.26	0.43	0.72	0.92	0.97	(89)

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

(90)m=	19.81	19.99	20.16	20.28	20.31	20.33	20.33	20.33	20.32	20.29	20.08	19.78	(90)

fLA = Living area ÷ (4) = 0.5 (91)

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

(92)m=	20.21	20.37	20.52	20.62	20.65	20.66	20.66	20.66	20.66	20.62	20.44	20.18	(92)

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

(93)m=	20.06	20.22	20.37	20.47	20.5	20.51	20.51	20.51	20.51	20.47	20.29	20.03	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.96	0.92	0.84	0.7	0.54	0.37	0.25	0.27	0.45	0.72	0.92	0.97	(94)

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

(95)m=	642.34	696.92	692.79	607.56	470.96	311.61	206.28	216.02	340.15	513.55	597.71	615.43	(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=	874.16	846.42	763.35	624.82	473.33	311.73	206.28	216.03	340.61	530.99	714.64	864.78	(97)

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

(98)m=	172.47	100.46	52.5	12.43	1.76	0	0	0	0	12.98	84.19	185.51	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 622.3 (98)

Space heating requirement in kWh/m²/year 8.41 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	172.47	100.46	52.5	12.43	1.76	0	0	0	0	12.98	84.19	185.51	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	191	111.25	58.14	13.76	1.95	0	0	0	0	14.37	93.23	205.44	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 689.15 (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

Output from water heater (calculated above)

	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11	

Efficiency of water heater 81 (216)

(217)m=	85.09	84.2	82.94	81.61	81.09	81	81	81	81	81.61	83.78	85.32	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	231.19	204.1	215.58	194.32	189.33	166.95	159.95	178.3	180.27	203.75	211.87	225.17	

Total = Sum(219a)$_{1...12}$ = 2360.76 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		689.15
Water heating fuel used		2360.76
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	173.68		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	203.68	(231)
Electricity for lighting		331.28	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3584.87	(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 =	23.98	(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 =	82.15	(247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	26.86	(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 =	43.7	(250)
Additional standing charges (Table 12)			120	(251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)…(254) =		296.7	(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] =	1.05	(257)
SAP rating (Section 12)		85.39	(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 =	148.86	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	509.92	(264)
Space and water heating	(261) + (262) + (263) + (264) =		658.78	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	105.71	(267)
Electricity for lighting	(232) x	0.519 =	171.93	(268)
Total CO2, kg/year	sum of (265)…(271) =		936.42	(272)
CO2 emissions per m²	(272) ÷ (4) =		12.65	(273)
EI rating (section 14)			89	(274)

13a. Primary Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22 =	840.76	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2880.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3720.89	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	625.29	(267)
Electricity for lighting	(232) x	0	=	1017.03	(268)
‘Total Primary Energy	sum of (265)…(271) =			5363.21	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			72.48	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: C336

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	230.77	**(P1)**
Transmission heat loss coefficient:	37	
Summer heat loss coefficient:	267.76	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	7.5	112.21	0.57	0.7	0.9	271.98	
West (W)	0.9 x	6	117.51	0.57	0.7	0.9	227.86	
						Total	499.84	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	416.34	399.5	407.99	
Total summer gains	940.15	899.34	876.8	**(P5)**
Summer gain/loss ratio	3.51	3.36	3.27	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.76	21.51	21.32	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:19:49

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 47.3m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 337

Address :

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)	19.97 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.45 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	16.7m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 337

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	47.3 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	16.7	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	31.32	16.7	14.62	0.18	0	False	N/A
Corridor	35.64	0	35.64	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0634

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

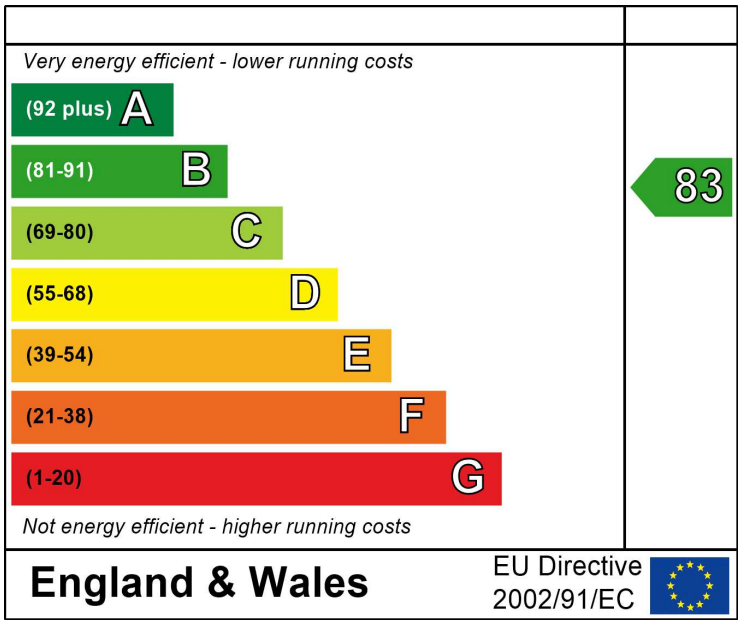
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	47.3 m²

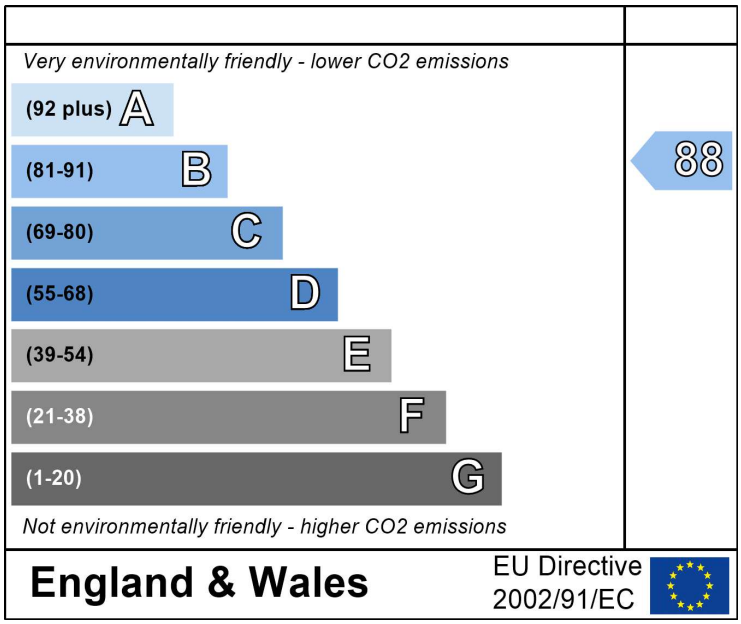
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 337

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	47.3	(1a) x	2.7	(2a) =	127.71	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	47.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.71	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			16.7	x1/[1/(1.4)+ 0.04] =	22.14			(27)
Walls Type1	31.32	16.7	14.62	x 0.18 =	2.63			(29)
Walls Type2	35.64	0	35.64	x 0.2 =	7.16			(29)
Total area of elements, m²			66.96					(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) = 31.93 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7795 (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 4.24 (36)

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

Total fabric heat loss (33) + (36) = 36.18 (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=	11.8	11.67	11.53	10.86	10.73	10.06	10.06	9.92	10.33	10.73	11	11.27	(38)

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

(39)m=	47.98	47.85	47.71	47.04	46.91	46.24	46.24	46.1	46.51	46.91	47.18	47.45	

Average = Sum(39)$_{1...12}$ /12= 47.01 (39)

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

(40)m=	1.01	1.01	1.01	0.99	0.99	0.98	0.98	0.97	0.98	0.99	1	1	

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

SAP WorkSheet: New dwelling design stage

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 1.61 (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 72.46 (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=	79.71	76.81	73.91	71.01	68.11	65.22	65.22	68.11	71.01	73.91	76.81	79.71	

Total = Sum(44)$_{1...12}$ = 869.54 (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=	118.2	103.38	106.68	93.01	89.24	77.01	71.36	81.89	82.87	96.57	105.42	114.47	

Total = Sum(45)$_{1...12}$ = 1140.1 (45)

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

(46)m=	17.73	15.51	16	13.95	13.39	11.55	10.7	12.28	12.43	14.49	15.81	17.17	(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=	40.62	35.35	37.66	35.02	34.71	32.16	33.23	34.71	35.02	37.66	37.88	40.62	(61)

SAP WorkSheet: New dwelling design stage

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=	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09	(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=	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09	

Output from water heater (annual)$_{1...12}$ 1574.75 (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=	49.46	43.21	44.89	39.68	38.35	33.65	32.04	35.9	36.31	41.53	44.52	48.22	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	(66)

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

(67)m=	31.25	27.76	22.58	17.09	12.78	10.79	11.65	15.15	20.33	25.82	30.13	32.12	(67)

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

(68)m=	209.29	211.47	205.99	194.34	179.63	165.81	156.58	154.4	159.88	171.53	186.24	200.06	(68)

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

(69)m=	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	(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=	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	(71)

Water heating gains (Table 5)

(72)m=	66.47	64.3	60.33	55.11	51.55	46.73	43.06	48.26	50.43	55.81	61.83	64.81	(72)

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

(73)m=	388.52	385.03	370.4	348.04	325.45	304.82	292.79	299.31	312.13	334.66	359.7	378.49	(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)	
West	0.9x 0.77	x	16.7	x	19.64	x	0.57	x	0.7	=	90.69	(80)
West	0.9x 0.77	x	16.7	x	38.42	x	0.57	x	0.7	=	177.41	(80)
West	0.9x 0.77	x	16.7	x	63.27	x	0.57	x	0.7	=	292.17	(80)
West	0.9x 0.77	x	16.7	x	92.28	x	0.57	x	0.7	=	426.12	(80)
West	0.9x 0.77	x	16.7	x	113.09	x	0.57	x	0.7	=	522.22	(80)
West	0.9x 0.77	x	16.7	x	115.77	x	0.57	x	0.7	=	534.59	(80)
West	0.9x 0.77	x	16.7	x	110.22	x	0.57	x	0.7	=	508.95	(80)
West	0.9x 0.77	x	16.7	x	94.68	x	0.57	x	0.7	=	437.18	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	16.7	x	73.59	x	0.57	x	0.7	=	339.81	(80)
West	0.9x	0.77	x	16.7	x	45.59	x	0.57	x	0.7	=	210.52	(80)
West	0.9x	0.77	x	16.7	x	24.49	x	0.57	x	0.7	=	113.08	(80)
West	0.9x	0.77	x	16.7	x	16.15	x	0.57	x	0.7	=	74.58	(80)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	90.69	177.41	292.17	426.12	522.22	534.59	508.95	437.18	339.81	210.52	113.08	74.58	(83)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	479.21	562.44	662.57	774.16	847.68	839.41	801.74	736.49	651.94	545.17	472.78	453.07	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.95	0.87	0.7	0.51	0.35	0.25	0.29	0.49	0.8	0.95	0.98	(86)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	20.32	20.52	20.76	20.94	20.99	21	21	21	20.99	20.89	20.58	20.28	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.07	20.07	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.08	(88)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.97	0.93	0.84	0.65	0.46	0.3	0.2	0.23	0.43	0.75	0.94	0.98	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	19.2	19.47	19.8	20.03	20.08	20.1	20.1	20.1	20.09	19.99	19.58	19.15	(90)

fLA = Living area ÷ (4) = 0.78 (91)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	20.07	20.28	20.54	20.73	20.79	20.8	20.8	20.8	20.79	20.69	20.35	20.03	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	19.92	20.13	20.39	20.58	20.64	20.65	20.65	20.65	20.64	20.54	20.2	19.88	(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:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.97	0.93	0.85	0.68	0.49	0.33	0.23	0.27	0.46	0.78	0.94	0.97	(94)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	464.05	525.44	562.19	524.03	415.24	279.29	187.16	195.82	302.15	423.3	443.32	441.7	(95)

Monthly average external temperature from Table 8

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(97)m=	749.49	728.82	662.97	549.63	419.19	279.63	187.2	195.89	304.25	466.26	618.19	743.84	(97)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m=	212.36	136.67	74.98	18.43	2.94	0	0	0	0	31.97	125.91	224.8	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 828.05 (98)

Space heating requirement in kWh/m²/year 17.51 (99)

SAP WorkSheet: New dwelling design stage

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

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	212.36	136.67	74.98	18.43	2.94	0	0	0	0	31.97	125.91	224.8	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	235.17	151.35	83.03	20.41	3.25	0	0	0	0	35.4	139.43	248.94	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 917 (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

Output from water heater (calculated above)

	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09

Efficiency of water heater 81 (216)

(217)m=	86.07	85.36	83.96	82.06	81.19	81	81	81	81	82.64	85.1	86.26	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	184.52	162.52	171.93	156.01	152.66	134.78	129.13	143.95	145.54	162.44	168.38	179.8	

Total = Sum(219a)$_{1...12}$ = 1891.66 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		917
Water heating fuel used		1891.66
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	111.01	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	141.01 (231)
Electricity for lighting		220.78 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3170.45 (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 =	31.91 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	65.83	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	18.6	(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 =	29.12	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			265.46	(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] =	1.21	(257)
SAP rating (Section 12)		83.15	(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	=	198.07	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	408.6	(264)
Space and water heating	(261) + (262) + (263) + (264) =					606.67	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	73.19	(267)
Electricity for lighting	(232)	x		0.519	=	114.58	(268)
Total CO2, kg/year			sum of (265)…(271) =			794.44	(272)
CO2 emissions per m²			(272) ÷ (4) =			16.8	(273)
EI rating (section 14)						88	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	1118.73	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2307.83	(264)
Space and water heating	(261) + (262) + (263) + (264) =					3426.56	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	432.91	(267)
Electricity for lighting	(232)	x		0	=	677.78	(268)
'Total Primary Energy			sum of (265)…(271) =			4537.26	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			95.93	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 337

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	147.51	**(P1)**
Transmission heat loss coefficient:	36.2	
Summer heat loss coefficient:	183.68	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	16.7	117.51	0.57	0.7	0.9	634.22	
						Total	634.22	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	301.82	289.79	296.31	
Total summer gains	975.06	924	854.27	**(P5)**
Summer gain/loss ratio	5.31	5.03	4.65	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.56	23.18	22.7	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:19:33

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 41.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 424

Address :

Client Details:

Name:

Address :

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

1a TER and DER

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

Target Carbon Dioxide Emission Rate (TER)	21.33 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.96 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.2 kWh/m²	
		Fail

Excess energy = 0.83 kg/m² (01.6 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	11m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 424

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 10 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 503

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	41.7 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	11	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	24.84	16.2	8.64	0.18	0	False	N/A
Corridor	33.75	0	33.75	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0729

	Length	**Psi-value**		
[Approved]	6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

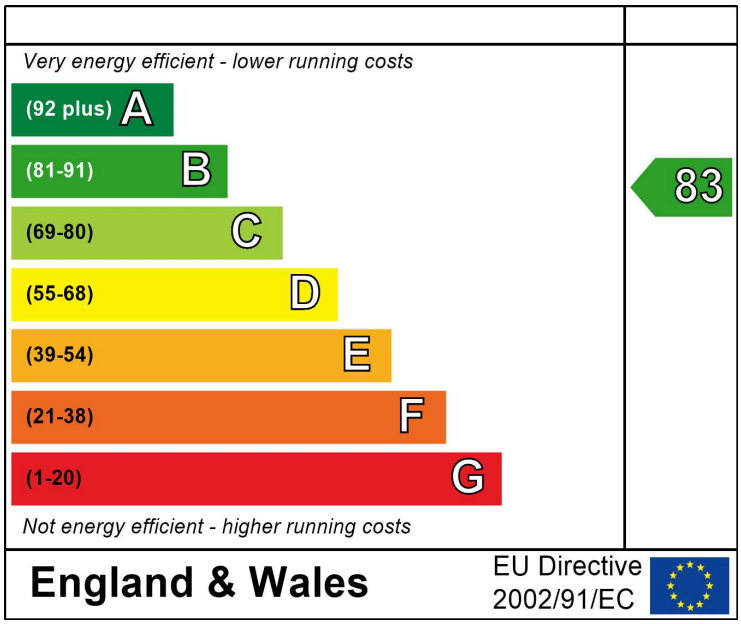
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	41.7 m²

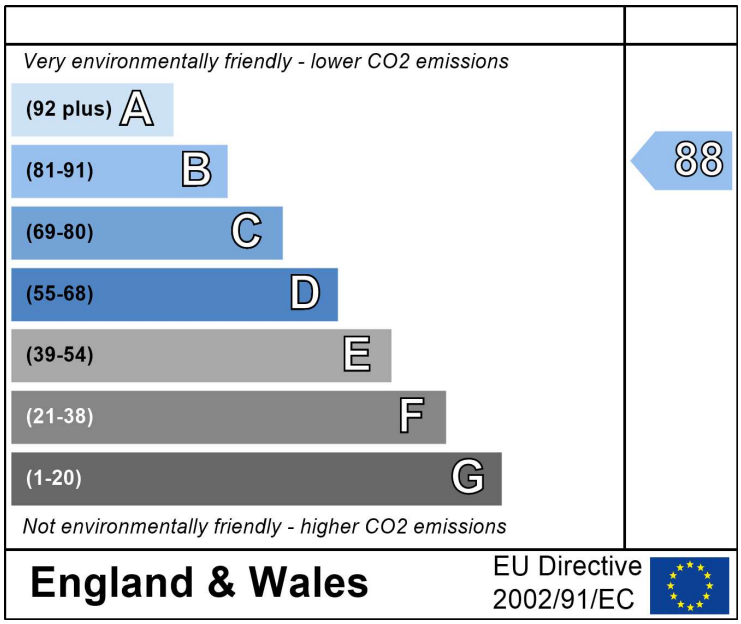
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 424

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	41.7	(1a) x	2.7	(2a) =	112.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	41.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		112.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			11	x1/[1/(1.4)+ 0.04] =	14.58			(27)
Walls Type1	24.84	16.2	8.64	x 0.18 =	1.56			(29)
Walls Type2	33.75	0	33.75	x 0.2 =	6.78			(29)
Total area of elements, m²			58.59					(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) = 29.82 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7017.3 (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 4.27 (36)

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

Total fabric heat loss (33) + (36) = 34.08 (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=	10.41	10.29	10.17	9.58	9.46	8.87	8.87	8.75	9.1	9.46	9.7	9.93	(38)

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

(39)m=	44.49	44.37	44.25	43.66	43.54	42.95	42.95	42.83	43.19	43.54	43.78	44.02	

Average = Sum(39)$_{1...12}$ /12= 43.63 (39)

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

(40)m=	1.07	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.06	

Average = Sum(40)$_{1...12}$ /12= 1.05 (40)

SAP WorkSheet: New dwelling design stage

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 1.45 (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 68.69 (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=	75.56	72.81	70.06	67.32	64.57	61.82	61.82	64.57	67.32	70.06	72.81	75.56	

Total = Sum(44)$_{1...12}$ = 824.28 (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=	112.05	98	101.13	88.17	84.6	73	67.65	77.63	78.55	91.55	99.93	108.52	

Total = Sum(45)$_{1...12}$ = 1080.76 (45)

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

(46)m=	16.81	14.7	15.17	13.22	12.69	10.95	10.15	11.64	11.78	13.73	14.99	16.28	(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=	38.5	33.51	35.7	33.2	32.9	30.49	31.5	32.9	33.2	35.7	35.91	38.5	(61)

SAP WorkSheet: New dwelling design stage

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=	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02	(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=	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02	

Output from water heater (annual)$_{1...12}$ 1492.79 (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=	46.88	40.96	42.55	37.61	36.35	31.89	30.37	34.04	34.42	39.36	42.2	45.71	(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=	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	(66)

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

(67)m=	28.04	24.91	20.26	15.34	11.46	9.68	10.46	13.59	18.25	23.17	27.04	28.82	(67)

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

(68)m=	187.81	189.76	184.85	174.39	161.19	148.79	140.5	138.55	143.46	153.92	167.12	179.52	(68)

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

(69)m=	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	(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=	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	(71)

Water heating gains (Table 5)

(72)m=	63.02	60.96	57.19	52.24	48.86	44.3	40.82	45.75	47.8	52.91	58.62	61.44	(72)

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

(73)m=	356.08	352.83	339.51	319.18	298.73	279.98	268.99	275.11	286.72	307.21	329.98	346.99	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)
North	0.9x 0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x 0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x 0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	11	x	19.64	x	0.57	x	0.7	=	59.74	(76)
East	0.9x	0.77	x	11	x	38.42	x	0.57	x	0.7	=	116.86	(76)
East	0.9x	0.77	x	11	x	63.27	x	0.57	x	0.7	=	192.45	(76)
East	0.9x	0.77	x	11	x	92.28	x	0.57	x	0.7	=	280.68	(76)
East	0.9x	0.77	x	11	x	113.09	x	0.57	x	0.7	=	343.98	(76)
East	0.9x	0.77	x	11	x	115.77	x	0.57	x	0.7	=	352.12	(76)
East	0.9x	0.77	x	11	x	110.22	x	0.57	x	0.7	=	335.24	(76)
East	0.9x	0.77	x	11	x	94.68	x	0.57	x	0.7	=	287.96	(76)
East	0.9x	0.77	x	11	x	73.59	x	0.57	x	0.7	=	223.83	(76)
East	0.9x	0.77	x	11	x	45.59	x	0.57	x	0.7	=	138.66	(76)
East	0.9x	0.77	x	11	x	24.49	x	0.57	x	0.7	=	74.49	(76)
East	0.9x	0.77	x	11	x	16.15	x	0.57	x	0.7	=	49.13	(76)

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

(83)m=	75.03	146.08	242.1	360.43	451.41	467.13	442.61	373.15	283.52	173.44	93.35	61.87	(83)

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

(84)m=	431.1	498.91	581.6	679.61	750.14	747.11	711.6	648.26	570.24	480.65	423.33	408.86	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.95	0.88	0.72	0.53	0.37	0.27	0.3	0.52	0.82	0.95	0.98	(86)

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

(87)m=	20.26	20.45	20.7	20.91	20.98	21	21	21	20.99	20.86	20.53	20.22	(87)

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

(88)m=	20.03	20.03	20.03	20.04	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04	(88)

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

(89)m=	0.97	0.94	0.85	0.68	0.48	0.31	0.21	0.24	0.45	0.77	0.94	0.98	(89)

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

(90)m=	19.08	19.35	19.69	19.96	20.03	20.06	20.06	20.06	20.05	19.91	19.47	19.04	(90)

fLA = Living area ÷ (4) = 0.88 (91)

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

(92)m=	20.12	20.32	20.58	20.8	20.87	20.89	20.89	20.89	20.88	20.75	20.4	20.08	(92)

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

(93)m=	19.97	20.17	20.43	20.65	20.72	20.74	20.74	20.74	20.73	20.6	20.25	19.93	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.97	0.94	0.87	0.71	0.52	0.35	0.25	0.29	0.5	0.8	0.94	0.98	(94)

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

(95)m=	417.84	469.05	503.88	480.24	387.14	262.97	177.62	185.63	282.9	384.51	398.67	398.71	(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=	697.26	677.5	616.58	513	392.79	263.53	177.68	185.76	286.22	435.39	575.81	692.48	(97)

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

(98)m=	207.88	140.08	83.85	23.58	4.2	0	0	0	0	37.86	127.54	218.57	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 843.57 (98)

Space heating requirement in kWh/m²/year 20.23 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	207.88	140.08	83.85	23.58	4.2	0	0	0	0	37.86	127.54	218.57	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	230.21	155.12	92.86	26.12	4.66	0	0	0	0	41.93	141.24	242.05	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 934.19 (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

Output from water heater (calculated above)

	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02	

Efficiency of water heater 81 (216)

(217)m=	86.15	85.54	84.3	82.38	81.29	81	81	81	81	82.96	85.25	86.31	(217)

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

(219)m=	174.77	153.74	162.32	147.32	144.55	127.76	122.41	136.46	137.96	153.39	159.34	170.33	

Total = Sum(219a)$_{1...12}$ = 1790.34 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		934.19
Water heating fuel used		1790.34
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	97.87		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	127.87	(231)
Electricity for lighting		198.11	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3050.51	(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 =	32.51	(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 =	62.3	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	16.87	(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 =	26.13	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				257.81	(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] =	1.25	(257)
SAP rating (Section 12)	82.58	(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	=	201.78	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	386.71	(264)
Space and water heating	(261) + (262) + (263) + (264) =				588.5	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	66.36	(267)
Electricity for lighting	(232) x		0.519	=	102.82	(268)
Total CO2, kg/year	sum of (265)…(271) =				757.68	(272)
CO2 emissions per m²	(272) ÷ (4) =				18.17	(273)
EI rating (section 14)					88	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	1139.71	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2184.21	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3323.92	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	392.56	(267)
Electricity for lighting	(232) x	0	=	608.21	(268)
‘Total Primary Energy	sum of (265)…(271) =			4324.69	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			103.71	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 424

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	130.04	**(P1)**
Transmission heat loss coefficient:	34.1	
Summer heat loss coefficient:	164.13	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	11	117.51	0.57	0.7	0.9	417.75	
						Total	554.19	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	276.98	265.99	272.11	
Total summer gains	868.04	820.18	750.56	**(P5)**
Summer gain/loss ratio	5.29	5	4.57	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.54	23.15	22.62	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:19:18

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 44m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 425

Address :

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)	19.59 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.84 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 425

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 10 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 503

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	44 m²	2.7 m

Living area: 36.7 m² (fraction 0.88)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.97	10.4	19.57	0.18	0	False	N/A
Corridor	10.26	0	10.26	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0768

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

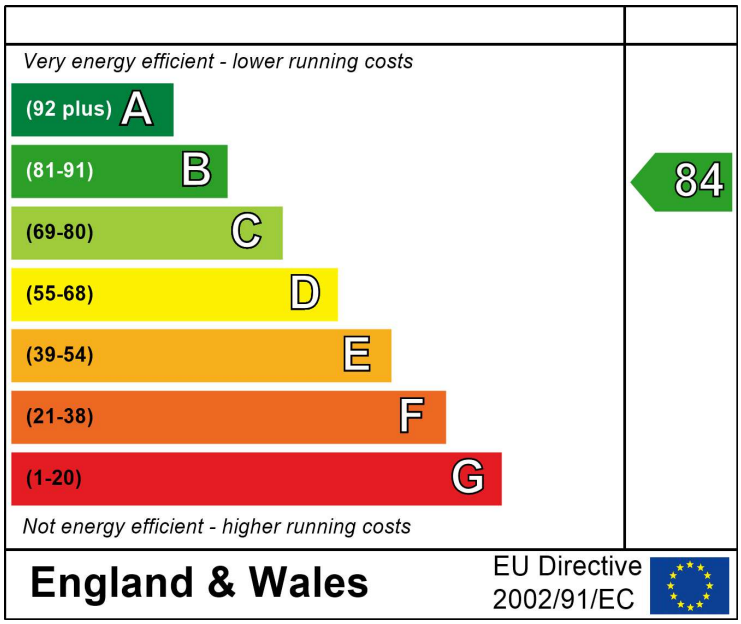
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	44 m²

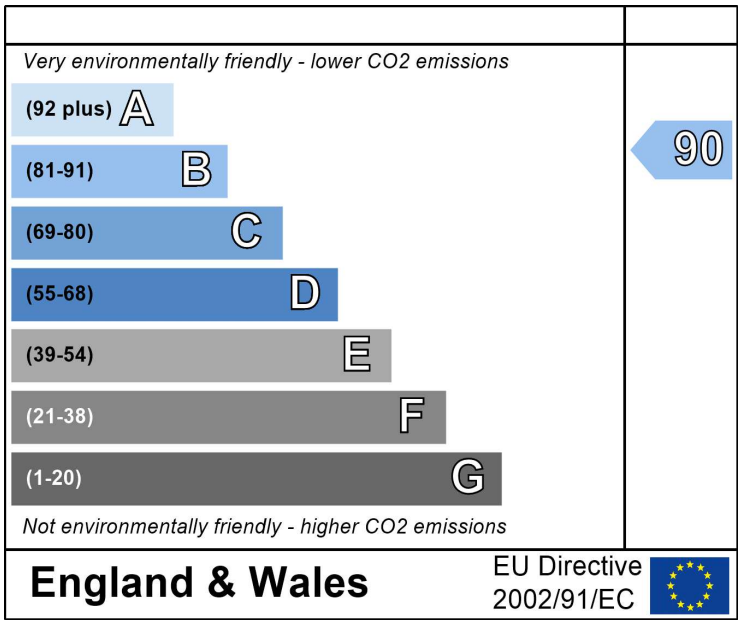
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 425

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	44 (1a)	x	2.7 (2a)	=	118.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	44 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	118.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Walls Type1	29.97	10.4	19.57	x 0.18 =	3.52			(29)
Walls Type2	10.26	0	10.26	x 0.2 =	2.06			(29)
Total area of elements, m²			40.23					(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) = 19.37 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3319.3 (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 3.09 (36)

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

Total fabric heat loss (33) + (36) = 22.46 (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=	10.98	10.85	10.73	10.1	9.98	9.36	9.36	9.23	9.6	9.98	10.23	10.48	(38)

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

(39)m=	33.44	33.32	33.19	32.57	32.44	31.82	31.82	31.69	32.07	32.44	32.69	32.94	

Average = Sum(39)$_{1...12}$ /12= 32.54 (39)

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

(40)m=	0.76	0.76	0.75	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74	0.75	

Average = Sum(40)$_{1...12}$ /12= 0.74 (40)

SAP WorkSheet: New dwelling design stage

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 1.52 (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 70.21 (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=	77.23	74.42	71.61	68.81	66	63.19	63.19	66	68.81	71.61	74.42	77.23	

Total = Sum(44)$_{1...12}$ = 842.53 (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=	114.53	100.17	103.37	90.12	86.47	74.62	69.14	79.34	80.29	93.57	102.14	110.92	

Total = Sum(45)$_{1...12}$ = 1104.69 (45)

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

(46)m=	17.18	15.03	15.51	13.52	12.97	11.19	10.37	11.9	12.04	14.04	15.32	16.64	(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=	39.36	34.26	36.49	33.93	33.63	31.16	32.2	33.63	33.93	36.49	36.7	39.36	(61)

SAP WorkSheet: New dwelling design stage

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=	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27	(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=	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27	

Output from water heater (annual)$_{1...12}$ 1525.84 (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=	47.92	41.87	43.49	38.45	37.16	32.6	31.04	34.79	35.18	40.24	43.14	46.72	(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=	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	(66)

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

(67)m=	29.35	26.07	21.2	16.05	12	10.13	10.95	14.23	19.1	24.25	28.3	30.17	(67)

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

(68)m=	196.58	198.62	193.48	182.54	168.72	155.74	147.06	145.02	150.17	161.11	174.92	187.91	(68)

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

(69)m=	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	(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=	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	(71)

Water heating gains (Table 5)

(72)m=	64.41	62.31	58.46	53.4	49.95	45.28	41.72	46.76	48.86	54.08	59.91	62.8	(72)

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

(73)m=	369.28	365.94	352.08	330.93	309.6	290.09	278.67	284.95	297.06	318.38	342.08	359.81	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)
North	0.9x 0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x 0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x 0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x	0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x	0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x	0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x	0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x	0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x	0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x	0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)
East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)

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

(83)m=	43.53	84.46	140.63	212.43	270.04	281.46	265.85	221.31	165.5	100.33	54.07	35.97	(83)

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

(84)m=	412.81	450.4	492.7	543.36	579.64	571.55	544.52	506.27	462.57	418.71	396.15	395.78	(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=	0.97	0.94	0.87	0.7	0.52	0.36	0.26	0.29	0.48	0.77	0.93	0.97	(86)

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

(87)m=	20.63	20.74	20.88	20.97	21	21	21	21	21	20.96	20.8	20.61	(87)

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

(88)m=	20.29	20.29	20.29	20.31	20.31	20.32	20.32	20.32	20.32	20.31	20.3	20.3	(88)

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

(89)m=	0.96	0.93	0.84	0.67	0.48	0.32	0.22	0.25	0.43	0.73	0.91	0.97	(89)

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

(90)m=	19.82	19.97	20.15	20.28	20.31	20.32	20.32	20.32	20.31	20.27	20.07	19.8	(90)

fLA = Living area ÷ (4) = 0.83 (91)

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

(92)m=	20.5	20.61	20.75	20.86	20.88	20.89	20.89	20.89	20.89	20.85	20.68	20.48	(92)

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

(93)m=	20.35	20.46	20.6	20.71	20.73	20.74	20.74	20.74	20.74	20.7	20.53	20.33	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.96	0.93	0.85	0.69	0.5	0.34	0.24	0.27	0.46	0.75	0.92	0.97	(94)

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

(95)m=	395.98	418.48	420.55	374.85	292.01	195.22	131.63	137.46	212.39	313.84	363.91	382.4	(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=	536.69	518.44	468.15	384.56	293.02	195.26	131.63	137.47	212.77	327.58	439.03	531.25	(97)

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

(98)m=	104.69	67.17	35.41	6.99	0.75	0	0	0	0	10.23	54.09	110.75	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 390.08 (98)

Space heating requirement in kWh/m²/year 8.87 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	104.69	67.17	35.41	6.99	0.75	0	0	0	0	10.23	54.09	110.75	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	115.93	74.39	39.22	7.75	0.84	0	0	0	0	11.33	59.89	122.64	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 431.98 (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

Output from water heater (calculated above)

	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27	

Efficiency of water heater 81 (216)

(217)m=	84.52	83.88	82.72	81.45	81.05	81	81	81	81	81.61	83.41	84.7	(217)

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

(219)m=	182.06	160.26	169.08	152.31	148.18	130.59	125.12	139.48	141.02	159.37	166.46	177.42	

Total = Sum(219a)$_{1...12}$ = 1851.34 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		431.98
Water heating fuel used		1851.34
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		103.27	(230a)
central heating pump:		30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	133.27	(231)
Electricity for lighting		207.37	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2623.95	(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 =	15.03	(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 =	64.43	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	17.58	(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 =	27.35	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				244.39	(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] =	1.15	(257)
SAP rating (Section 12)	83.91	(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	=	93.31	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	399.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =				493.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	69.17	(267)
Electricity for lighting	(232) x		0.519	=	107.62	(268)
Total CO2, kg/year	sum of (265)…(271) =				669.99	(272)
CO2 emissions per m²	(272) ÷ (4) =				15.23	(273)
EI rating (section 14)					90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	527.02	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2258.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2785.65	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	409.13	(267)
Electricity for lighting	(232) x	0	=	636.61	(268)
‘Total Primary Energy	sum of (265)…(271) =			3831.39	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			87.08	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 425

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	137.21	**(P1)**
Transmission heat loss coefficient:	22.5	
Summer heat loss coefficient:	159.68	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	333.92	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	287.09	275.67	281.95	
Total summer gains	644.33	609.59	566.62	**(P5)**
Summer gain/loss ratio	4.04	3.82	3.55	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.29	21.97	21.6	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:19:03

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 78.9m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 426

Address :

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)	14.19 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.28 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	30.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	25.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: South	9.7m²
Windows facing: East	6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 426

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	78.9 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	9.7	1
E	16mm or more	0.7	0.57	1.4	6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	47.52	15.7	31.82	0.18	0	False	N/A
Corridor	4.05	0	4.05	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0599

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

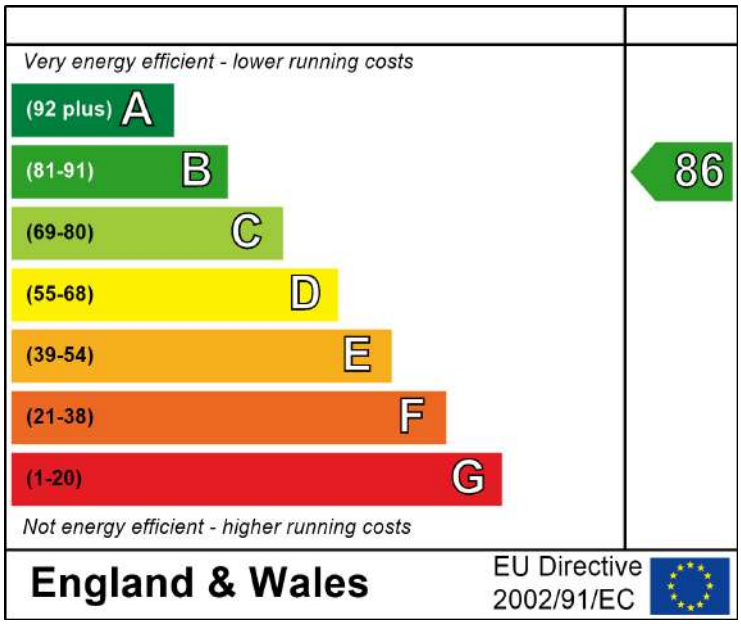
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	78.9 m²

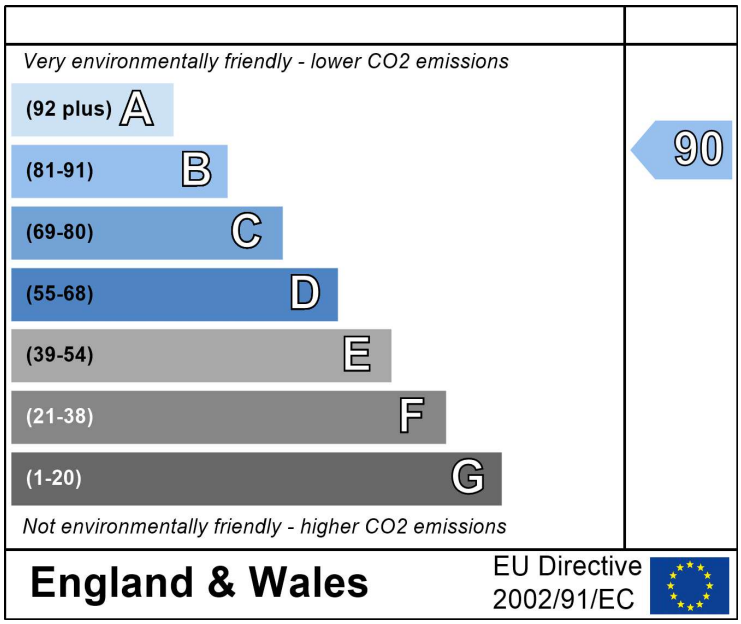
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 426

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.9	(1a) x	2.7	(2a) =	213.03	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.9	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		213.03	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			6	x1/[1/(1.4)+ 0.04] =	7.95			(27)
Walls Type1	47.52	15.7	31.82	x 0.18 =	5.73			(29)
Walls Type2	4.05	0	4.05	x 0.2 =	0.81			(29)
Total area of elements, m²			51.57					(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) = 27.36 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 2996.9 (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 3.09 (36)

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

Total fabric heat loss (33) + (36) = 30.44 (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=	19.69	19.46	19.24	18.12	17.9	16.78	16.78	16.55	17.22	17.9	18.34	18.79	(38)

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

(39)m=	50.13	49.91	49.69	48.56	48.34	47.22	47.22	47	47.67	48.34	48.79	49.24	

Average = Sum(39)$_{1...12}$ /12= 48.51 (39)

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

(40)m=	0.64	0.63	0.63	0.62	0.61	0.6	0.6	0.6	0.6	0.61	0.62	0.62	

Average = Sum(40)$_{1...12}$ /12= 0.61 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.44 (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 92.19 (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=	101.41	97.72	94.03	90.35	86.66	82.97	82.97	86.66	90.35	94.03	97.72	101.41	

Total = Sum(44)$_{1...12}$ = 1106.27 (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=	150.39	131.53	135.73	118.33	113.54	97.98	90.79	104.18	105.43	122.86	134.12	145.64	

Total = Sum(45)$_{1...12}$ = 1450.5 (45)

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

(46)m=	22.56	19.73	20.36	17.75	17.03	14.7	13.62	15.63	15.81	18.43	20.12	21.85	(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=	50.96	44.98	47.92	44.55	44.16	40.92	42.28	44.16	44.55	47.92	48.19	50.96	(61)

SAP WorkSheet: New dwelling design stage

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=	201.34	176.51	183.64	162.88	157.7	138.89	133.07	148.34	149.98	170.78	182.31	196.6	(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=	201.34	176.51	183.64	162.88	157.7	138.89	133.07	148.34	149.98	170.78	182.31	196.6	

Output from water heater (annual)$_{1...12}$ 2002.05 (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=	62.74	54.98	57.11	50.48	48.79	42.81	40.76	45.68	46.19	52.83	56.64	61.17	(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=	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	(66)

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

(67)m=	48.76	43.31	35.22	26.66	19.93	16.83	18.18	23.63	31.72	40.28	47.01	50.11	(67)

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

(68)m=	324.07	327.43	318.96	300.92	278.14	256.74	242.44	239.08	247.55	265.59	288.37	309.77	(68)

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

(69)m=	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	(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=	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	(71)

Water heating gains (Table 5)

(72)m=	84.33	81.81	76.76	70.11	65.58	59.45	54.78	61.4	64.16	71.01	78.67	82.21	(72)

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

(73)m=	561.09	556.48	534.86	501.62	467.58	436.95	419.33	428.04	447.36	480.81	517.97	546.02	(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)	
East	0.9x 0.77	x	6	x	19.64	x	0.57	x	0.7	=	32.58	(76)
East	0.9x 0.77	x	6	x	38.42	x	0.57	x	0.7	=	63.74	(76)
East	0.9x 0.77	x	6	x	63.27	x	0.57	x	0.7	=	104.97	(76)
East	0.9x 0.77	x	6	x	92.28	x	0.57	x	0.7	=	153.1	(76)
East	0.9x 0.77	x	6	x	113.09	x	0.57	x	0.7	=	187.63	(76)
East	0.9x 0.77	x	6	x	115.77	x	0.57	x	0.7	=	192.07	(76)
East	0.9x 0.77	x	6	x	110.22	x	0.57	x	0.7	=	182.86	(76)
East	0.9x 0.77	x	6	x	94.68	x	0.57	x	0.7	=	157.07	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	6	x	73.59	x	0.57	x	0.7	=	122.09	(76)
East	0.9x	0.77	x	6	x	45.59	x	0.57	x	0.7	=	75.63	(76)
East	0.9x	0.77	x	6	x	24.49	x	0.57	x	0.7	=	40.63	(76)
East	0.9x	0.77	x	6	x	16.15	x	0.57	x	0.7	=	26.8	(76)
South	0.9x	0.77	x	9.7	x	46.75	x	0.57	x	0.7	=	125.39	(78)
South	0.9x	0.77	x	9.7	x	76.57	x	0.57	x	0.7	=	205.36	(78)
South	0.9x	0.77	x	9.7	x	97.53	x	0.57	x	0.7	=	261.6	(78)
South	0.9x	0.77	x	9.7	x	110.23	x	0.57	x	0.7	=	295.66	(78)
South	0.9x	0.77	x	9.7	x	114.87	x	0.57	x	0.7	=	308.1	(78)
South	0.9x	0.77	x	9.7	x	110.55	x	0.57	x	0.7	=	296.5	(78)
South	0.9x	0.77	x	9.7	x	108.01	x	0.57	x	0.7	=	289.7	(78)
South	0.9x	0.77	x	9.7	x	104.89	x	0.57	x	0.7	=	281.34	(78)
South	0.9x	0.77	x	9.7	x	101.89	x	0.57	x	0.7	=	273.27	(78)
South	0.9x	0.77	x	9.7	x	82.59	x	0.57	x	0.7	=	221.5	(78)
South	0.9x	0.77	x	9.7	x	55.42	x	0.57	x	0.7	=	148.64	(78)
South	0.9x	0.77	x	9.7	x	40.4	x	0.57	x	0.7	=	108.35	(78)

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

(83)m=	157.98	269.11	366.57	448.76	495.72	488.57	472.56	438.41	395.36	297.14	189.26	135.15	(83)

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

(84)m=	719.06	825.58	901.43	950.38	963.3	925.52	891.89	866.45	842.71	777.95	707.23	681.17	(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=	0.95	0.88	0.77	0.61	0.47	0.33	0.23	0.25	0.39	0.64	0.87	0.96	(86)

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

(87)m=	20.79	20.9	20.97	21	21	21	21	21	21	20.99	20.92	20.77	(87)

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

(88)m=	20.4	20.4	20.4	20.42	20.42	20.43	20.43	20.43	20.43	20.42	20.41	20.41	(88)

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

(89)m=	0.94	0.86	0.75	0.59	0.44	0.3	0.2	0.22	0.36	0.61	0.85	0.95	(89)

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

(90)m=	20.14	20.28	20.37	20.41	20.42	20.43	20.43	20.43	20.43	20.41	20.32	20.12	(90)

fLA = Living area ÷ (4) = 0.47 (91)

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

(92)m=	20.45	20.57	20.65	20.68	20.69	20.7	20.7	20.7	20.69	20.68	20.6	20.42	(92)

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

(93)m=	20.3	20.42	20.5	20.53	20.54	20.55	20.55	20.55	20.54	20.53	20.45	20.27	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.93	0.86	0.75	0.59	0.44	0.3	0.21	0.22	0.36	0.61	0.85	0.95	(94)

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

(95)m=	671.79	711.7	675.42	562.2	427.04	280.76	186.32	194.9	307.1	477.2	604.17	645.67	(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=	801.89	774.51	695.38	564.94	427.26	280.76	186.32	194.9	307.13	480.2	651.42	791.32	(97)

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

(98)m=	96.79	42.2	14.85	1.97	0.17	0	0	0	0	2.23	34.02	108.36	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 300.59 (98)

Space heating requirement in kWh/m²/year 3.81 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	96.79	42.2	14.85	1.97	0.17	0	0	0	0	2.23	34.02	108.36	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	107.19	46.74	16.44	2.19	0.19	0	0	0	0	2.46	37.68	120	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 332.88 (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

Output from water heater (calculated above)

	201.34	176.51	183.64	162.88	157.7	138.89	133.07	148.34	149.98	170.78	182.31	196.6	

Efficiency of water heater 81 (216)

(217)m=	83.8	82.64	81.63	81.1	81.01	81	81	81	81	81.11	82.33	84.08	(217)

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

(219)m=	240.26	213.58	224.97	200.84	194.67	171.47	164.28	183.14	185.16	210.56	221.42	233.83	

Total = Sum(219a)$_{1...12}$ = 2444.2 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		332.88
Water heating fuel used		2444.2
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	185.18		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	215.18	(231)
Electricity for lighting		344.44	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3336.7	(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 =	11.58	(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 =	85.06	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	28.38	(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 =	45.43	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				290.46	(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] =	0.98	(257)
SAP rating (Section 12)	86.26	(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	=	71.9	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	527.95	(264)
Space and water heating	(261) + (262) + (263) + (264) =				599.85	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	111.68	(267)
Electricity for lighting	(232) x		0.519	=	178.77	(268)
Total CO2, kg/year	sum of (265)…(271) =				890.29	(272)
CO2 emissions per m²	(272) ÷ (4) =				11.28	(273)
EI rating (section 14)					90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	406.11	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2981.92	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3388.03	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	660.59	(267)
Electricity for lighting	(232) x	0	=	1057.44	(268)
‘Total Primary Energy	sum of (265)…(271) =			5106.07	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			64.72	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 426

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	246.05	**(P1)**
Transmission heat loss coefficient:	30.4	
Summer heat loss coefficient:	276.49	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	9.7	112.21	0.57	0.7	0.9	351.76	
East (E)	0.9 x	6	117.51	0.57	0.7	0.9	227.86	
						Total	579.62	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	433.95	416.33	425.04	
Total summer gains	1040.45	995.95	972.56	**(P5)**
Summer gain/loss ratio	3.76	3.6	3.52	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.01	21.75	21.57	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:18:49

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 427

Address :

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)	15.19 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.47 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	35.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	31.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: South	9.7m²
Windows facing: East	12m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 427

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 10 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 503

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	74 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	9.7	1
E	16mm or more	0.7	0.57	1.4	12	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	48.33	21.7	26.63	0.18	0	False	N/A
Corridor	11.61	0	11.61	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0515

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

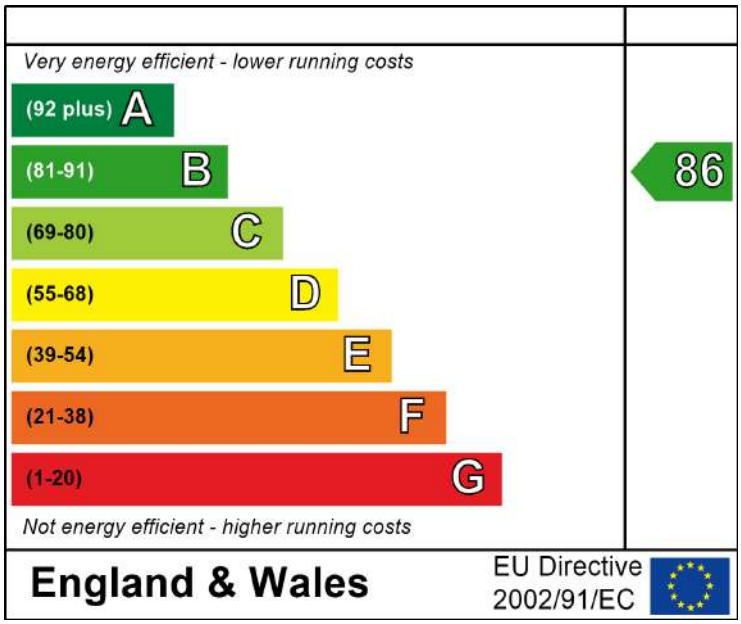
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	74 m²

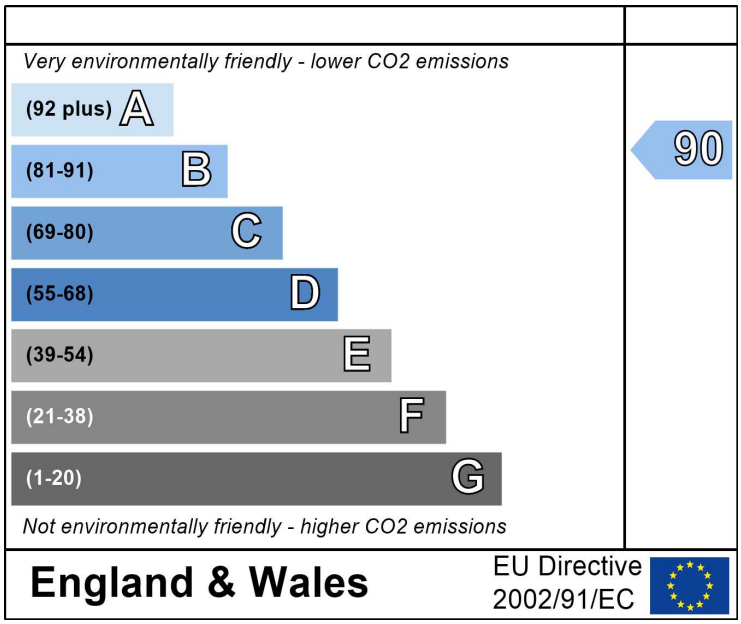
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 427

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74 (1a)	x	2.7 (2a)	=	199.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	199.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			12	x1/[1/(1.4)+ 0.04] =	15.91			(27)
Walls Type1	48.33	21.7	26.63	x 0.18 =	4.79			(29)
Walls Type2	11.61	0	11.61	x 0.2 =	2.33			(29)
Total area of elements, m²			59.94					(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) = 35.9 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4070 (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 3.09 (36)

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

Total fabric heat loss (33) + (36) = 38.98 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	18.47	18.26	18.05	16.99	16.78	15.73	15.73	15.52	16.15	16.78	17.2	17.62	(38)

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

(39)m=	57.45	57.24	57.03	55.98	55.77	54.72	54.72	54.51	55.14	55.77	56.19	56.61	

Average = Sum(39)$_{1...12}$ /12= 55.93 (39)

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

(40)m=	0.78	0.77	0.77	0.76	0.75	0.74	0.74	0.74	0.75	0.75	0.76	0.76	

Average = Sum(40)$_{1...12}$ /12= 0.76 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.34 (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 89.76 (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=	98.73	95.14	91.55	87.96	84.37	80.78	80.78	84.37	87.96	91.55	95.14	98.73	

Total = Sum(44)$_{1...12}$ = 1077.07 (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=	146.42	128.06	132.14	115.21	110.54	95.39	88.39	101.43	102.64	119.62	130.57	141.8	

Total = Sum(45)$_{1...12}$ = 1412.21 (45)

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

(46)m=	21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.21	15.4	17.94	19.59	21.27	(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=	50.31	43.79	46.65	43.38	42.99	39.84	41.16	42.99	43.38	46.65	46.92	50.31	(61)

SAP WorkSheet: New dwelling design stage

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=	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11	(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=	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11	

Output from water heater (annual)$_{1...12}$ 1950.6 (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=	61.26	53.53	55.6	49.15	47.5	41.68	39.68	44.47	44.97	51.44	55.15	59.73	(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=	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	(66)

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

(67)m=	46.01	40.87	33.24	25.16	18.81	15.88	17.16	22.3	29.93	38.01	44.36	47.29	(67)

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

(68)m=	308.13	311.33	303.27	286.12	264.46	244.11	230.52	227.32	235.38	252.53	274.18	294.53	(68)

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

(69)m=	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	(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=	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	(71)

Water heating gains (Table 5)

(72)m=	82.34	79.65	74.73	68.26	63.85	57.88	53.34	59.78	62.46	69.14	76.59	80.28	(72)

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

(73)m=	537.64	533.01	512.4	480.7	448.28	419.03	402.17	410.56	428.93	460.83	496.3	523.26	(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)	
East	0.9x 0.77	x	12	x	19.64	x	0.57	x	0.7	=	65.17	(76)
East	0.9x 0.77	x	12	x	38.42	x	0.57	x	0.7	=	127.48	(76)
East	0.9x 0.77	x	12	x	63.27	x	0.57	x	0.7	=	209.95	(76)
East	0.9x 0.77	x	12	x	92.28	x	0.57	x	0.7	=	306.19	(76)
East	0.9x 0.77	x	12	x	113.09	x	0.57	x	0.7	=	375.25	(76)
East	0.9x 0.77	x	12	x	115.77	x	0.57	x	0.7	=	384.14	(76)
East	0.9x 0.77	x	12	x	110.22	x	0.57	x	0.7	=	365.71	(76)
East	0.9x 0.77	x	12	x	94.68	x	0.57	x	0.7	=	314.14	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	12	x	73.59	x	0.57	x	0.7	=	244.18	(76)
East	0.9x	0.77	x	12	x	45.59	x	0.57	x	0.7	=	151.27	(76)
East	0.9x	0.77	x	12	x	24.49	x	0.57	x	0.7	=	81.26	(76)
East	0.9x	0.77	x	12	x	16.15	x	0.57	x	0.7	=	53.59	(76)
South	0.9x	0.77	x	9.7	x	46.75	x	0.57	x	0.7	=	125.39	(78)
South	0.9x	0.77	x	9.7	x	76.57	x	0.57	x	0.7	=	205.36	(78)
South	0.9x	0.77	x	9.7	x	97.53	x	0.57	x	0.7	=	261.6	(78)
South	0.9x	0.77	x	9.7	x	110.23	x	0.57	x	0.7	=	295.66	(78)
South	0.9x	0.77	x	9.7	x	114.87	x	0.57	x	0.7	=	308.1	(78)
South	0.9x	0.77	x	9.7	x	110.55	x	0.57	x	0.7	=	296.5	(78)
South	0.9x	0.77	x	9.7	x	108.01	x	0.57	x	0.7	=	289.7	(78)
South	0.9x	0.77	x	9.7	x	104.89	x	0.57	x	0.7	=	281.34	(78)
South	0.9x	0.77	x	9.7	x	101.89	x	0.57	x	0.7	=	273.27	(78)
South	0.9x	0.77	x	9.7	x	82.59	x	0.57	x	0.7	=	221.5	(78)
South	0.9x	0.77	x	9.7	x	55.42	x	0.57	x	0.7	=	148.64	(78)
South	0.9x	0.77	x	9.7	x	40.4	x	0.57	x	0.7	=	108.35	(78)

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

(83)m=	190.56	332.85	471.54	601.85	683.35	680.64	655.41	595.48	517.44	372.77	229.89	161.94	(83)

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

(84)m=	728.2	865.85	983.94	1082.56	1131.63	1099.67	1057.58	1006.04	946.38	833.61	726.19	685.2	(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=	0.96	0.9	0.79	0.62	0.46	0.32	0.23	0.25	0.4	0.68	0.91	0.97	(86)

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

(87)m=	20.65	20.81	20.93	20.99	21	21	21	21	21	20.98	20.83	20.61	(87)

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

(88)m=	20.27	20.28	20.28	20.29	20.29	20.31	20.31	20.31	20.3	20.29	20.29	20.28	(88)

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

(89)m=	0.95	0.88	0.76	0.58	0.42	0.28	0.19	0.21	0.36	0.64	0.89	0.96	(89)

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

(90)m=	19.82	20.04	20.2	20.28	20.29	20.31	20.31	20.31	20.3	20.28	20.09	19.78	(90)

fLA = Living area ÷ (4) = 0.5 (91)

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

(92)m=	20.23	20.42	20.56	20.63	20.64	20.65	20.65	20.65	20.65	20.63	20.46	20.19	(92)

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

(93)m=	20.08	20.27	20.41	20.48	20.49	20.5	20.5	20.5	20.5	20.48	20.31	20.04	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.95	0.88	0.76	0.59	0.43	0.29	0.2	0.22	0.37	0.65	0.89	0.96	(94)

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

(95)m=	690.47	763.41	752.01	641.4	489.65	322.82	213.41	223.56	352.56	540.73	643.29	657.84	(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=	906.68	879.89	793.4	648.26	490.36	322.85	213.41	223.57	352.74	550.75	742.2	896.85	(97)

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

(98)m=	160.86	78.27	30.79	4.94	0.53	0	0	0	0	7.46	71.22	177.82	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 531.88 (98)

Space heating requirement in kWh/m²/year 7.19 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	160.86	78.27	30.79	4.94	0.53	0	0	0	0	7.46	71.22	177.82	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	178.14	86.68	34.1	5.47	0.58	0	0	0	0	8.26	78.87	196.92	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 589.02 (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

Output from water heater (calculated above)

	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11	

Efficiency of water heater 81 (216)

(217)m=	84.94	83.7	82.24	81.25	81.03	81	81	81	81	81.36	83.46	85.22	(217)

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

(219)m=	231.62	205.32	217.4	195.17	189.48	166.95	159.95	178.3	180.27	204.37	212.67	225.43	

Total = Sum(219a)$_{1...12}$ = 2366.93 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		589.02
Water heating fuel used		2366.93
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	173.68		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	203.68	(231)
Electricity for lighting		325.04	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3484.66	(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 =	20.5	(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 =	82.37	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	26.86	(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 =	42.87	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			292.6	(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] =	1.03	(257)
SAP rating (Section 12)		85.59	(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	=	127.23	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	511.26	(264)
Space and water heating	(261) + (262) + (263) + (264) =			638.48	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	105.71	(267)
Electricity for lighting	(232) x	0.519	=	168.69	(268)
Total CO2, kg/year	sum of (265)…(271) =			912.89	(272)
CO2 emissions per m²	(272) ÷ (4) =			12.34	(273)
EI rating (section 14)				90	(274)

13a. Primary Energy

	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	718.6	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2887.65	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3606.25	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	625.29	(267)
Electricity for lighting	(232) x	0	=	997.86	(268)
‘Total Primary Energy	sum of (265)…(271) =			5229.4	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			70.67	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 427

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	230.77	**(P1)**
Transmission heat loss coefficient:	39	
Summer heat loss coefficient:	269.75	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	9.7	112.21	0.57	0.7	0.9	351.76	
East (E)	0.9 x	12	117.51	0.57	0.7	0.9	455.73	
						Total	807.48	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	416.03	399.17	407.56	
Total summer gains	1264.43	1206.65	1155.55	**(P5)**
Summer gain/loss ratio	4.69	4.47	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	20.94	22.62	22.33	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:18:37

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 47.3m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 428

Address :

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)	19.97 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.45 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	16.7m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 428

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	47.3 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	16.7	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	31.32	16.7	14.62	0.18	0	False	N/A
Corridor	35.64	0	35.64	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0634

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

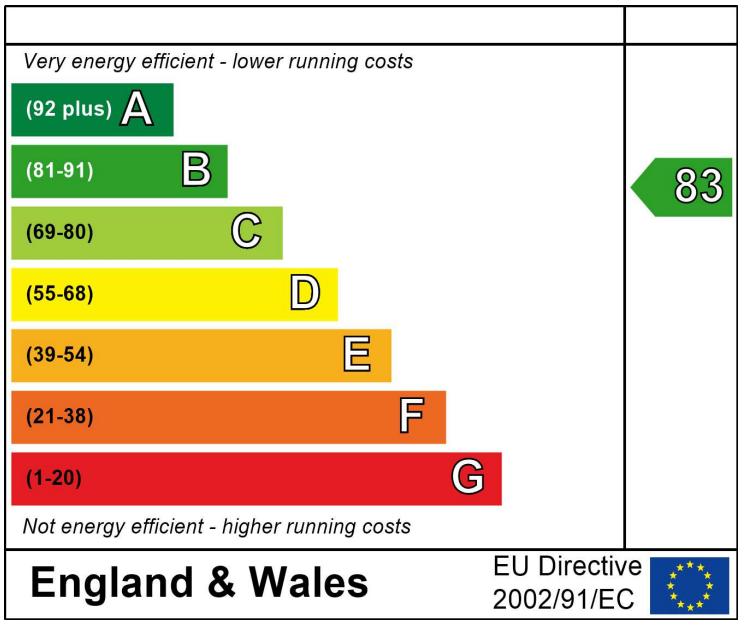
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	47.3 m²

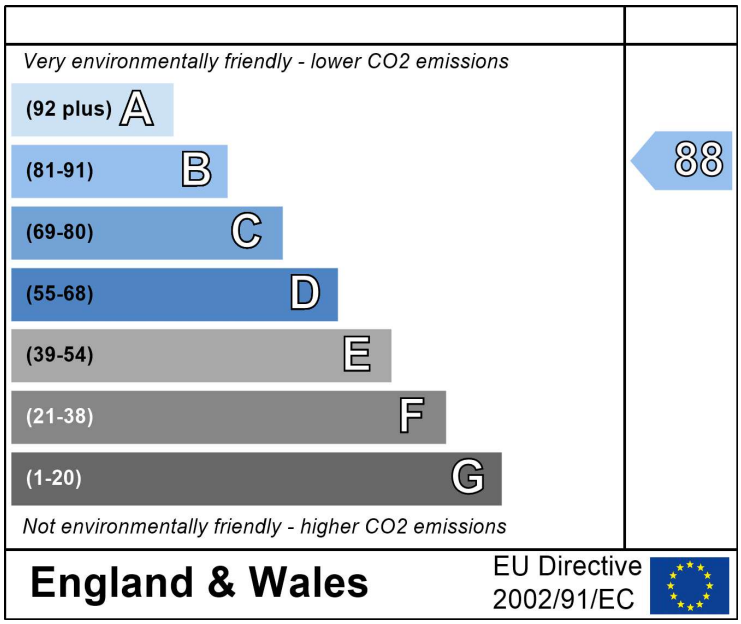
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 428

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	47.3	(1a) x	2.7	(2a) =	127.71	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	47.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.71	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			16.7	x1/[1/(1.4)+ 0.04] =	22.14			(27)
Walls Type1	31.32	16.7	14.62	x 0.18 =	2.63			(29)
Walls Type2	35.64	0	35.64	x 0.2 =	7.16			(29)
Total area of elements, m²			66.96					(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) = 31.93 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7795 (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 4.24 (36)

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

Total fabric heat loss (33) + (36) = 36.18 (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=	11.8	11.67	11.53	10.86	10.73	10.06	10.06	9.92	10.33	10.73	11	11.27	(38)

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

(39)m=	47.98	47.85	47.71	47.04	46.91	46.24	46.24	46.1	46.51	46.91	47.18	47.45	

Average = Sum(39)$_{1...12}$ /12= 47.01 (39)

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

(40)m=	1.01	1.01	1.01	0.99	0.99	0.98	0.98	0.97	0.98	0.99	1	1	

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

SAP WorkSheet: New dwelling design stage

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 1.61 (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 72.46 (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=	79.71	76.81	73.91	71.01	68.11	65.22	65.22	68.11	71.01	73.91	76.81	79.71	

Total = Sum(44)$_{1...12}$ = 869.54 (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=	118.2	103.38	106.68	93.01	89.24	77.01	71.36	81.89	82.87	96.57	105.42	114.47	

Total = Sum(45)$_{1...12}$ = 1140.1 (45)

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

(46)m=	17.73	15.51	16	13.95	13.39	11.55	10.7	12.28	12.43	14.49	15.81	17.17	(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=	40.62	35.35	37.66	35.02	34.71	32.16	33.23	34.71	35.02	37.66	37.88	40.62	(61)

SAP WorkSheet: New dwelling design stage

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=	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09	(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=	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09	

Output from water heater (annual)$_{1...12}$ 1574.75 (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=	49.46	43.21	44.89	39.68	38.35	33.65	32.04	35.9	36.31	41.53	44.52	48.22	(65)

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

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	(66)

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

(67)m=	31.25	27.76	22.58	17.09	12.78	10.79	11.65	15.15	20.33	25.82	30.13	32.12	(67)

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

(68)m=	209.29	211.47	205.99	194.34	179.63	165.81	156.58	154.4	159.88	171.53	186.24	200.06	(68)

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

(69)m=	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	(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=	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	(71)

Water heating gains (Table 5)

(72)m=	66.47	64.3	60.33	55.11	51.55	46.73	43.06	48.26	50.43	55.81	61.83	64.81	(72)

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

(73)m=	388.52	385.03	370.4	348.04	325.45	304.82	292.79	299.31	312.13	334.66	359.7	378.49	(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)	
West	0.9x 0.77	x	16.7	x	19.64	x	0.57	x	0.7	=	90.69	(80)
West	0.9x 0.77	x	16.7	x	38.42	x	0.57	x	0.7	=	177.41	(80)
West	0.9x 0.77	x	16.7	x	63.27	x	0.57	x	0.7	=	292.17	(80)
West	0.9x 0.77	x	16.7	x	92.28	x	0.57	x	0.7	=	426.12	(80)
West	0.9x 0.77	x	16.7	x	113.09	x	0.57	x	0.7	=	522.22	(80)
West	0.9x 0.77	x	16.7	x	115.77	x	0.57	x	0.7	=	534.59	(80)
West	0.9x 0.77	x	16.7	x	110.22	x	0.57	x	0.7	=	508.95	(80)
West	0.9x 0.77	x	16.7	x	94.68	x	0.57	x	0.7	=	437.18	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	16.7	x	73.59	x	0.57	x	0.7	=	339.81	(80)
West	0.9x	0.77	x	16.7	x	45.59	x	0.57	x	0.7	=	210.52	(80)
West	0.9x	0.77	x	16.7	x	24.49	x	0.57	x	0.7	=	113.08	(80)
West	0.9x	0.77	x	16.7	x	16.15	x	0.57	x	0.7	=	74.58	(80)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	90.69	177.41	292.17	426.12	522.22	534.59	508.95	437.18	339.81	210.52	113.08	74.58	(83)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	479.21	562.44	662.57	774.16	847.68	839.41	801.74	736.49	651.94	545.17	472.78	453.07	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.95	0.87	0.7	0.51	0.35	0.25	0.29	0.49	0.8	0.95	0.98	(86)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	20.32	20.52	20.76	20.94	20.99	21	21	21	20.99	20.89	20.58	20.28	(87)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	20.07	20.07	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.08	(88)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.97	0.93	0.84	0.65	0.46	0.3	0.2	0.23	0.43	0.75	0.94	0.98	(89)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	19.2	19.47	19.8	20.03	20.08	20.1	20.1	20.1	20.09	19.99	19.58	19.15	(90)

fLA = Living area ÷ (4) = 0.78 (91)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	20.07	20.28	20.54	20.73	20.79	20.8	20.8	20.8	20.79	20.69	20.35	20.03	(92)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	19.92	20.13	20.39	20.58	20.64	20.65	20.65	20.65	20.64	20.54	20.2	19.88	(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:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.97	0.93	0.85	0.68	0.49	0.33	0.23	0.27	0.46	0.78	0.94	0.97	(94)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	464.05	525.44	562.19	524.03	415.24	279.29	187.16	195.82	302.15	423.3	443.32	441.7	(95)

Monthly average external temperature from Table 8

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(97)m=	749.49	728.82	662.97	549.63	419.19	279.63	187.2	195.89	304.25	466.26	618.19	743.84	(97)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m=	212.36	136.67	74.98	18.43	2.94	0	0	0	0	31.97	125.91	224.8	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 828.05 (98)

Space heating requirement in kWh/m²/year 17.51 (99)

SAP WorkSheet: New dwelling design stage

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

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	212.36	136.67	74.98	18.43	2.94	0	0	0	0	31.97	125.91	224.8	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	235.17	151.35	83.03	20.41	3.25	0	0	0	0	35.4	139.43	248.94	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 917 (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

Output from water heater (calculated above)

	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09

Efficiency of water heater 81 (216)

(217)m=	86.07	85.36	83.96	82.06	81.19	81	81	81	81	82.64	85.1	86.26	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	184.52	162.52	171.93	156.01	152.66	134.78	129.13	143.95	145.54	162.44	168.38	179.8	

Total = Sum(219a)$_{1...12}$ = 1891.66 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		917
Water heating fuel used		1891.66
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	111.01	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	141.01 (231)
Electricity for lighting		220.78 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3170.45 (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 =	31.91 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	65.83	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	18.6	(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 =	29.12	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			265.46	(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] =	1.21	(257)
SAP rating (Section 12)		83.15	(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	=	198.07	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	408.6	(264)
Space and water heating	(261) + (262) + (263) + (264) =					606.67	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	73.19	(267)
Electricity for lighting	(232)	x		0.519	=	114.58	(268)
Total CO2, kg/year			sum of (265)…(271) =			794.44	(272)
CO2 emissions per m²			(272) ÷ (4) =			16.8	(273)
EI rating (section 14)						88	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	1118.73	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2307.83	(264)
Space and water heating	(261) + (262) + (263) + (264) =					3426.56	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	432.91	(267)
Electricity for lighting	(232)	x		0	=	677.78	(268)
'Total Primary Energy			sum of (265)…(271) =			4537.26	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			95.93	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 428

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	147.51	**(P1)**
Transmission heat loss coefficient:	36.2	
Summer heat loss coefficient:	183.68	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	16.7	117.51	0.57	0.7	0.9	634.22	
						Total	634.22	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	301.82	289.79	296.31	
Total summer gains	975.06	924	854.27	**(P5)**
Summer gain/loss ratio	5.31	5.03	4.65	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.56	23.18	22.7	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:18:25

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.2m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 429

Address :

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)	17.04 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.86 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	22.5m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 429

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	63.2 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	22.5	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	56.43	22.5	33.93	0.18	0	False	N/A
Corridor	5.94	0	5.94	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0681

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

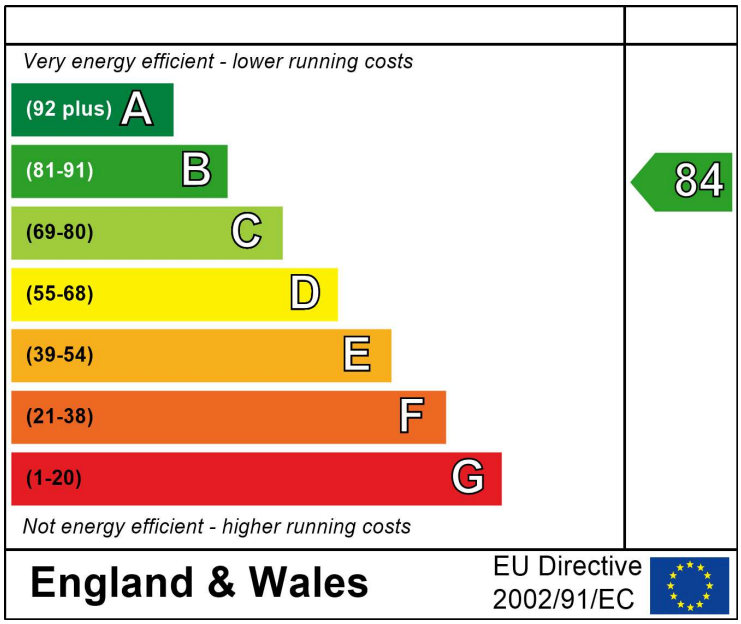
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	63.2 m²

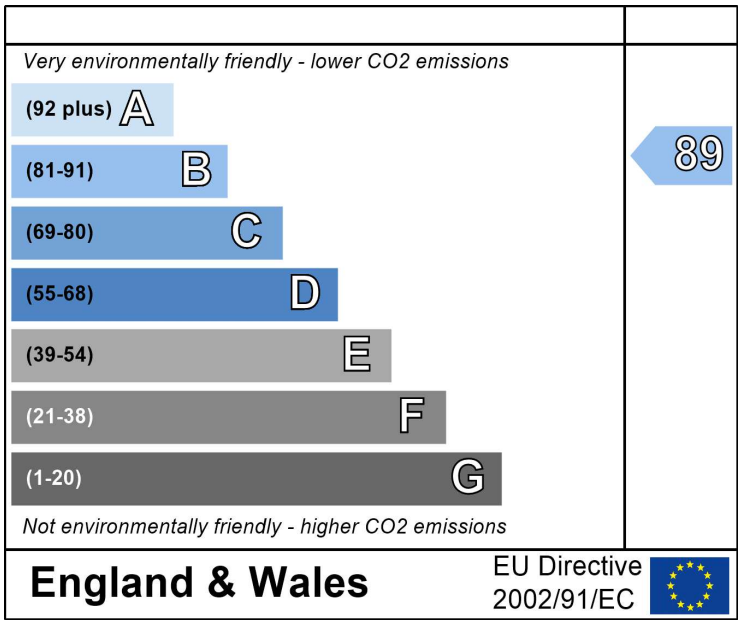
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 429

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	63.2	(1a) x	2.7	(2a) =	170.64	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		170.64	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			22.5	x1/[1/(1.4)+ 0.04] =	29.83			(27)
Walls Type1	56.43	22.5	33.93	x 0.18 =	6.11			(29)
Walls Type2	5.94	0	5.94	x 0.2 =	1.19			(29)
Total area of elements, m²			62.37					(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) = 37.13 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3503.7 (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 4.24 (36)

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

Total fabric heat loss (33) + (36) = 41.38 (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=	15.77	15.59	15.41	14.51	14.33	13.44	13.44	13.26	13.8	14.33	14.69	15.05	(38)

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

(39)m=	57.15	56.97	56.79	55.89	55.71	54.81	54.81	54.63	55.17	55.71	56.07	56.43	

Average = Sum(39)$_{1...12}$ /12= 55.85 (39)

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

(40)m=	0.9	0.9	0.9	0.88	0.88	0.87	0.87	0.86	0.87	0.88	0.89	0.89	

Average = Sum(40)$_{1...12}$ /12= 0.88 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.07 (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 83.37 (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=	91.71	88.38	85.04	81.71	78.37	75.04	75.04	78.37	81.71	85.04	88.38	91.71	

Total = Sum(44)$_{1...12}$ = 1000.5 (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=	136.01	118.95	122.75	107.01	102.68	88.61	82.11	94.22	95.35	111.12	121.29	131.72	

Total = Sum(45)$_{1...12}$ = 1311.81 (45)

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

(46)m=	20.4	17.84	18.41	16.05	15.4	13.29	12.32	14.13	14.3	16.67	18.19	19.76	(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=	46.74	40.68	43.34	40.29	39.94	37	38.24	39.94	40.29	43.34	43.58	46.74	(61)

SAP WorkSheet: New dwelling design stage

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=	182.74	159.63	166.08	147.31	142.62	125.61	120.35	134.16	135.64	154.45	164.88	178.45	(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=	182.74	159.63	166.08	147.31	142.62	125.61	120.35	134.16	135.64	154.45	164.88	178.45	

Output from water heater (annual)$_{1...12}$ 1811.92 (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=	56.91	49.72	51.65	45.66	44.13	38.71	36.86	41.31	41.78	47.78	51.23	55.48	(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=	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	(66)

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

(67)m=	40.33	35.82	29.13	22.05	16.48	13.92	15.04	19.55	26.24	33.31	38.88	41.45	(67)

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

(68)m=	270.06	272.86	265.8	250.77	231.79	213.95	202.04	199.23	206.3	221.33	240.31	258.14	(68)

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

(69)m=	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	(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=	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	(71)

Water heating gains (Table 5)

(72)m=	76.49	73.99	69.42	63.41	59.31	53.77	49.54	55.53	58.02	64.22	71.15	74.57	(72)

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

(73)m=	480.78	476.57	458.25	430.13	401.49	375.54	360.52	368.21	384.46	412.77	444.24	468.06	(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)	
West	0.9x 0.77	x	22.5	x	19.64	x	0.57	x	0.7	=	122.19	(80)
West	0.9x 0.77	x	22.5	x	38.42	x	0.57	x	0.7	=	239.03	(80)
West	0.9x 0.77	x	22.5	x	63.27	x	0.57	x	0.7	=	393.65	(80)
West	0.9x 0.77	x	22.5	x	92.28	x	0.57	x	0.7	=	574.11	(80)
West	0.9x 0.77	x	22.5	x	113.09	x	0.57	x	0.7	=	703.6	(80)
West	0.9x 0.77	x	22.5	x	115.77	x	0.57	x	0.7	=	720.26	(80)
West	0.9x 0.77	x	22.5	x	110.22	x	0.57	x	0.7	=	685.71	(80)
West	0.9x 0.77	x	22.5	x	94.68	x	0.57	x	0.7	=	589.02	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	22.5	x	73.59	x	0.57	x	0.7	=	457.83	(80)
West	0.9x	0.77	x	22.5	x	45.59	x	0.57	x	0.7	=	283.63	(80)
West	0.9x	0.77	x	22.5	x	24.49	x	0.57	x	0.7	=	152.36	(80)
West	0.9x	0.77	x	22.5	x	16.15	x	0.57	x	0.7	=	100.48	(80)

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

(83)m=	122.19	239.03	393.65	574.11	703.6	720.26	685.71	589.02	457.83	283.63	152.36	100.48	(83)

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

(84)m=	602.97	715.6	851.9	1004.24	1105.08	1095.8	1046.23	957.23	842.29	696.39	596.59	568.55	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.94	0.85	0.65	0.47	0.32	0.23	0.26	0.45	0.77	0.95	0.98	(86)

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

(87)m=	20.43	20.62	20.84	20.97	21	21	21	21	21	20.93	20.67	20.39	(87)

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

(88)m=	20.16	20.17	20.17	20.18	20.18	20.2	20.2	20.2	20.19	20.18	20.18	20.17	(88)

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

(89)m=	0.97	0.93	0.82	0.61	0.43	0.28	0.19	0.22	0.4	0.73	0.93	0.98	(89)

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

(90)m=	19.43	19.7	19.99	20.15	20.18	20.2	20.2	20.2	20.19	20.12	19.77	19.38	(90)

fLA = Living area ÷ (4) = 0.58 (91)

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

(92)m=	20.01	20.23	20.48	20.63	20.65	20.66	20.66	20.66	20.66	20.59	20.29	19.97	(92)

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

(93)m=	19.86	20.08	20.33	20.48	20.5	20.51	20.51	20.51	20.51	20.44	20.14	19.82	(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	0.93	0.82	0.63	0.44	0.3	0.2	0.23	0.42	0.74	0.93	0.98	(94)

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

(95)m=	583.76	663.54	701.08	631.48	488.77	323.98	214.45	224.72	352.72	516.58	556.35	554.55	(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=	889.35	865.04	785.45	646.96	490.48	324.08	214.46	224.74	353.58	548.36	731.29	881.43	(97)

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

(98)m=	227.36	135.4	62.77	11.15	1.27	0	0	0	0	23.64	125.96	243.2	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 830.75 (98)

Space heating requirement in kWh/m²/year 13.14 (99)

SAP WorkSheet: New dwelling design stage

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

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	227.36	135.4	62.77	11.15	1.27	0	0	0	0	23.64	125.96	243.2	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	251.78	149.95	69.51	12.34	1.4	0	0	0	0	26.18	139.49	269.33	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 919.98 (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

Output from water heater (calculated above)

	182.74	159.63	166.08	147.31	142.62	125.61	120.35	134.16	135.64	154.45	164.88	178.45

Efficiency of water heater 81 (216)

(217)m=	85.9	85.02	83.35	81.59	81.07	81	81	81	81	82.12	84.78	86.12	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	212.73	187.76	199.25	180.54	175.92	155.08	148.58	165.63	167.46	188.08	194.47	207.22	

Total = Sum(219a)$_{1...12}$ = 2182.7 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		919.98
Water heating fuel used		2182.7
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	148.33	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	178.33 (231)
Electricity for lighting		284.88 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3565.89 (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 =	32.02 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	75.96	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	23.52	(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 =	37.58	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			289.07	(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] =	1.12	(257)
SAP rating (Section 12)		84.35	(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	=	198.72	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	471.46	(264)
Space and water heating	(261) + (262) + (263) + (264) =					670.18	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	92.55	(267)
Electricity for lighting	(232)	x		0.519	=	147.85	(268)
Total CO2, kg/year			sum of (265)…(271) =			910.58	(272)
CO2 emissions per m²			(272) ÷ (4) =			14.41	(273)
EI rating (section 14)						89	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	1122.38	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2662.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =					3785.28	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	547.47	(267)
Electricity for lighting	(232)	x		0	=	874.57	(268)
'Total Primary Energy			sum of (265)…(271) =			5207.31	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			82.39	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 429

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	197.09	**(P1)**
Transmission heat loss coefficient:	41.4	
Summer heat loss coefficient:	238.47	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	22.5	117.51	0.57	0.7	0.9	854.49	
						Total	854.49	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	372.54	357.52	365.21	
Total summer gains	1279.6	1212.01	1116.96	**(P5)**
Summer gain/loss ratio	5.37	5.08	4.68	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.62	23.23	22.73	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:18:16

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 64m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 430

Address :

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)	16.65 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.60 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	37.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	9.9m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 430

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	64 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	9.9	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	37.53	9.9	27.63	0.18	0	False	N/A
Corridor	25.11	0	25.11	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0678

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

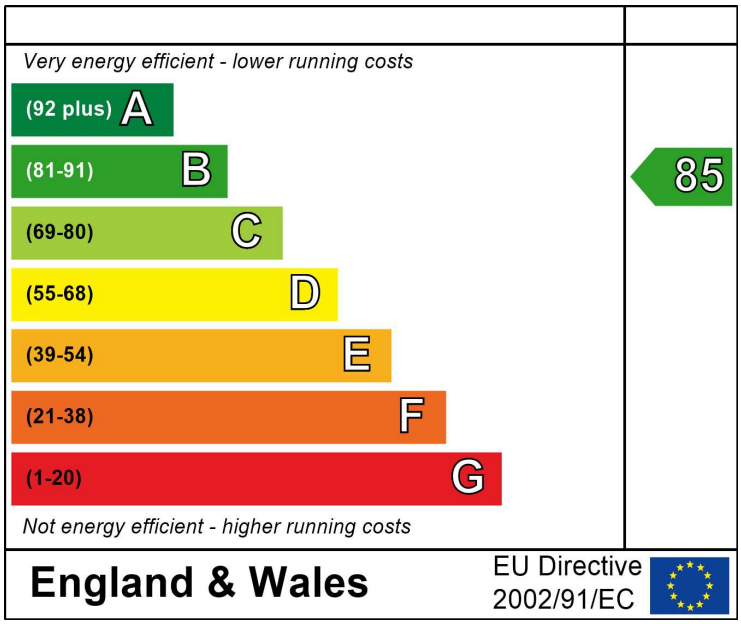
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	64 m²

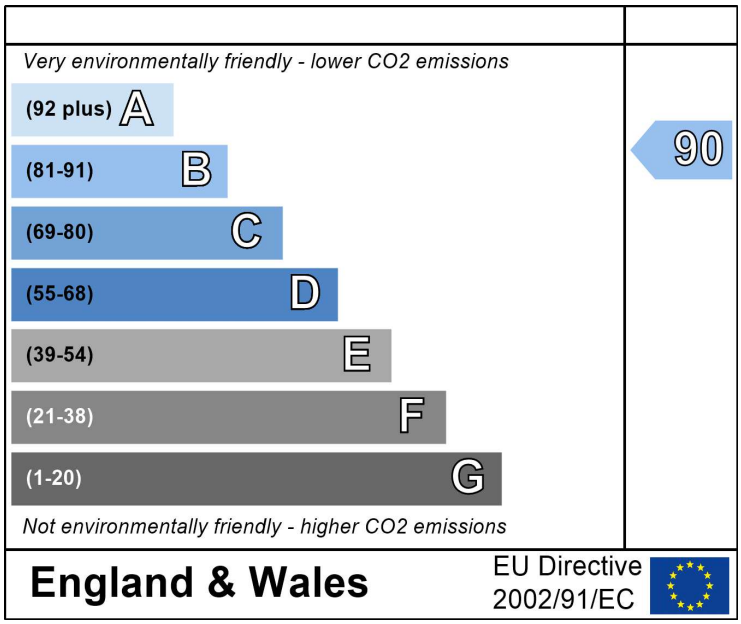
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 430

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	64	(1a) x	2.7	(2a) =	172.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	64	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		172.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			9.9	x1/[1/(1.4)+ 0.04] =	13.12			(27)
Walls Type1	37.53	9.9	27.63	x 0.18 =	4.97			(29)
Walls Type2	25.11	0	25.11	x 0.2 =	5.05			(29)
Total area of elements, m²			62.64					(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) = 23.15 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6705 (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 4.24 (36)

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

Total fabric heat loss (33) + (36) = 27.39 (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=	15.97	15.79	15.61	14.7	14.52	13.61	13.61	13.43	13.97	14.52	14.88	15.24	(38)

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

(39)m=	43.36	43.18	43	42.09	41.91	41	41	40.82	41.36	41.91	42.27	42.63	

Average = Sum(39)$_{1...12}$ /12= 42.04 (39)

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

(40)m=	0.68	0.67	0.67	0.66	0.65	0.64	0.64	0.64	0.65	0.65	0.66	0.67	

Average = Sum(40)$_{1...12}$ /12= 0.66 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.09 (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 83.89 (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=	92.28	88.92	85.57	82.21	78.86	75.5	75.5	78.86	82.21	85.57	88.92	92.28	

Total = Sum(44)$_{1...12}$ = 1006.67 (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=	136.85	119.69	123.51	107.68	103.32	89.15	82.61	94.8	95.93	111.8	122.04	132.53	

Total = Sum(45)$_{1...12}$ = 1319.91 (45)

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

(46)m=	20.53	17.95	18.53	16.15	15.5	13.37	12.39	14.22	14.39	16.77	18.31	19.88	(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=	47.02	40.93	43.6	40.54	40.18	37.23	38.47	40.18	40.54	43.6	43.85	47.02	(61)

SAP WorkSheet: New dwelling design stage

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=	183.87	160.62	167.11	148.22	143.5	126.39	121.09	134.99	136.48	155.41	165.89	179.55	(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=	183.87	160.62	167.11	148.22	143.5	126.39	121.09	134.99	136.48	155.41	165.89	179.55	

Output from water heater (annual)$_{1...12}$ 1823.1 (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=	57.26	50.03	51.97	45.94	44.4	38.95	37.09	41.57	42.03	48.08	51.54	55.82	(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=	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	(66)

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

(67)m=	42.82	38.03	30.93	23.42	17.5	14.78	15.97	20.76	27.86	35.37	41.28	44.01	(67)

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

(68)m=	273	275.83	268.7	253.5	234.31	216.28	204.24	201.4	208.54	223.74	242.93	260.96	(68)

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

(69)m=	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	(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=	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	(71)

Water heating gains (Table 5)

(72)m=	76.96	74.45	69.85	63.8	59.68	54.1	49.85	55.87	58.38	64.62	71.59	75.03	(72)

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

(73)m=	487.27	482.8	463.96	435.2	405.98	379.65	364.54	372.52	389.27	418.22	450.28	474.48	(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)	
West	0.9x 0.77	x	9.9	x	19.64	x	0.57	x	0.7	=	53.76	(80)
West	0.9x 0.77	x	9.9	x	38.42	x	0.57	x	0.7	=	105.17	(80)
West	0.9x 0.77	x	9.9	x	63.27	x	0.57	x	0.7	=	173.21	(80)
West	0.9x 0.77	x	9.9	x	92.28	x	0.57	x	0.7	=	252.61	(80)
West	0.9x 0.77	x	9.9	x	113.09	x	0.57	x	0.7	=	309.58	(80)
West	0.9x 0.77	x	9.9	x	115.77	x	0.57	x	0.7	=	316.91	(80)
West	0.9x 0.77	x	9.9	x	110.22	x	0.57	x	0.7	=	301.71	(80)
West	0.9x 0.77	x	9.9	x	94.68	x	0.57	x	0.7	=	259.17	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	9.9	x	73.59	x	0.57	x	0.7	=	201.44	(80)
West	0.9x	0.77	x	9.9	x	45.59	x	0.57	x	0.7	=	124.8	(80)
West	0.9x	0.77	x	9.9	x	24.49	x	0.57	x	0.7	=	67.04	(80)
West	0.9x	0.77	x	9.9	x	16.15	x	0.57	x	0.7	=	44.21	(80)

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

(83)m=	53.76	105.17	173.21	252.61	309.58	316.91	301.71	259.17	201.44	124.8	67.04	44.21	(83)

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

(84)m=	541.03	587.98	637.17	687.81	715.56	696.56	666.26	631.69	590.71	543.02	517.32	518.7	(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=	0.97	0.95	0.88	0.72	0.54	0.38	0.27	0.3	0.48	0.77	0.94	0.98	(86)

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

(87)m=	20.68	20.78	20.9	20.98	21	21	21	21	21	20.97	20.83	20.66	(87)

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

(88)m=	20.36	20.36	20.37	20.38	20.38	20.39	20.39	20.4	20.39	20.38	20.38	20.37	(88)

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

(89)m=	0.97	0.93	0.86	0.69	0.51	0.34	0.23	0.26	0.44	0.73	0.92	0.97	(89)

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

(90)m=	19.95	20.09	20.25	20.36	20.38	20.39	20.39	20.4	20.39	20.35	20.18	19.93	(90)

fLA = Living area ÷ (4) = 0.57 (91)

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

(92)m=	20.37	20.48	20.62	20.71	20.73	20.74	20.74	20.74	20.74	20.71	20.55	20.35	(92)

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

(93)m=	20.22	20.33	20.47	20.56	20.58	20.59	20.59	20.59	20.59	20.56	20.4	20.2	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.93	0.86	0.7	0.52	0.35	0.25	0.27	0.45	0.75	0.92	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	521.4	549.39	547.72	481.13	371.38	245.6	163.63	171.11	268.14	404.63	477.16	503.3	(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=	690.31	666.35	600.63	490.93	372.29	245.63	163.63	171.12	268.38	417.34	562.35	682.23	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	125.66	78.6	39.37	7.06	0.68	0	0	0	0	9.46	61.34	133.13	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 455.29 (98)

Space heating requirement in kWh/m²/year 7.11 (99)

SAP WorkSheet: New dwelling design stage

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

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	125.66	78.6	39.37	7.06	0.68	0	0	0	0	9.46	61.34	133.13	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	139.16	87.04	43.6	7.82	0.76	0	0	0	0	10.47	67.93	147.43	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 504.2 (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

Output from water heater (calculated above)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
183.87	160.62	167.11	148.22	143.5	126.39	121.09	134.99	136.48	155.41	165.89	179.55

Efficiency of water heater 81 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	84.53	83.84	82.62	81.38	81.04	81	81	81	81	81.48	83.32	84.71

(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	217.51	191.58	202.26	182.13	177.08	156.03	149.49	166.65	168.49	190.73	199.11	211.95

Total = Sum(219a)$_{1...12}$ = 2213 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		504.2
Water heating fuel used		2213
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	150.21	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	180.21 (231)
Electricity for lighting		302.49 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3199.9 (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 =	17.55 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	77.01	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	23.77	(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 =	39.9	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			278.23	(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] =	1.07	(257)
SAP rating (Section 12)		85.04	(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	=	108.91	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	478.01	(264)
Space and water heating	(261) + (262) + (263) + (264) =					586.92	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	93.53	(267)
Electricity for lighting	(232)	x		0.519	=	156.99	(268)
Total CO2, kg/year			sum of (265)…(271) =			837.44	(272)
CO2 emissions per m²			(272) ÷ (4) =			13.08	(273)
EI rating (section 14)						90	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	615.13	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2699.86	(264)
Space and water heating	(261) + (262) + (263) + (264) =					3314.99	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	553.23	(267)
Electricity for lighting	(232)	x		0	=	928.64	(268)
'Total Primary Energy			sum of (265)…(271) =			4796.86	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			74.95	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 430

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	199.58	**(P1)**
Transmission heat loss coefficient:	27.4	
Summer heat loss coefficient:	226.97	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	9.9	117.51	0.57	0.7	0.9	375.97	
						Total	375.97	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	376.65	361.54	369.52	
Total summer gains	775.75	737.52	700.29	**(P5)**
Summer gain/loss ratio	3.42	3.25	3.09	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.67	21.4	21.14	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:18:04

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 42.8m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 501

Address :

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)	23.96 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.35 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	56.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	2.6m²
Windows facing: North	7.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 501

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	42.8 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	2.6	1
N	16mm or more	0.7	0.57	1.4	7.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
N		External	North	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	22.95	10	12.95	0.18	0	False	N/A
Corridor	21.33	0	21.33	0.22	0.43	False	N/A
Roof	42.8	0	42.8	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1034

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	8.5	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

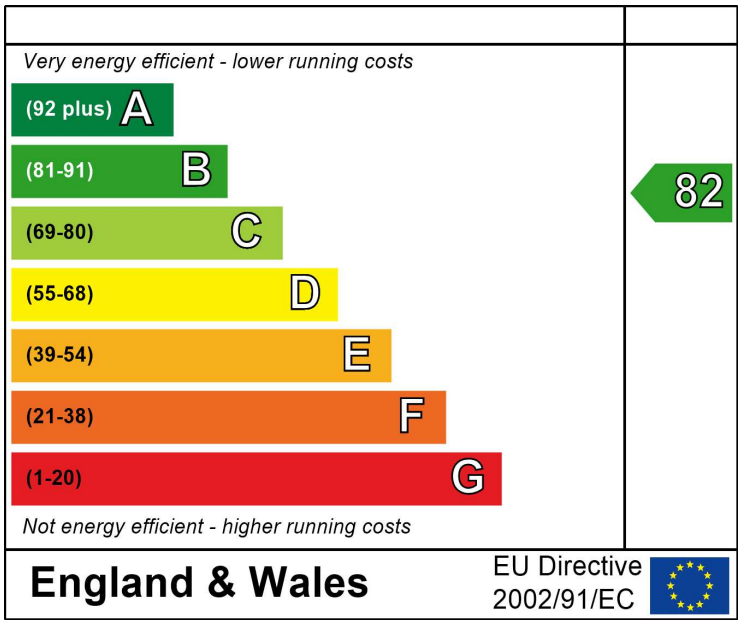
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	42.8 m²

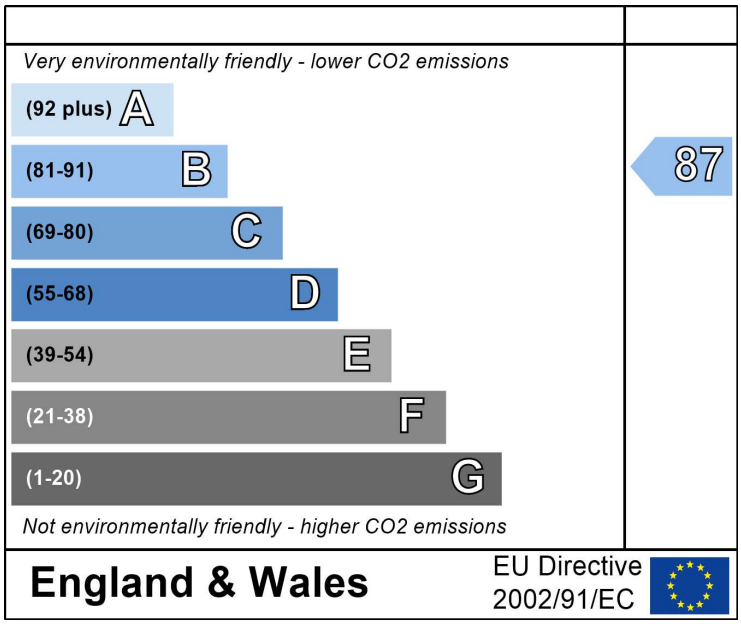
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 501

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	42.8 (1a)	x	2.7 (2a)	=	115.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	42.8 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	115.56	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			2.6	x1/[1/(1.4)+ 0.04] =	3.45			(27)
Windows Type 2			7.4	x1/[1/(1.4)+ 0.04] =	9.81			(27)
Walls Type1	22.95	10	12.95	x 0.18 =	2.33			(29)
Walls Type2	21.33	0	21.33	x 0.2 =	4.29			(29)
Roof	42.8	0	42.8	x 0.13 =	5.56			(30)
Total area of elements, m²			87.08					(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) = 25.44 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5344.4 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 9.01 (36)

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

Total fabric heat loss (33) + (36) = 34.44 (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=	10.68	10.56	10.44	9.83	9.71	9.1	9.1	8.98	9.34	9.71	9.95	10.19	(38)

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

(39)m=	45.12	45	44.88	44.27	44.15	43.54	43.54	43.42	43.79	44.15	44.4	44.64	

Average = Sum(39)$_{1...12}$ /12= 44.24 (39)

SAP WorkSheet: New dwelling design stage

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

(40)m=	1.05	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.04	1.04

Average = Sum(40)$_{1...12}$ /12= 1.03 (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 1.48 (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 69.41 (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=	76.35	73.58	70.8	68.02	65.25	62.47	62.47	65.25	68.02	70.8	73.58	76.35

Total = Sum(44)$_{1...12}$ = 832.94 (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=	113.23	99.03	102.19	89.09	85.49	73.77	68.36	78.44	79.38	92.51	100.98	109.66

Total = Sum(45)$_{1...12}$ = 1092.11 (45)

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

(46)m=	16.98	14.85	15.33	13.36	12.82	11.07	10.25	11.77	11.91	13.88	15.15	16.45

(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 dwelling design stage

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

(61)m=	38.91	33.87	36.08	33.55	33.25	30.81	31.83	33.25	33.55	36.08	36.28	38.91	(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=	152.14	132.9	138.27	122.64	118.74	104.58	100.19	111.69	112.92	128.59	137.26	148.56	(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=	152.14	132.9	138.27	122.64	118.74	104.58	100.19	111.69	112.92	128.59	137.26	148.56	

Output from water heater (annual)$_{1...12}$ 1508.47 (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=	47.38	41.39	43	38.01	36.74	32.23	30.69	34.39	34.78	39.78	42.65	46.19	(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=	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	(66)

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

(67)m=	28.67	25.46	20.71	15.68	11.72	9.89	10.69	13.9	18.65	23.68	27.64	29.47	(67)

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

(68)m=	191.99	193.98	188.96	178.28	164.78	152.1	143.63	141.64	146.66	157.35	170.84	183.52	(68)

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

(69)m=	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	(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=	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	(71)

Water heating gains (Table 5)

(72)m=	63.68	61.6	57.79	52.79	49.38	44.76	41.25	46.23	48.3	53.47	59.23	62.08	(72)

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

(73)m=	362.37	359.08	345.49	324.77	303.91	284.79	273.6	279.79	291.65	312.53	335.74	353.1	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	7.4	x	10.63	x	0.57	x	0.7	=	21.76	(74)
North	0.9x 0.77	x	7.4	x	20.32	x	0.57	x	0.7	=	41.58	(74)
North	0.9x 0.77	x	7.4	x	34.53	x	0.57	x	0.7	=	70.65	(74)
North	0.9x 0.77	x	7.4	x	55.46	x	0.57	x	0.7	=	113.49	(74)
North	0.9x 0.77	x	7.4	x	74.72	x	0.57	x	0.7	=	152.88	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	7.4	x	79.99	x	0.57	x	0.7	=	163.66	(74)
North	0.9x	0.77	x	7.4	x	74.68	x	0.57	x	0.7	=	152.8	(74)
North	0.9x	0.77	x	7.4	x	59.25	x	0.57	x	0.7	=	121.23	(74)
North	0.9x	0.77	x	7.4	x	41.52	x	0.57	x	0.7	=	84.95	(74)
North	0.9x	0.77	x	7.4	x	24.19	x	0.57	x	0.7	=	49.5	(74)
North	0.9x	0.77	x	7.4	x	13.12	x	0.57	x	0.7	=	26.84	(74)
North	0.9x	0.77	x	7.4	x	8.86	x	0.57	x	0.7	=	18.14	(74)
West	0.9x	0.77	x	2.6	x	19.64	x	0.57	x	0.7	=	14.12	(80)
West	0.9x	0.77	x	2.6	x	38.42	x	0.57	x	0.7	=	27.62	(80)
West	0.9x	0.77	x	2.6	x	63.27	x	0.57	x	0.7	=	45.49	(80)
West	0.9x	0.77	x	2.6	x	92.28	x	0.57	x	0.7	=	66.34	(80)
West	0.9x	0.77	x	2.6	x	113.09	x	0.57	x	0.7	=	81.3	(80)
West	0.9x	0.77	x	2.6	x	115.77	x	0.57	x	0.7	=	83.23	(80)
West	0.9x	0.77	x	2.6	x	110.22	x	0.57	x	0.7	=	79.24	(80)
West	0.9x	0.77	x	2.6	x	94.68	x	0.57	x	0.7	=	68.06	(80)
West	0.9x	0.77	x	2.6	x	73.59	x	0.57	x	0.7	=	52.9	(80)
West	0.9x	0.77	x	2.6	x	45.59	x	0.57	x	0.7	=	32.77	(80)
West	0.9x	0.77	x	2.6	x	24.49	x	0.57	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	2.6	x	16.15	x	0.57	x	0.7	=	11.61	(80)

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

(83)m=	35.88	69.2	116.14	179.83	234.18	246.89	232.04	189.29	137.85	82.27	44.45	29.75	(83)

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

(84)m=	398.24	428.28	461.64	504.6	538.09	531.68	505.64	469.09	429.5	394.8	380.19	382.85	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.98	0.95	0.87	0.71	0.52	0.38	0.42	0.67	0.9	0.97	0.99	(86)

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

(87)m=	20.19	20.31	20.52	20.78	20.94	20.99	21	21	20.97	20.77	20.45	20.17	(87)

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

(88)m=	20.04	20.04	20.04	20.05	20.06	20.07	20.07	20.07	20.06	20.06	20.05	20.05	(88)

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

(89)m=	0.98	0.97	0.93	0.84	0.66	0.45	0.3	0.34	0.59	0.87	0.96	0.98	(89)

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

(90)m=	18.99	19.17	19.47	19.82	20	20.06	20.07	20.07	20.04	19.81	19.37	18.96	(90)

fLA = Living area ÷ (4) = 0.86 (91)

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

(92)m=	20.02	20.15	20.37	20.65	20.81	20.86	20.87	20.87	20.84	20.63	20.29	20	(92)

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

SAP WorkSheet: New dwelling design stage

(93)m=	19.87	20	20.22	20.5	20.66	20.71	20.72	20.72	20.69	20.48	20.14	19.85	(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=	0.98	0.97	0.94	0.85	0.69	0.49	0.35	0.4	0.65	0.88	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	389.94	414.49	432.84	430.31	373.09	263.15	178.87	186.71	277.05	349.33	366.15	376.13	(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=	702.67	679.59	615.94	513.38	395.46	266.03	179.24	187.4	288.38	436.33	578.97	698.41	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	232.66	178.15	136.22	59.81	16.65	0	0	0	0	64.73	153.23	239.77	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1081.23 (98)

Space heating requirement in kWh/m²/year 25.26 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	232.66	178.15	136.22	59.81	16.65	0	0	0	0	64.73	153.23	239.77	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	257.66	197.28	150.86	66.23	18.43	0	0	0	0	71.68	169.69	265.53	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1197.37 (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

Output from water heater (calculated above)

	152.14	132.9	138.27	122.64	118.74	104.58	100.19	111.69	112.92	128.59	137.26	148.56

Efficiency of water heater 81 (216)

(217)m=	86.38	86.08	85.36	83.83	82.04	81	81	81	81	83.89	85.65	86.5	(217)

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

(219)m=	176.13	154.39	161.98	146.29	144.73	129.11	123.69	137.89	139.41	153.27	160.25	171.75	

Total = Sum(219a)$_{1...12}$ = 1798.89 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1197.37

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1798.89	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	100.45		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	130.45	(231)
Electricity for lighting		202.53	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3329.24	(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 =	41.67		(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 =	62.6		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	17.21		(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 =	26.71		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			268.19		(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] =	1.28	(257)
SAP rating (Section 12)		82.1	(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	=	258.63		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	388.56		(264)
Space and water heating	(261) + (262) + (263) + (264) =			647.19		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	67.7		(267)
Electricity for lighting	(232) x	0.519	=	105.11		(268)
Total CO2, kg/year	sum of (265)…(271) =			820.01		(272)
CO2 emissions per m²	(272) ÷ (4) =			19.16		(273)
EI rating (section 14)				87		(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	1460.79	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2194.65	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3655.44	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	400.48	(267)
Electricity for lighting	(232)	x	0	=	621.75	(268)
'Total Primary Energy			sum of (265)…(271) =		4677.68	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		109.29	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 501

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	133.47	**(P1)**
Transmission heat loss coefficient:	34.4	
Summer heat loss coefficient:	167.92	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	2.6	117.51	0.57	0.7	0.9	98.74	
North (N)	0.9 x	7.4	81.19	0.57	0.7	0.9	194.16	
						Total	292.9	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	281.79	270.6	276.79	
Total summer gains	596.67	563.5	521.53	**(P5)**
Summer gain/loss ratio	3.55	3.36	3.11	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.8	21.51	21.16	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:17:55

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 502

Address :

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)	17.17 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.96 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	38.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	2.6m²
Windows facing: North	7.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 502

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	61.7 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	2.6	1
N	16mm or more	0.7	0.57	1.4	7.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
N		External	North	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	26.46	10	16.46	0.18	0	False	N/A
Corridor	26.19	0	26.19	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0806

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

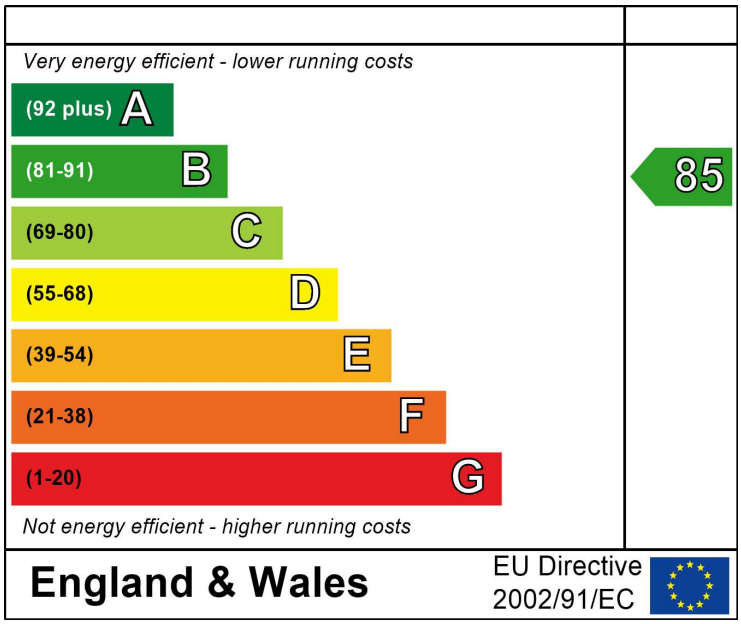
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	61.7 m²

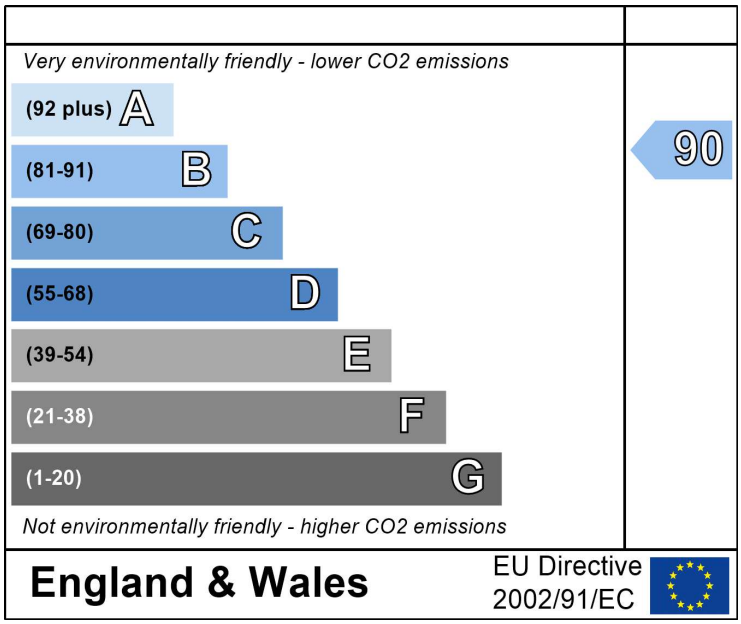
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 502

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.7	(1a) x	2.7	(2a) =	166.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		166.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

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

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			2.6	x1/[1/(1.4)+ 0.04] =	3.45			(27)
Windows Type 2			7.4	x1/[1/(1.4)+ 0.04] =	9.81			(27)
Walls Type1	26.46	10	16.46	x 0.18 =	2.96			(29)
Walls Type2	26.19	0	26.19	x 0.2 =	5.26			(29)
Total area of elements, m²			52.65					(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) = 21.48 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6128.3 (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 4.24 (36)

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

Total fabric heat loss (33) + (36) = 25.73 (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=	15.4	15.22	15.05	14.17	13.99	13.12	13.12	12.94	13.47	13.99	14.34	14.7	(38)

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

(39)m=	41.13	40.95	40.78	39.9	39.72	38.85	38.85	38.67	39.2	39.72	40.07	40.42	

Average = Sum(39)$_{1...12}$ /12= 39.86 (39)

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

(40)m=	0.67	0.66	0.66	0.65	0.64	0.63	0.63	0.63	0.64	0.64	0.65	0.66	

Average = Sum(40)$_{1...12}$ /12= 0.65 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.03 (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 82.4 (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=	90.63	87.34	84.04	80.75	77.45	74.16	74.16	77.45	80.75	84.04	87.34	90.63	

Total = Sum(44)$_{1...12}$ = 988.74 (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=	134.41	117.55	121.31	105.76	101.48	87.57	81.14	93.11	94.23	109.81	119.87	130.17	

Total = Sum(45)$_{1...12}$ = 1296.4 (45)

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

(46)m=	20.16	17.63	18.2	15.86	15.22	13.14	12.17	13.97	14.13	16.47	17.98	19.53	(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=	46.19	40.2	42.83	39.82	39.47	36.57	37.79	39.47	39.82	42.83	43.07	46.19	(61)

SAP WorkSheet: New dwelling design stage

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=	180.6	157.75	164.13	145.58	140.95	124.14	118.93	132.58	134.05	152.64	162.94	176.35	(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=	180.6	157.75	164.13	145.58	140.95	124.14	118.93	132.58	134.05	152.64	162.94	176.35	

Output from water heater (annual)$_{1...12}$ 1790.63 (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=	56.24	49.14	51.04	45.12	43.61	38.26	36.43	40.83	41.29	47.22	50.62	54.83	(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=	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	(66)

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

(67)m=	41.1	36.51	29.69	22.48	16.8	14.18	15.33	19.92	26.74	33.95	39.63	42.24	(67)

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

(68)m=	264.5	267.24	260.33	245.6	227.01	209.55	197.88	195.13	202.05	216.77	235.36	252.83	(68)

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

(69)m=	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	(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=	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	(71)

Water heating gains (Table 5)

(72)m=	75.59	73.12	68.6	62.67	58.61	53.14	48.96	54.88	57.34	63.47	70.31	73.69	(72)

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

(73)m=	473.98	469.66	451.41	423.53	395.22	369.66	354.95	362.72	378.92	406.98	438.09	461.55	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	7.4	x	10.63	x	0.57	x	0.7	=	21.76	(74)
North	0.9x 0.77	x	7.4	x	20.32	x	0.57	x	0.7	=	41.58	(74)
North	0.9x 0.77	x	7.4	x	34.53	x	0.57	x	0.7	=	70.65	(74)
North	0.9x 0.77	x	7.4	x	55.46	x	0.57	x	0.7	=	113.49	(74)
North	0.9x 0.77	x	7.4	x	74.72	x	0.57	x	0.7	=	152.88	(74)
North	0.9x 0.77	x	7.4	x	79.99	x	0.57	x	0.7	=	163.66	(74)
North	0.9x 0.77	x	7.4	x	74.68	x	0.57	x	0.7	=	152.8	(74)
North	0.9x 0.77	x	7.4	x	59.25	x	0.57	x	0.7	=	121.23	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	7.4	x	41.52	x	0.57	x	0.7	=	84.95	(74)
North	0.9x	0.77	x	7.4	x	24.19	x	0.57	x	0.7	=	49.5	(74)
North	0.9x	0.77	x	7.4	x	13.12	x	0.57	x	0.7	=	26.84	(74)
North	0.9x	0.77	x	7.4	x	8.86	x	0.57	x	0.7	=	18.14	(74)
West	0.9x	0.77	x	2.6	x	19.64	x	0.57	x	0.7	=	14.12	(80)
West	0.9x	0.77	x	2.6	x	38.42	x	0.57	x	0.7	=	27.62	(80)
West	0.9x	0.77	x	2.6	x	63.27	x	0.57	x	0.7	=	45.49	(80)
West	0.9x	0.77	x	2.6	x	92.28	x	0.57	x	0.7	=	66.34	(80)
West	0.9x	0.77	x	2.6	x	113.09	x	0.57	x	0.7	=	81.3	(80)
West	0.9x	0.77	x	2.6	x	115.77	x	0.57	x	0.7	=	83.23	(80)
West	0.9x	0.77	x	2.6	x	110.22	x	0.57	x	0.7	=	79.24	(80)
West	0.9x	0.77	x	2.6	x	94.68	x	0.57	x	0.7	=	68.06	(80)
West	0.9x	0.77	x	2.6	x	73.59	x	0.57	x	0.7	=	52.9	(80)
West	0.9x	0.77	x	2.6	x	45.59	x	0.57	x	0.7	=	32.77	(80)
West	0.9x	0.77	x	2.6	x	24.49	x	0.57	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	2.6	x	16.15	x	0.57	x	0.7	=	11.61	(80)

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

(83)m=	35.88	69.2	116.14	179.83	234.18	246.89	232.04	189.29	137.85	82.27	44.45	29.75	(83)

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

(84)m=	509.86	538.86	567.55	603.36	629.4	616.55	586.99	552.01	516.77	489.25	482.53	491.3	(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=	0.97	0.96	0.91	0.77	0.58	0.4	0.29	0.32	0.52	0.8	0.94	0.98	(86)

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

(87)m=	20.68	20.76	20.87	20.97	21	21	21	21	21	20.97	20.83	20.67	(87)

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

(88)m=	20.37	20.37	20.38	20.39	20.39	20.4	20.4	20.41	20.4	20.39	20.39	20.38	(88)

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

(89)m=	0.97	0.95	0.89	0.74	0.55	0.37	0.25	0.28	0.48	0.77	0.93	0.97	(89)

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

(90)m=	19.96	20.07	20.22	20.36	20.39	20.4	20.4	20.41	20.4	20.36	20.18	19.95	(90)

fLA = Living area ÷ (4) = 0.59 (91)

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

(92)m=	20.39	20.48	20.61	20.72	20.75	20.76	20.76	20.76	20.76	20.72	20.57	20.38	(92)

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

(93)m=	20.24	20.33	20.46	20.57	20.6	20.61	20.61	20.61	20.61	20.57	20.42	20.23	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.97	0.95	0.89	0.75	0.56	0.38	0.27	0.29	0.49	0.78	0.93	0.97	(94)

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

(95)m=	492.66	509.57	505.25	451.52	352.16	233.36	155.71	162.78	254.62	380.42	448.6	477.43	(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=	655.55	631.88	569.18	465.68	353.54	233.4	155.71	162.78	255	396.01	533.62	647.88	(97)

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

(98)m=	121.19	82.19	47.57	10.2	1.03	0	0	0	0	11.6	61.21	126.82	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 461.8 (98)

Space heating requirement in kWh/m²/year 7.48 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	121.19	82.19	47.57	10.2	1.03	0	0	0	0	11.6	61.21	126.82	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	134.21	91.02	52.67	11.29	1.14	0	0	0	0	12.84	67.79	140.44	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 511.41 (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

Output from water heater (calculated above)

	180.6	157.75	164.13	145.58	140.95	124.14	118.93	132.58	134.05	152.64	162.94	176.35	

Efficiency of water heater 81 (216)

(217)m=	84.49	83.96	82.92	81.55	81.06	81	81	81	81	81.59	83.34	84.65	(217)

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

(219)m=	213.74	187.89	197.94	178.51	173.88	153.26	146.83	163.68	165.49	187.07	195.5	208.34	

Total = Sum(219a)$_{1...12}$ = 2172.13 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		511.41
Water heating fuel used		2172.13
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		144.81	(230a)
central heating pump:		30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	174.81	(231)
Electricity for lighting		290.35	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3148.69	(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 =	17.8	(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 =	75.59	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	23.06	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	38.3	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				274.74	(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] =	1.08	(257)
SAP rating (Section 12)	84.91	(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	=	110.46	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	469.18	(264)
Space and water heating	(261) + (262) + (263) + (264) =				579.64	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	90.73	(267)
Electricity for lighting	(232) x		0.519	=	150.69	(268)
Total CO2, kg/year	sum of (265)…(271) =				821.06	(272)
CO2 emissions per m²	(272) ÷ (4) =				13.31	(273)
EI rating (section 14)					90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	623.91	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2649.99	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3273.91	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	536.66	(267)
Electricity for lighting	(232) x	0	=	891.38	(268)
‘Total Primary Energy	sum of (265)…(271) =			4701.95	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			76.21	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 502

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	192.41	**(P1)**
Transmission heat loss coefficient:	25.7	
Summer heat loss coefficient:	218.14	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	2.6	117.51	0.57	0.7	0.9	98.74	
North (N)	0.9 x	7.4	81.19	0.57	0.7	0.9	194.16	
						Total	292.9	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	366.66	351.95	359.72	
Total summer gains	681.53	644.86	604.46	**(P5)**
Summer gain/loss ratio	3.12	2.96	2.77	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.37	21.11	20.82	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:17:47

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 503

Address :

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)	17.02 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.80 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	38.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: West	2.6m²
Windows facing: North	7.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 503

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 10 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 503

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	61.7 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	2.6	1
N	16mm or more	0.7	0.57	1.4	7.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
N		External	North	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	25.65	10	15.65	0.18	0	False	N/A
Corridor	23.28	0	23.28	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0868

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

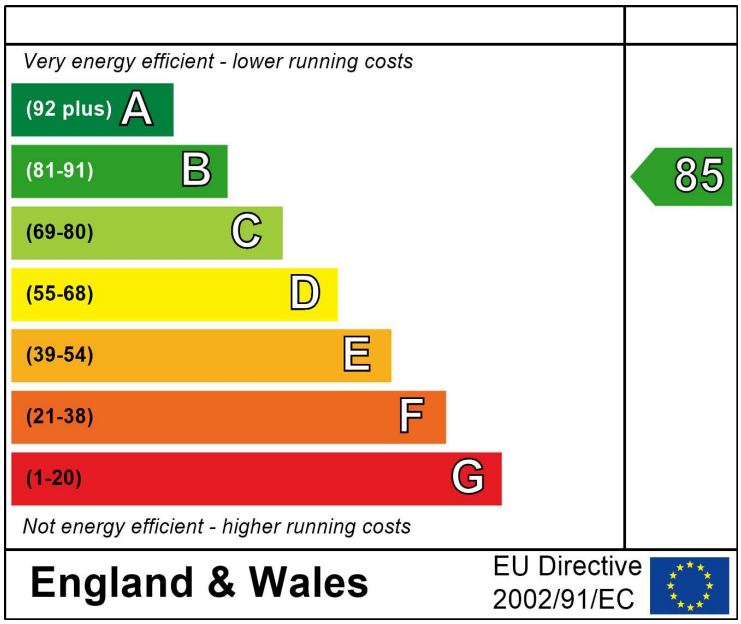
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	61.7 m²

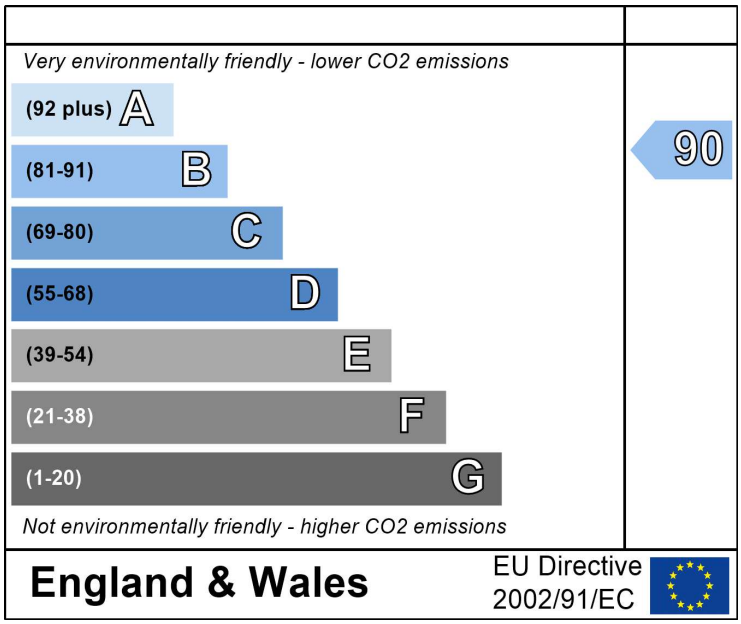
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 503

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.7 (1a)	x	2.7 (2a)	=	166.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	166.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			2.6	x1/[1/(1.4)+ 0.04] =	3.45			(27)
Windows Type 2			7.4	x1/[1/(1.4)+ 0.04] =	9.81			(27)
Walls Type1	25.65	10	15.65	x 0.18 =	2.82			(29)
Walls Type2	23.28	0	23.28	x 0.2 =	4.68			(29)
Total area of elements, m²			48.93					(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) = 20.75 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5518.7 (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 4.24 (36)

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

Total fabric heat loss (33) + (36) = 25 (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=	15.4	15.22	15.05	14.17	13.99	13.12	13.12	12.94	13.47	13.99	14.34	14.7	(38)

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

(39)m=	40.39	40.22	40.04	39.17	38.99	38.12	38.12	37.94	38.47	38.99	39.34	39.69	

Average = Sum(39)$_{1...12}$ /12= 39.12 (39)

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

(40)m=	0.65	0.65	0.65	0.63	0.63	0.62	0.62	0.61	0.62	0.63	0.64	0.64	

Average = Sum(40)$_{1...12}$ /12= 0.63 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.03 (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 82.4 (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=	90.63	87.34	84.04	80.75	77.45	74.16	74.16	77.45	80.75	84.04	87.34	90.63	

Total = Sum(44)$_{1...12}$ = 988.74 (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=	134.41	117.55	121.31	105.76	101.48	87.57	81.14	93.11	94.23	109.81	119.87	130.17	

Total = Sum(45)$_{1...12}$ = 1296.4 (45)

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

(46)m=	20.16	17.63	18.2	15.86	15.22	13.14	12.17	13.97	14.13	16.47	17.98	19.53	(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=	46.19	40.2	42.83	39.82	39.47	36.57	37.79	39.47	39.82	42.83	43.07	46.19	(61)

SAP WorkSheet: New dwelling design stage

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=	180.6	157.75	164.13	145.58	140.95	124.14	118.93	132.58	134.05	152.64	162.94	176.35	(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=	180.6	157.75	164.13	145.58	140.95	124.14	118.93	132.58	134.05	152.64	162.94	176.35	

Output from water heater (annual)$_{1...12}$ 1790.63 (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=	56.24	49.14	51.04	45.12	43.61	38.26	36.43	40.83	41.29	47.22	50.62	54.83	(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=	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	(66)

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

(67)m=	41.1	36.51	29.69	22.48	16.8	14.18	15.33	19.92	26.74	33.95	39.63	42.24	(67)

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

(68)m=	264.5	267.24	260.33	245.6	227.01	209.55	197.88	195.13	202.05	216.77	235.36	252.83	(68)

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

(69)m=	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	(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=	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	(71)

Water heating gains (Table 5)

(72)m=	75.59	73.12	68.6	62.67	58.61	53.14	48.96	54.88	57.34	63.47	70.31	73.69	(72)

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

(73)m=	473.98	469.66	451.41	423.53	395.22	369.66	354.95	362.72	378.92	406.98	438.09	461.55	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	7.4	x	10.63	x	0.57	x	0.7	=	21.76	(74)
North	0.9x 0.77	x	7.4	x	20.32	x	0.57	x	0.7	=	41.58	(74)
North	0.9x 0.77	x	7.4	x	34.53	x	0.57	x	0.7	=	70.65	(74)
North	0.9x 0.77	x	7.4	x	55.46	x	0.57	x	0.7	=	113.49	(74)
North	0.9x 0.77	x	7.4	x	74.72	x	0.57	x	0.7	=	152.88	(74)
North	0.9x 0.77	x	7.4	x	79.99	x	0.57	x	0.7	=	163.66	(74)
North	0.9x 0.77	x	7.4	x	74.68	x	0.57	x	0.7	=	152.8	(74)
North	0.9x 0.77	x	7.4	x	59.25	x	0.57	x	0.7	=	121.23	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	7.4	x	41.52	x	0.57	x	0.7	=	84.95	(74)
North	0.9x	0.77	x	7.4	x	24.19	x	0.57	x	0.7	=	49.5	(74)
North	0.9x	0.77	x	7.4	x	13.12	x	0.57	x	0.7	=	26.84	(74)
North	0.9x	0.77	x	7.4	x	8.86	x	0.57	x	0.7	=	18.14	(74)
West	0.9x	0.77	x	2.6	x	19.64	x	0.57	x	0.7	=	14.12	(80)
West	0.9x	0.77	x	2.6	x	38.42	x	0.57	x	0.7	=	27.62	(80)
West	0.9x	0.77	x	2.6	x	63.27	x	0.57	x	0.7	=	45.49	(80)
West	0.9x	0.77	x	2.6	x	92.28	x	0.57	x	0.7	=	66.34	(80)
West	0.9x	0.77	x	2.6	x	113.09	x	0.57	x	0.7	=	81.3	(80)
West	0.9x	0.77	x	2.6	x	115.77	x	0.57	x	0.7	=	83.23	(80)
West	0.9x	0.77	x	2.6	x	110.22	x	0.57	x	0.7	=	79.24	(80)
West	0.9x	0.77	x	2.6	x	94.68	x	0.57	x	0.7	=	68.06	(80)
West	0.9x	0.77	x	2.6	x	73.59	x	0.57	x	0.7	=	52.9	(80)
West	0.9x	0.77	x	2.6	x	45.59	x	0.57	x	0.7	=	32.77	(80)
West	0.9x	0.77	x	2.6	x	24.49	x	0.57	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	2.6	x	16.15	x	0.57	x	0.7	=	11.61	(80)

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

(83)m=	35.88	69.2	116.14	179.83	234.18	246.89	232.04	189.29	137.85	82.27	44.45	29.75	(83)

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

(84)m=	509.86	538.86	567.55	603.36	629.4	616.55	586.99	552.01	516.77	489.25	482.53	491.3	(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=	0.97	0.95	0.9	0.76	0.57	0.4	0.29	0.32	0.51	0.79	0.94	0.98	(86)

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

(87)m=	20.7	20.78	20.88	20.97	21	21	21	21	21	20.97	20.84	20.69	(87)

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

(88)m=	20.38	20.38	20.39	20.4	20.4	20.41	20.41	20.42	20.41	20.4	20.4	20.39	(88)

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

(89)m=	0.97	0.94	0.88	0.73	0.54	0.36	0.25	0.28	0.47	0.76	0.92	0.97	(89)

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

(90)m=	20	20.1	20.25	20.37	20.4	20.41	20.41	20.42	20.41	20.37	20.21	19.98	(90)

fLA = Living area ÷ (4) = 0.59 (91)

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

(92)m=	20.42	20.5	20.63	20.73	20.75	20.76	20.76	20.76	20.76	20.73	20.58	20.4	(92)

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

(93)m=	20.27	20.35	20.48	20.58	20.6	20.61	20.61	20.61	20.61	20.58	20.43	20.25	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.96	0.94	0.88	0.74	0.55	0.37	0.26	0.29	0.48	0.77	0.93	0.97	(94)

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

(95)m=	491.67	507.85	501.82	445.43	346.13	229.15	152.95	159.87	250.13	375.66	446.55	476.6	(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=	644.91	621.52	559.67	457.5	347.23	229.18	152.95	159.87	250.42	389.07	524.64	637.18	(97)

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

(98)m=	114.01	76.39	43.04	8.69	0.82	0	0	0	0	9.98	56.23	119.47	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 428.62 (98)

Space heating requirement in kWh/m²/year 6.95 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)	114.01	76.39	43.04	8.69	0.82	0	0	0	0	9.98	56.23	119.47	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	126.25	84.59	47.67	9.62	0.91	0	0	0	0	11.05	62.27	132.3	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 474.66 (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

Output from water heater (calculated above)

	180.6	157.75	164.13	145.58	140.95	124.14	118.93	132.58	134.05	152.64	162.94	176.35	

Efficiency of water heater 81 (216)

(217)m=	84.36	83.82	82.77	81.47	81.05	81	81	81	81	81.52	83.2	84.52	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	214.07	188.21	198.3	178.68	173.9	153.26	146.83	163.68	165.49	187.25	195.84	208.67	

Total = Sum(219a)$_{1...12}$ = 2174.18 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		474.66
Water heating fuel used		2174.18
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		144.81	(230a)
central heating pump:		30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	174.81	(231)
Electricity for lighting		290.35	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3114.01	(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 =	16.52	(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 =	75.66	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	23.06	(249)
(if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a						
Energy for lighting	(232)		13.19	x 0.01 =	38.3	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				273.53	(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] =	1.08	(257)
SAP rating (Section 12)	84.98	(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	=	102.53	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	469.62	(264)
Space and water heating	(261) + (262) + (263) + (264) =				572.15	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	90.73	(267)
Electricity for lighting	(232) x		0.519	=	150.69	(268)
Total CO2, kg/year	sum of (265)…(271) =				813.57	(272)
CO2 emissions per m²	(272) ÷ (4) =				13.19	(273)
EI rating (section 14)					90	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	579.09	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2652.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =			3231.59	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	536.66	(267)
Electricity for lighting	(232) x	0	=	891.38	(268)
‘Total Primary Energy	sum of (265)…(271) =			4659.64	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			75.52	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 503

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	192.41	**(P1)**
Transmission heat loss coefficient:	25	
Summer heat loss coefficient:	217.41	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	2.6	117.51	0.57	0.7	0.9	98.74	
North (N)	0.9 x	7.4	81.19	0.57	0.7	0.9	194.16	
						Total	292.9	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	366.66	351.95	359.72	
Total summer gains	681.53	644.86	604.46	**(P5)**
Summer gain/loss ratio	3.13	2.97	2.78	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.38	21.12	20.83	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:17:37

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 85.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 504

Address :

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)	16.59 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.15 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: East	15.6m²
Windows facing: North	11.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 504

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	85.7 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
E	16mm or more	0.7	0.57	1.4	15.6	1
N	16mm or more	0.7	0.57	1.4	11.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
E		External	East	0	0
N		External	North	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.21	27	33.21	0.18	0	False	N/A
Corridor	38.88	0	38.88	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0428

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

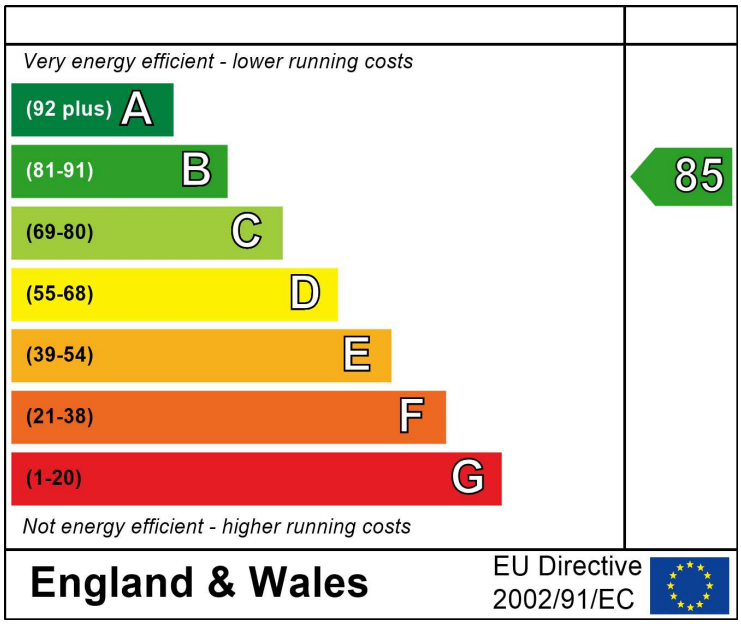
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	85.7 m²

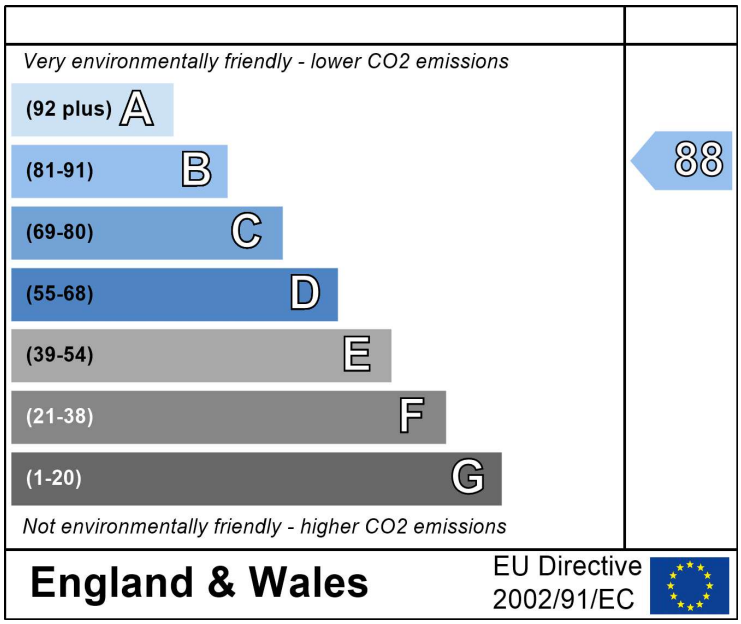
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 504

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.7	(1a) x	2.7	(2a) =	231.39	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	85.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		231.39	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			15.6	x1/[1/(1.4)+ 0.04] =	20.68			(27)
Windows Type 2			11.4	x1/[1/(1.4)+ 0.04] =	15.11			(27)
Walls Type1	60.21	27	33.21	x 0.18 =	5.98			(29)
Walls Type2	38.88	0	38.88	x 0.2 =	7.81			(29)
Total area of elements, m²			99.09					(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) = 49.59 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9711.9 (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 4.24 (36)

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

Total fabric heat loss (33) + (36) = 53.83 (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=	21.39	21.14	20.9	19.68	19.44	18.22	18.22	17.98	18.71	19.44	19.92	20.41	(38)

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

(39)m=	75.22	74.97	74.73	73.51	73.27	72.05	72.05	71.81	72.54	73.27	73.76	74.24	

Average = Sum(39)$_{1...12}$ /12= 73.45 (39)

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

(40)m=	0.88	0.87	0.87	0.86	0.85	0.84	0.84	0.84	0.85	0.85	0.86	0.87	

Average = Sum(40)$_{1...12}$ /12= 0.86 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.56 (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 95.05 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	104.56	100.75	96.95	93.15	89.35	85.55	85.55	89.35	93.15	96.95	100.75	104.56	

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

Total = Sum(44)$_{1...12}$ = 1140.62 (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=	155.05	135.61	139.94	122	117.06	101.02	93.61	107.42	108.7	126.68	138.28	150.16	

Total = Sum(45)$_{1...12}$ = 1495.53 (45)

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

(46)m=	23.26	20.34	20.99	18.3	17.56	15.15	14.04	16.11	16.3	19	20.74	22.52	(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=	50.96	46.03	49.41	45.94	45.53	42.19	43.59	45.53	45.94	49.41	49.32	50.96	(61)

SAP WorkSheet: New dwelling design stage

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=	206.01	181.64	189.35	167.94	162.6	143.2	137.2	152.95	154.64	176.08	187.59	201.12	(62)

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

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

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

Output from water heater

(64)m=	206.01	181.64	189.35	167.94	162.6	143.2	137.2	152.95	154.64	176.08	187.59	201.12	

Output from water heater (annual)$_{1...12}$ 2060.32 (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=	64.3	56.6	58.88	52.05	50.31	44.14	42.02	47.1	47.63	54.47	58.31	62.67	(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=	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	(66)

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

(67)m=	51.47	45.72	37.18	28.15	21.04	17.76	19.19	24.95	33.49	42.52	49.62	52.9	(67)

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

(68)m=	344.69	348.26	339.25	320.06	295.84	273.08	257.87	254.29	263.3	282.49	306.71	329.48	(68)

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

(69)m=	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	(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=	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	(71)

Water heating gains (Table 5)

(72)m=	86.42	84.22	79.14	72.29	67.62	61.3	56.48	63.3	66.15	73.22	80.98	84.23	(72)

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

(73)m=	589.76	585.38	562.75	527.68	491.68	459.32	440.72	449.72	470.12	505.4	544.5	573.79	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	11.4	x	10.63	x	0.57	x	0.7	=	33.52	(74)
North	0.9x 0.77	x	11.4	x	20.32	x	0.57	x	0.7	=	64.06	(74)
North	0.9x 0.77	x	11.4	x	34.53	x	0.57	x	0.7	=	108.85	(74)
North	0.9x 0.77	x	11.4	x	55.46	x	0.57	x	0.7	=	174.83	(74)
North	0.9x 0.77	x	11.4	x	74.72	x	0.57	x	0.7	=	235.52	(74)
North	0.9x 0.77	x	11.4	x	79.99	x	0.57	x	0.7	=	252.13	(74)
North	0.9x 0.77	x	11.4	x	74.68	x	0.57	x	0.7	=	235.39	(74)
North	0.9x 0.77	x	11.4	x	59.25	x	0.57	x	0.7	=	186.76	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	11.4	x	41.52	x	0.57	x	0.7	=	130.87	(74)
North	0.9x	0.77	x	11.4	x	24.19	x	0.57	x	0.7	=	76.25	(74)
North	0.9x	0.77	x	11.4	x	13.12	x	0.57	x	0.7	=	41.35	(74)
North	0.9x	0.77	x	11.4	x	8.86	x	0.57	x	0.7	=	27.94	(74)
East	0.9x	0.77	x	15.6	x	19.64	x	0.57	x	0.7	=	84.72	(76)
East	0.9x	0.77	x	15.6	x	38.42	x	0.57	x	0.7	=	165.73	(76)
East	0.9x	0.77	x	15.6	x	63.27	x	0.57	x	0.7	=	272.93	(76)
East	0.9x	0.77	x	15.6	x	92.28	x	0.57	x	0.7	=	398.05	(76)
East	0.9x	0.77	x	15.6	x	113.09	x	0.57	x	0.7	=	487.83	(76)
East	0.9x	0.77	x	15.6	x	115.77	x	0.57	x	0.7	=	499.38	(76)
East	0.9x	0.77	x	15.6	x	110.22	x	0.57	x	0.7	=	475.43	(76)
East	0.9x	0.77	x	15.6	x	94.68	x	0.57	x	0.7	=	408.39	(76)
East	0.9x	0.77	x	15.6	x	73.59	x	0.57	x	0.7	=	317.43	(76)
East	0.9x	0.77	x	15.6	x	45.59	x	0.57	x	0.7	=	196.65	(76)
East	0.9x	0.77	x	15.6	x	24.49	x	0.57	x	0.7	=	105.63	(76)
East	0.9x	0.77	x	15.6	x	16.15	x	0.57	x	0.7	=	69.67	(76)

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

(83)m=	118.24	229.78	381.77	572.88	723.34	751.51	710.82	595.14	448.3	272.9	146.98	97.61	(83)

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

(84)m=	707.99	815.17	944.53	1100.57	1215.02	1210.82	1151.54	1044.86	918.41	778.3	691.48	671.4	(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	0.97	0.91	0.76	0.55	0.38	0.28	0.32	0.54	0.86	0.97	0.99	(86)

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

(87)m=	20.36	20.52	20.75	20.94	20.99	21	21	21	20.99	20.89	20.59	20.33	(87)

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

(88)m=	20.19	20.19	20.19	20.2	20.21	20.22	20.22	20.22	20.21	20.21	20.2	20.2	(88)

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

(89)m=	0.98	0.96	0.9	0.72	0.51	0.33	0.23	0.26	0.48	0.82	0.96	0.99	(89)

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

(90)m=	19.35	19.58	19.89	20.14	20.2	20.22	20.22	20.22	20.21	20.09	19.69	19.31	(90)

fLA = Living area ÷ (4) = 0.43 (91)

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

(92)m=	19.78	19.98	20.26	20.48	20.54	20.55	20.55	20.55	20.55	20.43	20.08	19.75	(92)

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

(93)m=	19.63	19.83	20.11	20.33	20.39	20.4	20.4	20.4	20.4	20.28	19.93	19.6	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.98	0.96	0.89	0.73	0.52	0.35	0.24	0.28	0.49	0.82	0.96	0.99	(94)

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

(95)m=	694.8	781.75	843.36	799.34	631.76	417.82	274	287.5	454.19	639.74	663.53	661.73	(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=	1153.02	1119.51	1016.9	840.26	636.59	418.09	274.01	287.55	456.71	709.5	946.12	1143	(97)

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

(98)m=	340.91	226.98	129.11	29.46	3.6	0	0	0	0	51.9	203.46	358.06	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1343.48 (98)

Space heating requirement in kWh/m²/year 15.68 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	340.91	226.98	129.11	29.46	3.6	0	0	0	0	51.9	203.46	358.06	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	377.53	251.36	142.98	32.63	3.98	0	0	0	0	57.47	225.32	396.53	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1487.8 (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

Output from water heater (calculated above)

	206.01	181.64	189.35	167.94	162.6	143.2	137.2	152.95	154.64	176.08	187.59	201.12	

Efficiency of water heater 81 (216)

(217)m=	86.56	85.92	84.53	82.26	81.18	81	81	81	81	82.94	85.59	86.72	(217)

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

(219)m=	238.01	211.42	224	204.15	200.29	176.8	169.38	188.82	190.91	212.29	219.19	231.92	

Total = Sum(219a)$_{1...12}$ = 2467.18 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1487.8
Water heating fuel used		2467.18
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside	201.14		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	231.14	(231)
Electricity for lighting		363.6	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4549.71	(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 =	51.78	(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 =	85.86	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	30.49	(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 =	47.96	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				336.08	(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] =	1.08	(257)
SAP rating (Section 12)		84.93	(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	=	321.36	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	532.91	(264)
Space and water heating	(261) + (262) + (263) + (264) =				854.27	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	119.96	(267)
Electricity for lighting	(232) x		0.519	=	188.71	(268)
Total CO2, kg/year	sum of (265)…(271) =				1162.94	(272)
CO2 emissions per m²	(272) ÷ (4) =				13.57	(273)
EI rating (section 14)					88	(274)

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x		1.22	=	1815.11	(261)

SAP WorkSheet: New dwelling design stage

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	3009.95	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4825.07	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	709.59	(267)
Electricity for lighting	(232) x	0	=	1116.25	(268)
‘Total Primary Energy	sum of (265)…(271) =			6650.91	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			77.61	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 504

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	267.26	**(P1)**
Transmission heat loss coefficient:	53.8	
Summer heat loss coefficient:	321.09	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
East (E)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
East (E)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
East (E)	0.9 x	15.6	117.51	0.57	0.7	0.9	592.44	
North (N)	0.9 x	11.4	81.19	0.57	0.7	0.9	299.12	
						Total	891.56	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	456.32	437.72	446.72	
Total summer gains	1408.82	1329.28	1211.14	**(P5)**
Summer gain/loss ratio	4.39	4.14	3.77	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.64	22.29	21.82	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:17:28

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 41.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 505

Address :

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)	23.42 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.94 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	59.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Boiler systems with radiators or underfloor heating - mains gas Data from manufacturer Combi boiler Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	11m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 505

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	41.7 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	11	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	24.84	16.2	8.64	0.18	0	False	N/A
Corridor	33.75	0	33.75	0.22	0.43	False	N/A
Flat Roof	41.7	0	41.7	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0499

	Length	**Psi-value**		
[Approved]	6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	9.2	0.08	E14	Flat roof

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

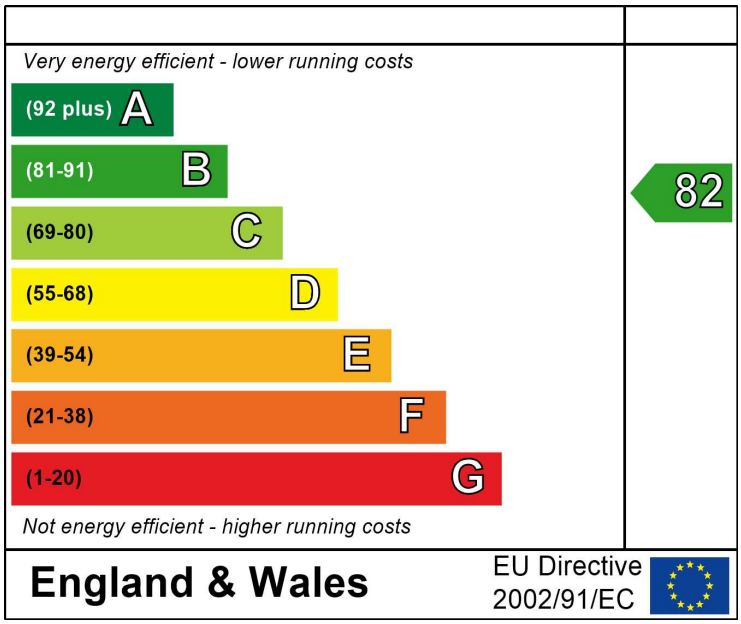
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	41.7 m²

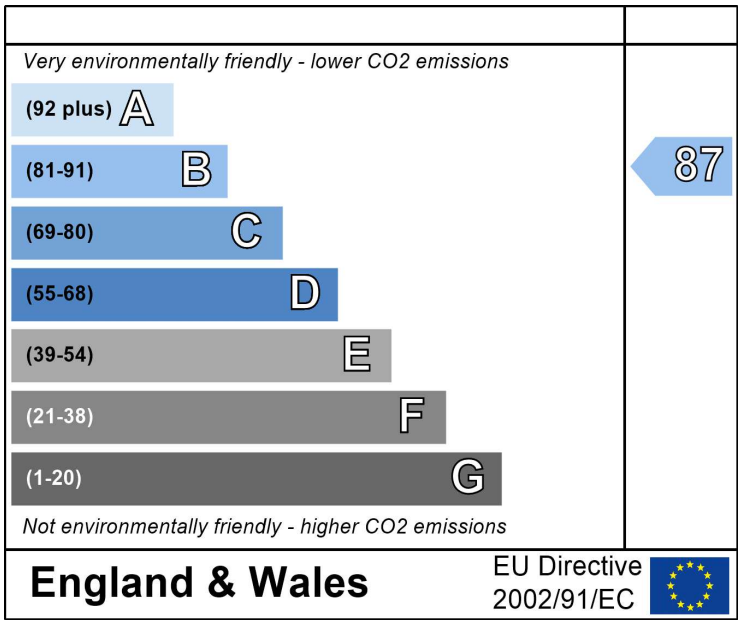
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 505

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	41.7	(1a) x	2.7	(2a) =	112.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	41.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		112.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			11	x1/[1/(1.4)+ 0.04] =	14.58			(27)
Walls Type1	24.84	16.2	8.64	x 0.18 =	1.56			(29)
Walls Type2	33.75	0	33.75	x 0.2 =	6.78			(29)
Roof	41.7	0	41.7	x 0.13 =	5.42			(30)
Total area of elements, m²			100.29					(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) = 35.24 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7392.6 (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 5.01 (36)

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

Total fabric heat loss (33) + (36) = 40.24 (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=	10.41	10.29	10.17	9.58	9.46	8.87	8.87	8.75	9.1	9.46	9.7	9.93	(38)

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

(39)m=	50.65	50.53	50.41	49.82	49.7	49.11	49.11	48.99	49.34	49.7	49.94	50.17	

Average = Sum(39)$_{1...12}$ /12= 49.79 (39)

SAP WorkSheet: New dwelling design stage

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

(40)m=	1.21	1.21	1.21	1.19	1.19	1.18	1.18	1.17	1.18	1.19	1.2	1.2

Average = Sum(40)$_{1...12}$ /12= 1.19 (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 1.45 (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 68.69 (43)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	75.56	72.81	70.06	67.32	64.57	61.82	61.82	64.57	67.32	70.06	72.81	75.56

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

Total = Sum(44)$_{1...12}$ = 824.28 (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=	112.05	98	101.13	88.17	84.6	73	67.65	77.63	78.55	91.55	99.93	108.52

Total = Sum(45)$_{1...12}$ = 1080.76 (45)

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

(46)m=	16.81	14.7	15.17	13.22	12.69	10.95	10.15	11.64	11.78	13.73	14.99	16.28

(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 dwelling design stage

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

(61)m=	38.5	33.51	35.7	33.2	32.9	30.49	31.5	32.9	33.2	35.7	35.91	38.5	(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=	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02	(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=	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02	

Output from water heater (annual)$_{1...12}$ 1492.79 (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=	46.88	40.96	42.55	37.61	36.35	31.89	30.37	34.04	34.42	39.36	42.2	45.71	(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=	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	(66)

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

(67)m=	28.04	24.91	20.26	15.34	11.46	9.68	10.46	13.59	18.25	23.17	27.04	28.82	(67)

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

(68)m=	187.81	189.76	184.85	174.39	161.19	148.79	140.5	138.55	143.46	153.92	167.12	179.52	(68)

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

(69)m=	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	(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=	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	(71)

Water heating gains (Table 5)

(72)m=	63.02	60.96	57.19	52.24	48.86	44.3	40.82	45.75	47.8	52.91	58.62	61.44	(72)

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

(73)m=	356.08	352.83	339.51	319.18	298.73	279.98	268.99	275.11	286.72	307.21	329.98	346.99	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x	0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x	0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)
North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	11	x	19.64	x	0.57	x	0.7	=	59.74	(76)
East	0.9x	0.77	x	11	x	38.42	x	0.57	x	0.7	=	116.86	(76)
East	0.9x	0.77	x	11	x	63.27	x	0.57	x	0.7	=	192.45	(76)
East	0.9x	0.77	x	11	x	92.28	x	0.57	x	0.7	=	280.68	(76)
East	0.9x	0.77	x	11	x	113.09	x	0.57	x	0.7	=	343.98	(76)
East	0.9x	0.77	x	11	x	115.77	x	0.57	x	0.7	=	352.12	(76)
East	0.9x	0.77	x	11	x	110.22	x	0.57	x	0.7	=	335.24	(76)
East	0.9x	0.77	x	11	x	94.68	x	0.57	x	0.7	=	287.96	(76)
East	0.9x	0.77	x	11	x	73.59	x	0.57	x	0.7	=	223.83	(76)
East	0.9x	0.77	x	11	x	45.59	x	0.57	x	0.7	=	138.66	(76)
East	0.9x	0.77	x	11	x	24.49	x	0.57	x	0.7	=	74.49	(76)
East	0.9x	0.77	x	11	x	16.15	x	0.57	x	0.7	=	49.13	(76)

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

(83)m=	75.03	146.08	242.1	360.43	451.41	467.13	442.61	373.15	283.52	173.44	93.35	61.87	(83)

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

(84)m=	431.1	498.91	581.6	679.61	750.14	747.11	711.6	648.26	570.24	480.65	423.33	408.86	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.91	0.78	0.59	0.42	0.3	0.35	0.58	0.86	0.96	0.98	(86)

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

(87)m=	20.06	20.26	20.55	20.83	20.96	20.99	21	21	20.97	20.77	20.36	20.02	(87)

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

(88)m=	19.91	19.91	19.91	19.92	19.93	19.94	19.94	19.94	19.93	19.93	19.92	19.92	(88)

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

(89)m=	0.97	0.95	0.88	0.73	0.53	0.35	0.23	0.27	0.5	0.81	0.95	0.98	(89)

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

(90)m=	18.7	18.98	19.38	19.75	19.89	19.93	19.94	19.94	19.92	19.69	19.14	18.65	(90)

fLA = Living area ÷ (4) = 0.88 (91)

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

(92)m=	19.9	20.1	20.41	20.7	20.83	20.87	20.87	20.87	20.85	20.64	20.21	19.85	(92)

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

(93)m=	19.75	19.95	20.26	20.55	20.68	20.72	20.72	20.72	20.7	20.49	20.06	19.7	(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	0.95	0.89	0.76	0.58	0.4	0.28	0.33	0.55	0.84	0.95	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	419.74	474.32	519.09	515.51	431.4	298.38	202.12	211.13	316.32	403.33	403.11	400.08	(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=	782.27	760.64	693.57	580.53	446.44	300.4	202.41	211.7	325.56	491.44	647.4	777.87	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	269.72	192.4	129.82	46.81	11.19	0	0	0	0	65.55	175.88	281.08	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1172.46 (98)

Space heating requirement in kWh/m²/year 28.12 (99)

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

Space heating:

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

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	269.72	192.4	129.82	46.81	11.19	0	0	0	0	65.55	175.88	281.08	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	298.69	213.07	143.76	51.84	12.39	0	0	0	0	72.6	194.78	311.27	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1298.4 (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

Output from water heater (calculated above)

	150.56	131.51	136.83	121.36	117.5	103.49	99.15	110.53	111.75	127.25	135.84	147.02

Efficiency of water heater 81 (216)

(217)m=	86.73	86.28	85.28	83.39	81.73	81	81	81	81	83.94	86	86.87	(217)

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

(219)m=	173.59	152.43	160.46	145.54	143.76	127.76	122.41	136.46	137.96	151.6	157.95	169.23	

Total = Sum(219a)$_{1...12}$ = 1779.15 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1298.4

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1779.15	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	97.87		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	127.87	(231)
Electricity for lighting		198.11	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3403.53	(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 =	45.18		(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 =	61.91		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	16.87		(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 =	26.13		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			270.1		(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] =	1.31	(257)
SAP rating (Section 12)		81.75	(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	=	280.45		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	384.3		(264)
Space and water heating	(261) + (262) + (263) + (264) =			664.75		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	66.36		(267)
Electricity for lighting	(232) x	0.519	=	102.82		(268)
Total CO2, kg/year	sum of (265)…(271) =			833.94		(272)
CO2 emissions per m²	(272) ÷ (4) =			20		(273)
EI rating (section 14)				87		(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	1584.05	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2170.56	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3754.61	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	392.56	(267)
Electricity for lighting	(232)	x	0	=	608.21	(268)
'Total Primary Energy			sum of (265)…(271) =		4755.38	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		114.04	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 505

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	130.04	**(P1)**
Transmission heat loss coefficient:	40.2	
Summer heat loss coefficient:	170.28	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	11	117.51	0.57	0.7	0.9	417.75	
						Total	554.19	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	276.98	265.99	272.11	
Total summer gains	868.04	820.18	750.56	**(P5)**
Summer gain/loss ratio	5.1	4.82	4.41	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.35	22.97	22.46	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:17:21

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 44m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 506

Address :

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)	23.46 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	20.57 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	54.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

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

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 506

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	44 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.97	10.4	19.57	0.18	0	False	N/A
Corridor	10.26	0	10.26	0.22	0.43	False	N/A
Roof	44	0	44	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1105

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	11.1	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

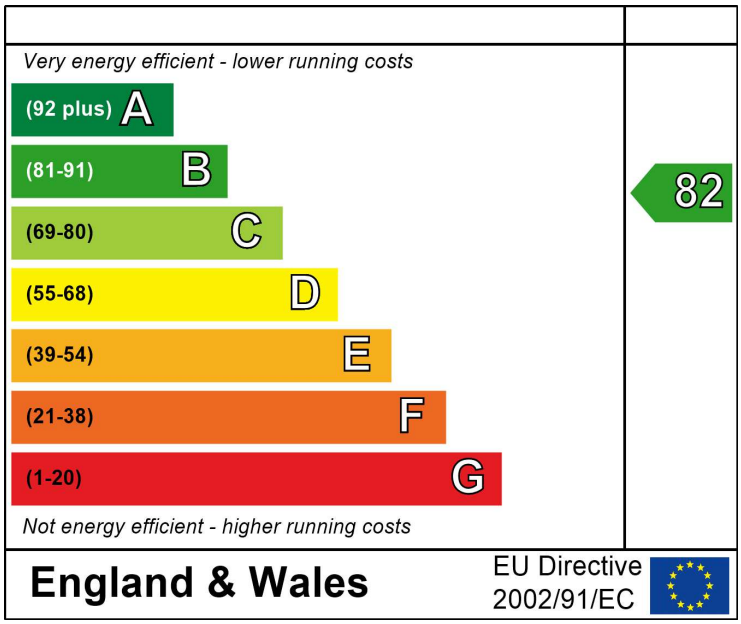
Predicted Energy Assessment

Dwelling type:	Top floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	44 m²

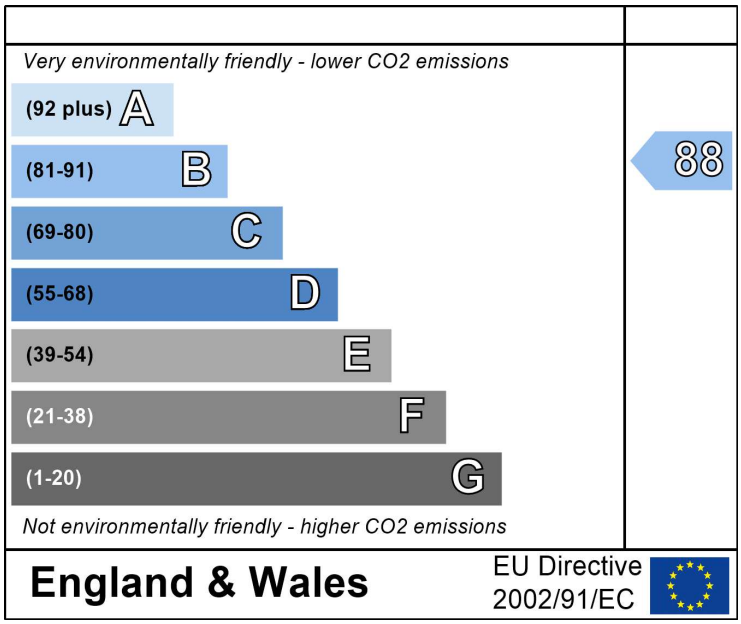
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 506

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	44	(1a) x	2.7	(2a) =	118.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	44	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		118.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

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

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

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

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

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

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Walls Type1	29.97	10.4	19.57	x 0.18 =	3.52			(29)
Walls Type2	10.26	0	10.26	x 0.2 =	2.06			(29)
Roof	44	0	44	x 0.13 =	5.72			(30)
Total area of elements, m²			84.23					(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) = 25.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3715.3 (34)

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

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

Thermal bridges : S (L x Y) calculated using Appendix K 9.31 (36)

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

Total fabric heat loss (33) + (36) = 34.4 (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=	10.98	10.85	10.73	10.1	9.98	9.36	9.36	9.23	9.6	9.98	10.23	10.48	(38)

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

(39)m=	45.38	45.25	45.13	44.5	44.38	43.75	43.75	43.63	44	44.38	44.63	44.88	

Average = Sum(39)$_{1...12}$ /12= 44.47 (39)

SAP WorkSheet: New dwelling design stage

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

(40)m=	1.03	1.03	1.03	1.01	1.01	0.99	0.99	0.99	1	1.01	1.01	1.02

Average = Sum(40)$_{1...12}$ /12= 1.01 (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 1.52 (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 70.21 (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=	77.23	74.42	71.61	68.81	66	63.19	63.19	66	68.81	71.61	74.42	77.23

Total = Sum(44)$_{1...12}$ = 842.53 (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=	114.53	100.17	103.37	90.12	86.47	74.62	69.14	79.34	80.29	93.57	102.14	110.92

Total = Sum(45)$_{1...12}$ = 1104.69 (45)

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

(46)m=	17.18	15.03	15.51	13.52	12.97	11.19	10.37	11.9	12.04	14.04	15.32	16.64

(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 dwelling design stage

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

(61)m=	39.36	34.26	36.49	33.93	33.63	31.16	32.2	33.63	33.93	36.49	36.7	39.36	(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=	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27	(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=	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27	

Output from water heater (annual)$_{1...12}$ 1525.84 (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=	47.92	41.87	43.49	38.45	37.16	32.6	31.04	34.79	35.18	40.24	43.14	46.72	(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=	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	(66)

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

(67)m=	29.35	26.07	21.2	16.05	12	10.13	10.95	14.23	19.1	24.25	28.3	30.17	(67)

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

(68)m=	196.58	198.62	193.48	182.54	168.72	155.74	147.06	145.02	150.17	161.11	174.92	187.91	(68)

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

(69)m=	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	(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=	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	(71)

Water heating gains (Table 5)

(72)m=	64.41	62.31	58.46	53.4	49.95	45.28	41.72	46.76	48.86	54.08	59.91	62.8	(72)

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

(73)m=	369.28	365.94	352.08	330.93	309.6	290.09	278.67	284.95	297.06	318.38	342.08	359.81	(73)

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x	0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x	0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)
North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x	0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x	0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x	0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x	0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x	0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x	0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x	0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)
East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)

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

(83)m=	43.53	84.46	140.63	212.43	270.04	281.46	265.85	221.31	165.5	100.33	54.07	35.97	(83)

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

(84)m=	412.81	450.4	492.7	543.36	579.64	571.55	544.52	506.27	462.57	418.71	396.15	395.78	(84)

7. Mean internal temperature (heating season)

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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.97	0.94	0.84	0.68	0.49	0.35	0.4	0.63	0.89	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.23	20.36	20.58	20.83	20.96	20.99	21	21	20.98	20.8	20.48	20.21	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.06	20.06	20.06	20.07	20.08	20.09	20.09	20.09	20.08	20.08	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.96	0.92	0.81	0.62	0.42	0.28	0.32	0.56	0.85	0.96	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.06	19.25	19.56	19.89	20.04	20.08	20.09	20.09	20.07	19.87	19.43	19.03	(90)

fLA = Living area ÷ (4) = 0.83 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.04	20.18	20.41	20.67	20.8	20.84	20.85	20.85	20.83	20.65	20.31	20.01	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.89	20.03	20.26	20.52	20.65	20.69	20.7	20.7	20.68	20.5	20.16	19.86	(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=	0.98	0.96	0.93	0.83	0.66	0.46	0.33	0.37	0.61	0.87	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	403.59	433.93	456.21	448.92	380.85	264.69	179.07	187.08	281.29	363.34	380.06	388.42	(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=	707.36	684.7	621	517.1	397.36	266.61	179.3	187.5	289.37	439.21	582.75	702.8	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	226.01	168.52	122.61	49.09	12.28	0	0	0	0	56.44	145.93	233.9	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1014.78 (98)

Space heating requirement in kWh/m²/year 23.06 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	226.01	168.52	122.61	49.09	12.28	0	0	0	0	56.44	145.93	233.9	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	250.29	186.62	135.78	54.36	13.6	0	0	0	0	62.51	161.61	259.03	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1123.79 (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

Output from water heater (calculated above)

	153.89	134.43	139.86	124.05	120.1	105.78	101.34	112.98	114.22	130.07	138.84	150.27

Efficiency of water heater 81 (216)

(217)m=	86.29	85.92	85.09	83.44	81.78	81	81	81	81	83.61	85.51	86.42	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	178.35	156.45	164.36	148.68	146.86	130.59	125.12	139.48	141.02	155.57	162.36	173.89	

Total = Sum(219a)$_{1...12}$ = 1822.72 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1123.79

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1822.72	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	103.27		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	133.27	(231)
Electricity for lighting		207.37	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3287.14	(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 =	39.11	(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 =	63.43	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	17.58	(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 =	27.35	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				267.47	(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] =	1.26	(257)
SAP rating (Section 12)	82.39	(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	=	242.74	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	393.71	(264)
Space and water heating	(261) + (262) + (263) + (264) =				636.45	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	69.17	(267)
Electricity for lighting	(232)	x	0.519	=	107.62	(268)
Total CO2, kg/year	sum of (265)…(271) =				813.23	(272)
CO2 emissions per m²	(272) ÷ (4) =				18.48	(273)
EI rating (section 14)					88	(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	1371.02	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2223.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =				3594.74	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	409.13	(267)
Electricity for lighting	(232)	x	0	=	636.61	(268)
'Total Primary Energy			sum of (265)…(271) =		4640.48	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		105.47	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 506

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	137.21	**(P1)**
Transmission heat loss coefficient:	34.4	
Summer heat loss coefficient:	171.61	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	333.92	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	287.09	275.67	281.95	
Total summer gains	644.33	609.59	566.62	**(P5)**
Summer gain/loss ratio	3.75	3.55	3.3	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20	21.7	21.35	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:17:14

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 78.9m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 507

Address :

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)	17.42 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.28 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	9.7m²
Windows facing: East	6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 507

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	78.9 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	9.7	1
E	16mm or more	0.7	0.57	1.4	6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	47.52	15.7	31.82	0.18	0	False	N/A
Corridor	4.05	0	4.05	0.22	0.43	False	N/A
Roof	78.9	0	78.9	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0992

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	17.6	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

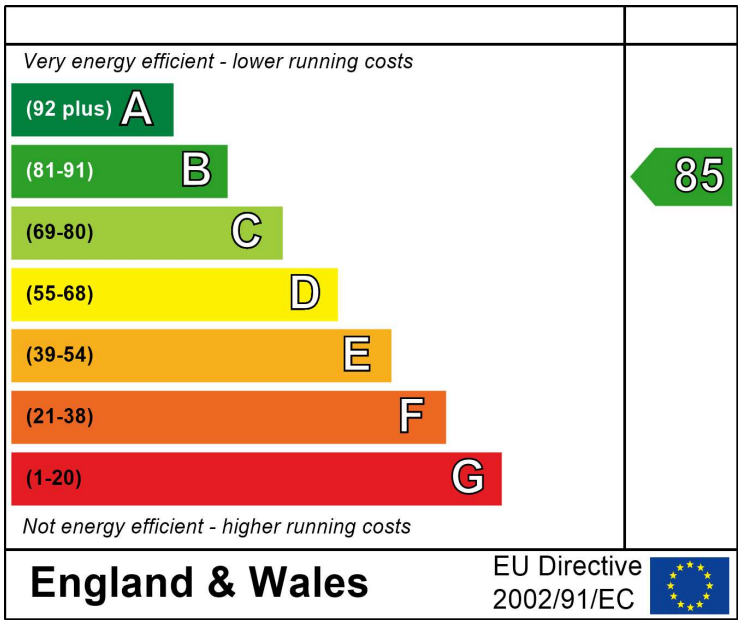
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	78.9 m²

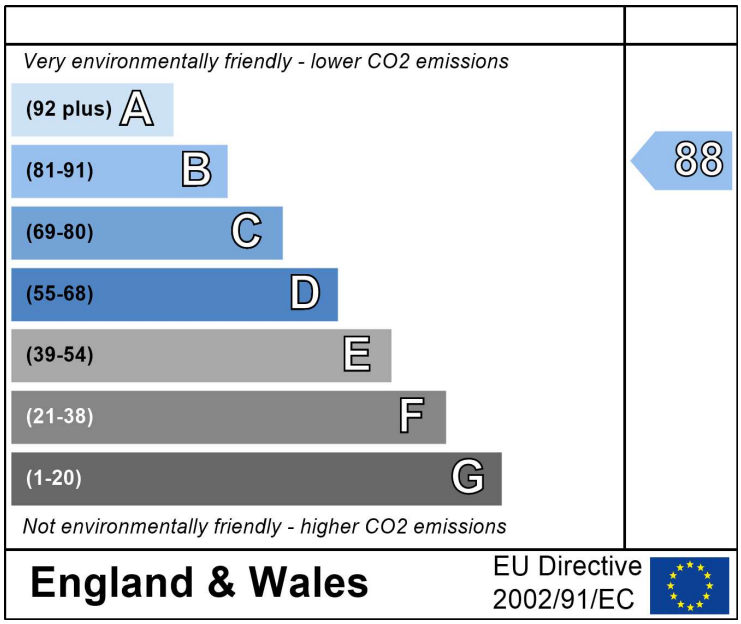
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 507

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.9	(1a) x	2.7	(2a) =	213.03	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.9	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		213.03	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			6	x1/[1/(1.4)+ 0.04] =	7.95			(27)
Walls Type1	47.52	15.7	31.82	x 0.18 =	5.73			(29)
Walls Type2	4.05	0	4.05	x 0.2 =	0.81			(29)
Roof	78.9	0	78.9	x 0.13 =	10.26			(30)
Total area of elements, m²			130.47					(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) = 37.61 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3707 (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 12.94 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 50.56 (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=	19.69	19.46	19.24	18.12	17.9	16.78	16.78	16.55	17.22	17.9	18.34	18.79	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	70.25	70.02	69.8	68.68	68.45	67.33	67.33	67.11	67.78	68.45	68.9	69.35	

Average = Sum(39)$_{1...12}$ /12= 68.62 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.89	0.89	0.88	0.87	0.87	0.85	0.85	0.85	0.86	0.87	0.87	0.88

Average = Sum(40)$_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.44 (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 92.19 (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=	101.41	97.72	94.03	90.35	86.66	82.97	82.97	86.66	90.35	94.03	97.72	101.41

Total = Sum(44)$_{1...12}$ = 1106.27 (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=	150.39	131.53	135.73	118.33	113.54	97.98	90.79	104.18	105.43	122.86	134.12	145.64

Total = Sum(45)$_{1...12}$ = 1450.5 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.56	19.73	20.36	17.75	17.03	14.7	13.62	15.63	15.81	18.43	20.12	21.85

(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 dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	44.98	47.92	44.55	44.16	40.92	42.28	44.16	44.55	47.92	48.19	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	201.34	176.51	183.64	162.88	157.7	138.89	133.07	148.34	149.98	170.78	182.31	196.6	(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=	201.34	176.51	183.64	162.88	157.7	138.89	133.07	148.34	149.98	170.78	182.31	196.6	

Output from water heater (annual)$_{1...12}$ 2002.05 (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=	62.74	54.98	57.11	50.48	48.79	42.81	40.76	45.68	46.19	52.83	56.64	61.17	(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=	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	48.76	43.31	35.22	26.66	19.93	16.83	18.18	23.63	31.72	40.28	47.01	50.11	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	324.07	327.43	318.96	300.92	278.14	256.74	242.44	239.08	247.55	265.59	288.37	309.77	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	(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=	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	(71)

Water heating gains (Table 5)

(72)m=	84.33	81.81	76.76	70.11	65.58	59.45	54.78	61.4	64.16	71.01	78.67	82.21	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	561.09	556.48	534.86	501.62	467.58	436.95	419.33	428.04	447.36	480.81	517.97	546.02	(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)	
East	0.9x 0.77	x	6	x	19.64	x	0.57	x	0.7	=	32.58	(76)
East	0.9x 0.77	x	6	x	38.42	x	0.57	x	0.7	=	63.74	(76)
East	0.9x 0.77	x	6	x	63.27	x	0.57	x	0.7	=	104.97	(76)
East	0.9x 0.77	x	6	x	92.28	x	0.57	x	0.7	=	153.1	(76)
East	0.9x 0.77	x	6	x	113.09	x	0.57	x	0.7	=	187.63	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	6	x	115.77	x	0.57	x	0.7	=	192.07	(76)
East	0.9x	0.77	x	6	x	110.22	x	0.57	x	0.7	=	182.86	(76)
East	0.9x	0.77	x	6	x	94.68	x	0.57	x	0.7	=	157.07	(76)
East	0.9x	0.77	x	6	x	73.59	x	0.57	x	0.7	=	122.09	(76)
East	0.9x	0.77	x	6	x	45.59	x	0.57	x	0.7	=	75.63	(76)
East	0.9x	0.77	x	6	x	24.49	x	0.57	x	0.7	=	40.63	(76)
East	0.9x	0.77	x	6	x	16.15	x	0.57	x	0.7	=	26.8	(76)
South	0.9x	0.77	x	9.7	x	46.75	x	0.57	x	0.7	=	125.39	(78)
South	0.9x	0.77	x	9.7	x	76.57	x	0.57	x	0.7	=	205.36	(78)
South	0.9x	0.77	x	9.7	x	97.53	x	0.57	x	0.7	=	261.6	(78)
South	0.9x	0.77	x	9.7	x	110.23	x	0.57	x	0.7	=	295.66	(78)
South	0.9x	0.77	x	9.7	x	114.87	x	0.57	x	0.7	=	308.1	(78)
South	0.9x	0.77	x	9.7	x	110.55	x	0.57	x	0.7	=	296.5	(78)
South	0.9x	0.77	x	9.7	x	108.01	x	0.57	x	0.7	=	289.7	(78)
South	0.9x	0.77	x	9.7	x	104.89	x	0.57	x	0.7	=	281.34	(78)
South	0.9x	0.77	x	9.7	x	101.89	x	0.57	x	0.7	=	273.27	(78)
South	0.9x	0.77	x	9.7	x	82.59	x	0.57	x	0.7	=	221.5	(78)
South	0.9x	0.77	x	9.7	x	55.42	x	0.57	x	0.7	=	148.64	(78)
South	0.9x	0.77	x	9.7	x	40.4	x	0.57	x	0.7	=	108.35	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	157.98	269.11	366.57	448.76	495.72	488.57	472.56	438.41	395.36	297.14	189.26	135.15	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	719.06	825.58	901.43	950.38	963.3	925.52	891.89	866.45	842.71	777.95	707.23	681.17	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.91	0.8	0.64	0.46	0.33	0.36	0.55	0.82	0.96	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.42	20.58	20.76	20.91	20.98	21	21	21	20.99	20.91	20.65	20.38	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.18	20.18	20.18	20.19	20.2	20.21	20.21	20.21	20.2	20.2	20.19	20.19	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.95	0.89	0.76	0.59	0.41	0.27	0.29	0.49	0.78	0.94	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.42	19.65	19.89	20.1	20.18	20.21	20.21	20.21	20.2	20.1	19.76	19.38	(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.88	20.08	20.29	20.48	20.55	20.57	20.58	20.58	20.57	20.48	20.17	19.84	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.73	19.93	20.14	20.33	20.4	20.42	20.43	20.43	20.42	20.33	20.02	19.69	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.97	0.94	0.88	0.77	0.61	0.42	0.29	0.31	0.5	0.79	0.94	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	699.03	778	797.1	730.64	584.45	391.26	257.55	270.15	425.46	613.34	665.36	666.3	(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=	1084.07	1052.54	952.36	784.74	595.58	392.17	257.61	270.26	428.27	665.99	890.4	1074.57	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	286.47	184.49	115.51	38.95	8.28	0	0	0	0	39.17	162.03	303.75	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1138.66 (98)

Space heating requirement in kWh/m²/year 14.43 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	286.47	184.49	115.51	38.95	8.28	0	0	0	0	39.17	162.03	303.75	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	317.24	204.31	127.92	43.14	9.17	0	0	0	0	43.38	179.44	336.38	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1260.97 (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

Output from water heater (calculated above)

	201.34	176.51	183.64	162.88	157.7	138.89	133.07	148.34	149.98	170.78	182.31	196.6	

Efficiency of water heater 81 (216)

(217)m=	86.21	85.5	84.35	82.64	81.42	81	81	81	81	82.59	85.13	86.4	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	233.54	206.44	217.7	197.09	193.69	171.47	164.28	183.14	185.16	206.79	214.16	227.54	

Total = Sum(219a)$_{1...12}$ = 2401.01 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1260.97

SAP WorkSheet: New dwelling design stage

Water heating fuel used		2401.01	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	185.18		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	215.18	(231)
Electricity for lighting		344.44	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4221.6	(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 =	43.88		(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 =	83.56		(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	28.38		(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 =	45.43		(250)
Additional standing charges (Table 12)				120		(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =			321.25		(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] =	1.09	(257)
SAP rating (Section 12)		84.81	(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	=	272.37		(261)
Space heating (secondary)	(215) x	0.519	=	0		(263)
Water heating	(219) x	0.216	=	518.62		(264)
Space and water heating	(261) + (262) + (263) + (264) =			790.99		(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	111.68		(267)
Electricity for lighting	(232) x	0.519	=	178.77		(268)
Total CO2, kg/year	sum of (265)…(271) =			1081.43		(272)
CO2 emissions per m²	(272) ÷ (4) =			13.71		(273)
EI rating (section 14)				88		(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	1538.39	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2929.24	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4467.62	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	660.59	(267)
Electricity for lighting	(232)	x	0	=	1057.44	(268)
'Total Primary Energy			sum of (265)…(271) =		6185.65	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		78.4	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 507

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	246.05	**(P1)**
Transmission heat loss coefficient:	50.6	
Summer heat loss coefficient:	296.61	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	9.7	112.21	0.57	0.7	0.9	351.76	
East (E)	0.9 x	6	117.51	0.57	0.7	0.9	227.86	
						Total	579.62	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	433.95	416.33	425.04	
Total summer gains	1040.45	995.95	972.56	**(P5)**
Summer gain/loss ratio	3.51	3.36	3.28	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.76	21.51	21.33	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:17:06

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 508

Address :

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	18.44 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.51 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	9.7m²
Windows facing: East	12m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 508

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	74 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	9.7	1
E	16mm or more	0.7	0.57	1.4	12	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	48.33	21.7	26.63	0.18	0	False	N/A
Corridor	11.61	0	11.61	0.22	0.43	False	N/A
Roof	74	0	74	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0954

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	17.3	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

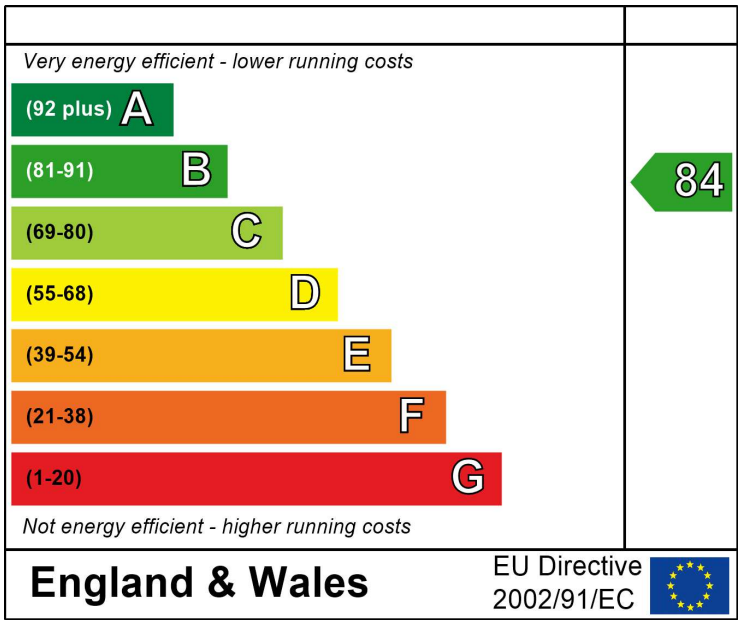
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	74 m²

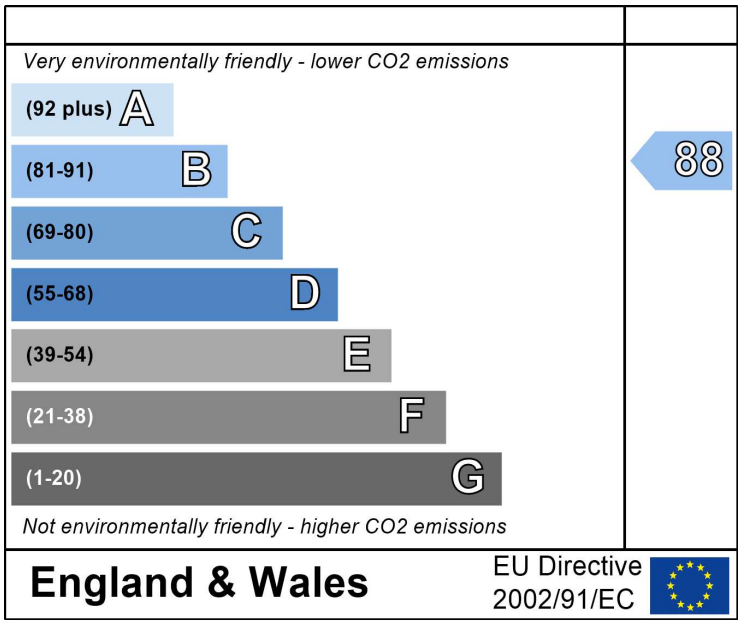
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 508

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74 (1a)	x	2.7 (2a)	=	199.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	199.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			12	x1/[1/(1.4)+ 0.04] =	15.91			(27)
Walls Type1	48.33	21.7	26.63	x 0.18 =	4.79			(29)
Walls Type2	11.61	0	11.61	x 0.2 =	2.33			(29)
Roof	74	0	74	x 0.13 =	9.62			(30)
Total area of elements, m²			133.94					(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) = 45.52 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4736 (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 12.78 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.29 (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=	18.47	18.26	18.05	16.99	16.78	15.73	15.73	15.52	16.15	16.78	17.2	17.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	76.76	76.55	76.34	75.29	75.08	74.03	74.03	73.82	74.45	75.08	75.5	75.92	

Average = Sum(39)$_{1...12}$ /12= 75.23 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.04	1.03	1.03	1.02	1.01	1	1	1	1.01	1.01	1.02	1.03

Average = Sum(40)$_{1...12}$ /12= 1.02 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.34 (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 89.76 (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=	98.73	95.14	91.55	87.96	84.37	80.78	80.78	84.37	87.96	91.55	95.14	98.73

Total = Sum(44)$_{1...12}$ = 1077.07 (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=	146.42	128.06	132.14	115.21	110.54	95.39	88.39	101.43	102.64	119.62	130.57	141.8

Total = Sum(45)$_{1...12}$ = 1412.21 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.21	15.4	17.94	19.59	21.27

(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 dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.31	43.79	46.65	43.38	42.99	39.84	41.16	42.99	43.38	46.65	46.92	50.31	(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=	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11	(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=	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11	

Output from water heater (annual)$_{1...12}$ 1950.6 (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=	61.26	53.53	55.6	49.15	47.5	41.68	39.68	44.47	44.97	51.44	55.15	59.73	(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=	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	46.01	40.87	33.24	25.16	18.81	15.88	17.16	22.3	29.93	38.01	44.36	47.29	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.13	311.33	303.27	286.12	264.46	244.11	230.52	227.32	235.38	252.53	274.18	294.53	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	(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=	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	(71)

Water heating gains (Table 5)

(72)m=	82.34	79.65	74.73	68.26	63.85	57.88	53.34	59.78	62.46	69.14	76.59	80.28	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	537.64	533.01	512.4	480.7	448.28	419.03	402.17	410.56	428.93	460.83	496.3	523.26	(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)	
East	0.9x 0.77	x	12	x	19.64	x	0.57	x	0.7	=	65.17	(76)
East	0.9x 0.77	x	12	x	38.42	x	0.57	x	0.7	=	127.48	(76)
East	0.9x 0.77	x	12	x	63.27	x	0.57	x	0.7	=	209.95	(76)
East	0.9x 0.77	x	12	x	92.28	x	0.57	x	0.7	=	306.19	(76)
East	0.9x 0.77	x	12	x	113.09	x	0.57	x	0.7	=	375.25	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	12	x	115.77	x	0.57	x	0.7	=	384.14	(76)
East	0.9x	0.77	x	12	x	110.22	x	0.57	x	0.7	=	365.71	(76)
East	0.9x	0.77	x	12	x	94.68	x	0.57	x	0.7	=	314.14	(76)
East	0.9x	0.77	x	12	x	73.59	x	0.57	x	0.7	=	244.18	(76)
East	0.9x	0.77	x	12	x	45.59	x	0.57	x	0.7	=	151.27	(76)
East	0.9x	0.77	x	12	x	24.49	x	0.57	x	0.7	=	81.26	(76)
East	0.9x	0.77	x	12	x	16.15	x	0.57	x	0.7	=	53.59	(76)
South	0.9x	0.77	x	9.7	x	46.75	x	0.57	x	0.7	=	125.39	(78)
South	0.9x	0.77	x	9.7	x	76.57	x	0.57	x	0.7	=	205.36	(78)
South	0.9x	0.77	x	9.7	x	97.53	x	0.57	x	0.7	=	261.6	(78)
South	0.9x	0.77	x	9.7	x	110.23	x	0.57	x	0.7	=	295.66	(78)
South	0.9x	0.77	x	9.7	x	114.87	x	0.57	x	0.7	=	308.1	(78)
South	0.9x	0.77	x	9.7	x	110.55	x	0.57	x	0.7	=	296.5	(78)
South	0.9x	0.77	x	9.7	x	108.01	x	0.57	x	0.7	=	289.7	(78)
South	0.9x	0.77	x	9.7	x	104.89	x	0.57	x	0.7	=	281.34	(78)
South	0.9x	0.77	x	9.7	x	101.89	x	0.57	x	0.7	=	273.27	(78)
South	0.9x	0.77	x	9.7	x	82.59	x	0.57	x	0.7	=	221.5	(78)
South	0.9x	0.77	x	9.7	x	55.42	x	0.57	x	0.7	=	148.64	(78)
South	0.9x	0.77	x	9.7	x	40.4	x	0.57	x	0.7	=	108.35	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	190.56	332.85	471.54	601.85	683.35	680.64	655.41	595.48	517.44	372.77	229.89	161.94	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	728.2	865.85	983.94	1082.56	1131.63	1099.67	1057.58	1006.04	946.38	833.61	726.19	685.2	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.95	0.89	0.77	0.6	0.43	0.31	0.34	0.53	0.82	0.96	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.26	20.47	20.7	20.89	20.98	21	21	21	20.99	20.87	20.54	20.22	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.05	20.05	20.06	20.07	20.07	20.08	20.08	20.09	20.08	20.07	20.07	20.06	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.87	0.72	0.55	0.37	0.24	0.27	0.47	0.77	0.94	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.1	19.4	19.71	19.96	20.05	20.08	20.08	20.09	20.07	19.94	19.51	19.05	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.68	19.93	20.2	20.42	20.51	20.54	20.54	20.54	20.53	20.4	20.02	19.63	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.53	19.78	20.05	20.27	20.36	20.39	20.39	20.39	20.38	20.25	19.87	19.48	(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	0.94	0.87	0.73	0.56	0.39	0.27	0.29	0.49	0.78	0.94	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	706.5	810.15	852.34	794.19	637.09	426.97	280.26	294.22	462.72	652.48	681.92	669.29	(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=	1168.96	1139.02	1034.53	856.25	650.11	428.27	280.38	294.42	467.3	724.82	963.94	1160	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	344.07	221	135.55	44.68	9.68	0	0	0	0	53.82	203.06	365.09	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1376.95 (98)

Space heating requirement in kWh/m²/year 18.61 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	344.07	221	135.55	44.68	9.68	0	0	0	0	53.82	203.06	365.09	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	381.03	244.74	150.11	49.48	10.72	0	0	0	0	59.6	224.87	404.31	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1524.86 (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

Output from water heater (calculated above)

	196.73	171.85	178.8	158.58	153.54	135.23	129.56	144.43	146.02	166.27	177.49	192.11

Efficiency of water heater 81 (216)

(217)m=	86.68	85.98	84.76	82.88	81.5	81	81	81	81	83.09	85.71	86.86	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	226.96	199.87	210.93	191.35	188.39	166.95	159.95	178.3	180.27	200.11	207.09	221.17	

Total = Sum(219a)$_{1...12}$ = 2331.33 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1524.86

SAP WorkSheet: New dwelling design stage

Water heating fuel used		2331.33	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	173.68		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	203.68	(231)
Electricity for lighting		325.04	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		4384.9	(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 =	53.07	(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 =	81.13	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	26.86	(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 =	42.87	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				323.93	(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] =	1.14	(257)
SAP rating (Section 12)	84.05	(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	=	329.37	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	503.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =					832.94	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	105.71	(267)
Electricity for lighting	(232)	x		0.519	=	168.69	(268)
Total CO2, kg/year	sum of (265)…(271) =					1107.34	(272)
CO2 emissions per m²	(272) ÷ (4) =					14.96	(273)
EI rating (section 14)						88	(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	1860.32	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2844.22	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4704.55	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	625.29	(267)
Electricity for lighting	(232)	x	0	=	997.86	(268)
'Total Primary Energy			sum of (265)…(271) =		6327.69	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		85.51	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 508

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	230.77	**(P1)**
Transmission heat loss coefficient:	58.3	
Summer heat loss coefficient:	289.06	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	9.7	112.21	0.57	0.7	0.9	351.76	
East (E)	0.9 x	12	117.51	0.57	0.7	0.9	455.73	
						Total	807.48	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	416.03	399.17	407.56	
Total summer gains	1264.43	1206.65	1155.55	**(P5)**
Summer gain/loss ratio	4.37	4.17	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	20.62	22.32	22.05	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:16:59

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 47.3m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 509

Address :

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)	23.69 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.94 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	62.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	16.7m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 509

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 10 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 503

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	47.3 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
W	16mm or more	0.7	0.57	1.4	16.7	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	31.32	16.7	14.62	0.18	0	False	N/A
Corridor	35.64	0	35.64	0.22	0.43	False	N/A
Flat	47.3	0	47.3	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.094

	Length	Psi-value		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof

SAP Input

11.6	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

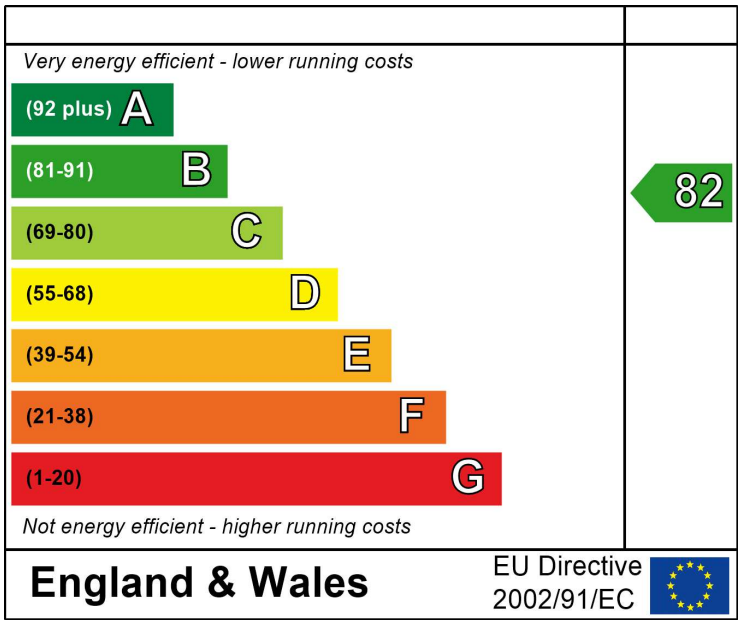
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	47.3 m²

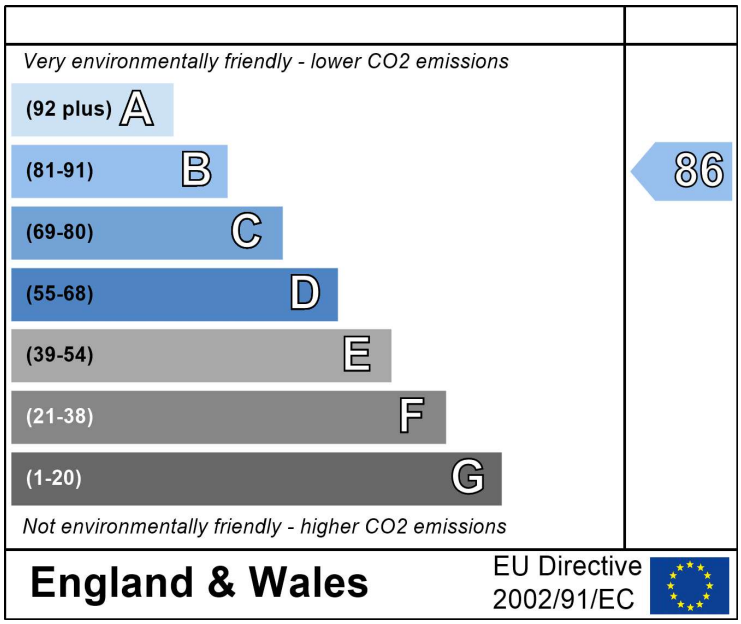
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 509

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	47.3 (1a)	x	2.7 (2a)	=	127.71	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	47.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	127.71	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			16.7	x1/[1/(1.4)+ 0.04] =	22.14			(27)
Walls Type1	31.32	16.7	14.62	x 0.18 =	2.63			(29)
Walls Type2	35.64	0	35.64	x 0.2 =	7.16			(29)
Roof	47.3	0	47.3	x 0.13 =	6.15			(30)
Total area of elements, m²			114.26					(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) = 38.08 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8220.7 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.74 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 48.82 (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=	11.8	11.67	11.53	10.86	10.73	10.06	10.06	9.92	10.33	10.73	11	11.27	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	60.63	60.49	60.36	59.69	59.55	58.88	58.88	58.75	59.15	59.55	59.82	60.09	

Average = Sum(39)$_{1...12}$ /12= 59.65 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.28	1.28	1.28	1.26	1.26	1.24	1.24	1.24	1.25	1.26	1.26	1.27	

Average = Sum(40)$_{1...12}$ /12= 1.26 (40)

SAP WorkSheet: New dwelling design stage

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 1.61 (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 72.46 (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=	79.71	76.81	73.91	71.01	68.11	65.22	65.22	68.11	71.01	73.91	76.81	79.71	

Total = Sum(44)$_{1...12}$ = 869.54 (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=	118.2	103.38	106.68	93.01	89.24	77.01	71.36	81.89	82.87	96.57	105.42	114.47	

Total = Sum(45)$_{1...12}$ = 1140.1 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	17.73	15.51	16	13.95	13.39	11.55	10.7	12.28	12.43	14.49	15.81	17.17	(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=	40.62	35.35	37.66	35.02	34.71	32.16	33.23	34.71	35.02	37.66	37.88	40.62	(61)

SAP WorkSheet: New dwelling design stage

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=	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09	(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=	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09	

Output from water heater (annual)$_{1...12}$ 1574.75 (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=	49.46	43.21	44.89	39.68	38.35	33.65	32.04	35.9	36.31	41.53	44.52	48.22	(65)

include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating

5. Internal gains (see Table 5 and 5a):

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	31.25	27.76	22.58	17.09	12.78	10.79	11.65	15.15	20.33	25.82	30.13	32.12	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	209.29	211.47	205.99	194.34	179.63	165.81	156.58	154.4	159.88	171.53	186.24	200.06	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	(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=	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	(71)

Water heating gains (Table 5)

(72)m=	66.47	64.3	60.33	55.11	51.55	46.73	43.06	48.26	50.43	55.81	61.83	64.81	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	388.52	385.03	370.4	348.04	325.45	304.82	292.79	299.31	312.13	334.66	359.7	378.49	(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)	
West	0.9x 0.77	x	16.7	x	19.64	x	0.57	x	0.7	=	90.69	(80)
West	0.9x 0.77	x	16.7	x	38.42	x	0.57	x	0.7	=	177.41	(80)
West	0.9x 0.77	x	16.7	x	63.27	x	0.57	x	0.7	=	292.17	(80)
West	0.9x 0.77	x	16.7	x	92.28	x	0.57	x	0.7	=	426.12	(80)
West	0.9x 0.77	x	16.7	x	113.09	x	0.57	x	0.7	=	522.22	(80)
West	0.9x 0.77	x	16.7	x	115.77	x	0.57	x	0.7	=	534.59	(80)
West	0.9x 0.77	x	16.7	x	110.22	x	0.57	x	0.7	=	508.95	(80)
West	0.9x 0.77	x	16.7	x	94.68	x	0.57	x	0.7	=	437.18	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	16.7	x	73.59	x	0.57	x	0.7	=	339.81	(80)
West	0.9x	0.77	x	16.7	x	45.59	x	0.57	x	0.7	=	210.52	(80)
West	0.9x	0.77	x	16.7	x	24.49	x	0.57	x	0.7	=	113.08	(80)
West	0.9x	0.77	x	16.7	x	16.15	x	0.57	x	0.7	=	74.58	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	90.69	177.41	292.17	426.12	522.22	534.59	508.95	437.18	339.81	210.52	113.08	74.58	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(84)m=	479.21	562.44	662.57	774.16	847.68	839.41	801.74	736.49	651.94	545.17	472.78	453.07	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.92	0.79	0.62	0.44	0.32	0.36	0.6	0.87	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(87)m=	19.95	20.16	20.48	20.79	20.94	20.99	21	21	20.96	20.72	20.27	19.91	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(88)m=	19.86	19.86	19.86	19.87	19.87	19.88	19.88	19.89	19.88	19.87	19.87	19.86	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.98	0.95	0.89	0.75	0.56	0.37	0.24	0.28	0.51	0.83	0.96	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	18.51	18.81	19.25	19.66	19.83	19.88	19.88	19.89	19.86	19.59	18.98	18.45	(90)

fLA = Living area ÷ (4) = 0.78 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(92)m=	19.63	19.86	20.2	20.54	20.69	20.74	20.75	20.75	20.72	20.47	19.98	19.58	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(93)m=	19.48	19.71	20.05	20.39	20.54	20.59	20.6	20.6	20.57	20.32	19.83	19.43	(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:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.98	0.95	0.9	0.77	0.59	0.42	0.29	0.33	0.57	0.85	0.96	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	467.58	536.16	594.23	596.23	503.59	349.35	234.93	245.69	368.96	462.01	451.96	444.16	(95)

Monthly average external temperature from Table 8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(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]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(97)m=	920.15	895.95	818.03	685.59	526.67	352.79	235.44	246.62	382.49	578.62	761.71	915.24	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(98)m=	336.71	241.78	166.51	64.33	17.17	0	0	0	0	86.76	223.02	350.48	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1486.77 (98)

Space heating requirement in kWh/m²/year 31.43 (99)

SAP WorkSheet: New dwelling design stage

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	336.71	241.78	166.51	64.33	17.17	0	0	0	0	86.76	223.02	350.48	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	372.88	267.75	184.4	71.24	19.02	0	0	0	0	96.08	246.98	388.13	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 1646.48 (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

Output from water heater (calculated above)

	158.82	138.73	144.34	128.03	123.95	109.17	104.59	116.6	117.88	134.24	143.29	155.09	

Efficiency of water heater 81 (216)

(217)m=	87.09	86.67	85.73	83.89	82.03	81	81	81	81	84.41	86.42	87.23	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	182.35	160.07	168.37	152.61	151.11	134.78	129.13	143.95	145.54	159.02	165.81	177.8	

Total = Sum(219a)$_{1...12}$ = 1870.55 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1646.48
Water heating fuel used		1870.55
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	111.01	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		141.01 (231)
Electricity for lighting		220.78 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3878.81 (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 =	57.3 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	65.09	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	18.6	(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 =	29.12	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			290.11	(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] =	1.32	(257)
SAP rating (Section 12)		81.58	(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	=	355.64	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	404.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =					759.68	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	73.19	(267)
Electricity for lighting	(232)	x		0.519	=	114.58	(268)
Total CO2, kg/year			sum of (265)…(271) =			947.44	(272)
CO2 emissions per m²			(272) ÷ (4) =			20.03	(273)
EI rating (section 14)						86	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	2008.7	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2282.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =					4290.77	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	432.91	(267)
Electricity for lighting	(232)	x		0	=	677.78	(268)
'Total Primary Energy			sum of (265)…(271) =			5401.46	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			114.2	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 509

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	147.51	**(P1)**
Transmission heat loss coefficient:	48.8	
Summer heat loss coefficient:	196.33	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	16.7	117.51	0.57	0.7	0.9	634.22	
						Total	634.22	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	301.82	289.79	296.31	
Total summer gains	975.06	924	854.27	**(P5)**
Summer gain/loss ratio	4.97	4.71	4.35	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.22	22.86	22.4	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:16:54

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 66m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 510

Address :

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)	14.74 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.46 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	29.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	28.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	19.5m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 510

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	66 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	19.5	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	30.78	19.5	11.28	0.18	0	False	N/A
Corridor	23.04	0	23.04	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0789

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

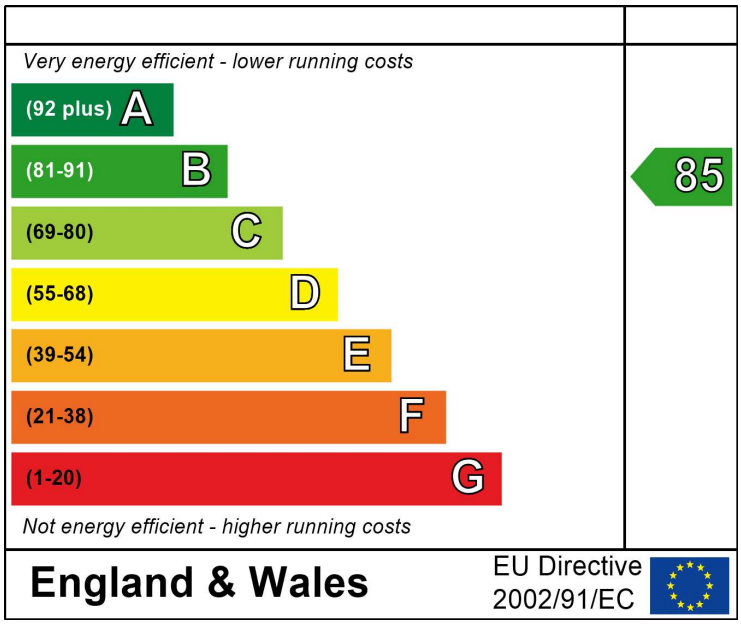
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	66 m²

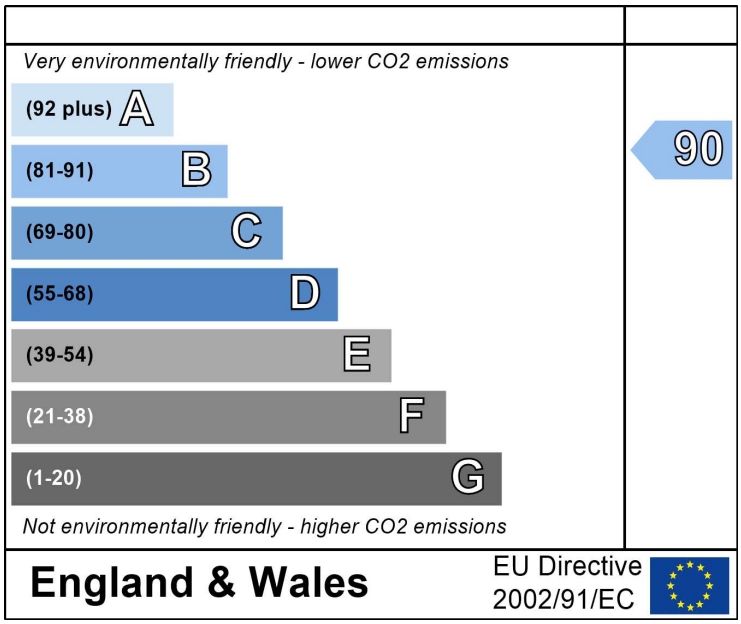
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 510

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	66	(1a) x	2.7	(2a) =	178.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	66	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		178.2	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			19.5	x1/[1/(1.4)+ 0.04] =	25.85			(27)
Walls Type1	30.78	19.5	11.28	x 0.18 =	2.03			(29)
Walls Type2	23.04	0	23.04	x 0.2 =	4.63			(29)
Total area of elements, m²			53.82					(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) = 32.51 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5167.2 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.76 (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=	16.47	16.28	16.09	15.16	14.97	14.03	14.03	13.85	14.41	14.97	15.34	15.72	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	53.23	53.04	52.85	51.92	51.73	50.79	50.79	50.6	51.17	51.73	52.1	52.48	

Average = Sum(39)$_{1...12}$ /12= 51.87 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.81	0.8	0.8	0.79	0.78	0.77	0.77	0.77	0.78	0.78	0.79	0.8	

Average = Sum(40)$_{1...12}$ /12= 0.79 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.15 (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 85.15 (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=	93.66	90.26	86.85	83.45	80.04	76.63	76.63	80.04	83.45	86.85	90.26	93.66	

Total = Sum(44)$_{1...12}$ = 1021.79 (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=	138.9	121.48	125.36	109.29	104.87	90.49	83.86	96.23	97.38	113.48	123.87	134.52	

Total = Sum(45)$_{1...12}$ = 1339.73 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.84	18.22	18.8	16.39	15.73	13.57	12.58	14.43	14.61	17.02	18.58	20.18	(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=	47.73	41.54	44.26	41.15	40.79	37.79	39.05	40.79	41.15	44.26	44.51	47.73	(61)

SAP WorkSheet: New dwelling design stage

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=	186.63	163.03	169.62	150.44	145.66	128.29	122.91	137.01	138.53	157.74	168.38	182.25	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	186.63	163.03	169.62	150.44	145.66	128.29	122.91	137.01	138.53	157.74	168.38	182.25	

Output from water heater (annual)$_{1...12}$ 1850.49 (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=	58.12	50.78	52.75	46.63	45.07	39.54	37.65	42.19	42.67	48.8	52.32	56.66	(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=	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.85	37.17	30.23	22.89	17.11	14.44	15.61	20.29	27.23	34.57	40.35	43.02	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	280.28	283.19	275.86	260.26	240.56	222.05	209.68	206.77	214.1	229.71	249.4	267.91	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	(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=	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	(71)

Water heating gains (Table 5)

(72)m=	78.11	75.56	70.9	64.76	60.57	54.91	50.6	56.71	59.26	65.59	72.66	76.16	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	496.17	491.85	472.91	443.83	414.16	387.33	371.81	379.69	396.51	425.79	458.34	483.01	(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)	
South	0.9x 0.77	x	19.5	x	46.75	x	0.57	x	0.7	=	252.08	(78)
South	0.9x 0.77	x	19.5	x	76.57	x	0.57	x	0.7	=	412.85	(78)
South	0.9x 0.77	x	19.5	x	97.53	x	0.57	x	0.7	=	525.89	(78)
South	0.9x 0.77	x	19.5	x	110.23	x	0.57	x	0.7	=	594.37	(78)
South	0.9x 0.77	x	19.5	x	114.87	x	0.57	x	0.7	=	619.37	(78)
South	0.9x 0.77	x	19.5	x	110.55	x	0.57	x	0.7	=	596.06	(78)
South	0.9x 0.77	x	19.5	x	108.01	x	0.57	x	0.7	=	582.39	(78)
South	0.9x 0.77	x	19.5	x	104.89	x	0.57	x	0.7	=	565.58	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	19.5	x	101.89	x	0.57	x	0.7	=	549.36	(78)
South	0.9x	0.77	x	19.5	x	82.59	x	0.57	x	0.7	=	445.29	(78)
South	0.9x	0.77	x	19.5	x	55.42	x	0.57	x	0.7	=	298.8	(78)
South	0.9x	0.77	x	19.5	x	40.4	x	0.57	x	0.7	=	217.82	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	252.08	412.85	525.89	594.37	619.37	596.06	582.39	565.58	549.36	445.29	298.8	217.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	748.25	904.69	998.8	1038.2	1033.54	983.39	954.2	945.27	945.87	871.08	757.14	700.83	(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=	0.93	0.84	0.73	0.6	0.46	0.33	0.23	0.25	0.37	0.61	0.85	0.95	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.71	20.86	20.95	20.99	21	21	21	21	21	20.99	20.88	20.67	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.25	20.25	20.25	20.26	20.27	20.28	20.28	20.28	20.27	20.27	20.26	20.26	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.92	0.82	0.7	0.56	0.43	0.29	0.2	0.21	0.33	0.57	0.83	0.94	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.89	20.09	20.2	20.25	20.27	20.28	20.28	20.28	20.27	20.26	20.13	19.84	(90)

fLA = Living area ÷ (4) = 0.56 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.35	20.52	20.61	20.66	20.67	20.68	20.68	20.68	20.68	20.66	20.55	20.3	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.2	20.37	20.46	20.51	20.52	20.53	20.53	20.53	20.53	20.51	20.4	20.15	(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=	0.92	0.82	0.71	0.57	0.44	0.31	0.21	0.22	0.35	0.58	0.83	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	686.67	746.31	710.71	596.76	455.49	301.15	199.62	209.06	328.75	507.31	629.11	655.65	(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=	846.08	820.57	738.08	602.83	456.4	301.2	199.62	209.06	328.88	512.82	692.76	837.19	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	118.6	49.9	20.36	4.37	0.67	0	0	0	0	4.1	45.83	135.07	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 378.91 (98)

Space heating requirement in kWh/m²/year 5.74 (99)

SAP WorkSheet: New dwelling design stage

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	118.6	49.9	20.36	4.37	0.67	0	0	0	0	4.1	45.83	135.07	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	131.34	55.27	22.55	4.84	0.74	0	0	0	0	4.54	50.75	149.58	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 419.62 (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

Output from water heater (calculated above)

	186.63	163.03	169.62	150.44	145.66	128.29	122.91	137.01	138.53	157.74	168.38	182.25	

Efficiency of water heater 81 (216)

(217)m=	84.38	83	81.9	81.24	81.04	81	81	81	81	81.21	82.82	84.71	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	221.19	196.41	207.1	185.19	179.74	158.38	151.74	169.15	171.02	194.23	203.3	215.14	

Total = Sum(219a)$_{1...12}$ = 2252.59 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		419.62
Water heating fuel used		2252.59
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	154.9	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year sum of (230a)…(230g) =		184.9 (231)
Electricity for lighting		295.66 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3152.77 (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 =	14.6 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	78.39	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	24.39	(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 =	39	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			276.38	(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] =	1.05	(257)
SAP rating (Section 12)		85.41	(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	=	90.64	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	486.56	(264)
Space and water heating	(261) + (262) + (263) + (264) =					577.2	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	95.96	(267)
Electricity for lighting	(232)	x		0.519	=	153.45	(268)
Total CO2, kg/year			sum of (265)…(271) =			826.61	(272)
CO2 emissions per m²			(272) ÷ (4) =			12.52	(273)
EI rating (section 14)						90	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	511.93	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2748.16	(264)
Space and water heating	(261) + (262) + (263) + (264) =					3260.09	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	567.64	(267)
Electricity for lighting	(232)	x		0	=	907.67	(268)
'Total Primary Energy			sum of (265)…(271) =			4735.41	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			71.75	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 510

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	205.82	**(P1)**
Transmission heat loss coefficient:	36.8	
Summer heat loss coefficient:	242.58	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	19.5	112.21	0.57	0.7	0.9	707.15	
						Total	707.15	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	384.33	368.81	376.69	
Total summer gains	1117.34	1075.95	1074.39	**(P5)**
Summer gain/loss ratio	4.61	4.44	4.43	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.86	22.59	22.48	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:16:48

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.2m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 511

Address :

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)	15.01 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.57 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	30.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	27.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	15.6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 511

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	63.2 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	15.6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	28.08	15.6	12.48	0.18	0	False	N/A
Corridor	24.96	0	24.96	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.08

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

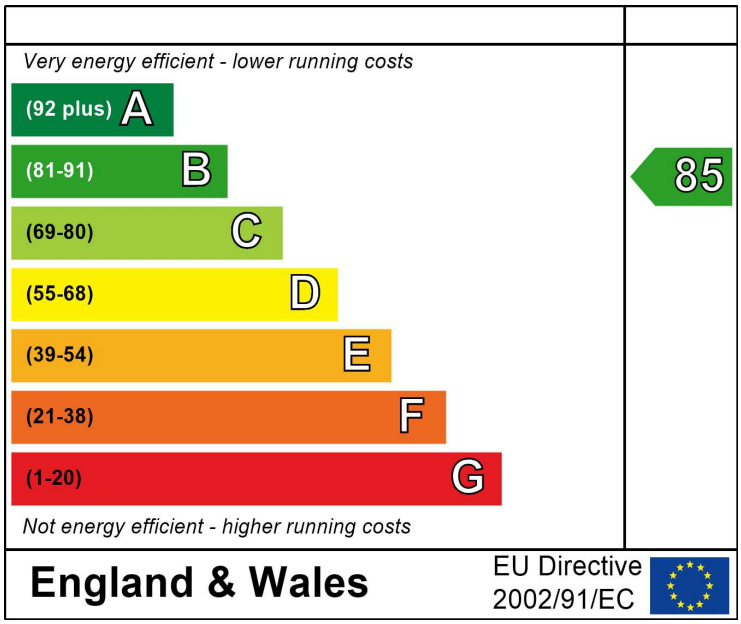
Predicted Energy Assessment

Dwelling type:	Mid floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	63.2 m²

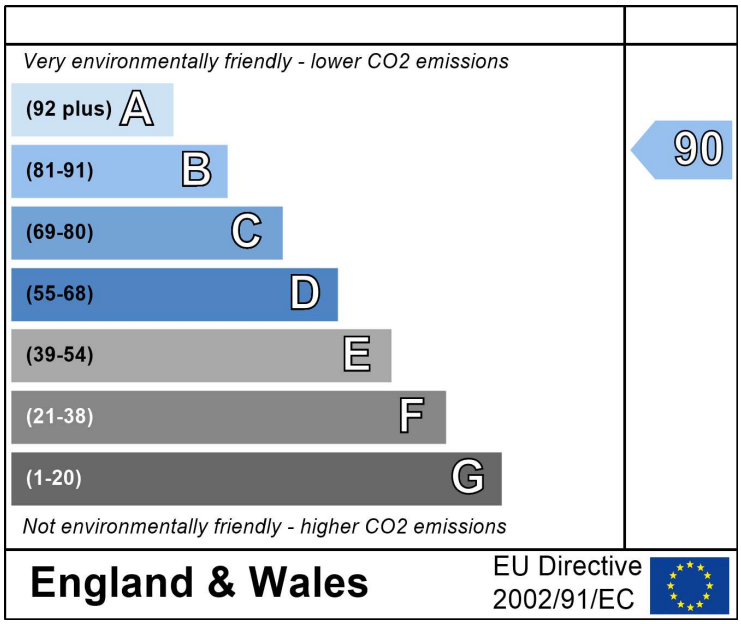
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 511

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	63.2	(1a) x	2.7	(2a) =	170.64	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.2	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		170.64	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			15.6	x1/[1/(1.4)+ 0.04] =	20.68			(27)
Walls Type1	28.08	15.6	12.48	x 0.18 =	2.25			(29)
Walls Type2	24.96	0	24.96	x 0.2 =	5.02			(29)
Total area of elements, m²			53.04					(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) = 27.94 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5616 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 32.19 (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=	15.77	15.59	15.41	14.51	14.33	13.44	13.44	13.26	13.8	14.33	14.69	15.05	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	47.96	47.78	47.6	46.7	46.52	45.63	45.63	45.45	45.99	46.52	46.88	47.24	

Average = Sum(39)$_{1...12}$ /12= 46.66 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.76	0.76	0.75	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74	0.75	

Average = Sum(40)$_{1...12}$ /12= 0.74 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.07 (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 83.37 (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=	91.71	88.38	85.04	81.71	78.37	75.04	75.04	78.37	81.71	85.04	88.38	91.71	

Total = Sum(44)$_{1...12}$ = 1000.5 (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=	136.01	118.95	122.75	107.01	102.68	88.61	82.11	94.22	95.35	111.12	121.29	131.72	

Total = Sum(45)$_{1...12}$ = 1311.81 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.4	17.84	18.41	16.05	15.4	13.29	12.32	14.13	14.3	16.67	18.19	19.76	(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=	46.74	40.68	43.34	40.29	39.94	37	38.24	39.94	40.29	43.34	43.58	46.74	(61)

SAP WorkSheet: New dwelling design stage

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=	182.74	159.63	166.08	147.31	142.62	125.61	120.35	134.16	135.64	154.45	164.88	178.45	(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=	182.74	159.63	166.08	147.31	142.62	125.61	120.35	134.16	135.64	154.45	164.88	178.45	

Output from water heater (annual)$_{1...12}$ 1811.92 (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=	56.91	49.72	51.65	45.66	44.13	38.71	36.86	41.31	41.78	47.78	51.23	55.48	(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=	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	40.33	35.82	29.13	22.05	16.48	13.92	15.04	19.55	26.24	33.31	38.88	41.45	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	270.06	272.86	265.8	250.77	231.79	213.95	202.04	199.23	206.3	221.33	240.31	258.14	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	(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=	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	(71)

Water heating gains (Table 5)

(72)m=	76.49	73.99	69.42	63.41	59.31	53.77	49.54	55.53	58.02	64.22	71.15	74.57	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	480.78	476.57	458.25	430.13	401.49	375.54	360.52	368.21	384.46	412.77	444.24	468.06	(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)	
South	0.9x 0.77	x	15.6	x	46.75	x	0.57	x	0.7	=	201.67	(78)
South	0.9x 0.77	x	15.6	x	76.57	x	0.57	x	0.7	=	330.28	(78)
South	0.9x 0.77	x	15.6	x	97.53	x	0.57	x	0.7	=	420.71	(78)
South	0.9x 0.77	x	15.6	x	110.23	x	0.57	x	0.7	=	475.5	(78)
South	0.9x 0.77	x	15.6	x	114.87	x	0.57	x	0.7	=	495.5	(78)
South	0.9x 0.77	x	15.6	x	110.55	x	0.57	x	0.7	=	476.85	(78)
South	0.9x 0.77	x	15.6	x	108.01	x	0.57	x	0.7	=	465.91	(78)
South	0.9x 0.77	x	15.6	x	104.89	x	0.57	x	0.7	=	452.46	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	15.6	x	101.89	x	0.57	x	0.7	=	439.48	(78)
South	0.9x	0.77	x	15.6	x	82.59	x	0.57	x	0.7	=	356.23	(78)
South	0.9x	0.77	x	15.6	x	55.42	x	0.57	x	0.7	=	239.04	(78)
South	0.9x	0.77	x	15.6	x	40.4	x	0.57	x	0.7	=	174.26	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	201.67	330.28	420.71	475.5	495.5	476.85	465.91	452.46	439.48	356.23	239.04	174.26	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	682.44	806.85	878.96	905.63	896.98	852.39	826.43	820.68	823.94	769	683.28	642.32	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.93	0.86	0.75	0.62	0.48	0.34	0.24	0.25	0.38	0.62	0.86	0.95	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.74	20.87	20.95	20.99	21	21	21	21	21	20.99	20.89	20.71	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.29	20.29	20.29	20.31	20.31	20.32	20.32	20.32	20.32	20.31	20.3	20.3	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.92	0.83	0.72	0.58	0.45	0.31	0.21	0.22	0.35	0.58	0.83	0.94	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.97	20.14	20.24	20.3	20.31	20.32	20.32	20.32	20.32	20.3	20.18	19.93	(90)

fLA = Living area ÷ (4) = 0.58 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.41	20.57	20.65	20.7	20.71	20.72	20.72	20.72	20.71	20.7	20.6	20.38	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.26	20.42	20.5	20.55	20.56	20.57	20.57	20.57	20.56	20.55	20.45	20.23	(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=	0.92	0.84	0.73	0.59	0.46	0.32	0.22	0.23	0.36	0.6	0.84	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	628.4	675.17	641.64	538.57	411.37	272.14	180.93	189.36	297.11	458.32	571.68	602.03	(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=	765.68	741.4	666.57	544.01	412.14	272.18	180.93	189.36	297.22	462.95	625.71	757.28	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	102.13	44.51	18.55	3.91	0.57	0	0	0	0	3.44	38.9	115.5	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 327.52 (98)

Space heating requirement in kWh/m²/year 5.18 (99)

SAP WorkSheet: New dwelling design stage

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	102.13	44.51	18.55	3.91	0.57	0	0	0	0	3.44	38.9	115.5	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	113.1	49.29	20.54	4.34	0.63	0	0	0	0	3.81	43.08	127.91	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 362.71 (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

Output from water heater (calculated above)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
182.74	159.63	166.08	147.31	142.62	125.61	120.35	134.16	135.64	154.45	164.88	178.45

Efficiency of water heater 81 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(217)m=	84.11	82.86	81.85	81.22	81.03	81	81	81	81	81.18	82.62	84.42	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	217.28	192.65	202.92	181.38	176	155.08	148.58	165.63	167.46	190.25	199.55	211.39

Total = Sum(219a)$_{1...12}$ = 2208.16 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		362.71
Water heating fuel used		2208.16
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	148.33	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	178.33 (231)
Electricity for lighting		284.88 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3034.07 (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 =	12.62 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	76.84	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	23.52	(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 =	37.58	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			270.56	(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] =	1.05	(257)
SAP rating (Section 12)		85.35	(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	=	78.34	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	476.96	(264)
Space and water heating	(261) + (262) + (263) + (264) =					555.31	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	92.55	(267)
Electricity for lighting	(232)	x		0.519	=	147.85	(268)
Total CO2, kg/year			sum of (265)…(271) =			795.71	(272)
CO2 emissions per m²			(272) ÷ (4) =			12.59	(273)
EI rating (section 14)						90	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	442.5	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2693.95	(264)
Space and water heating	(261) + (262) + (263) + (264) =					3136.46	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	547.47	(267)
Electricity for lighting	(232)	x		0	=	874.57	(268)
'Total Primary Energy			sum of (265)…(271) =			4558.5	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			72.13	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 511

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	197.09	**(P1)**
Transmission heat loss coefficient:	32.2	
Summer heat loss coefficient:	229.28	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	15.6	112.21	0.57	0.7	0.9	565.72	
						Total	565.72	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	372.54	357.52	365.21	
Total summer gains	958.95	923.24	923.37	**(P5)**
Summer gain/loss ratio	4.18	4.03	4.03	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.43	22.18	22.08	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:16:43

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 601

Address :

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)	20.31 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.46 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	53.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	14m²
Windows facing: West	5.6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 601

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	70.7 m²	2.7 m

Living area:	24.4 m² (fraction 0.345)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	14	1
W	16mm or more	0.7	0.57	1.4	5.6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
W		External	West	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	46.17	19.6	26.57	0.18	0	False	N/A
Corridor	12.48	0	12.48	0.22	0.43	False	N/A
Roof	70.7	0	70.7	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1068

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	17.1	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

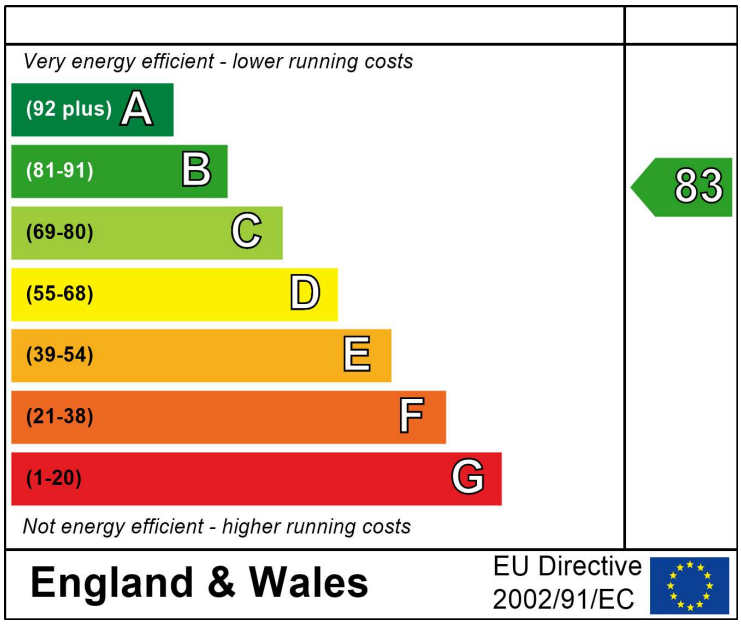
Predicted Energy Assessment

Dwelling type:	Top floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	70.7 m²

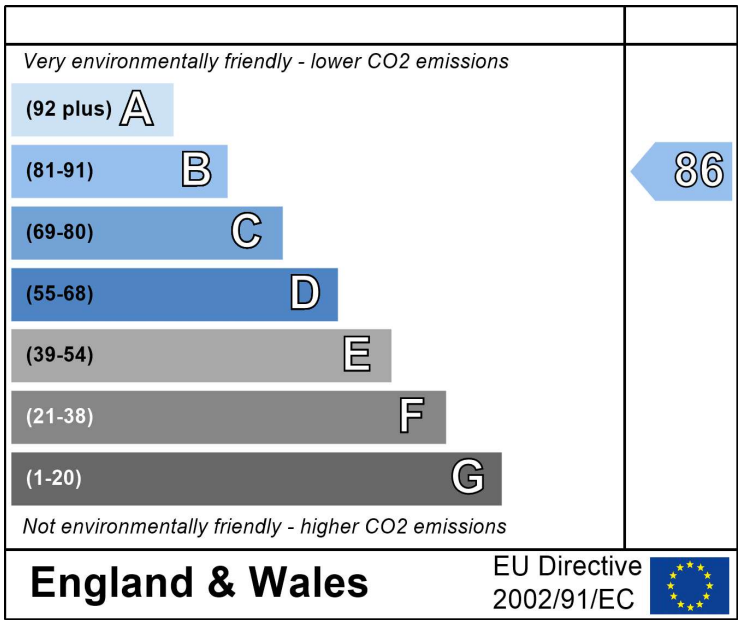
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 601

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.7	(1a) x	2.7	(2a) =	190.89	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		190.89	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			14	x1/[1/(1.4)+ 0.04] =	18.56			(27)
Windows Type 2			5.6	x1/[1/(1.4)+ 0.04] =	7.42			(27)
Walls Type1	46.17	19.6	26.57	x 0.18 =	4.78			(29)
Walls Type2	12.48	0	12.48	x 0.2 =	2.51			(29)
Roof	70.7	0	70.7	x 0.13 =	9.19			(30)
Total area of elements, m²			129.35					(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) = 42.47 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4867.4 (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 13.82 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 56.29 (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=	17.64	17.44	17.24	16.24	16.04	15.03	15.03	14.83	15.43	16.04	16.44	16.84	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	73.93	73.73	73.53	72.52	72.32	71.32	71.32	71.12	71.72	72.32	72.73	73.13	

Average = Sum(39)$_{1...12}$ /12= 72.47 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.05	1.04	1.04	1.03	1.02	1.01	1.01	1.01	1.01	1.02	1.03	1.03

Average = Sum(40)$_{1...12}$ /12= 1.03 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.26 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.95 (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=	96.74	93.22	89.71	86.19	82.67	79.15	79.15	82.67	86.19	89.71	93.22	96.74

Total = Sum(44)$_{1...12}$ = 1055.35 (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=	143.46	125.47	129.48	112.88	108.31	93.47	86.61	99.39	100.57	117.21	127.94	138.94

Total = Sum(45)$_{1...12}$ = 1383.74 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.52	18.82	19.42	16.93	16.25	14.02	12.99	14.91	15.09	17.58	19.19	20.84

(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 dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	49.3	42.91	45.71	42.5	42.13	39.03	40.33	42.13	42.5	45.71	45.97	49.3	(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=	192.76	168.38	175.19	155.39	150.44	132.5	126.94	141.51	143.08	162.92	173.92	188.24	(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=	192.76	168.38	175.19	155.39	150.44	132.5	126.94	141.51	143.08	162.92	173.92	188.24	

Output from water heater (annual)$_{1...12}$ 1911.27 (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=	60.03	52.45	54.48	48.16	46.55	40.84	38.88	43.58	44.07	50.4	54.03	58.52	(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=	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	44.34	39.38	32.02	24.24	18.12	15.3	16.53	21.49	28.84	36.62	42.75	45.57	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	296.9	299.98	292.22	275.69	254.83	235.22	222.12	219.04	226.8	243.33	264.19	283.8	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	(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=	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	(71)

Water heating gains (Table 5)

(72)m=	80.68	78.05	73.23	66.89	62.56	56.72	52.26	58.57	61.2	67.74	75.05	78.66	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	521.02	516.51	496.57	465.93	434.61	406.34	390.01	398.2	415.95	446.8	481.09	507.13	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	14	x	10.63	x	0.57	x	0.7	=	41.16	(74)
North	0.9x 0.77	x	14	x	20.32	x	0.57	x	0.7	=	78.66	(74)
North	0.9x 0.77	x	14	x	34.53	x	0.57	x	0.7	=	133.67	(74)
North	0.9x 0.77	x	14	x	55.46	x	0.57	x	0.7	=	214.71	(74)
North	0.9x 0.77	x	14	x	74.72	x	0.57	x	0.7	=	289.23	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	14	x	79.99	x	0.57	x	0.7	=	309.63	(74)
North	0.9x	0.77	x	14	x	74.68	x	0.57	x	0.7	=	289.08	(74)
North	0.9x	0.77	x	14	x	59.25	x	0.57	x	0.7	=	229.35	(74)
North	0.9x	0.77	x	14	x	41.52	x	0.57	x	0.7	=	160.71	(74)
North	0.9x	0.77	x	14	x	24.19	x	0.57	x	0.7	=	93.64	(74)
North	0.9x	0.77	x	14	x	13.12	x	0.57	x	0.7	=	50.78	(74)
North	0.9x	0.77	x	14	x	8.86	x	0.57	x	0.7	=	34.32	(74)
West	0.9x	0.77	x	5.6	x	19.64	x	0.57	x	0.7	=	30.41	(80)
West	0.9x	0.77	x	5.6	x	38.42	x	0.57	x	0.7	=	59.49	(80)
West	0.9x	0.77	x	5.6	x	63.27	x	0.57	x	0.7	=	97.97	(80)
West	0.9x	0.77	x	5.6	x	92.28	x	0.57	x	0.7	=	142.89	(80)
West	0.9x	0.77	x	5.6	x	113.09	x	0.57	x	0.7	=	175.12	(80)
West	0.9x	0.77	x	5.6	x	115.77	x	0.57	x	0.7	=	179.26	(80)
West	0.9x	0.77	x	5.6	x	110.22	x	0.57	x	0.7	=	170.67	(80)
West	0.9x	0.77	x	5.6	x	94.68	x	0.57	x	0.7	=	146.6	(80)
West	0.9x	0.77	x	5.6	x	73.59	x	0.57	x	0.7	=	113.95	(80)
West	0.9x	0.77	x	5.6	x	45.59	x	0.57	x	0.7	=	70.59	(80)
West	0.9x	0.77	x	5.6	x	24.49	x	0.57	x	0.7	=	37.92	(80)
West	0.9x	0.77	x	5.6	x	16.15	x	0.57	x	0.7	=	25.01	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	71.57	138.16	231.64	357.6	464.35	488.89	459.75	375.95	274.66	164.23	88.7	59.32

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	592.6	654.67	728.22	823.52	898.96	895.23	849.76	774.15	690.61	611.03	569.79	566.45

(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	0.87	0.7	0.5	0.37	0.42	0.68	0.92	0.98	0.99

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.12	20.26	20.5	20.78	20.95	20.99	21	21	20.97	20.74	20.39	20.1

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.05	20.05	20.05	20.06	20.06	20.08	20.08	20.08	20.07	20.06	20.06	20.05

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.94	0.84	0.65	0.43	0.29	0.34	0.6	0.89	0.97	0.99

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.9	19.1	19.44	19.83	20.02	20.07	20.08	20.08	20.05	19.78	19.29	18.86

(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.32	19.5	19.8	20.16	20.34	20.39	20.39	20.4	20.36	20.11	19.67	19.29

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.17	19.35	19.65	20.01	20.19	20.24	20.24	20.25	20.21	19.96	19.52	19.14	(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=	0.98	0.97	0.94	0.84	0.65	0.45	0.31	0.35	0.62	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	582.87	636.01	682.6	689.24	588.03	399.67	259.67	272.95	425.07	541.86	552.21	558.87	(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=	1099.35	1065.5	967.14	805.49	613.82	402.22	259.91	273.47	438.55	677.3	903.06	1092.48	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	384.26	288.61	211.7	83.7	19.18	0	0	0	0	100.77	252.61	397.01	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1737.85 (98)

Space heating requirement in kWh/m²/year 24.58 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	384.26	288.61	211.7	83.7	19.18	0	0	0	0	100.77	252.61	397.01	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	425.54	319.62	234.44	92.69	21.24	0	0	0	0	111.6	279.75	439.66	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1924.53 (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

Output from water heater (calculated above)

	192.76	168.38	175.19	155.39	150.44	132.5	126.94	141.51	143.08	162.92	173.92	188.24	

Efficiency of water heater 81 (216)

(217)m=	86.96	86.63	85.84	84.03	81.95	81	81	81	81	84.32	86.26	87.08	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	221.66	194.36	204.1	184.92	183.57	163.58	156.72	174.71	176.64	193.22	201.61	216.15	

Total = Sum(219a)$_{1...12}$ = 2271.23 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1924.53

SAP WorkSheet: New dwelling design stage

Water heating fuel used			2271.23	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		165.93		(230a)
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		195.93	(231)
Electricity for lighting			313.19	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4704.88	(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 =	66.97	(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 =	79.04	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	25.84	(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 =	41.31	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				333.17	(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] =	1.21	(257)
SAP rating (Section 12)		83.13	(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	=	415.7	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	490.59	(264)
Space and water heating	(261) + (262) + (263) + (264) =				906.28	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	101.69	(267)
Electricity for lighting	(232) x		0.519	=	162.55	(268)
Total CO2, kg/year	sum of (265)…(271) =				1170.52	(272)
CO2 emissions per m²	(272) ÷ (4) =				16.56	(273)
EI rating (section 14)					86	(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	2347.92	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2770.9	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5118.83	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	601.51	(267)
Electricity for lighting	(232)	x	0	=	961.51	(268)
'Total Primary Energy			sum of (265)…(271) =		6681.84	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		94.51	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 601

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	220.48	**(P1)**
Transmission heat loss coefficient:	56.3	
Summer heat loss coefficient:	276.77	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	14	81.19	0.57	0.7	0.9	367.34	
West (W)	0.9 x	5.6	117.51	0.57	0.7	0.9	212.67	
						Total	580.01	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	403.34	387.01	395.2	
Total summer gains	1026.5	967.02	880.97	**(P5)**
Summer gain/loss ratio	3.71	3.49	3.18	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.96	21.64	21.23	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:16:39

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 71.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 602

Address :

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)	19.85 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.05 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	14m²
Windows facing: West	5.6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 602

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 10 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 503

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	71.7 m²	2.7 m

Living area: 24.4 m² (fraction 0.345)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	14	1
W	16mm or more	0.7	0.57	1.4	5.6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	31.05	19.6	11.45	0.18	0	False	N/A
Corridor	34.08	0	34.08	0.22	0.43	False	N/A
Roof	71.7	0	71.7	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0781

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	11.5	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

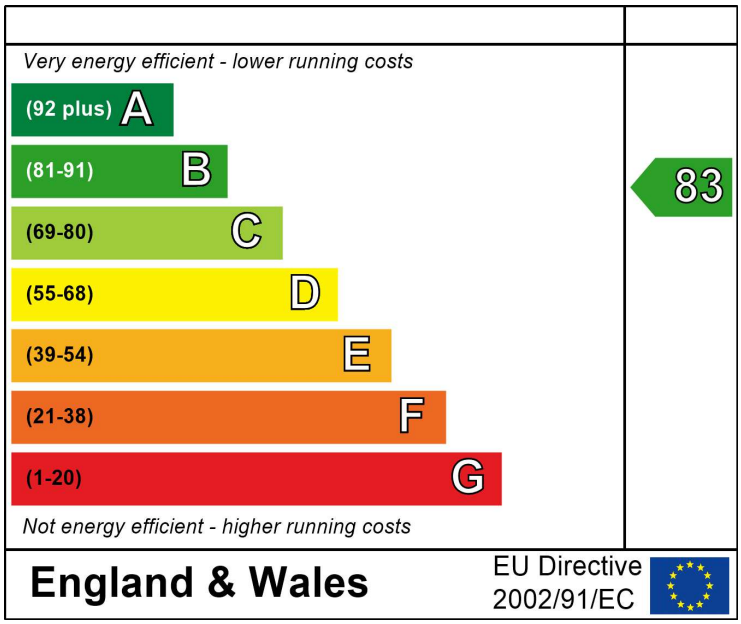
Predicted Energy Assessment

Dwelling type:	Top floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	71.7 m²

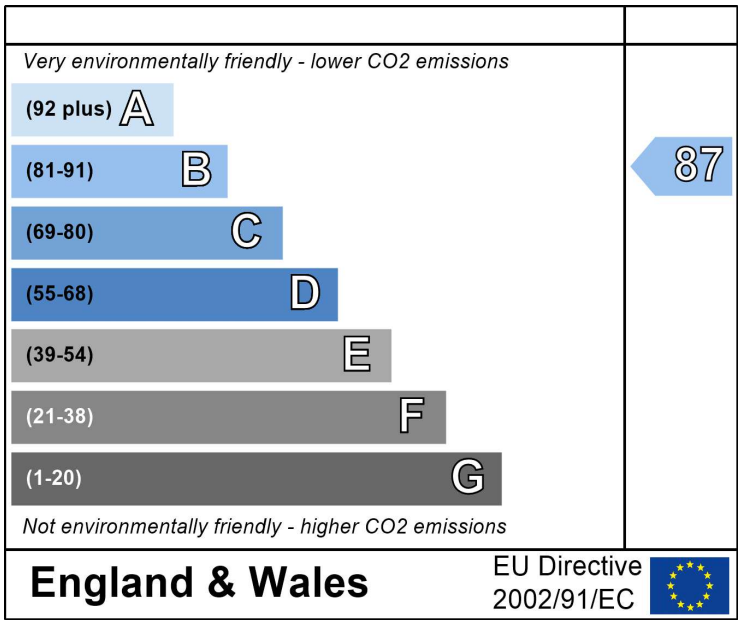
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 602

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	71.7 (1a)	x	2.7 (2a)	=	193.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	71.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	193.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			14	x1/[1/(1.4)+ 0.04] =	18.56			(27)
Windows Type 2			5.6	x1/[1/(1.4)+ 0.04] =	7.42			(27)
Walls Type1	31.05	19.6	11.45	x 0.18 =	2.06			(29)
Walls Type2	34.08	0	34.08	x 0.2 =	6.85			(29)
Roof	71.7	0	71.7	x 0.13 =	9.32			(30)
Total area of elements, m²			136.83					(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) = 44.22 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7922 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.69 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 54.9 (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=	17.89	17.69	17.48	16.47	16.26	15.24	15.24	15.04	15.65	16.26	16.67	17.08	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	72.79	72.59	72.39	71.37	71.16	70.15	70.15	69.94	70.55	71.16	71.57	71.98	

Average = Sum(39)$_{1...12}$ /12= 71.32 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.02	1.01	1.01	1	0.99	0.98	0.98	0.98	0.98	0.99	1	1

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.29 (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 88.51 (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=	97.36	93.82	90.28	86.74	83.2	79.66	79.66	83.2	86.74	90.28	93.82	97.36

Total = Sum(44)$_{1...12}$ = 1062.1 (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=	144.38	126.28	130.31	113.6	109.01	94.06	87.16	100.02	101.22	117.96	128.76	139.83

Total = Sum(45)$_{1...12}$ = 1392.59 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.66	18.94	19.55	17.04	16.35	14.11	13.07	15	15.18	17.69	19.31	20.97

(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 dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	49.61	43.18	46.01	42.78	42.4	39.28	40.59	42.4	42.78	46.01	46.27	49.61	(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=	193.99	169.46	176.31	156.38	151.4	133.35	127.76	142.42	143.99	163.96	175.03	189.44	(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=	193.99	169.46	176.31	156.38	151.4	133.35	127.76	142.42	143.99	163.96	175.03	189.44	

Output from water heater (annual)$_{1...12}$ 1923.49 (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=	60.41	52.78	54.83	48.47	46.84	41.1	39.13	43.86	44.35	50.72	54.38	58.9	(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=	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	44.85	39.84	32.4	24.53	18.33	15.48	16.72	21.74	29.18	37.05	43.24	46.1	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	300.35	303.46	295.61	278.89	257.78	237.95	224.69	221.58	229.43	246.15	267.26	287.09	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	(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=	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	(71)

Water heating gains (Table 5)

(72)m=	81.2	78.55	73.69	67.32	62.96	57.08	52.59	58.95	61.59	68.18	75.53	79.16	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	526.13	521.58	501.44	470.47	438.82	410.24	393.75	402	419.94	451.12	485.77	512.09	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	14	x	10.63	x	0.57	x	0.7	=	41.16	(74)
North	0.9x 0.77	x	14	x	20.32	x	0.57	x	0.7	=	78.66	(74)
North	0.9x 0.77	x	14	x	34.53	x	0.57	x	0.7	=	133.67	(74)
North	0.9x 0.77	x	14	x	55.46	x	0.57	x	0.7	=	214.71	(74)
North	0.9x 0.77	x	14	x	74.72	x	0.57	x	0.7	=	289.23	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	14	x	79.99	x	0.57	x	0.7	=	309.63	(74)
North	0.9x	0.77	x	14	x	74.68	x	0.57	x	0.7	=	289.08	(74)
North	0.9x	0.77	x	14	x	59.25	x	0.57	x	0.7	=	229.35	(74)
North	0.9x	0.77	x	14	x	41.52	x	0.57	x	0.7	=	160.71	(74)
North	0.9x	0.77	x	14	x	24.19	x	0.57	x	0.7	=	93.64	(74)
North	0.9x	0.77	x	14	x	13.12	x	0.57	x	0.7	=	50.78	(74)
North	0.9x	0.77	x	14	x	8.86	x	0.57	x	0.7	=	34.32	(74)
West	0.9x	0.77	x	5.6	x	19.64	x	0.57	x	0.7	=	30.41	(80)
West	0.9x	0.77	x	5.6	x	38.42	x	0.57	x	0.7	=	59.49	(80)
West	0.9x	0.77	x	5.6	x	63.27	x	0.57	x	0.7	=	97.97	(80)
West	0.9x	0.77	x	5.6	x	92.28	x	0.57	x	0.7	=	142.89	(80)
West	0.9x	0.77	x	5.6	x	113.09	x	0.57	x	0.7	=	175.12	(80)
West	0.9x	0.77	x	5.6	x	115.77	x	0.57	x	0.7	=	179.26	(80)
West	0.9x	0.77	x	5.6	x	110.22	x	0.57	x	0.7	=	170.67	(80)
West	0.9x	0.77	x	5.6	x	94.68	x	0.57	x	0.7	=	146.6	(80)
West	0.9x	0.77	x	5.6	x	73.59	x	0.57	x	0.7	=	113.95	(80)
West	0.9x	0.77	x	5.6	x	45.59	x	0.57	x	0.7	=	70.59	(80)
West	0.9x	0.77	x	5.6	x	24.49	x	0.57	x	0.7	=	37.92	(80)
West	0.9x	0.77	x	5.6	x	16.15	x	0.57	x	0.7	=	25.01	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	71.57	138.16	231.64	357.6	464.35	488.89	459.75	375.95	274.66	164.23	88.7	59.32

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	597.71	659.74	733.08	828.07	903.17	899.14	853.5	777.95	694.61	615.35	574.47	571.42

(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	0.87	0.69	0.49	0.36	0.41	0.67	0.92	0.98	0.99

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.16	20.3	20.53	20.8	20.95	20.99	21	21	20.97	20.76	20.42	20.14

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.07	20.07	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.08	20.08

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.94	0.83	0.64	0.43	0.29	0.33	0.59	0.89	0.97	0.99

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.97	19.17	19.5	19.87	20.05	20.1	20.1	20.1	20.08	19.83	19.35	18.94

(90)

fLA = Living area ÷ (4) = 0.34 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.38	19.56	19.85	20.19	20.36	20.4	20.41	20.41	20.38	20.15	19.72	19.35

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.23	19.41	19.7	20.04	20.21	20.25	20.26	20.26	20.23	20	19.57	19.2	(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=	0.98	0.97	0.94	0.83	0.65	0.44	0.3	0.35	0.61	0.88	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	587.82	640.66	686.04	688.82	583.11	394.5	256.33	269.42	421.15	543.36	556.4	563.73	(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=	1086.65	1053.02	955.57	795.06	605.35	396.54	256.51	269.83	432.57	668.9	892.26	1079.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	371.12	277.1	200.53	76.49	16.55	0	0	0	0	93.4	241.82	383.77	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1660.78 (98)

Space heating requirement in kWh/m²/year 23.16 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	371.12	277.1	200.53	76.49	16.55	0	0	0	0	93.4	241.82	383.77	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	410.99	306.87	222.07	84.71	18.33	0	0	0	0	103.43	267.79	424.99	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1839.18 (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

Output from water heater (calculated above)

	193.99	169.46	176.31	156.38	151.4	133.35	127.76	142.42	143.99	163.96	175.03	189.44

Efficiency of water heater 81 (216)

(217)m=	86.88	86.53	85.7	83.84	81.83	81	81	81	81	84.15	86.15	87	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	223.3	195.84	205.74	186.53	185.02	164.63	157.72	175.83	177.77	194.86	203.17	217.75	

Total = Sum(219a)$_{1...12}$ = 2288.15 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1839.18

SAP WorkSheet: New dwelling design stage

Water heating fuel used			2288.15	
Electricity for pumps, fans and electric keep-hot				
mechanical ventilation - balanced, extract or positive input from outside		168.28		(230a)
central heating pump:		30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =		198.28	(231)
Electricity for lighting			316.83	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =			4642.44	(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 =	64	(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 =	79.63	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	26.15	(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 =	41.79	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				331.57	(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] =	1.19	(257)
SAP rating (Section 12)	83.35	(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	=	397.26	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	494.24	(264)
Space and water heating	(261) + (262) + (263) + (264) =				891.5	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	102.91	(267)
Electricity for lighting	(232) x		0.519	=	164.43	(268)
Total CO2, kg/year	sum of (265)…(271) =				1158.84	(272)
CO2 emissions per m²	(272) ÷ (4) =				16.16	(273)
EI rating (section 14)					87	(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	2243.8	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2791.55	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5035.35	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	608.71	(267)
Electricity for lighting	(232)	x	0	=	972.65	(268)
'Total Primary Energy			sum of (265)…(271) =		6616.72	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		92.28	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 602

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	223.6	**(P1)**
Transmission heat loss coefficient:	54.9	
Summer heat loss coefficient:	278.5	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	14	81.19	0.57	0.7	0.9	367.34	
West (W)	0.9 x	5.6	117.51	0.57	0.7	0.9	212.67	
						Total	580.01	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	407.24	390.75	399	
Total summer gains	1030.41	970.76	884.78	**(P5)**
Summer gain/loss ratio	3.7	3.49	3.18	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.95	21.64	21.23	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:16:34

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 85.7m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 603

Address :

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)	20.11 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.67 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	57.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	15.6m²
Windows facing: North	11.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 603

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	85.7 m²	2.7 m
Living area:	36.7 m² (fraction 0.428)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
E	16mm or more	0.7	0.57	1.4	15.6	1
N	16mm or more	0.7	0.57	1.4	11.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
E		External	East	0	0
N		External	North	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.21	27	33.21	0.18	0	False	N/A
Corridor	38.88	0	38.88	0.22	0.43	False	N/A
Flat	85.7	0	85.7	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0906

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	22.3	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

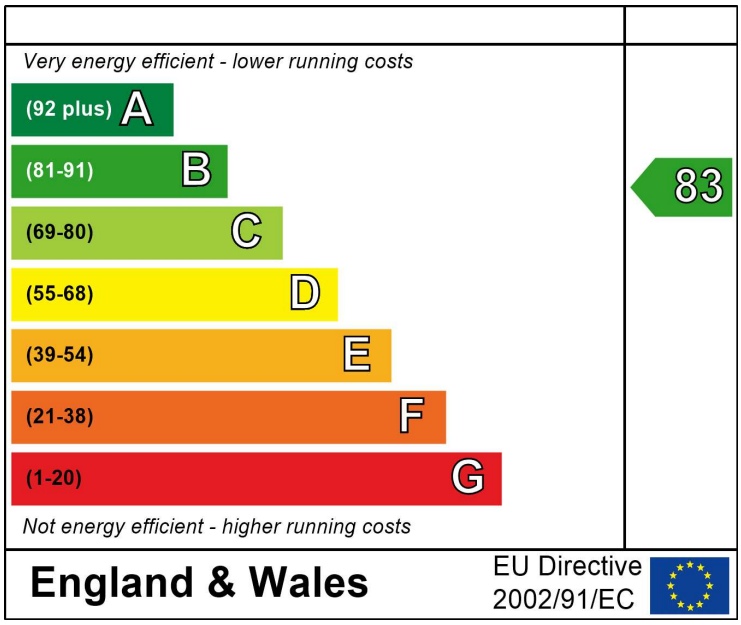
Predicted Energy Assessment

Dwelling type:	Top floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	85.7 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 603

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.7	(1a) x	2.7	(2a) =	231.39	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	85.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		231.39	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			15.6	x1/[1/(1.4)+ 0.04] =	20.68			(27)
Windows Type 2			11.4	x1/[1/(1.4)+ 0.04] =	15.11			(27)
Walls Type1	60.21	27	33.21	x 0.18 =	5.98			(29)
Walls Type2	38.88	0	38.88	x 0.2 =	7.81			(29)
Roof	85.7	0	85.7	x 0.13 =	11.14			(30)
Total area of elements, m²			184.79					(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) = 60.73 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10483.2 (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 16.73 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 77.46 (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=	21.39	21.14	20.9	19.68	19.44	18.22	18.22	17.98	18.71	19.44	19.92	20.41	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	98.85	98.6	98.36	97.14	96.9	95.68	95.68	95.44	96.17	96.9	97.39	97.87	

Average = Sum(39)$_{1...12}$ /12= 97.08 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.15	1.15	1.15	1.13	1.13	1.12	1.12	1.11	1.12	1.13	1.14	1.14

Average = Sum(40)$_{1...12}$ /12= 1.13 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.56 (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 95.05 (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=	104.56	100.75	96.95	93.15	89.35	85.55	85.55	89.35	93.15	96.95	100.75	104.56

Total = Sum(44)$_{1...12}$ = 1140.62 (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=	155.05	135.61	139.94	122	117.06	101.02	93.61	107.42	108.7	126.68	138.28	150.16

Total = Sum(45)$_{1...12}$ = 1495.53 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.26	20.34	20.99	18.3	17.56	15.15	14.04	16.11	16.3	19	20.74	22.52

(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 dwelling design stage

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	46.03	49.41	45.94	45.53	42.19	43.59	45.53	45.94	49.41	49.32	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	206.01	181.64	189.35	167.94	162.6	143.2	137.2	152.95	154.64	176.08	187.59	201.12	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	206.01	181.64	189.35	167.94	162.6	143.2	137.2	152.95	154.64	176.08	187.59	201.12	

Output from water heater (annual)$_{1...12}$ 2060.32 (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=	64.3	56.6	58.88	52.05	50.31	44.14	42.02	47.1	47.63	54.47	58.31	62.67	(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=	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	51.47	45.72	37.18	28.15	21.04	17.76	19.19	24.95	33.49	42.52	49.62	52.9	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	344.69	348.26	339.25	320.06	295.84	273.08	257.87	254.29	263.3	282.49	306.71	329.48	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	(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=	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	(71)

Water heating gains (Table 5)

(72)m=	86.42	84.22	79.14	72.29	67.62	61.3	56.48	63.3	66.15	73.22	80.98	84.23	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	589.76	585.38	562.75	527.68	491.68	459.32	440.72	449.72	470.12	505.4	544.5	573.79	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	11.4	x	10.63	x	0.57	x	0.7	=	33.52	(74)
North	0.9x 0.77	x	11.4	x	20.32	x	0.57	x	0.7	=	64.06	(74)
North	0.9x 0.77	x	11.4	x	34.53	x	0.57	x	0.7	=	108.85	(74)
North	0.9x 0.77	x	11.4	x	55.46	x	0.57	x	0.7	=	174.83	(74)
North	0.9x 0.77	x	11.4	x	74.72	x	0.57	x	0.7	=	235.52	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	11.4	x	79.99	x	0.57	x	0.7	=	252.13	(74)
North	0.9x	0.77	x	11.4	x	74.68	x	0.57	x	0.7	=	235.39	(74)
North	0.9x	0.77	x	11.4	x	59.25	x	0.57	x	0.7	=	186.76	(74)
North	0.9x	0.77	x	11.4	x	41.52	x	0.57	x	0.7	=	130.87	(74)
North	0.9x	0.77	x	11.4	x	24.19	x	0.57	x	0.7	=	76.25	(74)
North	0.9x	0.77	x	11.4	x	13.12	x	0.57	x	0.7	=	41.35	(74)
North	0.9x	0.77	x	11.4	x	8.86	x	0.57	x	0.7	=	27.94	(74)
East	0.9x	0.77	x	15.6	x	19.64	x	0.57	x	0.7	=	84.72	(76)
East	0.9x	0.77	x	15.6	x	38.42	x	0.57	x	0.7	=	165.73	(76)
East	0.9x	0.77	x	15.6	x	63.27	x	0.57	x	0.7	=	272.93	(76)
East	0.9x	0.77	x	15.6	x	92.28	x	0.57	x	0.7	=	398.05	(76)
East	0.9x	0.77	x	15.6	x	113.09	x	0.57	x	0.7	=	487.83	(76)
East	0.9x	0.77	x	15.6	x	115.77	x	0.57	x	0.7	=	499.38	(76)
East	0.9x	0.77	x	15.6	x	110.22	x	0.57	x	0.7	=	475.43	(76)
East	0.9x	0.77	x	15.6	x	94.68	x	0.57	x	0.7	=	408.39	(76)
East	0.9x	0.77	x	15.6	x	73.59	x	0.57	x	0.7	=	317.43	(76)
East	0.9x	0.77	x	15.6	x	45.59	x	0.57	x	0.7	=	196.65	(76)
East	0.9x	0.77	x	15.6	x	24.49	x	0.57	x	0.7	=	105.63	(76)
East	0.9x	0.77	x	15.6	x	16.15	x	0.57	x	0.7	=	69.67	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	118.24	229.78	381.77	572.88	723.34	751.51	710.82	595.14	448.3	272.9	146.98	97.61	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	707.99	815.17	944.53	1100.57	1215.02	1210.82	1151.54	1044.86	918.41	778.3	691.48	671.4	(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	0.95	0.86	0.69	0.5	0.36	0.42	0.68	0.92	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.96	20.14	20.42	20.75	20.93	20.99	21	21	20.96	20.68	20.26	19.93	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.96	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.98	19.98	19.97	19.97	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.94	0.83	0.63	0.42	0.28	0.33	0.6	0.89	0.98	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.6	18.86	19.26	19.71	19.92	19.98	19.99	19.99	19.95	19.63	19.04	18.56	(90)

fLA = Living area ÷ (4) = 0.43 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.18	19.4	19.76	20.15	20.35	20.41	20.42	20.42	20.38	20.08	19.56	19.14	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.03	19.25	19.61	20	20.2	20.26	20.27	20.27	20.23	19.93	19.41	18.99	(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=	0.99	0.97	0.93	0.83	0.64	0.44	0.3	0.35	0.62	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	698.08	792.74	882.28	910.27	783.49	537.07	350.61	368.26	566.36	694.03	672.91	663.92	(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=	1456.2	1415.4	1289.42	1078.57	823.94	541.88	351.16	369.38	589.69	904.24	1199.17	1447.89	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	564.04	418.43	302.91	121.18	30.1	0	0	0	0	156.4	378.91	583.27	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2555.23 (98)

Space heating requirement in kWh/m²/year 29.82 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 90.3 (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)													
	564.04	418.43	302.91	121.18	30.1	0	0	0	0	156.4	378.91	583.27	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	624.63	463.38	335.45	134.19	33.33	0	0	0	0	173.2	419.61	645.93	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2829.71 (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

Output from water heater (calculated above)

	206.01	181.64	189.35	167.94	162.6	143.2	137.2	152.95	154.64	176.08	187.59	201.12

Efficiency of water heater 81 (216)

(217)m=	87.61	87.27	86.48	84.65	82.32	81	81	81	81	85.12	86.99	87.72	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	235.15	208.14	218.95	198.38	197.51	176.8	169.38	188.82	190.91	206.86	215.64	229.28	

Total = Sum(219a)$_{1...12}$ = 2435.82 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 2829.71

SAP WorkSheet: New dwelling design stage

Water heating fuel used		2435.82	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	201.14		(230a)
central heating pump:	30		(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	231.14	(231)
Electricity for lighting		363.6	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		5860.27	(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 =	98.47	(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 =	84.77	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	30.49	(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 =	47.96	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				381.69	(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] =	1.23	(257)
SAP rating (Section 12)	82.89	(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	=	611.22	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	526.14	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1137.35	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	119.96	(267)
Electricity for lighting	(232)	x	0.519	=	188.71	(268)
Total CO2, kg/year	sum of (265)…(271) =				1446.02	(272)
CO2 emissions per m²	(272) ÷ (4) =				16.87	(273)
EI rating (section 14)					85	(274)

SAP WorkSheet: New dwelling design stage

13a. Primary Energy

	Energy kWh/year		Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211)	x	1.22	=	3452.24	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2971.7	(264)
Space and water heating	(261) + (262) + (263) + (264) =				6423.95	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	709.59	(267)
Electricity for lighting	(232)	x	0	=	1116.25	(268)
'Total Primary Energy			sum of (265)…(271) =		8249.79	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		96.26	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 603

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	267.26	**(P1)**
Transmission heat loss coefficient:	77.5	
Summer heat loss coefficient:	344.72	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
East (E)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
East (E)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
East (E)	0.9 x	15.6	117.51	0.57	0.7	0.9	592.44	
North (N)	0.9 x	11.4	81.19	0.57	0.7	0.9	299.12	
						Total	891.56	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	456.32	437.72	446.72	
Total summer gains	1408.82	1329.28	1211.14	**(P5)**
Summer gain/loss ratio	4.09	3.86	3.51	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.34	22.01	21.56	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:16:30

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 66m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 604

Address :

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)	17.48 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.91 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	19.5m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 604

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 10 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 503

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	66 m²	2.7 m

Living area: 36.7 m² (fraction 0.428)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
S	16mm or more	0.7	0.57	1.4	19.5	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	30.78	19.5	11.28	0.18	0	False	N/A
Corridor	23.04	0	23.04	0.22	0.43	False	N/A
Flat	66	0	66	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0887

	Length	Psi-value		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	11.4	0.56	E15	Flat roof with parapet

SAP Input

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

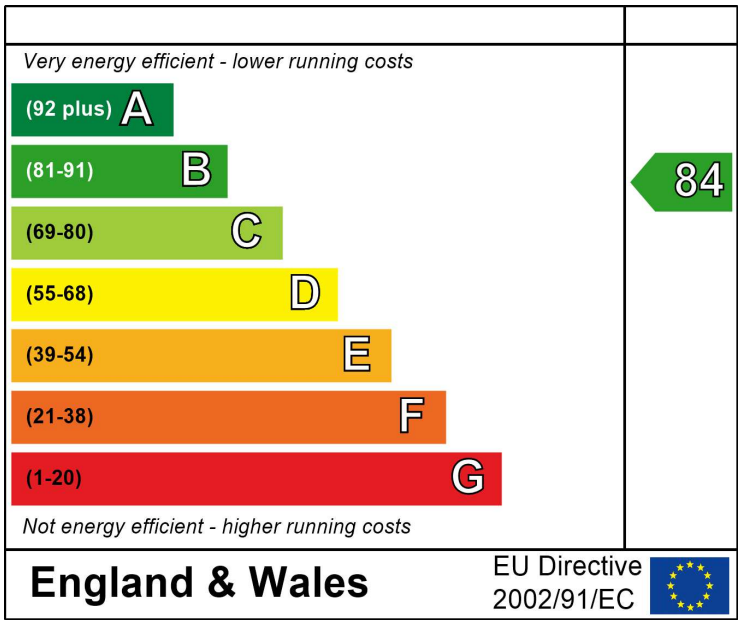
Predicted Energy Assessment

Dwelling type:	Top floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	66 m²

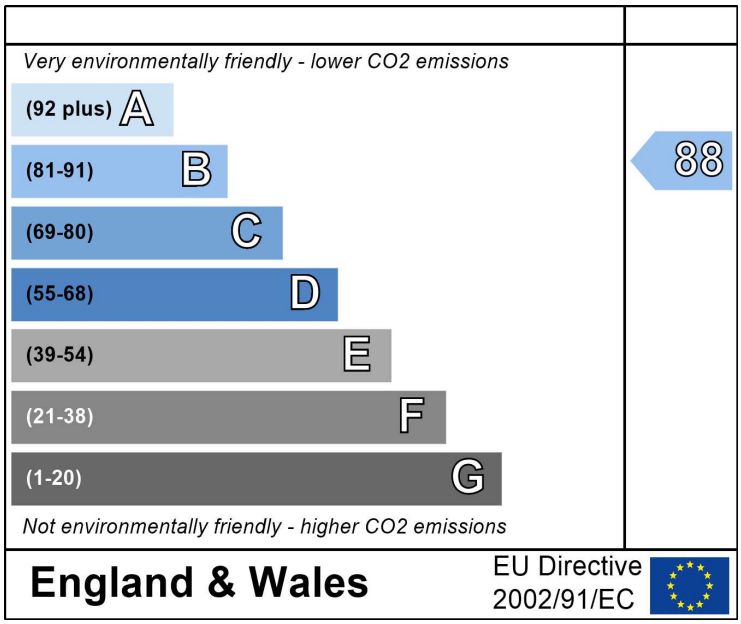
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 604

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	66 (1a)	x	2.7 (2a)	=	178.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	66 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	178.2	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			19.5	x1/[1/(1.4)+ 0.04] =	25.85			(27)
Walls Type1	30.78	19.5	11.28	x 0.18 =	2.03			(29)
Walls Type2	23.04	0	23.04	x 0.2 =	4.63			(29)
Roof	66	0	66	x 0.13 =	8.58			(30)
Total area of elements, m²			119.82					(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) = 41.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5761.2 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.63 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 51.72 (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=	16.47	16.28	16.09	15.16	14.97	14.03	14.03	13.85	14.41	14.97	15.34	15.72	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	68.19	68	67.82	66.88	66.69	65.75	65.75	65.57	66.13	66.69	67.07	67.44	

Average = Sum(39)$_{1...12}$ /12= 66.83 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.03	1.01	1.01	1	1	0.99	1	1.01	1.02	1.02	

Average = Sum(40)$_{1...12}$ /12= 1.01 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.15 (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 85.15 (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=	93.66	90.26	86.85	83.45	80.04	76.63	76.63	80.04	83.45	86.85	90.26	93.66	

Total = Sum(44)$_{1...12}$ = 1021.79 (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=	138.9	121.48	125.36	109.29	104.87	90.49	83.86	96.23	97.38	113.48	123.87	134.52	

Total = Sum(45)$_{1...12}$ = 1339.73 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.84	18.22	18.8	16.39	15.73	13.57	12.58	14.43	14.61	17.02	18.58	20.18	(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=	47.73	41.54	44.26	41.15	40.79	37.79	39.05	40.79	41.15	44.26	44.51	47.73	(61)

SAP WorkSheet: New dwelling design stage

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=	186.63	163.03	169.62	150.44	145.66	128.29	122.91	137.01	138.53	157.74	168.38	182.25	(62)

Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)

(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)

(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)

Output from water heater

(64)m=	186.63	163.03	169.62	150.44	145.66	128.29	122.91	137.01	138.53	157.74	168.38	182.25	

Output from water heater (annual)$_{1...12}$ 1850.49 (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=	58.12	50.78	52.75	46.63	45.07	39.54	37.65	42.19	42.67	48.8	52.32	56.66	(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=	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.85	37.17	30.23	22.89	17.11	14.44	15.61	20.29	27.23	34.57	40.35	43.02	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	280.28	283.19	275.86	260.26	240.56	222.05	209.68	206.77	214.1	229.71	249.4	267.91	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	(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=	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	(71)

Water heating gains (Table 5)

(72)m=	78.11	75.56	70.9	64.76	60.57	54.91	50.6	56.71	59.26	65.59	72.66	76.16	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	496.17	491.85	472.91	443.83	414.16	387.33	371.81	379.69	396.51	425.79	458.34	483.01	(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)	
South	0.9x 0.77	x	19.5	x	46.75	x	0.57	x	0.7	=	252.08	(78)
South	0.9x 0.77	x	19.5	x	76.57	x	0.57	x	0.7	=	412.85	(78)
South	0.9x 0.77	x	19.5	x	97.53	x	0.57	x	0.7	=	525.89	(78)
South	0.9x 0.77	x	19.5	x	110.23	x	0.57	x	0.7	=	594.37	(78)
South	0.9x 0.77	x	19.5	x	114.87	x	0.57	x	0.7	=	619.37	(78)
South	0.9x 0.77	x	19.5	x	110.55	x	0.57	x	0.7	=	596.06	(78)
South	0.9x 0.77	x	19.5	x	108.01	x	0.57	x	0.7	=	582.39	(78)
South	0.9x 0.77	x	19.5	x	104.89	x	0.57	x	0.7	=	565.58	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	19.5	x	101.89	x	0.57	x	0.7	=	549.36	(78)
South	0.9x	0.77	x	19.5	x	82.59	x	0.57	x	0.7	=	445.29	(78)
South	0.9x	0.77	x	19.5	x	55.42	x	0.57	x	0.7	=	298.8	(78)
South	0.9x	0.77	x	19.5	x	40.4	x	0.57	x	0.7	=	217.82	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	252.08	412.85	525.89	594.37	619.37	596.06	582.39	565.58	549.36	445.29	298.8	217.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	748.25	904.69	998.8	1038.2	1033.54	983.39	954.2	945.27	945.87	871.08	757.14	700.83	(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=	0.96	0.91	0.84	0.73	0.59	0.43	0.3	0.32	0.48	0.74	0.92	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.39	20.61	20.79	20.92	20.98	21	21	21	20.99	20.93	20.66	20.34	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.06	20.06	20.06	20.07	20.07	20.09	20.09	20.09	20.08	20.07	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.9	0.81	0.68	0.53	0.37	0.24	0.26	0.42	0.69	0.9	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.29	19.59	19.82	19.99	20.06	20.08	20.09	20.09	20.08	20	19.67	19.22	(90)

fLA = Living area ÷ (4) = 0.56 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.9	20.16	20.36	20.51	20.57	20.59	20.59	20.6	20.59	20.52	20.22	19.85	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.75	20.01	20.21	20.36	20.42	20.44	20.44	20.45	20.44	20.37	20.07	19.7	(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=	0.95	0.89	0.81	0.7	0.55	0.39	0.26	0.28	0.44	0.7	0.9	0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	710.97	809.09	813.47	723.45	571	382.98	252.67	265.09	416.68	613.3	681.13	673.49	(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=	1053.69	1027.31	929.8	766.26	581.5	384.14	252.77	265.23	419.1	651.35	869.68	1045.06	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	254.98	146.64	86.55	30.82	7.81	0	0	0	0	28.31	135.76	276.45	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 967.32 (98)

Space heating requirement in kWh/m²/year 14.66 (99)

SAP WorkSheet: New dwelling design stage

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	254.98	146.64	86.55	30.82	7.81	0	0	0	0	28.31	135.76	276.45	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	282.37	162.4	95.85	34.13	8.65	0	0	0	0	31.35	150.34	306.14	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1071.23 (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

Output from water heater (calculated above)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	186.63	163.03	169.62	150.44	145.66	128.29	122.91	137.01	138.53	157.74	168.38	182.25

Efficiency of water heater 81 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	86.12	85.15	83.92	82.44	81.43	81	81	81	81	82.29	84.9	86.36

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	216.71	191.45	202.12	182.48	178.88	158.38	151.74	169.15	171.02	191.69	198.33	211.03

Total = Sum(219a)$_{1...12}$ = 2222.98 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1071.23
Water heating fuel used		2222.98
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	154.9	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	184.9 (231)
Electricity for lighting		295.66 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3774.77 (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 =	37.28 (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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	77.36	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	24.39	(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 =	39	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			298.02	(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] =	1.13	(257)
SAP rating (Section 12)		84.27	(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	=	231.39	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	480.16	(264)
Space and water heating	(261) + (262) + (263) + (264) =					711.55	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	95.96	(267)
Electricity for lighting	(232)	x		0.519	=	153.45	(268)
Total CO2, kg/year			sum of (265)…(271) =			960.96	(272)
CO2 emissions per m²			(272) ÷ (4) =			14.56	(273)
EI rating (section 14)						88	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	1306.9	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2712.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =					4018.94	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	567.64	(267)
Electricity for lighting	(232)	x		0	=	907.67	(268)
'Total Primary Energy			sum of (265)…(271) =			5494.26	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			83.25	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 604

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	205.82	**(P1)**
Transmission heat loss coefficient:	51.7	
Summer heat loss coefficient:	257.54	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	19.5	112.21	0.57	0.7	0.9	707.15	
						Total	707.15	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	384.33	368.81	376.69	
Total summer gains	1117.34	1075.95	1074.39	**(P5)**
Summer gain/loss ratio	4.34	4.18	4.17	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.59	22.33	22.22	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 10 August 2022 at 07:16:26

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.4m²

Site Reference : 6 - 8 Market Place - Be Lean **Plot Reference:** 605

Address :

Client Details:

Name:

Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	18.76 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.08 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system: Boiler systems with radiators or underfloor heating - mains gas
Data from manufacturer
Combi boiler
Efficiency 89.5 % 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

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	19.5m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h

SAP Input

Property Details: 605

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	10 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	503

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	61.4 m²	2.7 m

Living area:	36.7 m² (fraction 0.428)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	19.5	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	44.28	19.5	24.78	0.18	0	False	N/A
Corridor	11.76	0	11.76	0.22	0.43	False	N/A
Flat	61.4	0	61.4	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1143

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	16.4	0.56	E15	Flat roof with parapet

SAP Input

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

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: 89.5% (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

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

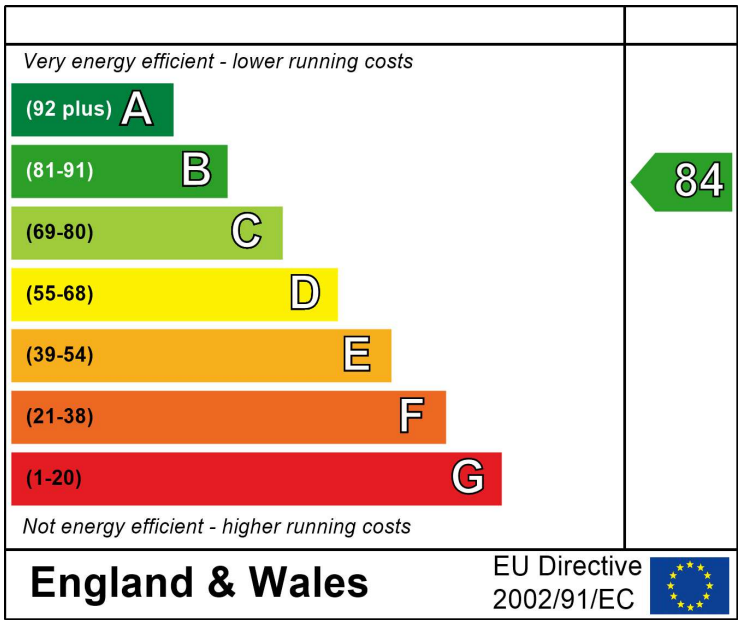
Predicted Energy Assessment

Dwelling type:	Top floor Flat
Date of assessment:	08 August 2022
Produced by:	Samuel Westover
Total floor area:	61.4 m²

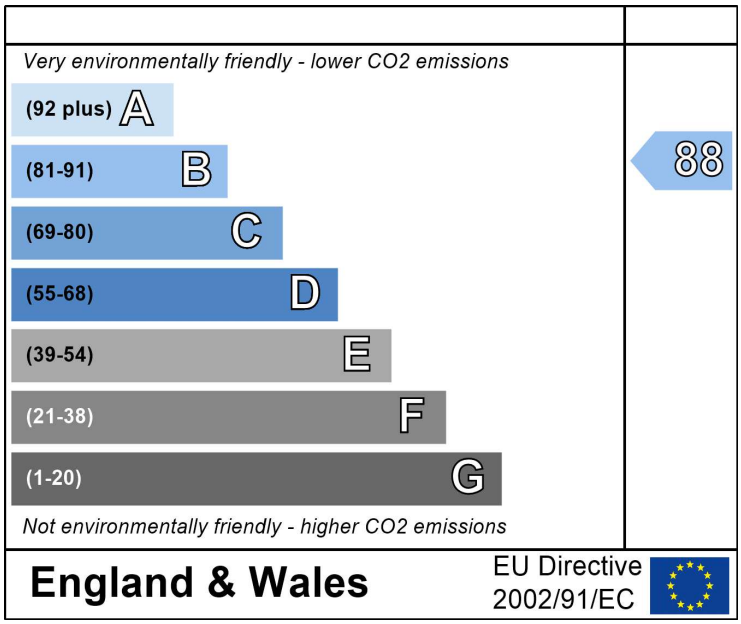
This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

Energy Efficiency Rating



Environmental Impact (CO_2) Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 605

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.4	(1a) x	2.7	(2a) =	165.78	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.4	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		165.78	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			19.5	x1/[1/(1.4)+ 0.04] =	25.85			(27)
Walls Type1	44.28	19.5	24.78	x 0.18 =	4.46			(29)
Walls Type2	11.76	0	11.76	x 0.2 =	2.36			(29)
Roof	61.4	0	61.4	x 0.13 =	7.98			(30)
Total area of elements, m²			117.44					(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) = 40.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4521.6 (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 13.43 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 54.09 (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=	15.32	15.15	14.97	14.1	13.93	13.05	13.05	12.88	13.4	13.93	14.28	14.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	69.41	69.23	69.06	68.19	68.01	67.14	67.14	66.97	67.49	68.01	68.36	68.71	

Average = Sum(39)$_{1...12}$ /12= 68.14 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.13	1.13	1.12	1.11	1.11	1.09	1.09	1.09	1.1	1.11	1.11	1.12	

Average = Sum(40)$_{1...12}$ /12= 1.11 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.02 (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 82.2 (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=	90.42	87.13	83.84	80.55	77.27	73.98	73.98	77.27	80.55	83.84	87.13	90.42	

Total = Sum(44)$_{1...12}$ = 986.36 (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=	134.09	117.27	121.01	105.5	101.23	87.36	80.95	92.89	94	109.55	119.58	129.85	

Total = Sum(45)$_{1...12}$ = 1293.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.11	17.59	18.15	15.83	15.18	13.1	12.14	13.93	14.1	16.43	17.94	19.48	(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=	46.08	40.1	42.72	39.72	39.37	36.48	37.7	39.37	39.72	42.72	42.97	46.08	(61)

SAP WorkSheet: New dwelling design stage

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=	180.16	157.38	163.74	145.23	140.61	123.84	118.65	132.26	133.72	152.27	162.55	175.93	(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=	180.16	157.38	163.74	145.23	140.61	123.84	118.65	132.26	133.72	152.27	162.55	175.93	

Output from water heater (annual)$_{1...12}$ 1786.33 (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=	56.1	49.02	50.92	45.01	43.5	38.17	36.34	40.73	41.19	47.11	50.5	54.7	(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=	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	39.33	34.93	28.41	21.51	16.08	13.57	14.67	19.06	25.59	32.49	37.92	40.42	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	263.38	266.11	259.22	244.56	226.05	208.66	197.04	194.31	201.19	215.85	234.36	251.76	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	(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=	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	(71)

Water heating gains (Table 5)

(72)m=	75.41	72.94	68.44	62.52	58.47	53.01	48.84	54.74	57.2	63.31	70.14	73.52	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	470.68	466.55	448.64	421.15	393.17	367.81	353.11	360.68	376.55	404.22	434.99	458.26	(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)	
South	0.9x 0.77	x	19.5	x	46.75	x	0.57	x	0.7	=	252.08	(78)
South	0.9x 0.77	x	19.5	x	76.57	x	0.57	x	0.7	=	412.85	(78)
South	0.9x 0.77	x	19.5	x	97.53	x	0.57	x	0.7	=	525.89	(78)
South	0.9x 0.77	x	19.5	x	110.23	x	0.57	x	0.7	=	594.37	(78)
South	0.9x 0.77	x	19.5	x	114.87	x	0.57	x	0.7	=	619.37	(78)
South	0.9x 0.77	x	19.5	x	110.55	x	0.57	x	0.7	=	596.06	(78)
South	0.9x 0.77	x	19.5	x	108.01	x	0.57	x	0.7	=	582.39	(78)
South	0.9x 0.77	x	19.5	x	104.89	x	0.57	x	0.7	=	565.58	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	19.5	x	101.89	x	0.57	x	0.7	=	549.36	(78)
South	0.9x	0.77	x	19.5	x	82.59	x	0.57	x	0.7	=	445.29	(78)
South	0.9x	0.77	x	19.5	x	55.42	x	0.57	x	0.7	=	298.8	(78)
South	0.9x	0.77	x	19.5	x	40.4	x	0.57	x	0.7	=	217.82	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	252.08	412.85	525.89	594.37	619.37	596.06	582.39	565.58	549.36	445.29	298.8	217.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	722.76	879.4	974.53	1015.52	1012.54	963.87	935.5	926.26	925.9	849.51	733.79	676.08	(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=	0.96	0.92	0.85	0.74	0.6	0.44	0.32	0.33	0.5	0.75	0.92	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.29	20.53	20.73	20.89	20.97	20.99	21	21	20.99	20.9	20.58	20.24	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.98	19.98	19.98	19.99	19.99	20.01	20.01	20.01	20	19.99	19.99	19.99	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.9	0.82	0.7	0.54	0.38	0.24	0.26	0.43	0.7	0.9	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.08	19.41	19.68	19.88	19.97	20	20.01	20.01	20	19.9	19.5	19.01	(90)

fLA = Living area ÷ (4) = 0.6 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.8	20.08	20.31	20.48	20.56	20.6	20.6	20.6	20.59	20.49	20.15	19.74	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.65	19.93	20.16	20.33	20.41	20.45	20.45	20.45	20.44	20.34	20	19.59	(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=	0.95	0.9	0.82	0.71	0.57	0.41	0.28	0.29	0.46	0.72	0.9	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	687.27	789.52	801.55	722.1	576.75	390.37	258.25	270.94	423.72	611.36	663.27	649.92	(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=	1065.68	1040.4	943.13	779.49	592.67	392.49	258.47	271.24	427.87	662.69	881.58	1057.68	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	281.54	168.59	105.34	41.32	11.84	0	0	0	0	38.19	157.19	303.37	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1107.38 (98)

Space heating requirement in kWh/m²/year 18.04 (99)

SAP WorkSheet: New dwelling design stage

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system		0 (201)
Fraction of space heat from main system(s)	(202) = 1 – (201) =	1 (202)
Fraction of total heating from main system 1	(204) = (202) × [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		90.3 (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)													
	281.54	168.59	105.34	41.32	11.84	0	0	0	0	38.19	157.19	303.37	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	311.78	186.7	116.65	45.76	13.12	0	0	0	0	42.29	174.07	335.96	
Total (kWh/year) =Sum(211)$_{1..5,10...12}$=													1226.33 (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)	180.16	157.38	163.74	145.23	140.61	123.84	118.65	132.26	133.72	152.27	162.55	175.93	
Efficiency of water heater													81 (216)
(217)m=	86.43	85.56	84.4	82.89	81.65	81	81	81	81	82.71	85.32	86.65	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	208.45	183.94	194	175.2	172.2	152.89	146.48	163.29	165.09	184.11	190.51	203.04	
Total = Sum(219a)$_{1...12}$ =													2139.19 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1226.33
Water heating fuel used		2139.19
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	144.1	(230a)
central heating pump:	30	(230c)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	174.1 (231)
Electricity for lighting		277.83 (232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3817.46 (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 =	42.68	(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)

SAP WorkSheet: New dwelling design stage

Water heating cost (other fuel)	(219)	3.48	x 0.01 =	74.44	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	22.96	(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 =	36.65	(250)
Additional standing charges (Table 12)				120	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			296.73	(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] =	1.17	(257)
SAP rating (Section 12)		83.66	(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	=	264.89	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	462.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =					726.95	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	90.36	(267)
Electricity for lighting	(232)	x		0.519	=	144.19	(268)
Total CO2, kg/year			sum of (265)…(271) =			961.51	(272)
CO2 emissions per m²			(272) ÷ (4) =			15.66	(273)
EI rating (section 14)						88	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x		1.22	=	1496.13	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2609.82	(264)
Space and water heating	(261) + (262) + (263) + (264) =					4105.94	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	534.5	(267)
Electricity for lighting	(232)	x		0	=	852.94	(268)
'Total Primary Energy			sum of (265)…(271) =			5493.38	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			89.47	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 August 2022

Property Details: 605

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	191.48	**(P1)**
Transmission heat loss coefficient:	54.1	
Summer heat loss coefficient:	245.56	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	19.5	112.21	0.57	0.7	0.9	707.15	
						Total	707.15	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	364.81	350.11	357.68	
Total summer gains	1097.82	1057.26	1055.37	**(P5)**
Summer gain/loss ratio	4.47	4.31	4.3	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.72	22.46	22.35	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Block Compliance WorkSheet: 6 - 8 Market Place - Be Green

User Details

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP	**Software Version:**	Version: 1.0.5.53

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
C101	22.99	29.15	52.5	58.4	76.6
C102	22.16	29.53	50.7	56	65.8
C103	23.87	36.04	58.6	63.2	42.6
C104	16.16	26.55	39.4	42.9	61.8
C105	21.05	29.52	50	54	61.3
C106	22.98	30.34	53.7	57.3	62.3
C243	15.84	24.5	38.7	42.2	73
C244	18.01	28.66	45.2	46.2	52.1
334	20.59	32.63	51.2	50.4	41.7
335	14.36	29.85	37.7	43.1	44
336	11.34	23.07	27.8	31.5	62.6
C334	24.24	30.28	55.4	61.4	73
C335	21.49	31.25	52.2	54.8	52.1
C336	13.95	23.16	33.3	36.8	74
337	19.04	30.3	47.1	47.5	47.3
424	20.59	32.63	51.2	50.4	41.7
425	14.36	29.85	37.7	43.1	44
426	10.78	20.71	25.8	30.6	78.9
427	12.87	22.33	31	35.1	74
428	19.04	30.3	47.1	47.5	47.3
429	16.57	25.3	40.4	41	63.2
430	13.56	24.52	33.4	37.3	64
501	23.66	36.43	56.8	63.2	42.8
502	13.91	25.32	34.7	38.8	61.7
503	13.58	25.09	34	38	61.7
504	17.86	24.26	42.1	45.4	85.7

Block Compliance WorkSheet: 6 - 8 Market Place - Be GreenCo

Dwelling	DER	TER	DFEE	TFEE	TFA
505	24.91	35.77	59.7	60.5	41.7
506	22.41	35.65	54.1	61.8	44
507	17.34	25.59	40.2	46.9	78.9
508	19.55	27.24	45.1	51.3	74
509	26.7	35.92	62.1	65.3	47.3
510	11.89	21.9	28	29.7	66
511	11.67	22.39	27.6	30.1	63.2
601	23.25	30.07	53.4	59.7	70.7
602	22.47	29.34	51.8	57.6	71.7
603	25.67	29.65	57.8	63.2	85.7
604	17.23	25.99	40.7	43.5	66
605	19.13	28.05	45.1	48.3	61.4

Calculation Summary

Total Floor Area	2325.80
Average TER	27.78
Average DER	18.41
Average DFEE	43.85
Average TFEE	47.73
Compliance	Pass
% Improvement DER|TER	33.73
% Improvement DFEE|TFEE	8.13

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:18:56

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 76.6m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C101

Address :

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)	29.15 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.99 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	52.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	7m²
Windows facing: East	9m²
Ventilation rate:	2.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C101

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	76.6 m²	2.7 m

Living area:	29.1 m² (fraction 0.38)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	7	1
E	16mm or more	0.7	0.57	1.4	9	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	53.19	16	37.19	0.18	0	False	N/A
Corridor	42.12	0	42.12	0.22	0.43	False	N/A
GF	76.7			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0632

	Length	**Psi-value**		
[Approved]	8.6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.7	0.04	E3	Sill
[Approved]	26.6	0.05	E4	Jamb

SAP Input

[Approved]	35.3	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	4.5	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery
Number of wet rooms: Kitchen + 2
Ductwork: Insulation, Rigid
Approved Installation Scheme: True

Number of chimneys: 0

Number of open flues: 0

Number of fans: 0

Number of passive stacks: 0

Number of sides sheltered: 2

Pressure test: 3

Main heating system:

Main heating system: Room heaters
Electric (direct acting) room heaters
Fuel: Electricity
Info Source: SAP Tables
SAP Table: 691
Panel, convector or radiant heaters

Central heating pump : 2013 or later
Design flow temperature: Unknown
Unknown
Boiler interlock: Yes
MCS Installation Certificate

Main heating Control:

Main heating Control: Programmer and room thermostats
Control code: 2605

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: 941 From DHW-only community scheme
Heat source: Electric heat pump for water heating only
Electricity, heat fraction 0, efficiency 0

Hot water cylinder
Cylinder volume: 350 litres
Cylinder insulation: Measured loss, 1.49kWh/day
Primary pipework insulation: False
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

SAP Input

Photovoltaics:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C101

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	76.6	(1a) x	2.7	(2a) =	206.82	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	76.6	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		206.82	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			7	x1/[1/(1.4)+ 0.04] =	9.28			(27)
Windows Type 2			9	x1/[1/(1.4)+ 0.04] =	11.93			(27)
Floor			76.7	x 0.14 =	10.738			(28)
Walls Type1	53.19	16	37.19	x 0.18 =	6.69			(29)
Walls Type2	42.12	0	42.12	x 0.2 =	8.47			(29)
Total area of elements, m²			172.01					(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) = 47.11 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 16358.6 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.86 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 57.97 (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=	19.11	18.9	18.68	17.59	17.37	16.29	16.29	16.07	16.72	17.37	17.81	18.24	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	77.09	76.87	76.65	75.57	75.35	74.26	74.26	74.04	74.7	75.35	75.78	76.22	

Average = Sum(39)$_{1...12}$ /12= 75.51 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.01	1	1	0.99	0.98	0.97	0.97	0.97	0.98	0.98	0.99	1

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.4 (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 91.09 (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=	100.19	96.55	92.91	89.26	85.62	81.98	81.98	85.62	89.26	92.91	96.55	100.19

Total = Sum(44)$_{1...12}$ = 1093.03 (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=	148.59	129.95	134.1	116.91	112.18	96.8	89.7	102.93	104.16	121.39	132.51	143.9

Total = Sum(45)$_{1...12}$ = 1433.13 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.29	19.49	20.12	17.54	16.83	14.52	13.46	15.44	15.62	18.21	19.88	21.58

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	213.16	188.28	198.68	179.41	176.76	138.72	133.02	146.25	146.08	185.97	195.01	208.48	(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=	213.16	188.28	198.68	179.41	176.76	138.72	133.02	146.25	146.08	185.97	195.01	208.48	

Output from water heater (annual)$_{1...12}$ 2109.81 (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=	101.07	89.87	96.25	88.87	88.96	65.72	64.48	68.88	68.17	92.03	94.06	99.51	(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=	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	143.71	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	47.44	42.14	34.27	25.94	19.39	16.37	17.69	22.99	30.86	39.19	45.74	48.76	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	316.7	319.99	311.7	294.07	271.82	250.9	236.93	233.64	241.92	259.55	281.81	302.73	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	51.77	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	-95.81	(71)

Water heating gains (Table 5)

(72)m=	135.84	133.74	129.37	123.43	119.57	91.28	86.66	92.58	94.68	123.69	130.63	133.75	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	599.65	595.53	575.01	543.12	510.45	458.22	440.95	448.88	467.13	522.1	557.85	584.9	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	7	x	10.63	x	0.57	x	0.7	=	20.58	(74)
North	0.9x 0.77	x	7	x	20.32	x	0.57	x	0.7	=	39.33	(74)
North	0.9x 0.77	x	7	x	34.53	x	0.57	x	0.7	=	66.84	(74)
North	0.9x 0.77	x	7	x	55.46	x	0.57	x	0.7	=	107.35	(74)
North	0.9x 0.77	x	7	x	74.72	x	0.57	x	0.7	=	144.62	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	7	x	79.99	x	0.57	x	0.7	=	154.82	(74)
North	0.9x	0.77	x	7	x	74.68	x	0.57	x	0.7	=	144.54	(74)
North	0.9x	0.77	x	7	x	59.25	x	0.57	x	0.7	=	114.67	(74)
North	0.9x	0.77	x	7	x	41.52	x	0.57	x	0.7	=	80.36	(74)
North	0.9x	0.77	x	7	x	24.19	x	0.57	x	0.7	=	46.82	(74)
North	0.9x	0.77	x	7	x	13.12	x	0.57	x	0.7	=	25.39	(74)
North	0.9x	0.77	x	7	x	8.86	x	0.57	x	0.7	=	17.16	(74)
East	0.9x	0.77	x	9	x	19.64	x	0.57	x	0.7	=	48.88	(76)
East	0.9x	0.77	x	9	x	38.42	x	0.57	x	0.7	=	95.61	(76)
East	0.9x	0.77	x	9	x	63.27	x	0.57	x	0.7	=	157.46	(76)
East	0.9x	0.77	x	9	x	92.28	x	0.57	x	0.7	=	229.64	(76)
East	0.9x	0.77	x	9	x	113.09	x	0.57	x	0.7	=	281.44	(76)
East	0.9x	0.77	x	9	x	115.77	x	0.57	x	0.7	=	288.1	(76)
East	0.9x	0.77	x	9	x	110.22	x	0.57	x	0.7	=	274.29	(76)
East	0.9x	0.77	x	9	x	94.68	x	0.57	x	0.7	=	235.61	(76)
East	0.9x	0.77	x	9	x	73.59	x	0.57	x	0.7	=	183.13	(76)
East	0.9x	0.77	x	9	x	45.59	x	0.57	x	0.7	=	113.45	(76)
East	0.9x	0.77	x	9	x	24.49	x	0.57	x	0.7	=	60.94	(76)
East	0.9x	0.77	x	9	x	16.15	x	0.57	x	0.7	=	40.19	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	69.46	134.94	224.29	337	426.05	442.92	418.83	350.28	263.49	160.27	86.33	57.35

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	669.11	730.47	799.31	880.12	936.51	901.14	859.78	799.16	730.62	682.37	644.18	642.25

(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	0.95	0.87	0.71	0.52	0.38	0.42	0.67	0.9	0.98	0.99

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.21	20.34	20.56	20.81	20.95	20.99	21	21	20.97	20.79	20.46	20.19

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.08	20.08	20.08	20.09	20.1	20.11	20.11	20.11	20.1	20.1	20.09	20.09

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.94	0.83	0.65	0.45	0.3	0.34	0.6	0.87	0.97	0.99

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.05	19.24	19.54	19.89	20.05	20.1	20.11	20.11	20.08	19.87	19.42	19.02

(90)

fLA = Living area ÷ (4) = 0.38 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.49	19.66	19.93	20.24	20.39	20.44	20.45	20.45	20.42	20.22	19.82	19.46

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.49	19.66	19.93	20.24	20.39	20.44	20.45	20.45	20.42	20.22	19.82	19.46	(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=	0.98	0.97	0.93	0.84	0.67	0.48	0.33	0.37	0.63	0.88	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	656.31	707.22	746.35	738.29	626.91	430.51	285.34	299.07	457.82	597.3	620.94	632.05	(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=	1171.03	1134.35	1029.3	856.65	655.09	433.83	285.67	299.71	472.16	724.84	963.84	1163.39	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	382.95	287.03	210.52	85.22	20.96	0	0	0	0	94.9	246.89	395.32	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1723.78 (98)

Space heating requirement in kWh/m²/year 22.5 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	382.95	287.03	210.52	85.22	20.96	0	0	0	0	94.9	246.89	395.32	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	382.95	287.03	210.52	85.22	20.96	0	0	0	0	94.9	246.89	395.32	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1723.78 (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

Output from water heater (calculated above)

	213.16	188.28	198.68	179.41	176.76	138.72	133.02	146.25	146.08	185.97	195.01	208.48

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	125.39	110.75	116.87	105.53	103.98	81.6	78.24	86.03	85.93	109.4	114.71	122.63	

Total = Sum(219a)$_{1...12}$ = 1241.06 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1723.78

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1241.06	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	179.78		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	179.78	(231)
Electricity for lighting		335.12	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2788.85	(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 =		227.37	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		163.7	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		23.71	(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 =		44.2	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				367.85	(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] =	1.27 (257)
SAP rating (Section 12)		82.28 (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	13.19	0.519	=	894.64	(261)
Space heating (secondary)	(215) x	13.19	0.519	=	0	(263)
Water heating	(219) x	13.19	0.519	=	644.11	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1538.75	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	93.3	(267)
Electricity for lighting	(232)	x	0.519	=	173.93	(268)
Energy saving/generation technologies Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year		sum of (265)…(271) =			1447.41	(272)
CO2 emissions per m²		(272) ÷ (4) =			18.9	(273)
EI rating (section 14)					84	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	5292	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3810.06	(264)
Space and water heating	(261) + (262) + (263) + (264) =				9102.06	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	551.92	(267)
Electricity for lighting	(232)	x	0	=	1028.82	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy		sum of (265)…(271) =			8561.76	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			111.77	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C101

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	2 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	136.5	**(P1)**
Transmission heat loss coefficient:	58	
Summer heat loss coefficient:	194.48	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	7	81.19	0.57	0.7	0.9	183.67	
East (E)	0.9 x	9	117.51	0.57	0.7	0.9	341.79	
						Total	525.46	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	458.22	440.95	448.88	
Total summer gains	1019.75	966.41	898.92	**(P5)**
Summer gain/loss ratio	5.24	4.97	4.62	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.49	23.12	22.67	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:18:43

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 65.8m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C102

Address :

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)	29.53 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.16 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	14.3m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C102

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	65.8 m²	2.7 m

Living area:	26.7 m² (fraction 0.406)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
E	16mm or more	0.7	0.57	1.4	14.3	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.43	14.3	15.13	0.18	0	False	N/A
Corridor	58.32	0	58.32	0.22	0.43	False	N/A
GF	65.8			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0572

	Length	**Psi-value**		
[Approved]	5.5	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4.4	0.04	E3	Sill
[Approved]	15.2	0.05	E4	Jamb
[Approved]	32.5	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

SAP Input

[Approved]	4.5	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C102

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	65.8 (1a)	x	2.7 (2a)	=	177.66	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	65.8 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	177.66	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			14.3	x1/[1/(1.4)+ 0.04] =	18.96			(27)
Floor			65.8	x 0.14 =	9.212001			(28)
Walls Type1	29.43	14.3	15.13	x 0.18 =	2.72			(29)
Walls Type2	58.32	0	58.32	x 0.2 =	11.72			(29)
Total area of elements, m²			153.55					(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) = 42.62 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 17074.9 (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 8.78 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 51.4 (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=	16.42	16.23	16.05	15.11	14.92	13.99	13.99	13.8	14.36	14.92	15.3	15.67	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	67.82	67.63	67.45	66.51	66.32	65.39	65.39	65.2	65.76	66.32	66.7	67.07	

Average = Sum(39)$_{1...12}$ /12= 66.46 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.03	1.01	1.01	0.99	0.99	0.99	1	1.01	1.01	1.02	

Average = Sum(40)$_{1...12}$ /12= 1.01 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.14 (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 85.03 (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=	93.53	90.13	86.73	83.32	79.92	76.52	76.52	79.92	83.32	86.73	90.13	93.53	

Total = Sum(44)$_{1...12}$ = 1020.3 (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=	138.7	121.31	125.18	109.13	104.72	90.36	83.73	96.09	97.23	113.32	123.69	134.32	

Total = Sum(45)$_{1...12}$ = 1337.78 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.8	18.2	18.78	16.37	15.71	13.55	12.56	14.41	14.58	17	18.55	20.15	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	203.28	179.64	189.76	171.63	169.3	132.28	127.05	139.4	139.15	177.9	186.19	198.9	(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=	203.28	179.64	189.76	171.63	169.3	132.28	127.05	139.4	139.15	177.9	186.19	198.9	

Output from water heater (annual)$_{1...12}$ 2014.46 (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=	97.78	87	93.29	86.28	86.48	63.58	62.49	66.6	65.86	89.34	91.12	96.33	(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=	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	128.4	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.78	37.11	30.18	22.85	17.08	14.42	15.58	20.25	27.18	34.51	40.28	42.94	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	279.56	282.46	275.15	259.59	239.94	221.48	209.14	206.24	213.55	229.11	248.76	267.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	49.98	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	-85.6	(71)

Water heating gains (Table 5)

(72)m=	131.43	129.46	125.38	119.84	116.24	88.3	83.99	89.51	91.48	120.08	126.56	129.47	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	545.54	541.81	523.49	495.05	466.04	416.98	401.5	408.79	424.99	476.49	508.38	532.41	(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)	
East	0.9x 0.77	x	14.3	x	19.64	x	0.57	x	0.7	=	77.66	(76)
East	0.9x 0.77	x	14.3	x	38.42	x	0.57	x	0.7	=	151.92	(76)
East	0.9x 0.77	x	14.3	x	63.27	x	0.57	x	0.7	=	250.19	(76)
East	0.9x 0.77	x	14.3	x	92.28	x	0.57	x	0.7	=	364.88	(76)
East	0.9x 0.77	x	14.3	x	113.09	x	0.57	x	0.7	=	447.17	(76)
East	0.9x 0.77	x	14.3	x	115.77	x	0.57	x	0.7	=	457.76	(76)
East	0.9x 0.77	x	14.3	x	110.22	x	0.57	x	0.7	=	435.81	(76)
East	0.9x 0.77	x	14.3	x	94.68	x	0.57	x	0.7	=	374.35	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	14.3	x	73.59	x	0.57	x	0.7	=	290.98	(76)
East	0.9x	0.77	x	14.3	x	45.59	x	0.57	x	0.7	=	180.26	(76)
East	0.9x	0.77	x	14.3	x	24.49	x	0.57	x	0.7	=	96.83	(76)
East	0.9x	0.77	x	14.3	x	16.15	x	0.57	x	0.7	=	63.86	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	77.66	151.92	250.19	364.88	447.17	457.76	435.81	374.35	290.98	180.26	96.83	63.86	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	623.2	693.72	773.67	859.93	913.21	874.74	837.3	783.14	715.96	656.75	605.21	596.28	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.97	0.93	0.82	0.65	0.47	0.34	0.38	0.62	0.87	0.97	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.24	20.39	20.62	20.85	20.96	21	21	21	20.98	20.82	20.5	20.21	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.06	20.06	20.06	20.07	20.08	20.09	20.09	20.09	20.08	20.08	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.96	0.91	0.78	0.59	0.41	0.27	0.31	0.54	0.83	0.95	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.08	19.29	19.61	19.92	20.05	20.09	20.09	20.09	20.07	19.9	19.46	19.04	(90)

fLA = Living area ÷ (4) = 0.41 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.55	19.74	20.02	20.3	20.42	20.45	20.46	20.46	20.44	20.27	19.88	19.52	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.55	19.74	20.02	20.3	20.42	20.45	20.46	20.46	20.44	20.27	19.88	19.52	(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	0.91	0.79	0.61	0.44	0.3	0.34	0.57	0.84	0.95	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	607.27	662.85	701.6	679.26	560.97	380.82	252.08	264.29	408.4	550.51	576.05	583.64	(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=	1034.18	1003.47	911.76	758.08	578.29	382.83	252.27	264.66	416.92	641.57	852.32	1027.33	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	317.62	228.89	156.35	56.75	12.89	0	0	0	0	67.75	198.92	330.1	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1369.28 (98)

Space heating requirement in kWh/m²/year 20.81 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	317.62	228.89	156.35	56.75	12.89	0	0	0	0	67.75	198.92	330.1	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	317.62	228.89	156.35	56.75	12.89	0	0	0	0	67.75	198.92	330.1	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1369.28 (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

Output from water heater (calculated above)

	203.28	179.64	189.76	171.63	169.3	132.28	127.05	139.4	139.15	177.9	186.19	198.9	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	119.58	105.67	111.62	100.96	99.59	77.81	74.73	82	81.85	104.64	109.52	117	

Total = Sum(219a)$_{1...12}$ = 1184.97 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1369.28
Water heating fuel used		1184.97
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	154.43	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	154.43 (231)
Electricity for lighting		295.13 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2312.92 (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 =	180.61 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	156.3	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	20.37	(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 =	38.93	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			305.07	(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] =	1.16	(257)
SAP rating (Section 12)		83.87	(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	=	710.65	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	615	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1325.66	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	80.15	(267)
Electricity for lighting	(232) x		0.519	=	153.17	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				1200.4	(272)
CO2 emissions per m²	(272) ÷ (4) =				18.24	(273)
EI rating (section 14)					85	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	4203.68	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	3637.87	(264)
Space and water heating	(261) + (262) + (263) + (264) =				7841.54	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	474.1	(267)
Electricity for lighting	(232)	x	0	=	906.05	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		7100.65	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		107.91	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C102

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	175.88	**(P1)**
Transmission heat loss coefficient:	51.4	
Summer heat loss coefficient:	227.28	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
East (E)	0.9 x	14.3	117.51	0.57	0.7	0.9	543.07	
						Total	543.07	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	416.98	401.5	408.79	
Total summer gains	993.46	944.57	886.56	**(P5)**
Summer gain/loss ratio	4.37	4.16	3.9	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.62	22.31	21.95	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:18:30

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 42.6m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C103

Address :

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)	36.04 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	23.87 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	58.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C103

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	42.6 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.43	10.4	19.03	0.18	0	False	N/A
Corridor	29.43	0	29.43	0.22	0.43	False	N/A
GF	42.6			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0715

	Length	**Psi-value**		
[Approved]	5.2	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4.1	0.04	E3	Sill
[Approved]	16.8	0.05	E4	Jamb

SAP Input

	[Approved]	21.8	0.16	E5	Ground floor (normal)
	[Approved]	13.5	0.09	E16	Corner (normal)
	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	[Approved]	7.9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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

SAP Input

Photovoltaics:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C103

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	42.6 (1a)	x	2.7 (2a)	=	115.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	42.6 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	115.02	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Floor			42.6	x 0.14 =	5.964			(28)
Walls Type1	29.43	10.4	19.03	x 0.18 =	3.43			(29)
Walls Type2	29.43	0	29.43	x 0.2 =	5.92			(29)
Total area of elements, m²			101.46					(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) = 29.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10118.8 (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 7.26 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.35 (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=	10.63	10.51	10.39	9.78	9.66	9.06	9.06	8.94	9.3	9.66	9.9	10.15	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	46.98	46.86	46.74	46.13	46.01	45.4	45.4	45.28	45.65	46.01	46.25	46.49	

Average = Sum(39)$_{1...12}$ /12= 46.1 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.1	1.1	1.1	1.08	1.08	1.07	1.07	1.06	1.07	1.08	1.09	1.09

Average = Sum(40)$_{1...12}$ /12= 1.08 (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

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 1.48 (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 69.28 (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=	76.21	73.44	70.66	67.89	65.12	62.35	62.35	65.12	67.89	70.66	73.44	76.21

Total = Sum(44)$_{1...12}$ = 831.35 (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=	113.01	98.84	102	88.92	85.32	73.63	68.23	78.29	79.23	92.33	100.79	109.45

Total = Sum(45)$_{1...12}$ = 1090.03 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	16.95	14.83	15.3	13.34	12.8	11.04	10.23	11.74	11.88	13.85	15.12	16.42

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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

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

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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

SAP WorkSheet: New dwelling design stage

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=	177.59	157.17	166.58	151.42	149.9	115.54	111.54	121.6	121.14	156.91	163.28	174.03	(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=	177.59	157.17	166.58	151.42	149.9	115.54	111.54	121.6	121.14	156.91	163.28	174.03	

Output from water heater (annual)$_{1...12}$ 1766.71 (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=	89.24	79.53	85.58	79.56	80.03	58.01	57.34	60.68	59.88	82.36	83.51	88.05	(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=	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	88.62	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.56	25.36	20.63	15.62	11.67	9.85	10.65	13.84	18.58	23.59	27.53	29.35	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	191.23	193.21	188.21	177.57	164.13	151.5	143.06	141.08	146.08	156.72	170.16	182.79	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	45.34	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	-59.08	(71)

Water heating gains (Table 5)

(72)m=	119.95	118.35	115.02	110.51	107.57	80.58	77.06	81.56	83.16	110.7	115.98	118.35	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	414.61	411.8	398.74	378.57	358.25	316.81	305.65	311.36	322.7	365.9	388.56	405.37	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x	0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x	0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)
North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x	0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x	0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x	0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x	0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x	0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x	0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x	0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)
East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	43.53	84.46	140.63	212.43	270.04	281.46	265.85	221.31	165.5	100.33	54.07	35.97

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	458.14	496.26	539.37	591	628.29	598.27	571.5	532.68	488.2	466.23	442.63	441.34

(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=	0.97	0.96	0.92	0.82	0.65	0.48	0.35	0.39	0.62	0.85	0.95	0.98

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.25	20.38	20.59	20.83	20.96	20.99	21	21	20.97	20.82	20.51	20.22

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20	20	20	20.01	20.02	20.03	20.03	20.03	20.02	20.02	20.01	20.01

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.78	0.59	0.41	0.27	0.31	0.54	0.81	0.94	0.97

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.04	19.23	19.52	19.84	19.98	20.02	20.03	20.03	20.01	19.83	19.42	19.01

(90)

fLA = Living area ÷ (4) = 0.68 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.86	20.01	20.25	20.52	20.65	20.69	20.69	20.69	20.67	20.51	20.16	19.84

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.86	20.01	20.25	20.52	20.65	20.69	20.69	20.69	20.67	20.51	20.16	19.84	(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	0.95	0.9	0.8	0.63	0.46	0.32	0.36	0.6	0.83	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	442.2	470.09	487.08	470.89	395.31	273.92	185.46	193.78	290.73	387.55	415.78	428.08	(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=	731.17	708.2	642.84	535.83	411.64	276.33	185.77	194.33	299.79	455.77	604.06	727	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	215	160.01	115.88	46.75	12.14	0	0	0	0	50.76	135.56	222.39	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 958.5 (98)

Space heating requirement in kWh/m²/year 22.5 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	215	160.01	115.88	46.75	12.14	0	0	0	0	50.76	135.56	222.39	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	215	160.01	115.88	46.75	12.14	0	0	0	0	50.76	135.56	222.39	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 958.5 (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

Output from water heater (calculated above)

	177.59	157.17	166.58	151.42	149.9	115.54	111.54	121.6	121.14	156.91	163.28	174.03	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	104.47	92.45	97.99	89.07	88.18	67.97	65.61	71.53	71.26	92.3	96.05	102.37	

Total = Sum(219a)$_{1...12}$ = 1039.24 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 958.5

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1039.24	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	99.98		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	99.98	(231)
Electricity for lighting		201.72	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1608.54	(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 =		126.43	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		137.08	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		13.19	(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 =		26.61	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)…(254) =	212.17	(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] =	1.02	(257)
SAP rating (Section 12)		85.81	(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	=		497.46	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		539.37	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1036.83	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	51.89	(267)
Electricity for lighting	(232) x	0.519	=	104.69	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			834.83	(272)
CO2 emissions per m²	(272) ÷ (4) =			19.6	(273)
EI rating (section 14)				87	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	2942.58	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3190.47	(264)
Space and water heating	(261) + (262) + (263) + (264) =			6133.06	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	306.94	(267)
Electricity for lighting	(232) x	0	=	619.28	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
‘Total Primary Energy	sum of (265)…(271) =			4938.23	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			115.92	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C103

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	113.87	**(P1)**
Transmission heat loss coefficient:	36.3	
Summer heat loss coefficient:	150.22	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	333.92	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	316.81	305.65	311.36	
Total summer gains	674.05	639.57	596.03	**(P5)**
Summer gain/loss ratio	4.49	4.26	3.97	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.74	22.41	22.02	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:18:18

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.8m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C104

Address :

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)	26.55 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.16 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.9 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	39.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	4.8m²
Windows facing: East	4.8m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C104

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	61.8 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	4.8	1
E	16mm or more	0.7	0.57	1.4	4.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	28.62	9.6	19.02	0.18	0	False	N/A
Corridor	20.25	0	20.25	0.22	0.43	False	N/A
GF	61.8			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0566

	Length	**Psi-value**		
[Approved]	4.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4.1	0.04	E3	Sill
[Approved]	17.6	0.05	E4	Jamb

SAP Input

[Approved]	18.1	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	4.6	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery
Number of wet rooms: Kitchen + 1
Ductwork: Insulation, Rigid
Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Room heaters
Electric (direct acting) room heaters
Fuel: Electricity
Info Source: SAP Tables
SAP Table: 691
Panel, convector or radiant heaters

Central heating pump : 2013 or later
Design flow temperature: Unknown
Unknown
Boiler interlock: Yes
MCS Installation Certificate

Main heating Control:

Main heating Control: Programmer and room thermostats
Control code: 2605

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: 941 From DHW-only community scheme
Heat source: Electric heat pump for water heating only
Electricity, heat fraction 0, efficiency 0

Hot water cylinder
Cylinder volume: 350 litres
Cylinder insulation: Measured loss, 1.49kWh/day
Primary pipework insulation: False
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

SAP Input

Photovoltaics:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C104

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.8 (1a)	x	2.7 (2a)	=	166.86	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.8 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	166.86	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.8	x1/[1/(1.4)+ 0.04] =	6.36			(27)
Windows Type 2			4.8	x1/[1/(1.4)+ 0.04] =	6.36			(27)
Floor			61.8	x 0.14 =	8.651999			(28)
Walls Type1	28.62	9.6	19.02	x 0.18 =	3.42			(29)
Walls Type2	20.25	0	20.25	x 0.2 =	4.07			(29)
Total area of elements, m²			110.67					(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) = 28.87 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9813.9 (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 6.26 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 35.14 (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=	15.42	15.25	15.07	14.19	14.02	13.14	13.14	12.96	13.49	14.02	14.37	14.72	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	50.56	50.38	50.21	49.33	49.16	48.28	48.28	48.1	48.63	49.16	49.51	49.86	

Average = Sum(39)$_{1...12}$ /12= 49.29 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.82	0.82	0.81	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.8	0.81

Average = Sum(40)$_{1...12}$ /12= 0.8 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.03 (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 82.46 (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=	90.71	87.41	84.11	80.81	77.51	74.21	74.21	77.51	80.81	84.11	87.41	90.71

Total = Sum(44)$_{1...12}$ = 989.53 (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=	134.52	117.65	121.4	105.84	101.56	87.64	81.21	93.19	94.3	109.9	119.96	130.27

Total = Sum(45)$_{1...12}$ = 1297.43 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.18	17.65	18.21	15.88	15.23	13.15	12.18	13.98	14.15	16.48	17.99	19.54

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	199.1	175.98	185.98	168.34	166.14	129.55	124.52	136.5	136.22	174.48	182.46	194.85	(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=	199.1	175.98	185.98	168.34	166.14	129.55	124.52	136.5	136.22	174.48	182.46	194.85	

Output from water heater (annual)$_{1...12}$ 1974.11 (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=	96.39	85.78	92.03	85.19	85.43	62.67	61.65	65.64	64.89	88.2	89.88	94.98	(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=	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	121.92	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.51	36.87	29.98	22.7	16.97	14.33	15.48	20.12	27	34.29	40.02	42.66	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	264.87	267.62	260.69	245.95	227.33	209.84	198.15	195.41	202.33	217.08	235.69	253.18	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	49.22	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	-81.28	(71)

Water heating gains (Table 5)

(72)m=	129.56	127.65	123.7	118.32	114.83	87.04	82.87	88.22	90.12	118.55	124.84	127.66	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	525.8	522	504.24	476.83	448.99	401.08	386.36	393.61	409.32	459.79	490.41	513.37	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	4.8	x	19.64	x	0.57	x	0.7	=	26.07	(76)
East	0.9x 0.77	x	4.8	x	38.42	x	0.57	x	0.7	=	50.99	(76)
East	0.9x 0.77	x	4.8	x	63.27	x	0.57	x	0.7	=	83.98	(76)
East	0.9x 0.77	x	4.8	x	92.28	x	0.57	x	0.7	=	122.48	(76)
East	0.9x 0.77	x	4.8	x	113.09	x	0.57	x	0.7	=	150.1	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	4.8	x	115.77	x	0.57	x	0.7	=	153.65	(76)
East	0.9x	0.77	x	4.8	x	110.22	x	0.57	x	0.7	=	146.29	(76)
East	0.9x	0.77	x	4.8	x	94.68	x	0.57	x	0.7	=	125.66	(76)
East	0.9x	0.77	x	4.8	x	73.59	x	0.57	x	0.7	=	97.67	(76)
East	0.9x	0.77	x	4.8	x	45.59	x	0.57	x	0.7	=	60.51	(76)
East	0.9x	0.77	x	4.8	x	24.49	x	0.57	x	0.7	=	32.5	(76)
East	0.9x	0.77	x	4.8	x	16.15	x	0.57	x	0.7	=	21.44	(76)
South	0.9x	0.77	x	4.8	x	46.75	x	0.57	x	0.7	=	62.05	(78)
South	0.9x	0.77	x	4.8	x	76.57	x	0.57	x	0.7	=	101.62	(78)
South	0.9x	0.77	x	4.8	x	97.53	x	0.57	x	0.7	=	129.45	(78)
South	0.9x	0.77	x	4.8	x	110.23	x	0.57	x	0.7	=	146.31	(78)
South	0.9x	0.77	x	4.8	x	114.87	x	0.57	x	0.7	=	152.46	(78)
South	0.9x	0.77	x	4.8	x	110.55	x	0.57	x	0.7	=	146.72	(78)
South	0.9x	0.77	x	4.8	x	108.01	x	0.57	x	0.7	=	143.36	(78)
South	0.9x	0.77	x	4.8	x	104.89	x	0.57	x	0.7	=	139.22	(78)
South	0.9x	0.77	x	4.8	x	101.89	x	0.57	x	0.7	=	135.23	(78)
South	0.9x	0.77	x	4.8	x	82.59	x	0.57	x	0.7	=	109.61	(78)
South	0.9x	0.77	x	4.8	x	55.42	x	0.57	x	0.7	=	73.55	(78)
South	0.9x	0.77	x	4.8	x	40.4	x	0.57	x	0.7	=	53.62	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	88.12	152.62	213.43	268.78	302.56	300.38	289.64	264.88	232.9	170.12	106.05	75.05	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	613.92	674.62	717.66	745.61	751.56	701.45	676.01	658.49	642.22	629.9	596.47	588.42	(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=	0.96	0.94	0.88	0.76	0.6	0.44	0.31	0.34	0.52	0.77	0.92	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.59	20.71	20.84	20.95	20.99	21	21	21	21	20.95	20.78	20.57	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.24	20.24	20.24	20.25	20.26	20.27	20.27	20.27	20.26	20.26	20.25	20.25	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.85	0.72	0.55	0.39	0.26	0.28	0.47	0.72	0.91	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.72	19.88	20.06	20.2	20.25	20.27	20.27	20.27	20.26	20.21	19.99	19.69	(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.13	20.27	20.43	20.55	20.6	20.61	20.61	20.61	20.61	20.56	20.36	20.11	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	20.13	20.27	20.43	20.55	20.6	20.61	20.61	20.61	20.61	20.56	20.36	20.11	(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=	0.95	0.92	0.86	0.74	0.58	0.41	0.29	0.31	0.49	0.74	0.91	0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	585.76	621.66	616.09	549	432.75	289.9	193.74	202.7	315.26	466.9	542.32	565.85	(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=	800.33	774.41	699.17	574.86	437.37	290.28	193.76	202.74	316.5	489.63	656.5	792.99	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	159.64	102.65	61.81	18.62	3.44	0	0	0	0	16.91	82.21	168.99	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 614.27 (98)

Space heating requirement in kWh/m²/year 9.94 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	159.64	102.65	61.81	18.62	3.44	0	0	0	0	16.91	82.21	168.99	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	159.64	102.65	61.81	18.62	3.44	0	0	0	0	16.91	82.21	168.99	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 614.27 (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

Output from water heater (calculated above)

	199.1	175.98	185.98	168.34	166.14	129.55	124.52	136.5	136.22	174.48	182.46	194.85

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	117.11	103.52	109.4	99.02	97.73	76.21	73.25	80.29	80.13	102.63	107.33	114.62	

Total = Sum(219a)$_{1...12}$ = 1161.24 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		614.27

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1161.24	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	145.04		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	145.04	(231)
Electricity for lighting		293.23	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1522.89	(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 =		81.02	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		153.17	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		19.13	(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 =		38.68	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				200.87	(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] =	0.79 (257)
SAP rating (Section 12)		88.98 (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	13.19	0.519	=	318.81	(261)
Space heating (secondary)	(215) x	13.19	0.519	=	0	(263)
Water heating	(219) x	13.19	0.519	=	602.68	(264)
Space and water heating	(261) + (262) + (263) + (264) =				921.49	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	75.28	(267)
Electricity for lighting	(232) x	0.519	=	152.19	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			790.38	(272)
CO2 emissions per m²	(272) ÷ (4) =			12.79	(273)
EI rating (section 14)				90	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	1885.81	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3565.01	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5450.82	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	445.28	(267)
Electricity for lighting	(232) x	0	=	900.21	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =			4675.26	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			75.65	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C104

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	165.19	**(P1)**
Transmission heat loss coefficient:	35.1	
Summer heat loss coefficient:	200.33	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	4.8	112.21	0.57	0.7	0.9	174.07	
East (E)	0.9 x	4.8	117.51	0.57	0.7	0.9	182.29	
						Total	356.36	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	401.08	386.36	393.61	
Total summer gains	775.02	742.72	725.72	**(P5)**
Summer gain/loss ratio	3.87	3.71	3.62	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.12	21.86	21.67	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:18:06

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.3m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C105

Address :

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)	29.52 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.05 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	50.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	11.8m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C105

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	61.3 m²	2.7 m

Living area:	29.1 m² (fraction 0.38)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	11.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	39.69	16	23.69	0.18	0	False	N/A
Corridor	14.04	0	14.04	0.22	0.43	False	N/A
GF	61.3			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0768

	Length	**Psi-value**		
[Approved]	7.7	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6.1	0.04	E3	Sill
[Approved]	31.2	0.05	E4	Jamb

SAP Input

[Approved]	19.9	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	13.5	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery
Number of wet rooms: Kitchen + 1
Ductwork: Insulation, Rigid
Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system:

Main heating system: Room heaters
Electric (direct acting) room heaters
Fuel: Electricity
Info Source: SAP Tables
SAP Table: 691
Panel, convector or radiant heaters

Central heating pump : 2013 or later
Design flow temperature: Unknown
Unknown
Boiler interlock: Yes
MCS Installation Certificate

Main heating Control:

Main heating Control: Programmer and room thermostats
Control code: 2605

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: 941 From DHW-only community scheme
Heat source: Electric heat pump for water heating only
Electricity, heat fraction 0, efficiency 0

Hot water cylinder
Cylinder volume: 350 litres
Cylinder insulation: Measured loss, 1.49kWh/day
Primary pipework insulation: False
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

SAP Input

Photovoltaics:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C105

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.3 (1a)	x	2.7 (2a)	=	165.51	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.3 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	165.51	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			11.8	x1/[1/(1.4)+ 0.04] =	15.64			(27)
Floor			61.3	x 0.14 =	8.582			(28)
Walls Type1	39.69	16	23.69	x 0.18 =	4.26			(29)
Walls Type2	14.04	0	14.04	x 0.2 =	2.82			(29)
Total area of elements, m²			115.03					(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) = 36.88 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8923.4 (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 8.84 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 45.72 (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=	15.3	15.12	14.95	14.08	13.9	13.03	13.03	12.86	13.38	13.9	14.25	14.6	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	61.01	60.84	60.67	59.8	59.62	58.75	58.75	58.58	59.1	59.62	59.97	60.32	

Average = Sum(39)$_{1...12}$ /12= 59.75 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.96	0.97	0.98	0.98

Average = Sum(40)$_{1...12}$ /12= 0.97 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.02 (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 82.13 (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=	90.34	87.06	83.77	80.49	77.2	73.92	73.92	77.2	80.49	83.77	87.06	90.34

Total = Sum(44)$_{1...12}$ = 985.57 (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=	133.98	117.18	120.92	105.42	101.15	87.29	80.88	92.81	93.92	109.46	119.48	129.75

Total = Sum(45)$_{1...12}$ = 1292.24 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.1	17.58	18.14	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	198.56	175.51	185.5	167.91	165.73	129.2	124.2	136.13	135.84	174.04	181.98	194.33	(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=	198.56	175.51	185.5	167.91	165.73	129.2	124.2	136.13	135.84	174.04	181.98	194.33	

Output from water heater (annual)$_{1...12}$ 1968.91 (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=	96.21	85.63	91.87	85.05	85.3	62.56	61.54	65.51	64.76	88.06	89.72	94.81	(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=	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	121.09	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	39.27	34.88	28.37	21.48	16.05	13.55	14.65	19.04	25.55	32.44	37.86	40.37	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	263	265.73	258.86	244.22	225.73	208.36	196.76	194.03	200.91	215.55	234.03	251.4	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	49.13	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	-80.73	(71)

Water heating gains (Table 5)

(72)m=	129.32	127.42	123.48	118.12	114.65	86.88	82.72	88.05	89.95	118.36	124.62	127.43	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	521.08	517.53	500.19	473.3	445.92	398.29	383.61	390.61	405.89	455.84	486	508.68	(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)	
East	0.9x 0.77	x	11.8	x	19.64	x	0.57	x	0.7	=	64.08	(76)
East	0.9x 0.77	x	11.8	x	38.42	x	0.57	x	0.7	=	125.36	(76)
East	0.9x 0.77	x	11.8	x	63.27	x	0.57	x	0.7	=	206.45	(76)
East	0.9x 0.77	x	11.8	x	92.28	x	0.57	x	0.7	=	301.09	(76)
East	0.9x 0.77	x	11.8	x	113.09	x	0.57	x	0.7	=	369	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	11.8	x	115.77	x	0.57	x	0.7	=	377.73	(76)
East	0.9x	0.77	x	11.8	x	110.22	x	0.57	x	0.7	=	359.62	(76)
East	0.9x	0.77	x	11.8	x	94.68	x	0.57	x	0.7	=	308.91	(76)
East	0.9x	0.77	x	11.8	x	73.59	x	0.57	x	0.7	=	240.11	(76)
East	0.9x	0.77	x	11.8	x	45.59	x	0.57	x	0.7	=	148.75	(76)
East	0.9x	0.77	x	11.8	x	24.49	x	0.57	x	0.7	=	79.9	(76)
East	0.9x	0.77	x	11.8	x	16.15	x	0.57	x	0.7	=	52.7	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	72.97	142.74	235.08	342.84	420.17	430.12	409.49	351.74	273.4	169.38	90.98	60.01

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	594.05	660.27	735.27	816.15	866.09	828.41	793.1	742.35	679.3	625.21	576.99	568.69

(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(86)m=	0.98	0.96	0.92	0.8	0.62	0.45	0.33	0.36	0.59	0.85	0.96	0.98

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.31	20.46	20.67	20.88	20.97	21	21	21	20.99	20.86	20.56	20.28

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.09	20.09	20.09	20.1	20.11	20.12	20.12	20.12	20.11	20.11	20.1	20.1

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.89	0.76	0.57	0.39	0.26	0.29	0.52	0.81	0.95	0.98

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.2	19.41	19.71	19.98	20.08	20.12	20.12	20.12	20.1	19.96	19.56	19.17

(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.73	19.91	20.17	20.41	20.51	20.53	20.54	20.54	20.52	20.39	20.03	19.7

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.73	19.91	20.17	20.41	20.51	20.53	20.54	20.54	20.52	20.39	20.03	19.7	(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	0.95	0.9	0.77	0.59	0.42	0.29	0.33	0.55	0.82	0.95	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	577	627.31	658.97	628.97	513.11	347.33	231.15	242.13	373.75	513.4	545.6	555.12	(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=	941.26	912.95	829.02	688.24	525.09	348.64	231.27	242.36	379.58	583.55	775.62	934.68	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	271.01	191.95	126.52	42.67	8.92	0	0	0	0	52.19	165.62	282.39	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1141.26 (98)

Space heating requirement in kWh/m²/year 18.62 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	271.01	191.95	126.52	42.67	8.92	0	0	0	0	52.19	165.62	282.39	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	271.01	191.95	126.52	42.67	8.92	0	0	0	0	52.19	165.62	282.39	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1141.26 (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

Output from water heater (calculated above)

	198.56	175.51	185.5	167.91	165.73	129.2	124.2	136.13	135.84	174.04	181.98	194.33	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	116.8	103.24	109.12	98.77	97.49	76	73.06	80.08	79.91	102.38	107.05	114.31	

Total = Sum(219a)$_{1...12}$ = 1158.18 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1141.26

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1158.18	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	143.87		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	143.87	(231)
Electricity for lighting		277.44	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2029.86	(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 =	150.53	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)			1			(243)
Low-rate fraction	1.0 – (243) =		0			(244)
High-rate cost	(219) x (243) x		13.19	x 0.01 =	152.76	(245)
Low-rate cost	(219) x (244) x		13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	18.98	(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 =	36.59	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				267.74	(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] =	1.06	(257)
SAP rating (Section 12)		85.24	(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	=	592.32	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	601.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1193.41	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	74.67	(267)
Electricity for lighting	(232) x	0.519	=	143.99	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			1053.5	(272)
CO2 emissions per m²	(272) ÷ (4) =			17.19	(273)
EI rating (section 14)				87	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	3503.68	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3555.63	(264)
Space and water heating	(261) + (262) + (263) + (264) =			7059.3	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	441.68	(267)
Electricity for lighting	(232) x	0	=	851.73	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
‘Total Primary Energy	sum of (265)…(271) =			6231.66	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			101.66	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C105

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	163.85	**(P1)**
Transmission heat loss coefficient:	45.7	
Summer heat loss coefficient:	209.57	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	11.8	117.51	0.57	0.7	0.9	448.13	
						Total	536.74	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	398.29	383.61	390.61	
Total summer gains	968.06	920.36	862.82	**(P5)**
Summer gain/loss ratio	4.62	4.39	4.12	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.87	22.54	22.17	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:17:53

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.3m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C106

Address :

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)	30.34 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.98 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	53.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	**OK**
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	14.1m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C106

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	62.3 m²	2.7 m

Living area:	29.1 m² (fraction 0.38)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	14.1	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.75	18.3	42.45	0.18	0	False	N/A
Corridor	9.45	0	9.45	0.22	0.43	False	N/A
GF	62.3			0.14			N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.072

	Length	**Psi-value**		
[Approved]	7.7	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6.1	0.04	E3	Sill
[Approved]	31.2	0.05	E4	Jamb

SAP Input

[Approved]	26	0.16	E5	Ground floor (normal)
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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

SAP Input

Photovoltaics:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C106

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.3	(1a) x	2.7	(2a) =	168.21	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		168.21	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			14.1	x1/[1/(1.4)+ 0.04] =	18.69			(27)
Floor			62.3	x 0.14 =	8.722			(28)
Walls Type1	60.75	18.3	42.45	x 0.18 =	7.64			(29)
Walls Type2	9.45	0	9.45	x 0.2 =	1.9			(29)
Total area of elements, m²			132.5					(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) = 42.52 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9439.5 (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 9.54 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 52.07 (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=	15.55	15.37	15.19	14.31	14.13	13.25	13.25	13.07	13.6	14.13	14.48	14.84	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	67.61	67.44	67.26	66.37	66.2	65.31	65.31	65.14	65.67	66.2	66.55	66.91	

Average = Sum(39)$_{1...12}$ /12= 66.33 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.09	1.08	1.08	1.07	1.06	1.05	1.05	1.05	1.05	1.06	1.07	1.07

Average = Sum(40)$_{1...12}$ /12= 1.06 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.05 (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 82.79 (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=	91.07	87.76	84.44	81.13	77.82	74.51	74.51	77.82	81.13	84.44	87.76	91.07

Total = Sum(44)$_{1...12}$ = 993.47 (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=	135.05	118.12	121.89	106.26	101.96	87.99	81.53	93.56	94.68	110.34	120.44	130.79

Total = Sum(45)$_{1...12}$ = 1302.6 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.26	17.72	18.28	15.94	15.29	13.2	12.23	14.03	14.2	16.55	18.07	19.62

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	199.63	176.45	186.47	168.76	166.54	129.9	124.84	136.87	136.59	174.91	182.94	195.37	(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=	199.63	176.45	186.47	168.76	166.54	129.9	124.84	136.87	136.59	174.91	182.94	195.37	

Output from water heater (annual)$_{1...12}$ 1979.27 (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=	96.57	85.94	92.19	85.33	85.57	62.79	61.76	65.76	65.01	88.35	90.04	95.15	(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=	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	122.75	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	39.83	35.38	28.77	21.78	16.28	13.75	14.85	19.31	25.91	32.9	38.4	40.94	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	266.73	269.5	262.52	247.67	228.93	211.31	199.54	196.78	203.75	218.6	237.34	254.96	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	49.32	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	-81.83	(71)

Water heating gains (Table 5)

(72)m=	129.8	127.88	123.91	118.51	115.01	87.21	83.01	88.39	90.3	118.75	125.06	127.89	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	526.59	522.99	505.44	478.21	450.46	402.5	387.65	394.71	410.2	460.49	491.04	514.03	(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)	
East	0.9x 0.77	x	14.1	x	19.64	x	0.57	x	0.7	=	76.57	(76)
East	0.9x 0.77	x	14.1	x	38.42	x	0.57	x	0.7	=	149.79	(76)
East	0.9x 0.77	x	14.1	x	63.27	x	0.57	x	0.7	=	246.69	(76)
East	0.9x 0.77	x	14.1	x	92.28	x	0.57	x	0.7	=	359.78	(76)
East	0.9x 0.77	x	14.1	x	113.09	x	0.57	x	0.7	=	440.92	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	14.1	x	115.77	x	0.57	x	0.7	=	451.36	(76)
East	0.9x	0.77	x	14.1	x	110.22	x	0.57	x	0.7	=	429.71	(76)
East	0.9x	0.77	x	14.1	x	94.68	x	0.57	x	0.7	=	369.12	(76)
East	0.9x	0.77	x	14.1	x	73.59	x	0.57	x	0.7	=	286.91	(76)
East	0.9x	0.77	x	14.1	x	45.59	x	0.57	x	0.7	=	177.74	(76)
East	0.9x	0.77	x	14.1	x	24.49	x	0.57	x	0.7	=	95.48	(76)
East	0.9x	0.77	x	14.1	x	16.15	x	0.57	x	0.7	=	62.97	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	85.46	167.18	275.31	401.53	492.09	503.74	479.58	411.95	320.2	198.37	106.56	70.28

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	612.05	690.17	780.76	879.74	942.55	906.24	867.23	806.66	730.4	658.86	597.6	584.3

(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(86)m=	0.98	0.96	0.92	0.8	0.63	0.46	0.33	0.37	0.6	0.86	0.96	0.98

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.19	20.36	20.61	20.85	20.96	20.99	21	21	20.98	20.81	20.47	20.16

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.01	20.02	20.02	20.03	20.03	20.04	20.04	20.05	20.04	20.03	20.03	20.02

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.95	0.9	0.76	0.57	0.39	0.26	0.29	0.53	0.82	0.95	0.98

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.97	19.21	19.55	19.87	20	20.04	20.04	20.05	20.02	19.84	19.37	18.93

(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.54	19.75	20.04	20.33	20.45	20.49	20.49	20.49	20.47	20.3	19.88	19.51

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.54	19.75	20.04	20.33	20.45	20.49	20.49	20.49	20.47	20.3	19.88	19.51	(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	0.95	0.9	0.77	0.6	0.42	0.29	0.33	0.56	0.83	0.95	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	595.43	656.84	701.24	680.98	562.07	382.3	253.81	266	409.2	547.81	567.34	571.18	(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=	1030.67	1001.19	910.94	758.63	579.3	384.43	254.04	266.44	418.31	641.84	850.74	1024.16	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	323.82	231.41	156.01	55.91	12.82	0	0	0	0	69.95	204.05	337.02	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1390.99 (98)

Space heating requirement in kWh/m²/year 22.33 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	323.82	231.41	156.01	55.91	12.82	0	0	0	0	69.95	204.05	337.02	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	323.82	231.41	156.01	55.91	12.82	0	0	0	0	69.95	204.05	337.02	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1390.99 (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

Output from water heater (calculated above)

	199.63	176.45	186.47	168.76	166.54	129.9	124.84	136.87	136.59	174.91	182.94	195.37

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	117.43	103.79	109.69	99.27	97.97	76.41	73.44	80.51	80.35	102.89	107.61	114.92	

Total = Sum(219a)$_{1...12}$ = 1164.28 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1390.99

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1164.28	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	146.22		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	146.22	(231)
Electricity for lighting		281.36	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2291.95	(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 =	183.47	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)			1			(243)
Low-rate fraction	1.0 – (243) =		0			(244)
High-rate cost	(219) x (243) x		13.19	x 0.01 =	153.57	(245)
Low-rate cost	(219) x (244) x		13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	19.29	(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 =	37.11	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				302.31	(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] =	1.18	(257)
SAP rating (Section 12)		83.49	(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	=	721.92	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	604.26	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1326.19	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	75.89	(267)
Electricity for lighting	(232) x	0.519	=	146.03	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			1189.52	(272)
CO2 emissions per m²	(272) ÷ (4) =			19.09	(273)
EI rating (section 14)				85	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	4270.35	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3574.33	(264)
Space and water heating	(261) + (262) + (263) + (264) =			7844.68	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	448.88	(267)
Electricity for lighting	(232) x	0	=	863.79	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
‘Total Primary Energy	sum of (265)…(271) =			7036.3	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			112.94	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C106

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	166.53	**(P1)**
Transmission heat loss coefficient:	52.1	
Summer heat loss coefficient:	218.59	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	14.1	117.51	0.57	0.7	0.9	535.48	
						Total	624.09	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	402.5	387.65	394.71	
Total summer gains	1064.99	1011.74	943.76	**(P5)**
Summer gain/loss ratio	4.87	4.63	4.32	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.12	22.78	22.37	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:17:42

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 73m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C243

Address :

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)	24.5 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.84 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	38.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	16.8m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C243

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	73 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	16.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.75	21	39.75	0.18	0	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1057

	Length	**Psi-value**		
[Approved]	9.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	8.3	0.04	E3	Sill
[Approved]	40	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

SAP Input

[Approved]	9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C243

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73 (1a)	x	2.7 (2a)	=	197.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	197.1	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			16.8	x1/[1/(1.4)+ 0.04] =	22.27			(27)
Walls	60.75	21	39.75	x 0.18 =	7.16			(29)
Total area of elements, m²			60.75					(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) = 35 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 2782.5 (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 6.42 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.42 (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=	18.22	18.01	17.8	16.76	16.56	15.52	15.52	15.31	15.94	16.56	16.97	17.39	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	59.63	59.43	59.22	58.18	57.97	56.94	56.94	56.73	57.35	57.97	58.39	58.8	

Average = Sum(39)$_{1...12}$ /12= 58.13 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.82	0.81	0.81	0.8	0.79	0.78	0.78	0.78	0.79	0.79	0.8	0.81	

Average = Sum(40)$_{1...12}$ /12= 0.8 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.32 (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 89.22 (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=	98.14	94.57	91.01	87.44	83.87	80.3	80.3	83.87	87.44	91.01	94.57	98.14	

Total = Sum(44)$_{1...12}$ = 1070.66 (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=	145.54	127.29	131.36	114.52	109.88	94.82	87.87	100.83	102.03	118.91	129.8	140.95	

Total = Sum(45)$_{1...12}$ = 1403.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.83	19.09	19.7	17.18	16.48	14.22	13.18	15.12	15.3	17.84	19.47	21.14	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	210.12	185.62	195.94	177.02	174.46	136.74	131.18	144.14	143.95	183.49	192.29	205.53	(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=	210.12	185.62	195.94	177.02	174.46	136.74	131.18	144.14	143.95	183.49	192.29	205.53	

Output from water heater (annual)$_{1...12}$ 2080.48 (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=	100.06	88.99	95.34	88.07	88.2	65.06	63.87	68.18	67.46	91.2	93.15	98.53	(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=	139	139	139	139	139	139	139	139	139	139	139	139	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	45.51	40.42	32.87	24.89	18.6	15.71	16.97	22.06	29.61	37.59	43.88	46.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	304.77	307.93	299.96	283	261.58	241.45	228	224.84	232.81	249.78	271.19	291.32	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	(71)

Water heating gains (Table 5)

(72)m=	134.49	132.42	128.14	122.33	118.55	90.36	85.84	91.63	93.69	122.58	129.38	132.43	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	582.32	578.33	558.53	527.76	496.28	445.07	428.37	436.08	453.66	507.5	542	568.08	(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)	
East	0.9x 0.77	x	16.8	x	19.64	x	0.57	x	0.7	=	91.24	(76)
East	0.9x 0.77	x	16.8	x	38.42	x	0.57	x	0.7	=	178.48	(76)
East	0.9x 0.77	x	16.8	x	63.27	x	0.57	x	0.7	=	293.92	(76)
East	0.9x 0.77	x	16.8	x	92.28	x	0.57	x	0.7	=	428.67	(76)
East	0.9x 0.77	x	16.8	x	113.09	x	0.57	x	0.7	=	525.35	(76)
East	0.9x 0.77	x	16.8	x	115.77	x	0.57	x	0.7	=	537.79	(76)
East	0.9x 0.77	x	16.8	x	110.22	x	0.57	x	0.7	=	512	(76)
East	0.9x 0.77	x	16.8	x	94.68	x	0.57	x	0.7	=	439.8	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	16.8	x	73.59	x	0.57	x	0.7	=	341.85	(76)
East	0.9x	0.77	x	16.8	x	45.59	x	0.57	x	0.7	=	211.78	(76)
East	0.9x	0.77	x	16.8	x	24.49	x	0.57	x	0.7	=	113.76	(76)
East	0.9x	0.77	x	16.8	x	16.15	x	0.57	x	0.7	=	75.03	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	100.12	195.86	322.55	470.42	576.52	590.17	561.87	482.64	375.14	232.4	124.84	82.34	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	682.44	774.19	881.08	998.18	1072.8	1035.24	990.24	918.72	828.8	739.91	666.84	650.42	(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=	0.97	0.94	0.86	0.68	0.5	0.35	0.25	0.28	0.48	0.77	0.94	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.55	20.69	20.86	20.97	21	21	21	21	21	20.95	20.75	20.52	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.24	20.24	20.24	20.26	20.26	20.27	20.27	20.27	20.27	20.26	20.25	20.25	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.93	0.83	0.65	0.46	0.31	0.21	0.24	0.43	0.73	0.92	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.66	19.86	20.08	20.23	20.26	20.27	20.27	20.27	20.26	20.21	19.95	19.62	(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.01	20.19	20.39	20.52	20.55	20.56	20.56	20.56	20.56	20.51	20.27	19.98	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.01	20.19	20.39	20.52	20.55	20.56	20.56	20.56	20.56	20.51	20.27	19.98	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.96	0.93	0.84	0.66	0.48	0.33	0.23	0.26	0.45	0.74	0.92	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	657.86	718.69	738.86	660.15	511.39	339.32	225.55	236.15	369.53	547.94	616.57	631.52	(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=	936.84	908.48	822.73	676.32	513.13	339.42	225.55	236.16	370.33	574.37	768.77	927.94	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	207.56	127.53	62.4	11.65	1.3	0	0	0	0	19.66	109.58	220.53	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 760.22 (98)

Space heating requirement in kWh/m²/year 10.41 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	207.56	127.53	62.4	11.65	1.3	0	0	0	0	19.66	109.58	220.53	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	207.56	127.53	62.4	11.65	1.3	0	0	0	0	19.66	109.58	220.53	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 760.22 (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

Output from water heater (calculated above)

	210.12	185.62	195.94	177.02	174.46	136.74	131.18	144.14	143.95	183.49	192.29	205.53	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	123.6	109.19	115.26	104.13	102.63	80.43	77.16	84.79	84.68	107.93	113.11	120.9	

Total = Sum(219a)$_{1...12}$ = 1223.81 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		760.22
Water heating fuel used		1223.81
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		171.33	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	171.33	(231)
Electricity for lighting		321.49	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1785.95	(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 =	100.27	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)			1			(243)
Low-rate fraction	1.0 – (243) =		0			(244)
High-rate cost	(219) x (243) x		13.19	x 0.01 =	161.42	(245)
Low-rate cost	(219) x (244) x		13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	22.6	(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 =	42.4	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				235.57	(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] =	0.84	(257)
SAP rating (Section 12)	88.3	(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	=	394.55	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	635.16	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1029.71	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	88.92	(267)
Electricity for lighting	(232)	x	0.519	=	166.85	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			926.91	(272)
CO2 emissions per m²	(272) ÷ (4) =			12.7	(273)
EI rating (section 14)				89	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	2333.86	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3757.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =				6090.96	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	525.98	(267)
Electricity for lighting	(232)	x	0	=	986.98	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				5482.87	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				75.11	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C243

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	195.13	**(P1)**
Transmission heat loss coefficient:	41.4	
Summer heat loss coefficient:	236.55	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	16.8	117.51	0.57	0.7	0.9	638.02	
						Total	726.63	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	445.07	428.37	436.08	
Total summer gains	1216.4	1155	1075.35	**(P5)**
Summer gain/loss ratio	5.14	4.88	4.55	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.39	23.03	22.6	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:17:32

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.1m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C244

Address :

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)	28.66 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.01 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	12m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C244

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	52.1 m²	2.7 m
Living area:	29.1 m² (fraction 0.38)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	12	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	32.4	16.2	16.2	0.18	0	False	N/A
Corridor	28.89	0	28.89	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.085

	Length	**Psi-value**		
[Approved]	7.3	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6.2	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8

SAP Input

	Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C244

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.1 (1a)	x	2.7 (2a)	=	140.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	140.67	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			12	x1/[1/(1.4)+ 0.04] =	15.91			(27)
Walls Type1	32.4	16.2	16.2	x 0.18 =	2.92			(29)
Walls Type2	28.89	0	28.89	x 0.2 =	5.81			(29)
Total area of elements, m²			61.29					(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) = 30.2 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6623.1 (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 5.21 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 35.41 (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=	13	12.85	12.7	11.97	11.82	11.08	11.08	10.93	11.37	11.82	12.11	12.41	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	48.41	48.26	48.11	47.37	47.22	46.48	46.48	46.34	46.78	47.22	47.52	47.82	

Average = Sum(39)$_{1...12}$ /12= 47.33 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.93	0.93	0.92	0.91	0.91	0.89	0.89	0.89	0.9	0.91	0.91	0.92	

Average = Sum(40)$_{1...12}$ /12= 0.91 (40)

SAP WorkSheet: New dwelling design stage

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 1.75 (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 75.81 (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=	83.39	80.36	77.33	74.29	71.26	68.23	68.23	71.26	74.29	77.33	80.36	83.39	

Total = Sum(44)$_{1...12}$ = 909.73 (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=	123.67	108.16	111.61	97.31	93.37	80.57	74.66	85.67	86.7	101.03	110.29	119.77	

Total = Sum(45)$_{1...12}$ = 1192.79 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.55	16.22	16.74	14.6	14.01	12.09	11.2	12.85	13	15.16	16.54	17.96	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	188.25	166.49	176.19	159.8	157.95	122.48	117.97	128.99	128.61	165.61	172.78	184.34	(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=	188.25	166.49	176.19	159.8	157.95	122.48	117.97	128.99	128.61	165.61	172.78	184.34	

Output from water heater (annual)$_{1...12}$ 1869.47 (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=	92.78	82.63	88.77	82.35	82.71	60.32	59.47	63.14	62.36	85.26	86.67	91.49	(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=	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	34.03	30.23	24.58	18.61	13.91	11.74	12.69	16.49	22.14	28.11	32.81	34.98	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	227.89	230.25	224.29	211.61	195.59	180.54	170.49	168.12	174.08	186.77	202.78	217.83	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	(71)

Water heating gains (Table 5)

(72)m=	124.71	122.96	119.32	114.38	111.17	83.78	79.94	84.86	86.61	114.59	120.37	122.96	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	468.93	465.74	450.5	426.9	402.98	358.37	345.42	351.78	365.14	411.78	438.27	458.08	(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)	
East	0.9x 0.77	x	12	x	19.64	x	0.57	x	0.7	=	65.17	(76)
East	0.9x 0.77	x	12	x	38.42	x	0.57	x	0.7	=	127.48	(76)
East	0.9x 0.77	x	12	x	63.27	x	0.57	x	0.7	=	209.95	(76)
East	0.9x 0.77	x	12	x	92.28	x	0.57	x	0.7	=	306.19	(76)
East	0.9x 0.77	x	12	x	113.09	x	0.57	x	0.7	=	375.25	(76)
East	0.9x 0.77	x	12	x	115.77	x	0.57	x	0.7	=	384.14	(76)
East	0.9x 0.77	x	12	x	110.22	x	0.57	x	0.7	=	365.71	(76)
East	0.9x 0.77	x	12	x	94.68	x	0.57	x	0.7	=	314.14	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	12	x	73.59	x	0.57	x	0.7	=	244.18	(76)
East	0.9x	0.77	x	12	x	45.59	x	0.57	x	0.7	=	151.27	(76)
East	0.9x	0.77	x	12	x	24.49	x	0.57	x	0.7	=	81.26	(76)
East	0.9x	0.77	x	12	x	16.15	x	0.57	x	0.7	=	53.59	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	74.05	144.87	238.57	347.95	426.42	436.52	415.58	356.98	277.47	171.9	92.34	60.9	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.99	610.61	689.07	774.84	829.4	794.89	761	708.76	642.61	583.67	530.6	518.98	(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=	0.97	0.94	0.86	0.7	0.52	0.37	0.27	0.3	0.5	0.78	0.93	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.47	20.62	20.81	20.95	20.99	21	21	21	21	20.93	20.69	20.44	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.14	20.15	20.15	20.16	20.16	20.17	20.17	20.18	20.17	20.16	20.16	20.15	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.92	0.84	0.66	0.48	0.33	0.22	0.25	0.44	0.73	0.92	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.47	19.67	19.93	20.11	20.16	20.17	20.17	20.18	20.17	20.09	19.79	19.43	(90)

fLA = Living area ÷ (4) = 0.56 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.03	20.2	20.42	20.58	20.62	20.63	20.64	20.64	20.63	20.56	20.29	19.99	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.03	20.2	20.42	20.58	20.62	20.63	20.64	20.64	20.63	20.56	20.29	19.99	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.96	0.92	0.84	0.69	0.5	0.35	0.25	0.28	0.47	0.75	0.92	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	520.21	564.64	582.15	530.84	418.02	280.23	187.56	196.25	303.8	439.16	487.87	500.88	(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=	761.26	738.36	669.59	553.22	421.36	280.52	187.58	196.3	305.45	470.29	626.83	755.23	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	179.34	116.74	65.05	16.11	2.49	0	0	0	0	23.16	100.05	189.24	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 692.17 (98)

Space heating requirement in kWh/m²/year 13.29 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	179.34	116.74	65.05	16.11	2.49	0	0	0	0	23.16	100.05	189.24	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	179.34	116.74	65.05	16.11	2.49	0	0	0	0	23.16	100.05	189.24	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 692.17 (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

Output from water heater (calculated above)

	188.25	166.49	176.19	159.8	157.95	122.48	117.97	128.99	128.61	165.61	172.78	184.34	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	110.73	97.94	103.64	94	92.91	72.05	69.4	75.87	75.65	97.42	101.64	108.44	

Total = Sum(219a)$_{1...12}$ = 1099.69 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		692.17
Water heating fuel used		1099.69
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		122.28	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	122.28	(231)
Electricity for lighting		240.39	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1463.63	(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 =		91.3	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)		1				(243)
Low-rate fraction	1.0 – (243) =	0				(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		145.05	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		16.13	(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 =		31.71	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				193.05	(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] =	0.84	(257)
SAP rating (Section 12)		88.35	(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	=		359.24	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		570.74	(264)
Space and water heating	(261) + (262) + (263) + (264) =				929.98	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=		63.46	(267)
Electricity for lighting	(232) x	0.519	=		124.76	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			759.63	(272)
CO2 emissions per m²	(272) ÷ (4) =			14.58	(273)
EI rating (section 14)				90	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	2124.97	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3376.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5501.01	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	375.39	(267)
Electricity for lighting	(232)	x	0	=	738	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				4493.36	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				86.24	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C244

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	139.26	**(P1)**
Transmission heat loss coefficient:	35.4	
Summer heat loss coefficient:	174.67	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	12	117.51	0.57	0.7	0.9	455.73	
						Total	544.34	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	358.37	345.42	351.78	
Total summer gains	936.2	889.76	830.67	**(P5)**
Summer gain/loss ratio	5.36	5.09	4.76	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.61	23.24	22.81	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:17:21

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 41.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 334

Address :

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)	32.63 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	20.59 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.2 kWh/m²	
		Fail

Excess energy = 0.83 kg/m² (01.6 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	11m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 334

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	41.7 m²	2.7 m

Living area:	36.7 m² (fraction 0.88)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	11	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	North	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	24.84	16.2	8.64	0.18	0	False	N/A
Corridor	33.75	0	33.75	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0729

	Length	**Psi-value**		
[Approved]	6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 334

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	41.7	(1a) x	2.7	(2a) =	112.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	41.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		112.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			11	x1/[1/(1.4)+ 0.04] =	14.58			(27)
Walls Type1	24.84	16.2	8.64	x 0.18 =	1.56			(29)
Walls Type2	33.75	0	33.75	x 0.2 =	6.78			(29)
Total area of elements, m²			58.59					(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) = 29.82 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7017.3 (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 4.27 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.08 (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=	10.41	10.29	10.17	9.58	9.46	8.87	8.87	8.75	9.1	9.46	9.7	9.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	44.49	44.37	44.25	43.66	43.54	42.95	42.95	42.83	43.19	43.54	43.78	44.02	

Average = Sum(39)$_{1...12}$ /12= 43.63 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.07	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.06	

Average = Sum(40)$_{1...12}$ /12= 1.05 (40)

SAP WorkSheet: New dwelling design stage

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 1.45 (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 68.69 (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=	75.56	72.81	70.06	67.32	64.57	61.82	61.82	64.57	67.32	70.06	72.81	75.56	

Total = Sum(44)$_{1...12}$ = 824.28 (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=	112.05	98	101.13	88.17	84.6	73	67.65	77.63	78.55	91.55	99.93	108.52	

Total = Sum(45)$_{1...12}$ = 1080.76 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	16.81	14.7	15.17	13.22	12.69	10.95	10.15	11.64	11.78	13.73	14.99	16.28	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	(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=	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	

Output from water heater (annual)$_{1...12}$ 1757.44 (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=	88.92	79.25	85.29	79.31	79.79	57.81	57.14	60.46	59.65	82.1	83.22	87.75	(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=	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.04	24.91	20.26	15.34	11.46	9.68	10.46	13.59	18.25	23.17	27.04	28.82	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	187.81	189.76	184.85	174.39	161.19	148.79	140.5	138.55	143.46	153.92	167.12	179.52	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	(71)

Water heating gains (Table 5)

(72)m=	119.52	117.93	114.64	110.16	107.25	80.29	76.81	81.26	82.85	110.35	115.59	117.94	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	409.58	406.81	393.95	374.09	354.11	312.96	301.98	307.62	318.77	361.65	383.95	400.49	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)
North	0.9x 0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x 0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x 0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	11	x	19.64	x	0.57	x	0.7	=	59.74	(76)
East	0.9x	0.77	x	11	x	38.42	x	0.57	x	0.7	=	116.86	(76)
East	0.9x	0.77	x	11	x	63.27	x	0.57	x	0.7	=	192.45	(76)
East	0.9x	0.77	x	11	x	92.28	x	0.57	x	0.7	=	280.68	(76)
East	0.9x	0.77	x	11	x	113.09	x	0.57	x	0.7	=	343.98	(76)
East	0.9x	0.77	x	11	x	115.77	x	0.57	x	0.7	=	352.12	(76)
East	0.9x	0.77	x	11	x	110.22	x	0.57	x	0.7	=	335.24	(76)
East	0.9x	0.77	x	11	x	94.68	x	0.57	x	0.7	=	287.96	(76)
East	0.9x	0.77	x	11	x	73.59	x	0.57	x	0.7	=	223.83	(76)
East	0.9x	0.77	x	11	x	45.59	x	0.57	x	0.7	=	138.66	(76)
East	0.9x	0.77	x	11	x	24.49	x	0.57	x	0.7	=	74.49	(76)
East	0.9x	0.77	x	11	x	16.15	x	0.57	x	0.7	=	49.13	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	75.03	146.08	242.1	360.43	451.41	467.13	442.61	373.15	283.52	173.44	93.35	61.87	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	484.61	552.88	636.05	734.52	805.52	780.09	744.59	680.77	602.29	535.09	477.3	462.36	(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=	0.96	0.93	0.85	0.68	0.5	0.35	0.25	0.29	0.49	0.77	0.93	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.37	20.54	20.76	20.94	20.99	21	21	21	20.99	20.9	20.62	20.33	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.03	20.03	20.03	20.04	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.91	0.82	0.64	0.45	0.3	0.2	0.23	0.42	0.72	0.91	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.23	19.47	19.77	19.98	20.04	20.06	20.06	20.06	20.05	19.95	19.59	19.19	(90)

fLA = Living area ÷ (4) = 0.88 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.23	20.41	20.64	20.82	20.87	20.89	20.89	20.89	20.88	20.79	20.5	20.19	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.23	20.41	20.64	20.82	20.87	20.89	20.89	20.89	20.88	20.79	20.5	20.19	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.84	0.67	0.49	0.35	0.25	0.28	0.48	0.76	0.92	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	462.49	508.04	531.73	494.16	394.99	269.46	184.06	192.06	289.85	404.54	437.52	444.67	(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=	708.76	688.29	625.92	520.47	399.5	269.98	184.13	192.19	292.79	443.62	586.45	704.02	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	183.22	121.13	70.08	18.94	3.35	0	0	0	0	29.08	107.23	192.96	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 726 (98)

Space heating requirement in kWh/m²/year 17.41 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	183.22	121.13	70.08	18.94	3.35	0	0	0	0	29.08	107.23	192.96	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	183.22	121.13	70.08	18.94	3.35	0	0	0	0	29.08	107.23	192.96	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 726 (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

Output from water heater (calculated above)

	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	103.9	91.96	97.48	88.62	87.75	67.6	65.27	71.14	70.86	91.84	95.54	101.82	

Total = Sum(219a)$_{1...12}$ = 1033.79 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		726
Water heating fuel used		1033.79
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		97.87	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	97.87	(231)
Electricity for lighting		198.11	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1364.87	(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 =		95.76	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		136.36	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		12.91	(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 =		26.13	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				180.03	(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] =	0.87	(257)
SAP rating (Section 12)		87.83	(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	=		376.79	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		536.54	(264)
Space and water heating	(261) + (262) + (263) + (264) =				913.33	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=		50.79	(267)
Electricity for lighting	(232) x	0.519	=		102.82	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			708.37	(272)
CO2 emissions per m²	(272) ÷ (4) =			16.99	(273)
EI rating (section 14)				89	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	2228.81	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3173.73	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5402.54	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	300.46	(267)
Electricity for lighting	(232)	x	0	=	608.21	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				4190.16	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				100.48	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 334

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	130.04	**(P1)**
Transmission heat loss coefficient:	34.1	
Summer heat loss coefficient:	164.13	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (W)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (W)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	11	117.51	0.57	0.7	0.9	417.75	
						Total	554.19	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	312.96	301.98	307.62	
Total summer gains	904.02	856.16	786.08	**(P5)**
Summer gain/loss ratio	5.51	5.22	4.79	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.76	23.37	22.84	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:17:11

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 44m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 335

Address :

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)	29.85 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.36 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 335

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 25 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 504

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	44 m²	2.7 m

Living area: 36.7 m² (fraction 0.88)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.97	10.4	19.57	0.18	0	False	N/A
Corridor	10.26	0	10.26	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0768

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 335

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	44	(1a) x	2.7	(2a) =	118.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	44	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		118.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Walls Type1	29.97	10.4	19.57	x 0.18 =	3.52			(29)
Walls Type2	10.26	0	10.26	x 0.2 =	2.06			(29)
Total area of elements, m²			40.23					(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) = 19.37 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3319.3 (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 3.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 22.46 (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=	10.98	10.85	10.73	10.1	9.98	9.36	9.36	9.23	9.6	9.98	10.23	10.48	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	33.44	33.32	33.19	32.57	32.44	31.82	31.82	31.69	32.07	32.44	32.69	32.94	

Average = Sum(39)$_{1...12}$ /12= 32.54 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.76	0.76	0.75	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74	0.75	

Average = Sum(40)$_{1...12}$ /12= 0.74 (40)

SAP WorkSheet: New dwelling design stage

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 1.52 (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 70.21 (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=	77.23	74.42	71.61	68.81	66	63.19	63.19	66	68.81	71.61	74.42	77.23	

Total = Sum(44)$_{1...12}$ = 842.53 (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=	114.53	100.17	103.37	90.12	86.47	74.62	69.14	79.34	80.29	93.57	102.14	110.92	

Total = Sum(45)$_{1...12}$ = 1104.69 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	17.18	15.03	15.51	13.52	12.97	11.19	10.37	11.9	12.04	14.04	15.32	16.64	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5	(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=	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5	

Output from water heater (annual)$_{1...12}$ 1781.36 (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=	89.75	79.97	86.03	79.96	80.41	58.34	57.64	61.03	60.23	82.78	83.96	88.54	(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=	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.35	26.07	21.2	16.05	12	10.13	10.95	14.23	19.1	24.25	28.3	30.17	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	196.58	198.62	193.48	182.54	168.72	155.74	147.06	145.02	150.17	161.11	174.92	187.91	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	(71)

Water heating gains (Table 5)

(72)m=	120.63	119	115.64	111.06	108.08	81.03	77.47	82.03	83.65	111.26	116.61	119.01	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	422.5	419.63	406.26	385.58	364.74	322.84	311.42	317.22	328.85	372.55	395.77	413.03	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)
North	0.9x 0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x 0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x 0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x	0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x	0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x	0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x	0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x	0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x	0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x	0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)
East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	43.53	84.46	140.63	212.43	270.04	281.46	265.85	221.31	165.5	100.33	54.07	35.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	466.03	504.09	546.88	598.02	634.78	604.3	577.27	538.54	494.36	472.88	449.84	448.99	(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=	0.94	0.9	0.81	0.65	0.47	0.34	0.24	0.27	0.45	0.69	0.88	0.95	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.72	20.81	20.92	20.98	21	21	21	21	21	20.98	20.87	20.71	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.29	20.29	20.29	20.31	20.31	20.32	20.32	20.32	20.32	20.31	20.3	20.3	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.93	0.88	0.79	0.61	0.44	0.3	0.21	0.23	0.4	0.65	0.86	0.94	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.94	20.06	20.2	20.29	20.31	20.32	20.32	20.32	20.31	20.29	20.15	19.93	(90)

fLA = Living area ÷ (4) = 0.83 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.59	20.69	20.8	20.87	20.88	20.89	20.89	20.89	20.89	20.87	20.75	20.58	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.59	20.69	20.8	20.87	20.88	20.89	20.89	20.89	20.89	20.87	20.75	20.58	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.93	0.89	0.81	0.64	0.47	0.33	0.24	0.26	0.44	0.69	0.87	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	435.02	450.96	441.27	383.53	297.29	200	136.4	142.22	217.3	324.9	393.58	423.09	(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=	544.9	526.01	474.59	389.8	297.93	200.04	136.41	142.22	217.59	333.01	446.21	539.5	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	81.75	50.43	24.79	4.51	0.48	0	0	0	0	6.04	37.9	86.61	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 292.5 (98)

Space heating requirement in kWh/m²/year 6.65 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	81.75	50.43	24.79	4.51	0.48	0	0	0	0	6.04	37.9	86.61	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	81.75	50.43	24.79	4.51	0.48	0	0	0	0	6.04	37.9	86.61	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 292.5 (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

Output from water heater (calculated above)

	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	105.36	93.24	98.79	89.77	88.85	68.55	66.15	72.15	71.89	93.03	96.85	103.23	

Total = Sum(219a)$_{1...12}$ = 1047.86 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		292.5
Water heating fuel used		1047.86
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		103.27	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	103.27	(231)
Electricity for lighting		207.37	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		960.1	(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 =		38.58	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		138.21	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		13.62	(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 =		27.35	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				126.64	(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] =	0.6 (257)
SAP rating (Section 12)		91.66 (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	13.19	0.519	=	151.81	(261)
Space heating (secondary)	(215) x	0	0.519	=	0	(263)
Water heating	(219) x	1048.32	0.519	=	543.84	(264)
Space and water heating	(261) + (262) + (263) + (264) =				695.65	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	103.27	0.519	=	53.6	(267)
Electricity for lighting	(232) x	207.37	0.519	=	107.62	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			498.29	(272)
CO2 emissions per m²	(272) ÷ (4) =			11.32	(273)
EI rating (section 14)				92	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	897.99	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3216.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4114.92	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	317.03	(267)
Electricity for lighting	(232)	x	0	=	636.61	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				2947.51	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				66.99	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 335

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	137.21	**(P1)**
Transmission heat loss coefficient:	22.5	
Summer heat loss coefficient:	159.68	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	333.92	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	322.84	311.42	317.22	
Total summer gains	680.08	645.34	601.9	**(P5)**
Summer gain/loss ratio	4.26	4.04	3.77	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.51	22.19	21.82	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:17:02

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 62.6m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 336

Address :

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)	23.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.34 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	31.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	27.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 336

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	62.6 m²	2.7 m

Living area:	36.7 m² (fraction 0.88)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	28.62	10.4	18.22	0.18	0	False	N/A
Corridor	20.52	0	20.52	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0629

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 336

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	62.6	(1a) x	2.7	(2a) =	169.02	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	62.6	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		169.02	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Walls Type1	28.62	10.4	18.22	x 0.18 =	3.28			(29)
Walls Type2	20.52	0	20.52	x 0.2 =	4.12			(29)
Total area of elements, m²			49.14					(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) = 21.19 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5174.2 (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 3.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 24.28 (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=	15.62	15.44	15.27	14.38	14.2	13.31	13.31	13.13	13.67	14.2	14.55	14.91	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	39.9	39.72	39.55	38.66	38.48	37.59	37.59	37.41	37.95	38.48	38.83	39.19	

Average = Sum(39)$_{1...12}$ /12= 38.61 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.64	0.63	0.63	0.62	0.61	0.6	0.6	0.6	0.61	0.61	0.62	0.63	

Average = Sum(40)$_{1...12}$ /12= 0.62 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.05 (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 82.99 (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=	91.28	87.96	84.64	81.33	78.01	74.69	74.69	78.01	81.33	84.64	87.96	91.28	

Total = Sum(44)$_{1...12}$ = 995.82 (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=	135.37	118.4	122.17	106.51	102.2	88.19	81.72	93.78	94.9	110.6	120.73	131.1	

Total = Sum(45)$_{1...12}$ = 1305.68 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.31	17.76	18.33	15.98	15.33	13.23	12.26	14.07	14.24	16.59	18.11	19.66	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	199.95	176.73	186.75	169.01	166.78	130.11	125.04	137.09	136.82	175.18	183.22	195.68	(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=	199.95	176.73	186.75	169.01	166.78	130.11	125.04	137.09	136.82	175.18	183.22	195.68	

Output from water heater (annual)$_{1...12}$ 1982.36 (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=	96.67	86.03	92.29	85.41	85.65	62.86	61.82	65.83	65.09	88.44	90.14	95.25	(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=	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	123.25	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.43	36.79	29.92	22.65	16.93	14.3	15.45	20.08	26.95	34.22	39.94	42.58	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	267.84	270.62	263.62	248.71	229.88	212.19	200.38	197.6	204.6	219.51	238.33	256.02	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	49.38	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	-82.16	(71)

Water heating gains (Table 5)

(72)m=	129.94	128.02	124.04	118.63	115.12	87.3	83.1	88.48	90.4	118.87	125.19	128.03	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	529.67	525.9	508.04	480.45	452.39	404.25	389.38	396.62	412.41	463.06	493.93	517.09	(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)	
East	0.9x 0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x 0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x 0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x 0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x 0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x 0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x 0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x 0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)
South	0.9x	0.77	x	5.2	x	46.75	x	0.57	x	0.7	=	67.22	(78)
South	0.9x	0.77	x	5.2	x	76.57	x	0.57	x	0.7	=	110.09	(78)
South	0.9x	0.77	x	5.2	x	97.53	x	0.57	x	0.7	=	140.24	(78)
South	0.9x	0.77	x	5.2	x	110.23	x	0.57	x	0.7	=	158.5	(78)
South	0.9x	0.77	x	5.2	x	114.87	x	0.57	x	0.7	=	165.17	(78)
South	0.9x	0.77	x	5.2	x	110.55	x	0.57	x	0.7	=	158.95	(78)
South	0.9x	0.77	x	5.2	x	108.01	x	0.57	x	0.7	=	155.3	(78)
South	0.9x	0.77	x	5.2	x	104.89	x	0.57	x	0.7	=	150.82	(78)
South	0.9x	0.77	x	5.2	x	101.89	x	0.57	x	0.7	=	146.49	(78)
South	0.9x	0.77	x	5.2	x	82.59	x	0.57	x	0.7	=	118.74	(78)
South	0.9x	0.77	x	5.2	x	55.42	x	0.57	x	0.7	=	79.68	(78)
South	0.9x	0.77	x	5.2	x	40.4	x	0.57	x	0.7	=	58.09	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	95.46	165.33	231.21	291.18	327.77	325.41	313.78	286.95	252.3	184.29	114.89	81.31	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	625.13	691.23	739.26	771.63	780.17	729.66	703.16	683.57	664.72	647.35	608.82	598.4	(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=	0.92	0.85	0.75	0.6	0.46	0.33	0.24	0.25	0.39	0.61	0.83	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.85	20.92	20.97	21	21	21	21	21	21	21	20.95	20.83	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.4	20.4	20.4	20.41	20.42	20.43	20.43	20.43	20.42	20.42	20.41	20.41	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.9	0.83	0.73	0.57	0.43	0.3	0.2	0.22	0.36	0.58	0.81	0.92	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.21	20.3	20.37	20.41	20.42	20.43	20.43	20.43	20.42	20.41	20.35	20.2	(90)

fLA = Living area ÷ (4) = 0.59 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.58	20.66	20.72	20.75	20.76	20.76	20.76	20.77	20.76	20.75	20.7	20.57	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.58	20.66	20.72	20.75	20.76	20.76	20.76	20.77	20.76	20.75	20.7	20.57	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.91	0.84	0.74	0.59	0.45	0.32	0.22	0.24	0.38	0.6	0.82	0.92	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	567.89	583.02	547.48	455.98	348.36	231.7	156.53	163.31	252.75	388.64	499.73	551.67	(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=	649.73	626.24	562.46	458.21	348.56	231.71	156.53	163.31	252.79	390.74	528.15	641.54	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	60.88	29.04	11.14	1.61	0.15	0	0	0	0	1.57	20.46	66.86	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 191.72 (98)

Space heating requirement in kWh/m²/year 3.06 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	60.88	29.04	11.14	1.61	0.15	0	0	0	0	1.57	20.46	66.86	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	60.88	29.04	11.14	1.61	0.15	0	0	0	0	1.57	20.46	66.86	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 191.72 (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

Output from water heater (calculated above)

	199.95	176.73	186.75	169.01	166.78	130.11	125.04	137.09	136.82	175.18	183.22	195.68	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	117.62	103.96	109.86	99.42	98.11	76.54	73.55	80.64	80.48	103.04	107.78	115.11	

Total = Sum(219a)$_{1...12}$ = 1166.09 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		191.72
Water heating fuel used		1166.09
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		146.92	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	146.92	(231)
Electricity for lighting		292.64	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1106.47	(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 =		25.29	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		153.81	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		19.38	(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 =		38.6	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				145.94	(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] =	0.57 (257)
SAP rating (Section 12)		92.05 (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	13.19	0.519	=	99.5	(261)
Space heating (secondary)	(215) x	0	0.519	=	0	(263)
Water heating	(219) x	1168.8	0.519	=	605.2	(264)
Space and water heating	(261) + (262) + (263) + (264) =				704.7	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	146.92	0.519	=	76.25	(267)
Electricity for lighting	(232) x	292.64	0.519	=	151.88	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			574.26	(272)
CO2 emissions per m²	(272) ÷ (4) =			9.17	(273)
EI rating (section 14)				93	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	588.58	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3579.9	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4168.48	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	451.05	(267)
Electricity for lighting	(232)	x	0	=	898.39	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				3396.87	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				54.26	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 336

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	195.22	**(P1)**
Transmission heat loss coefficient:	24.3	
Summer heat loss coefficient:	219.5	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	5.2	112.21	0.57	0.7	0.9	188.57	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	386.05	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	404.25	389.38	396.62	
Total summer gains	809.35	775.43	756.41	**(P5)**
Summer gain/loss ratio	3.69	3.53	3.45	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.94	21.68	21.5	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:54

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 73m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C334

Address :

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)	30.28 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	24.24 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	55.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	16.8m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C334

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	73 m²	2.7 m
Living area:	29.1 m² (fraction 0.399)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	16.8	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.75	21	39.75	0.18	0	False	N/A
Flat Roof	73	0	73	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1422

	Length	**Psi-value**		
[Approved]	9.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	8.3	0.04	E3	Sill
[Approved]	40	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	9	0.06	E18	Party wall between dwellings
	22.5	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C334

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	73 (1a)	x	2.7 (2a)	=	197.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	73 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	197.1	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			16.8	x1/[1/(1.4)+ 0.04] =	22.27			(27)
Walls	60.75	21	39.75	x 0.18 =	7.16			(29)
Roof	73	0	73	x 0.13 =	9.49			(30)
Total area of elements, m²			133.75					(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) = 44.49 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3439.5 (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 19.02 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 63.51 (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=	18.22	18.01	17.8	16.76	16.56	15.52	15.52	15.31	15.94	16.56	16.97	17.39	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	81.72	81.52	81.31	80.27	80.06	79.03	79.03	78.82	79.44	80.06	80.48	80.89	

Average = Sum(39)$_{1...12}$ /12= 80.22 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.12	1.12	1.11	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.1	1.11	

Average = Sum(40)$_{1...12}$ /12= 1.1 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.32 (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 89.22 (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=	98.14	94.57	91.01	87.44	83.87	80.3	80.3	83.87	87.44	91.01	94.57	98.14	

Total = Sum(44)$_{1...12}$ = 1070.66 (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=	145.54	127.29	131.36	114.52	109.88	94.82	87.87	100.83	102.03	118.91	129.8	140.95	

Total = Sum(45)$_{1...12}$ = 1403.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.83	19.09	19.7	17.18	16.48	14.22	13.18	15.12	15.3	17.84	19.47	21.14	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	210.12	185.62	195.94	177.02	174.46	136.74	131.18	144.14	143.95	183.49	192.29	205.53	(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=	210.12	185.62	195.94	177.02	174.46	136.74	131.18	144.14	143.95	183.49	192.29	205.53	

Output from water heater (annual)$_{1...12}$ 2080.48 (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=	100.06	88.99	95.34	88.07	88.2	65.06	63.87	68.18	67.46	91.2	93.15	98.53	(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=	139	139	139	139	139	139	139	139	139	139	139	139	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	45.51	40.42	32.87	24.89	18.6	15.71	16.97	22.06	29.61	37.59	43.88	46.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	304.77	307.93	299.96	283	261.58	241.45	228	224.84	232.81	249.78	271.19	291.32	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	51.22	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	-92.67	(71)

Water heating gains (Table 5)

(72)m=	134.49	132.42	128.14	122.33	118.55	90.36	85.84	91.63	93.69	122.58	129.38	132.43	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	582.32	578.33	558.53	527.76	496.28	445.07	428.37	436.08	453.66	507.5	542	568.08	(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)	
East	0.9x 0.77	x	16.8	x	19.64	x	0.57	x	0.7	=	91.24	(76)
East	0.9x 0.77	x	16.8	x	38.42	x	0.57	x	0.7	=	178.48	(76)
East	0.9x 0.77	x	16.8	x	63.27	x	0.57	x	0.7	=	293.92	(76)
East	0.9x 0.77	x	16.8	x	92.28	x	0.57	x	0.7	=	428.67	(76)
East	0.9x 0.77	x	16.8	x	113.09	x	0.57	x	0.7	=	525.35	(76)
East	0.9x 0.77	x	16.8	x	115.77	x	0.57	x	0.7	=	537.79	(76)
East	0.9x 0.77	x	16.8	x	110.22	x	0.57	x	0.7	=	512	(76)
East	0.9x 0.77	x	16.8	x	94.68	x	0.57	x	0.7	=	439.8	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	16.8	x	73.59	x	0.57	x	0.7	=	341.85	(76)
East	0.9x	0.77	x	16.8	x	45.59	x	0.57	x	0.7	=	211.78	(76)
East	0.9x	0.77	x	16.8	x	24.49	x	0.57	x	0.7	=	113.76	(76)
East	0.9x	0.77	x	16.8	x	16.15	x	0.57	x	0.7	=	75.03	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	100.12	195.86	322.55	470.42	576.52	590.17	561.87	482.64	375.14	232.4	124.84	82.34

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	682.44	774.19	881.08	998.18	1072.8	1035.24	990.24	918.72	828.8	739.91	666.84	650.42

(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	0.97	0.93	0.83	0.66	0.48	0.35	0.39	0.63	0.88	0.97	0.99

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.1	20.28	20.54	20.81	20.95	20.99	21	21	20.97	20.77	20.39	20.07

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.98	19.99	19.99	20	20	20.02	20.02	20.02	20.01	20	20	19.99

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.96	0.91	0.79	0.6	0.41	0.27	0.31	0.55	0.85	0.96	0.98

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.82	19.07	19.44	19.8	19.96	20.01	20.01	20.02	19.99	19.76	19.24	18.78

(90)

fLA = Living area ÷ (4) = 0.4 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.34	19.55	19.88	20.2	20.36	20.4	20.41	20.41	20.38	20.16	19.7	19.3

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.34	19.55	19.88	20.2	20.36	20.4	20.41	20.41	20.38	20.16	19.7	19.3

(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.98	0.96	0.91	0.8	0.62	0.44	0.3	0.34	0.58	0.85	0.96	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	667.22	742.73	803.32	795.04	666.22	455.01	300.47	315.16	484.56	631.35	638.95	638.53	(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=	1228.71	1194.24	1087.54	907.42	693.05	458.51	300.86	315.9	498.97	765.7	1014.1	1221.3	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	417.75	303.41	211.46	80.91	19.96	0	0	0	0	99.96	270.11	433.58	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1837.15 (98)

Space heating requirement in kWh/m²/year 25.17 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	417.75	303.41	211.46	80.91	19.96	0	0	0	0	99.96	270.11	433.58	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	417.75	303.41	211.46	80.91	19.96	0	0	0	0	99.96	270.11	433.58	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1837.15 (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

Output from water heater (calculated above)

	210.12	185.62	195.94	177.02	174.46	136.74	131.18	144.14	143.95	183.49	192.29	205.53	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	123.6	109.19	115.26	104.13	102.63	80.43	77.16	84.79	84.68	107.93	113.11	120.9	

Total = Sum(219a)$_{1...12}$ = 1223.81 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1837.15
Water heating fuel used		1223.81
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		171.33	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	171.33	(231)
Electricity for lighting		321.49	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2862.88	(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 =	242.32	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)			1			(243)
Low-rate fraction	1.0 – (243) =		0			(244)
High-rate cost	(219) x (243) x		13.19	x 0.01 =	161.42	(245)
Low-rate cost	(219) x (244) x		13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	22.6	(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 =	42.4	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				377.61	(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] =	1.34	(257)
SAP rating (Section 12)	81.25	(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	=	953.48	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	635.16	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1588.64	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	88.92	(267)
Electricity for lighting	(232)	x	0.519	=	166.85	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			1485.84	(272)
CO2 emissions per m²	(272) ÷ (4) =			20.35	(273)
EI rating (section 14)				83	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	5640.04	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3757.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =				9397.14	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	525.98	(267)
Electricity for lighting	(232)	x	0	=	986.98	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				8789.05	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				120.4	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C334

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	195.13	**(P1)**
Transmission heat loss coefficient:	63.5	
Summer heat loss coefficient:	258.64	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	16.8	117.51	0.57	0.7	0.9	638.02	
						Total	726.63	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	445.07	428.37	436.08	
Total summer gains	1216.4	1155	1075.35	**(P5)**
Summer gain/loss ratio	4.7	4.47	4.16	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.95	22.62	22.21	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:45

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 52.1m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C335

Address :

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)	31.25 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.49 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	54.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	52.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	4.2m²
Windows facing: East	12m²
Ventilation rate:	3.00

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C335

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	52.1 m²	2.7 m
Living area:	29.1 m² (fraction 0.399)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	4.2	1
E	16mm or more	0.7	0.57	1.4	12	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	52.11	16.2	35.91	0.18	0	False	N/A
Corridor	9.72	0	9.72	0.22	0.43	False	N/A
Flat	52.1	0	52.1	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0457

	Length	**Psi-value**		
[Approved]	7.3	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6.2	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
[Approved]	9	0.06	E18	Party wall between dwellings

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C335

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	52.1	(1a) x	2.7	(2a) =	140.67	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	52.1	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		140.67	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			4.2	x1/[1/(1.4)+ 0.04] =	5.57			(27)
Windows Type 2			12	x1/[1/(1.4)+ 0.04] =	15.91			(27)
Walls Type1	52.11	16.2	35.91	x 0.18 =	6.46			(29)
Walls Type2	9.72	0	9.72	x 0.2 =	1.95			(29)
Roof	52.1	0	52.1	x 0.13 =	6.77			(30)
Total area of elements, m²			113.93					(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) = 36.67 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4829.4 (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 5.21 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.87 (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=	13	12.85	12.7	11.97	11.82	11.08	11.08	10.93	11.37	11.82	12.11	12.41	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	54.88	54.73	54.58	53.84	53.69	52.95	52.95	52.8	53.25	53.69	53.99	54.28	

Average = Sum(39)$_{1...12}$ /12= 53.8 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.05	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.04	1.04

Average = Sum(40)$_{1...12}$ /12= 1.03 (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 1.75 (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 75.81 (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=	83.39	80.36	77.33	74.29	71.26	68.23	68.23	71.26	74.29	77.33	80.36	83.39

Total = Sum(44)$_{1...12}$ = 909.73 (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=	123.67	108.16	111.61	97.31	93.37	80.57	74.66	85.67	86.7	101.03	110.29	119.77

Total = Sum(45)$_{1...12}$ = 1192.79 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	18.55	16.22	16.74	14.6	14.01	12.09	11.2	12.85	13	15.16	16.54	17.96

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	188.25	166.49	176.19	159.8	157.95	122.48	117.97	128.99	128.61	165.61	172.78	184.34	(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=	188.25	166.49	176.19	159.8	157.95	122.48	117.97	128.99	128.61	165.61	172.78	184.34	

Output from water heater (annual)$_{1...12}$ 1869.47 (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=	92.78	82.63	88.77	82.35	82.71	60.32	59.47	63.14	62.36	85.26	86.67	91.49	(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=	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	105.12	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	34.03	30.23	24.58	18.61	13.91	11.74	12.69	16.49	22.14	28.11	32.81	34.98	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	227.89	230.25	224.29	211.61	195.59	180.54	170.49	168.12	174.08	186.77	202.78	217.83	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	47.26	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	-70.08	(71)

Water heating gains (Table 5)

(72)m=	124.71	122.96	119.32	114.38	111.17	83.78	79.94	84.86	86.61	114.59	120.37	122.96	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	468.93	465.74	450.5	426.9	402.98	358.37	345.42	351.78	365.14	411.78	438.27	458.08	(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)	
East	0.9x 0.77	x	12	x	19.64	x	0.57	x	0.7	=	65.17	(76)
East	0.9x 0.77	x	12	x	38.42	x	0.57	x	0.7	=	127.48	(76)
East	0.9x 0.77	x	12	x	63.27	x	0.57	x	0.7	=	209.95	(76)
East	0.9x 0.77	x	12	x	92.28	x	0.57	x	0.7	=	306.19	(76)
East	0.9x 0.77	x	12	x	113.09	x	0.57	x	0.7	=	375.25	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	12	x	115.77	x	0.57	x	0.7	=	384.14	(76)
East	0.9x	0.77	x	12	x	110.22	x	0.57	x	0.7	=	365.71	(76)
East	0.9x	0.77	x	12	x	94.68	x	0.57	x	0.7	=	314.14	(76)
East	0.9x	0.77	x	12	x	73.59	x	0.57	x	0.7	=	244.18	(76)
East	0.9x	0.77	x	12	x	45.59	x	0.57	x	0.7	=	151.27	(76)
East	0.9x	0.77	x	12	x	24.49	x	0.57	x	0.7	=	81.26	(76)
East	0.9x	0.77	x	12	x	16.15	x	0.57	x	0.7	=	53.59	(76)
West	0.9x	0.3	x	4.2	x	19.64	x	0.57	x	0.7	=	8.89	(80)
West	0.9x	0.3	x	4.2	x	38.42	x	0.57	x	0.7	=	17.38	(80)
West	0.9x	0.3	x	4.2	x	63.27	x	0.57	x	0.7	=	28.63	(80)
West	0.9x	0.3	x	4.2	x	92.28	x	0.57	x	0.7	=	41.75	(80)
West	0.9x	0.3	x	4.2	x	113.09	x	0.57	x	0.7	=	51.17	(80)
West	0.9x	0.3	x	4.2	x	115.77	x	0.57	x	0.7	=	52.38	(80)
West	0.9x	0.3	x	4.2	x	110.22	x	0.57	x	0.7	=	49.87	(80)
West	0.9x	0.3	x	4.2	x	94.68	x	0.57	x	0.7	=	42.84	(80)
West	0.9x	0.3	x	4.2	x	73.59	x	0.57	x	0.7	=	33.3	(80)
West	0.9x	0.3	x	4.2	x	45.59	x	0.57	x	0.7	=	20.63	(80)
West	0.9x	0.3	x	4.2	x	24.49	x	0.57	x	0.7	=	11.08	(80)
West	0.9x	0.3	x	4.2	x	16.15	x	0.57	x	0.7	=	7.31	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	74.05	144.87	238.57	347.95	426.42	436.52	415.58	356.98	277.47	171.9	92.34	60.9

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	542.99	610.61	689.07	774.84	829.4	794.89	761	708.76	642.61	583.67	530.6	518.98

(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=	0.97	0.95	0.9	0.76	0.59	0.42	0.31	0.34	0.56	0.83	0.95	0.98

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.29	20.45	20.68	20.89	20.98	21	21	21	20.99	20.86	20.55	20.26

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.04	20.04	20.04	20.06	20.06	20.07	20.07	20.07	20.07	20.06	20.05	20.05

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.87	0.72	0.53	0.36	0.24	0.27	0.49	0.78	0.94	0.97

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.13	19.36	19.67	19.94	20.04	20.07	20.07	20.07	20.06	19.92	19.51	19.09

(90)

fLA = Living area ÷ (4) = 0.56 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.78	19.97	20.24	20.47	20.56	20.59	20.59	20.59	20.58	20.44	20.09	19.74

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.78	19.97	20.24	20.47	20.56	20.59	20.59	20.59	20.58	20.44	20.09	19.74	(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	0.94	0.88	0.74	0.56	0.4	0.28	0.31	0.53	0.8	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	524.4	574.07	604.66	574.22	465.98	315.85	211.1	221.01	339.62	467.6	496.94	504.15	(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=	849.36	824.68	749.68	623.07	475.84	317.01	211.23	221.24	344.82	528.57	701.19	843.75	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	241.77	168.41	107.9	35.17	7.33	0	0	0	0	45.36	147.06	252.66	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1005.66 (98)

Space heating requirement in kWh/m²/year 19.3 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	241.77	168.41	107.9	35.17	7.33	0	0	0	0	45.36	147.06	252.66	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	241.77	168.41	107.9	35.17	7.33	0	0	0	0	45.36	147.06	252.66	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1005.66 (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

Output from water heater (calculated above)

	188.25	166.49	176.19	159.8	157.95	122.48	117.97	128.99	128.61	165.61	172.78	184.34	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	110.73	97.94	103.64	94	92.91	72.05	69.4	75.87	75.65	97.42	101.64	108.44	

Total = Sum(219a)$_{1...12}$ = 1099.69 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1005.66

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1099.69	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	122.28		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	122.28	(231)
Electricity for lighting		240.39	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1777.12	(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 =		132.65	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		145.05	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		16.13	(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 =		31.71	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)…(254) =	234.4 (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] =	1.01 (257)
SAP rating (Section 12)		85.86 (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	=		521.94	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		570.74	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1092.67	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	63.46	(267)
Electricity for lighting	(232) x	0.519	=	124.76	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			922.33	(272)
CO2 emissions per m²	(272) ÷ (4) =			17.7	(273)
EI rating (section 14)				87	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	3087.37	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3376.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =			6463.41	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	375.39	(267)
Electricity for lighting	(232) x	0	=	738	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =			5455.76	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			104.72	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C335

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
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:	139.26	**(P1)**
Transmission heat loss coefficient:	41.9	
Summer heat loss coefficient:	181.14	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.5	1	0.5	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.5 x	4.2	117.51	0.57	0.7	0.5	88.61	
East (E)	0.9 x	12	117.51	0.57	0.7	0.9	455.73	
						Total	544.34	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	358.37	345.42	351.78	
Total summer gains	936.2	889.76	830.67	**(P5)**
Summer gain/loss ratio	5.17	4.91	4.59	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.42	23.06	22.64	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:37

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** C336

Address :

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)	23.16 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.95 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	36.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.3 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	7.5m²
Windows facing: West	6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: C336

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	74 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	7.5	1
W	16mm or more	0.7	0.57	1.4	6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	47.52	13.5	34.02	0.18	0	False	N/A
Corridor	34.83	0	34.83	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0725

	Length	**Psi-value**		
[Approved]	12.6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	11.6	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: C336

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74 (1a)	x	2.7 (2a)	=	199.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	199.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			7.5	x1/[1/(1.4)+ 0.04] =	9.94			(27)
Windows Type 2			6	x1/[1/(1.4)+ 0.04] =	7.95			(27)
Walls Type1	47.52	13.5	34.02	x 0.18 =	6.12			(29)
Walls Type2	34.83	0	34.83	x 0.2 =	7			(29)
Total area of elements, m²			82.35					(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) = 31.02 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8999.1 (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 5.97 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.99 (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=	18.47	18.26	18.05	16.99	16.78	15.73	15.73	15.52	16.15	16.78	17.2	17.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	55.46	55.25	55.04	53.99	53.78	52.73	52.73	52.52	53.15	53.78	54.2	54.62	

Average = Sum(39)$_{1...12}$ /12= 53.94 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.75	0.75	0.74	0.73	0.73	0.71	0.71	0.71	0.72	0.73	0.73	0.74	

Average = Sum(40)$_{1...12}$ /12= 0.73 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.34 (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 89.76 (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=	98.73	95.14	91.55	87.96	84.37	80.78	80.78	84.37	87.96	91.55	95.14	98.73	

Total = Sum(44)$_{1...12}$ = 1077.07 (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=	146.42	128.06	132.14	115.21	110.54	95.39	88.39	101.43	102.64	119.62	130.57	141.8	

Total = Sum(45)$_{1...12}$ = 1412.21 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.21	15.4	17.94	19.59	21.27	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	(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=	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	

Output from water heater (annual)$_{1...12}$ 2088.89 (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=	100.35	89.24	95.6	88.3	88.42	65.25	64.04	68.38	67.66	91.44	93.41	98.81	(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=	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	46.9	41.65	33.87	25.65	19.17	16.18	17.49	22.73	30.51	38.74	45.21	48.2	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.13	311.33	303.27	286.12	264.46	244.11	230.52	227.32	235.38	252.53	274.18	294.53	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	(71)

Water heating gains (Table 5)

(72)m=	134.87	132.8	128.5	122.64	118.84	90.62	86.08	91.9	93.97	122.9	129.74	132.81	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	588.06	583.94	563.8	532.56	500.63	449.08	432.24	440.11	458.02	512.33	547.3	573.7	(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)	
South	0.9x 0.77	x	7.5	x	46.75	x	0.57	x	0.7	=	96.95	(78)
South	0.9x 0.77	x	7.5	x	76.57	x	0.57	x	0.7	=	158.79	(78)
South	0.9x 0.77	x	7.5	x	97.53	x	0.57	x	0.7	=	202.27	(78)
South	0.9x 0.77	x	7.5	x	110.23	x	0.57	x	0.7	=	228.6	(78)
South	0.9x 0.77	x	7.5	x	114.87	x	0.57	x	0.7	=	238.22	(78)
South	0.9x 0.77	x	7.5	x	110.55	x	0.57	x	0.7	=	229.25	(78)
South	0.9x 0.77	x	7.5	x	108.01	x	0.57	x	0.7	=	224	(78)
South	0.9x 0.77	x	7.5	x	104.89	x	0.57	x	0.7	=	217.53	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	7.5	x	101.89	x	0.57	x	0.7	=	211.29	(78)
South	0.9x	0.77	x	7.5	x	82.59	x	0.57	x	0.7	=	171.27	(78)
South	0.9x	0.77	x	7.5	x	55.42	x	0.57	x	0.7	=	114.92	(78)
South	0.9x	0.77	x	7.5	x	40.4	x	0.57	x	0.7	=	83.78	(78)
West	0.9x	0.77	x	6	x	19.64	x	0.57	x	0.7	=	32.58	(80)
West	0.9x	0.77	x	6	x	38.42	x	0.57	x	0.7	=	63.74	(80)
West	0.9x	0.77	x	6	x	63.27	x	0.57	x	0.7	=	104.97	(80)
West	0.9x	0.77	x	6	x	92.28	x	0.57	x	0.7	=	153.1	(80)
West	0.9x	0.77	x	6	x	113.09	x	0.57	x	0.7	=	187.63	(80)
West	0.9x	0.77	x	6	x	115.77	x	0.57	x	0.7	=	192.07	(80)
West	0.9x	0.77	x	6	x	110.22	x	0.57	x	0.7	=	182.86	(80)
West	0.9x	0.77	x	6	x	94.68	x	0.57	x	0.7	=	157.07	(80)
West	0.9x	0.77	x	6	x	73.59	x	0.57	x	0.7	=	122.09	(80)
West	0.9x	0.77	x	6	x	45.59	x	0.57	x	0.7	=	75.63	(80)
West	0.9x	0.77	x	6	x	24.49	x	0.57	x	0.7	=	40.63	(80)
West	0.9x	0.77	x	6	x	16.15	x	0.57	x	0.7	=	26.8	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	129.54	222.53	307.24	381.7	425.85	421.32	406.85	374.6	333.38	246.9	155.55	110.57	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	717.6	806.47	871.04	914.26	926.48	870.4	839.09	814.72	791.4	759.23	702.85	684.28	(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=	0.96	0.92	0.84	0.7	0.54	0.39	0.28	0.3	0.46	0.71	0.91	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.67	20.79	20.91	20.98	21	21	21	21	21	20.98	20.84	20.65	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.3	20.3	20.3	20.31	20.32	20.33	20.33	20.33	20.32	20.32	20.31	20.31	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.9	0.81	0.66	0.5	0.35	0.23	0.25	0.42	0.67	0.89	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.88	20.05	20.19	20.29	20.31	20.33	20.33	20.33	20.32	20.3	20.13	19.86	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.28	20.42	20.55	20.63	20.65	20.66	20.66	20.66	20.66	20.63	20.48	20.25	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.28	20.42	20.55	20.63	20.65	20.66	20.66	20.66	20.66	20.63	20.48	20.25	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.95	0.9	0.82	0.68	0.52	0.37	0.26	0.27	0.44	0.69	0.89	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	681.04	728.4	714.38	619.6	479.61	319.53	214.18	223.9	348.16	526.22	627.77	655.84	(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=	886.03	857.41	773.15	633.37	481.47	319.64	214.19	223.91	348.6	539.59	725.27	876.66	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	152.51	86.69	43.72	9.91	1.39	0	0	0	0	9.94	70.2	164.3	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 538.68 (98)

Space heating requirement in kWh/m²/year 7.28 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	152.51	86.69	43.72	9.91	1.39	0	0	0	0	9.94	70.2	164.3	

(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)

	152.51	86.69	43.72	9.91	1.39	0	0	0	0	9.94	70.2	164.3	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 538.68 (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

Output from water heater (calculated above)

	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	124.11	109.64	115.72	104.53	103.01	80.77	77.47	85.14	85.03	108.35	113.57	121.4	

Total = Sum(219a)$_{1...12}$ = 1228.76 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		538.68
Water heating fuel used		1228.76
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		173.68	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	173.68	(231)
Electricity for lighting		331.28	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1581.5	(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 =		71.05	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		162.07	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		22.91	(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 =		43.7	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				208.6	(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] =	0.74 (257)
SAP rating (Section 12)		89.73 (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	=		279.57	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		637.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =				917.3	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=		90.14	(267)
Electricity for lighting	(232) x	0.519	=		171.93	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			820.8	(272)
CO2 emissions per m²	(272) ÷ (4) =			11.09	(273)
EI rating (section 14)				91	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	1653.75	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3772.28	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5426.03	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	533.19	(267)
Electricity for lighting	(232)	x	0	=	1017.03	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				4855.19	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				65.61	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: C336

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	230.77	**(P1)**
Transmission heat loss coefficient:	37	
Summer heat loss coefficient:	267.76	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	7.5	112.21	0.57	0.7	0.9	271.98	
West (W)	0.9 x	6	117.51	0.57	0.7	0.9	227.86	
						Total	499.84	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	449.08	432.24	440.11	
Total summer gains	972.89	932.08	908.92	**(P5)**
Summer gain/loss ratio	3.63	3.48	3.39	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.88	21.63	21.44	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:30

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 47.3m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 337

Address :

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)	30.3 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.04 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	16.7m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 337

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	47.3 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	16.7	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	31.32	16.7	14.62	0.18	0	False	N/A
Corridor	35.64	0	35.64	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0634

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 337

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	47.3	(1a) x	2.7	(2a) =	127.71	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	47.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.71	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			16.7	x1/[1/(1.4)+ 0.04] =	22.14			(27)
Walls Type1	31.32	16.7	14.62	x 0.18 =	2.63			(29)
Walls Type2	35.64	0	35.64	x 0.2 =	7.16			(29)
Total area of elements, m²			66.96					(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) = 31.93 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7795 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.18 (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=	11.8	11.67	11.53	10.86	10.73	10.06	10.06	9.92	10.33	10.73	11	11.27	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	47.98	47.85	47.71	47.04	46.91	46.24	46.24	46.1	46.51	46.91	47.18	47.45	

Average = Sum(39)$_{1...12}$ /12= 47.01 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.01	1.01	1.01	0.99	0.99	0.98	0.98	0.97	0.98	0.99	1	1	

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

SAP WorkSheet: New dwelling design stage

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 1.61 (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 72.46 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	79.71	76.81	73.91	71.01	68.11	65.22	65.22	68.11	71.01	73.91	76.81	79.71	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 869.54 (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=	118.2	103.38	106.68	93.01	89.24	77.01	71.36	81.89	82.87	96.57	105.42	114.47	

Total = Sum(45)$_{1...12}$ = 1140.1 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	17.73	15.51	16	13.95	13.39	11.55	10.7	12.28	12.43	14.49	15.81	17.17	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05	(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=	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05	

Output from water heater (annual)$_{1...12}$ 1816.77 (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=	90.97	81.04	87.13	80.92	81.34	59.14	58.38	61.88	61.09	83.77	85.05	89.73	(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=	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	31.25	27.76	22.58	17.09	12.78	10.79	11.65	15.15	20.33	25.82	30.13	32.12	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	209.29	211.47	205.99	194.34	179.63	165.81	156.58	154.4	159.88	171.53	186.24	200.06	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	(71)

Water heating gains (Table 5)

(72)m=	122.27	120.59	117.12	112.39	109.32	82.14	78.46	83.17	84.84	112.6	118.12	120.6	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	441.31	438.31	424.18	402.32	380.23	337.23	325.19	331.22	343.55	388.44	412.99	431.28	(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)	
West	0.9x 0.77	x	16.7	x	19.64	x	0.57	x	0.7	=	90.69	(80)
West	0.9x 0.77	x	16.7	x	38.42	x	0.57	x	0.7	=	177.41	(80)
West	0.9x 0.77	x	16.7	x	63.27	x	0.57	x	0.7	=	292.17	(80)
West	0.9x 0.77	x	16.7	x	92.28	x	0.57	x	0.7	=	426.12	(80)
West	0.9x 0.77	x	16.7	x	113.09	x	0.57	x	0.7	=	522.22	(80)
West	0.9x 0.77	x	16.7	x	115.77	x	0.57	x	0.7	=	534.59	(80)
West	0.9x 0.77	x	16.7	x	110.22	x	0.57	x	0.7	=	508.95	(80)
West	0.9x 0.77	x	16.7	x	94.68	x	0.57	x	0.7	=	437.18	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	16.7	x	73.59	x	0.57	x	0.7	=	339.81	(80)
West	0.9x	0.77	x	16.7	x	45.59	x	0.57	x	0.7	=	210.52	(80)
West	0.9x	0.77	x	16.7	x	24.49	x	0.57	x	0.7	=	113.08	(80)
West	0.9x	0.77	x	16.7	x	16.15	x	0.57	x	0.7	=	74.58	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	90.69	177.41	292.17	426.12	522.22	534.59	508.95	437.18	339.81	210.52	113.08	74.58	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	532	615.73	716.36	828.44	902.45	871.82	834.14	768.4	683.36	598.96	526.07	505.86	(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=	0.96	0.93	0.83	0.66	0.48	0.34	0.24	0.28	0.47	0.75	0.93	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.41	20.59	20.81	20.95	20.99	21	21	21	21	20.92	20.66	20.37	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.07	20.07	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.08	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.91	0.8	0.62	0.43	0.29	0.19	0.22	0.41	0.7	0.91	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.33	19.58	19.86	20.04	20.08	20.1	20.1	20.1	20.09	20.02	19.68	19.28	(90)

fLA = Living area ÷ (4) = 0.78 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.17	20.36	20.59	20.75	20.79	20.8	20.8	20.8	20.79	20.72	20.44	20.13	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.17	20.36	20.59	20.75	20.79	20.8	20.8	20.8	20.79	20.72	20.44	20.13	(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=	0.95	0.91	0.82	0.65	0.47	0.33	0.23	0.26	0.45	0.74	0.91	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	507.91	562.84	587.55	536.49	423.12	286.25	194.1	202.74	309.37	441.23	480.9	486.99	(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=	761.43	739.93	672.48	557.38	426.35	286.58	194.13	202.81	311.28	474.68	629.18	755.83	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	188.62	119.01	63.19	15.04	2.4	0	0	0	0	24.89	106.76	200.02	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 719.92 (98)

Space heating requirement in kWh/m²/year 15.22 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	188.62	119.01	63.19	15.04	2.4	0	0	0	0	24.89	106.76	200.02	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	188.62	119.01	63.19	15.04	2.4	0	0	0	0	24.89	106.76	200.02	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 719.92 (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)	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	107.52	95.12	100.74	91.47	90.48	69.96	67.46	73.65	73.4	94.79	98.77	105.33	

Total = Sum(219a)$_{1...12}$ = 1068.69 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		719.92
Water heating fuel used		1068.69
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	111.01	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	111.01 (231)
Electricity for lighting		220.78 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1429.51 (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 =	94.96 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	140.96	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	14.64	(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 =	29.12	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			188.55	(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] =	0.86	(257)
SAP rating (Section 12)		88.03	(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	=	373.64	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	554.65	(264)
Space and water heating	(261) + (262) + (263) + (264) =				928.29	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	57.62	(267)
Electricity for lighting	(232) x		0.519	=	114.58	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				741.91	(272)
CO2 emissions per m²	(272) ÷ (4) =				15.69	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	2210.16	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	3280.88	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5491.04	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	340.81	(267)
Electricity for lighting	(232)	x	0	=	677.78	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		4388.58	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		92.78	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 337

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	147.51	**(P1)**
Transmission heat loss coefficient:	36.2	
Summer heat loss coefficient:	183.68	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	16.7	117.51	0.57	0.7	0.9	634.22	
						Total	634.22	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	337.23	325.19	331.22	
Total summer gains	1010.47	959.41	889.18	**(P5)**
Summer gain/loss ratio	5.5	5.22	4.84	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.75	23.37	22.89	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:24

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 41.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 424

Address :

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)	32.63 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	20.59 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.2 kWh/m²	
		Fail

Excess energy = 0.83 kg/m² (01.6 %)

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	11m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 424

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 25 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 504

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	41.7 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	11	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	24.84	16.2	8.64	0.18	0	False	N/A
Corridor	33.75	0	33.75	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0729

	Length	**Psi-value**		
[Approved]	6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 424

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	41.7	(1a) x	2.7	(2a) =	112.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	41.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		112.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			11	x1/[1/(1.4)+ 0.04] =	14.58			(27)
Walls Type1	24.84	16.2	8.64	x 0.18 =	1.56			(29)
Walls Type2	33.75	0	33.75	x 0.2 =	6.78			(29)
Total area of elements, m²			58.59					(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) = 29.82 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7017.3 (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 4.27 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.08 (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=	10.41	10.29	10.17	9.58	9.46	8.87	8.87	8.75	9.1	9.46	9.7	9.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	44.49	44.37	44.25	43.66	43.54	42.95	42.95	42.83	43.19	43.54	43.78	44.02	

Average = Sum(39)$_{1...12}$ /12= 43.63 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.07	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.06	

Average = Sum(40)$_{1...12}$ /12= 1.05 (40)

SAP WorkSheet: New dwelling design stage

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 1.45 (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 68.69 (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=	75.56	72.81	70.06	67.32	64.57	61.82	61.82	64.57	67.32	70.06	72.81	75.56	

Total = Sum(44)$_{1...12}$ = 824.28 (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=	112.05	98	101.13	88.17	84.6	73	67.65	77.63	78.55	91.55	99.93	108.52	

Total = Sum(45)$_{1...12}$ = 1080.76 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	16.81	14.7	15.17	13.22	12.69	10.95	10.15	11.64	11.78	13.73	14.99	16.28	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	(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=	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	

Output from water heater (annual)$_{1...12}$ 1757.44 (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=	88.92	79.25	85.29	79.31	79.79	57.81	57.14	60.46	59.65	82.1	83.22	87.75	(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=	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.04	24.91	20.26	15.34	11.46	9.68	10.46	13.59	18.25	23.17	27.04	28.82	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	187.81	189.76	184.85	174.39	161.19	148.79	140.5	138.55	143.46	153.92	167.12	179.52	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	(71)

Water heating gains (Table 5)

(72)m=	119.52	117.93	114.64	110.16	107.25	80.29	76.81	81.26	82.85	110.35	115.59	117.94	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	409.58	406.81	393.95	374.09	354.11	312.96	301.98	307.62	318.77	361.65	383.95	400.49	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)
North	0.9x 0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x 0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x 0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	11	x	19.64	x	0.57	x	0.7	=	59.74	(76)
East	0.9x	0.77	x	11	x	38.42	x	0.57	x	0.7	=	116.86	(76)
East	0.9x	0.77	x	11	x	63.27	x	0.57	x	0.7	=	192.45	(76)
East	0.9x	0.77	x	11	x	92.28	x	0.57	x	0.7	=	280.68	(76)
East	0.9x	0.77	x	11	x	113.09	x	0.57	x	0.7	=	343.98	(76)
East	0.9x	0.77	x	11	x	115.77	x	0.57	x	0.7	=	352.12	(76)
East	0.9x	0.77	x	11	x	110.22	x	0.57	x	0.7	=	335.24	(76)
East	0.9x	0.77	x	11	x	94.68	x	0.57	x	0.7	=	287.96	(76)
East	0.9x	0.77	x	11	x	73.59	x	0.57	x	0.7	=	223.83	(76)
East	0.9x	0.77	x	11	x	45.59	x	0.57	x	0.7	=	138.66	(76)
East	0.9x	0.77	x	11	x	24.49	x	0.57	x	0.7	=	74.49	(76)
East	0.9x	0.77	x	11	x	16.15	x	0.57	x	0.7	=	49.13	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	75.03	146.08	242.1	360.43	451.41	467.13	442.61	373.15	283.52	173.44	93.35	61.87	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	484.61	552.88	636.05	734.52	805.52	780.09	744.59	680.77	602.29	535.09	477.3	462.36	(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=	0.96	0.93	0.85	0.68	0.5	0.35	0.25	0.29	0.49	0.77	0.93	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.37	20.54	20.76	20.94	20.99	21	21	21	20.99	20.9	20.62	20.33	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.03	20.03	20.03	20.04	20.05	20.06	20.06	20.06	20.05	20.05	20.04	20.04	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.91	0.82	0.64	0.45	0.3	0.2	0.23	0.42	0.72	0.91	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.23	19.47	19.77	19.98	20.04	20.06	20.06	20.06	20.05	19.95	19.59	19.19	(90)

fLA = Living area ÷ (4) = 0.88 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.23	20.41	20.64	20.82	20.87	20.89	20.89	20.89	20.88	20.79	20.5	20.19	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.23	20.41	20.64	20.82	20.87	20.89	20.89	20.89	20.88	20.79	20.5	20.19	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.84	0.67	0.49	0.35	0.25	0.28	0.48	0.76	0.92	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	462.49	508.04	531.73	494.16	394.99	269.46	184.06	192.06	289.85	404.54	437.52	444.67	(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=	708.76	688.29	625.92	520.47	399.5	269.98	184.13	192.19	292.79	443.62	586.45	704.02	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	183.22	121.13	70.08	18.94	3.35	0	0	0	0	29.08	107.23	192.96	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 726 (98)

Space heating requirement in kWh/m²/year 17.41 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	183.22	121.13	70.08	18.94	3.35	0	0	0	0	29.08	107.23	192.96	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	183.22	121.13	70.08	18.94	3.35	0	0	0	0	29.08	107.23	192.96	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 726 (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

Output from water heater (calculated above)

	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	103.9	91.96	97.48	88.62	87.75	67.6	65.27	71.14	70.86	91.84	95.54	101.82	

Total = Sum(219a)$_{1...12}$ = 1033.79 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		726
Water heating fuel used		1033.79
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		97.87	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	97.87	(231)
Electricity for lighting		198.11	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1364.87	(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 =		95.76	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		136.36	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		12.91	(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 =		26.13	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				180.03	(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] =	0.87	(257)
SAP rating (Section 12)		87.83	(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	=		376.79	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		536.54	(264)
Space and water heating	(261) + (262) + (263) + (264) =				913.33	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=		50.79	(267)
Electricity for lighting	(232) x	0.519	=		102.82	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			708.37	(272)
CO2 emissions per m²	(272) ÷ (4) =			16.99	(273)
EI rating (section 14)				89	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	2228.81	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3173.73	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5402.54	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	300.46	(267)
Electricity for lighting	(232)	x	0	=	608.21	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				4190.16	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				100.48	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 424

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	130.04	**(P1)**
Transmission heat loss coefficient:	34.1	
Summer heat loss coefficient:	164.13	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	11	117.51	0.57	0.7	0.9	417.75	
						Total	554.19	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	312.96	301.98	307.62	
Total summer gains	904.02	856.16	786.08	**(P5)**
Summer gain/loss ratio	5.51	5.22	4.79	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.76	23.37	22.84	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:17

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 44m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 425

Address :

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)	29.85 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	14.36 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	37.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 425

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	44 m²	2.7 m

Living area:	36.7 m² (fraction 0.88)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.97	10.4	19.57	0.18	0	False	N/A
Corridor	10.26	0	10.26	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0768

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 425

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	44 (1a)	x	2.7 (2a)	=	118.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	44 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	118.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Walls Type1	29.97	10.4	19.57	x 0.18 =	3.52			(29)
Walls Type2	10.26	0	10.26	x 0.2 =	2.06			(29)
Total area of elements, m²			40.23					(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) = 19.37 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3319.3 (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 3.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 22.46 (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=	10.98	10.85	10.73	10.1	9.98	9.36	9.36	9.23	9.6	9.98	10.23	10.48	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	33.44	33.32	33.19	32.57	32.44	31.82	31.82	31.69	32.07	32.44	32.69	32.94	

Average = Sum(39)$_{1...12}$ /12= 32.54 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.76	0.76	0.75	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74	0.75	

Average = Sum(40)$_{1...12}$ /12= 0.74 (40)

SAP WorkSheet: New dwelling design stage

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 1.52 (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 70.21 (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=	77.23	74.42	71.61	68.81	66	63.19	63.19	66	68.81	71.61	74.42	77.23	

Total = Sum(44)$_{1...12}$ = 842.53 (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=	114.53	100.17	103.37	90.12	86.47	74.62	69.14	79.34	80.29	93.57	102.14	110.92	

Total = Sum(45)$_{1...12}$ = 1104.69 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	17.18	15.03	15.51	13.52	12.97	11.19	10.37	11.9	12.04	14.04	15.32	16.64	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5	(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=	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5	

Output from water heater (annual)$_{1...12}$ 1781.36 (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=	89.75	79.97	86.03	79.96	80.41	58.34	57.64	61.03	60.23	82.78	83.96	88.54	(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=	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.35	26.07	21.2	16.05	12	10.13	10.95	14.23	19.1	24.25	28.3	30.17	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	196.58	198.62	193.48	182.54	168.72	155.74	147.06	145.02	150.17	161.11	174.92	187.91	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	(71)

Water heating gains (Table 5)

(72)m=	120.63	119	115.64	111.06	108.08	81.03	77.47	82.03	83.65	111.26	116.61	119.01	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	422.5	419.63	406.26	385.58	364.74	322.84	311.42	317.22	328.85	372.55	395.77	413.03	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)
North	0.9x 0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x 0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x 0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x	0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x	0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x	0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x	0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x	0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x	0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x	0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)
East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	43.53	84.46	140.63	212.43	270.04	281.46	265.85	221.31	165.5	100.33	54.07	35.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	466.03	504.09	546.88	598.02	634.78	604.3	577.27	538.54	494.36	472.88	449.84	448.99	(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=	0.94	0.9	0.81	0.65	0.47	0.34	0.24	0.27	0.45	0.69	0.88	0.95	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.72	20.81	20.92	20.98	21	21	21	21	21	20.98	20.87	20.71	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.29	20.29	20.29	20.31	20.31	20.32	20.32	20.32	20.32	20.31	20.3	20.3	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.93	0.88	0.79	0.61	0.44	0.3	0.21	0.23	0.4	0.65	0.86	0.94	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.94	20.06	20.2	20.29	20.31	20.32	20.32	20.32	20.31	20.29	20.15	19.93	(90)

fLA = Living area ÷ (4) = 0.83 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.59	20.69	20.8	20.87	20.88	20.89	20.89	20.89	20.89	20.87	20.75	20.58	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.59	20.69	20.8	20.87	20.88	20.89	20.89	20.89	20.89	20.87	20.75	20.58	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.93	0.89	0.81	0.64	0.47	0.33	0.24	0.26	0.44	0.69	0.87	0.94	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	435.02	450.96	441.27	383.53	297.29	200	136.4	142.22	217.3	324.9	393.58	423.09	(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=	544.9	526.01	474.59	389.8	297.93	200.04	136.41	142.22	217.59	333.01	446.21	539.5	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	81.75	50.43	24.79	4.51	0.48	0	0	0	0	6.04	37.9	86.61	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 292.5 (98)

Space heating requirement in kWh/m²/year 6.65 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	81.75	50.43	24.79	4.51	0.48	0	0	0	0	6.04	37.9	86.61	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	81.75	50.43	24.79	4.51	0.48	0	0	0	0	6.04	37.9	86.61	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 292.5 (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

Output from water heater (calculated above)

	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	105.36	93.24	98.79	89.77	88.85	68.55	66.15	72.15	71.89	93.03	96.85	103.23	

Total = Sum(219a)$_{1...12}$ = 1047.86 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		292.5
Water heating fuel used		1047.86
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		103.27	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	103.27	(231)
Electricity for lighting		207.37	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		960.1	(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 =		38.58	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		138.21	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		13.62	(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 =		27.35	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				126.64	(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] =	0.6 (257)
SAP rating (Section 12)		91.66 (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	13.19	0.519	=	151.81	(261)
Space heating (secondary)	(215) x	0	0.519	=	0	(263)
Water heating	(219) x	1048.32	0.519	=	543.84	(264)
Space and water heating	(261) + (262) + (263) + (264) =				695.65	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	103.27	0.519	=	53.6	(267)
Electricity for lighting	(232) x	207.37	0.519	=	107.62	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			498.29	(272)
CO2 emissions per m²	(272) ÷ (4) =			11.32	(273)
EI rating (section 14)				92	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	897.99	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3216.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4114.92	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	317.03	(267)
Electricity for lighting	(232)	x	0	=	636.61	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				2947.51	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				66.99	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 425

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	137.21	**(P1)**
Transmission heat loss coefficient:	22.5	
Summer heat loss coefficient:	159.68	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	333.92	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	322.84	311.42	317.22	
Total summer gains	680.08	645.34	601.9	**(P5)**
Summer gain/loss ratio	4.26	4.04	3.77	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.51	22.19	21.82	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:11

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 78.9m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 426

Address :

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)	20.71 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.78 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	30.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	25.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	9.7m²
Windows facing: East	6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 426

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	78.9 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	9.7	1
E	16mm or more	0.7	0.57	1.4	6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	47.52	15.7	31.82	0.18	0	False	N/A
Corridor	4.05	0	4.05	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0599

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 426

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.9	(1a) x	2.7	(2a) =	213.03	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.9	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		213.03	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			6	x1/[1/(1.4)+ 0.04] =	7.95			(27)
Walls Type1	47.52	15.7	31.82	x 0.18 =	5.73			(29)
Walls Type2	4.05	0	4.05	x 0.2 =	0.81			(29)
Total area of elements, m²			51.57					(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) = 27.36 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 2996.9 (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 3.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 30.44 (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=	19.69	19.46	19.24	18.12	17.9	16.78	16.78	16.55	17.22	17.9	18.34	18.79	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	50.13	49.91	49.69	48.56	48.34	47.22	47.22	47	47.67	48.34	48.79	49.24	

Average = Sum(39)$_{1...12}$ /12= 48.51 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.64	0.63	0.63	0.62	0.61	0.6	0.6	0.6	0.6	0.61	0.62	0.62	

Average = Sum(40)$_{1...12}$ /12= 0.61 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.44 (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 92.19 (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=	101.41	97.72	94.03	90.35	86.66	82.97	82.97	86.66	90.35	94.03	97.72	101.41	

Total = Sum(44)$_{1...12}$ = 1106.27 (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=	150.39	131.53	135.73	118.33	113.54	97.98	90.79	104.18	105.43	122.86	134.12	145.64	

Total = Sum(45)$_{1...12}$ = 1450.5 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.56	19.73	20.36	17.75	17.03	14.7	13.62	15.63	15.81	18.43	20.12	21.85	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	214.96	189.86	200.3	180.82	178.12	139.89	134.1	147.49	147.34	187.44	196.61	210.22	(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=	214.96	189.86	200.3	180.82	178.12	139.89	134.1	147.49	147.34	187.44	196.61	210.22	

Output from water heater (annual)$_{1...12}$ 2127.17 (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=	101.67	90.4	96.79	89.34	89.42	66.11	64.84	69.29	68.59	92.52	94.59	100.09	(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=	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	48.76	43.31	35.22	26.66	19.93	16.83	18.18	23.63	31.72	40.28	47.01	50.11	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	324.07	327.43	318.96	300.92	278.14	256.74	242.44	239.08	247.55	265.59	288.37	309.77	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	(71)

Water heating gains (Table 5)

(72)m=	136.65	134.52	130.1	124.08	120.18	91.82	87.15	93.13	95.26	124.35	131.38	134.53	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	610.4	606.18	585.2	552.59	519.18	466.31	448.7	456.77	475.46	531.15	567.68	595.34	(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)	
East	0.9x 0.77	x	6	x	19.64	x	0.57	x	0.7	=	32.58	(76)
East	0.9x 0.77	x	6	x	38.42	x	0.57	x	0.7	=	63.74	(76)
East	0.9x 0.77	x	6	x	63.27	x	0.57	x	0.7	=	104.97	(76)
East	0.9x 0.77	x	6	x	92.28	x	0.57	x	0.7	=	153.1	(76)
East	0.9x 0.77	x	6	x	113.09	x	0.57	x	0.7	=	187.63	(76)
East	0.9x 0.77	x	6	x	115.77	x	0.57	x	0.7	=	192.07	(76)
East	0.9x 0.77	x	6	x	110.22	x	0.57	x	0.7	=	182.86	(76)
East	0.9x 0.77	x	6	x	94.68	x	0.57	x	0.7	=	157.07	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	6	x	73.59	x	0.57	x	0.7	=	122.09	(76)
East	0.9x	0.77	x	6	x	45.59	x	0.57	x	0.7	=	75.63	(76)
East	0.9x	0.77	x	6	x	24.49	x	0.57	x	0.7	=	40.63	(76)
East	0.9x	0.77	x	6	x	16.15	x	0.57	x	0.7	=	26.8	(76)
South	0.9x	0.77	x	9.7	x	46.75	x	0.57	x	0.7	=	125.39	(78)
South	0.9x	0.77	x	9.7	x	76.57	x	0.57	x	0.7	=	205.36	(78)
South	0.9x	0.77	x	9.7	x	97.53	x	0.57	x	0.7	=	261.6	(78)
South	0.9x	0.77	x	9.7	x	110.23	x	0.57	x	0.7	=	295.66	(78)
South	0.9x	0.77	x	9.7	x	114.87	x	0.57	x	0.7	=	308.1	(78)
South	0.9x	0.77	x	9.7	x	110.55	x	0.57	x	0.7	=	296.5	(78)
South	0.9x	0.77	x	9.7	x	108.01	x	0.57	x	0.7	=	289.7	(78)
South	0.9x	0.77	x	9.7	x	104.89	x	0.57	x	0.7	=	281.34	(78)
South	0.9x	0.77	x	9.7	x	101.89	x	0.57	x	0.7	=	273.27	(78)
South	0.9x	0.77	x	9.7	x	82.59	x	0.57	x	0.7	=	221.5	(78)
South	0.9x	0.77	x	9.7	x	55.42	x	0.57	x	0.7	=	148.64	(78)
South	0.9x	0.77	x	9.7	x	40.4	x	0.57	x	0.7	=	108.35	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	157.98	269.11	366.57	448.76	495.72	488.57	472.56	438.41	395.36	297.14	189.26	135.15	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	768.38	875.29	951.77	1001.35	1014.91	954.88	921.25	895.18	870.82	828.28	756.94	730.49	(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=	0.93	0.85	0.74	0.58	0.44	0.32	0.23	0.24	0.38	0.6	0.84	0.94	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.84	20.92	20.98	21	21	21	21	21	21	21	20.94	20.82	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.4	20.4	20.4	20.42	20.42	20.43	20.43	20.43	20.43	20.42	20.41	20.41	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.91	0.83	0.71	0.56	0.42	0.29	0.2	0.21	0.35	0.57	0.81	0.93	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.2	20.31	20.38	20.41	20.42	20.43	20.43	20.43	20.43	20.42	20.35	20.18	(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.49	20.6	20.66	20.68	20.69	20.7	20.7	20.7	20.69	20.69	20.63	20.47	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.49	20.6	20.66	20.68	20.69	20.7	20.7	20.7	20.69	20.69	20.63	20.47	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.92	0.84	0.72	0.57	0.43	0.3	0.21	0.23	0.36	0.59	0.82	0.93	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	703.19	732.62	687.72	570.21	434.35	287.84	193.41	201.95	314.25	485.38	623.64	679.56	(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=	811.8	783.33	703.32	572.3	434.52	287.85	193.41	201.95	314.28	487.54	659.92	801.31	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	80.81	34.08	11.6	1.51	0.13	0	0	0	0	1.61	26.12	90.58	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 246.45 (98)

Space heating requirement in kWh/m²/year 3.12 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	80.81	34.08	11.6	1.51	0.13	0	0	0	0	1.61	26.12	90.58	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	80.81	34.08	11.6	1.51	0.13	0	0	0	0	1.61	26.12	90.58	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 246.45 (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

Output from water heater (calculated above)

	214.96	189.86	200.3	180.82	178.12	139.89	134.1	147.49	147.34	187.44	196.61	210.22	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	126.45	111.68	117.83	106.37	104.78	82.29	78.88	86.76	86.67	110.26	115.65	123.66	

Total = Sum(219a)$_{1...12}$ = 1251.28 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		246.45
Water heating fuel used		1251.28
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		185.18	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	185.18	(231)
Electricity for lighting		344.44	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1336.45	(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 =		32.51	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		165.04	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		24.42	(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 =		45.43	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				176.28	(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] =	0.6	(257)
SAP rating (Section 12)	91.66	(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	=		127.91	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		649.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =				777.32	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=		96.11	(267)
Electricity for lighting	(232) x	0.519	=		178.77	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			693.62	(272)
CO2 emissions per m²	(272) ÷ (4) =			8.79	(273)
EI rating (section 14)				92	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	756.59	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3841.43	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4598.02	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	568.49	(267)
Electricity for lighting	(232)	x	0	=	1057.44	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				4102.9	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				52	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 426

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	246.05	**(P1)**
Transmission heat loss coefficient:	30.4	
Summer heat loss coefficient:	276.49	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	9.7	112.21	0.57	0.7	0.9	351.76	
East (E)	0.9 x	6	117.51	0.57	0.7	0.9	227.86	
						Total	579.62	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	466.31	448.7	456.77	
Total summer gains	1072.82	1028.32	1004.29	**(P5)**
Summer gain/loss ratio	3.88	3.72	3.63	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.13	21.87	21.68	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:06

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 427

Address :

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)	22.33 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.87 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	35.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	31.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	9.7m²
Windows facing: East	12m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 427

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 25 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 504

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	74 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	9.7	1
E	16mm or more	0.7	0.57	1.4	12	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	48.33	21.7	26.63	0.18	0	False	N/A
Corridor	11.61	0	11.61	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0515

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 427

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74 (1a)	x	2.7 (2a)	=	199.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	199.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			12	x1/[1/(1.4)+ 0.04] =	15.91			(27)
Walls Type1	48.33	21.7	26.63	x 0.18 =	4.79			(29)
Walls Type2	11.61	0	11.61	x 0.2 =	2.33			(29)
Total area of elements, m²			59.94					(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) = 35.9 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4070 (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 3.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 38.98 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	18.47	18.26	18.05	16.99	16.78	15.73	15.73	15.52	16.15	16.78	17.2	17.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	57.45	57.24	57.03	55.98	55.77	54.72	54.72	54.51	55.14	55.77	56.19	56.61	

Average = Sum(39)$_{1...12}$ /12= 55.93 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.78	0.77	0.77	0.76	0.75	0.74	0.74	0.74	0.75	0.75	0.76	0.76	

Average = Sum(40)$_{1...12}$ /12= 0.76 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.34 (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 89.76 (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=	98.73	95.14	91.55	87.96	84.37	80.78	80.78	84.37	87.96	91.55	95.14	98.73	

Total = Sum(44)$_{1...12}$ = 1077.07 (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=	146.42	128.06	132.14	115.21	110.54	95.39	88.39	101.43	102.64	119.62	130.57	141.8	

Total = Sum(45)$_{1...12}$ = 1412.21 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.21	15.4	17.94	19.59	21.27	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	(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=	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	

Output from water heater (annual)$_{1...12}$ 2088.89 (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=	100.35	89.24	95.6	88.3	88.42	65.25	64.04	68.38	67.66	91.44	93.41	98.81	(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=	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	46.01	40.87	33.24	25.16	18.81	15.88	17.16	22.3	29.93	38.01	44.36	47.29	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.13	311.33	303.27	286.12	264.46	244.11	230.52	227.32	235.38	252.53	274.18	294.53	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	(71)

Water heating gains (Table 5)

(72)m=	134.87	132.8	128.5	122.64	118.84	90.62	86.08	91.9	93.97	122.9	129.74	132.81	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	587.18	583.15	563.16	532.08	500.27	448.78	431.91	439.69	457.44	511.6	546.44	572.79	(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)	
East	0.9x 0.77	x	12	x	19.64	x	0.57	x	0.7	=	65.17	(76)
East	0.9x 0.77	x	12	x	38.42	x	0.57	x	0.7	=	127.48	(76)
East	0.9x 0.77	x	12	x	63.27	x	0.57	x	0.7	=	209.95	(76)
East	0.9x 0.77	x	12	x	92.28	x	0.57	x	0.7	=	306.19	(76)
East	0.9x 0.77	x	12	x	113.09	x	0.57	x	0.7	=	375.25	(76)
East	0.9x 0.77	x	12	x	115.77	x	0.57	x	0.7	=	384.14	(76)
East	0.9x 0.77	x	12	x	110.22	x	0.57	x	0.7	=	365.71	(76)
East	0.9x 0.77	x	12	x	94.68	x	0.57	x	0.7	=	314.14	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	12	x	73.59	x	0.57	x	0.7	=	244.18	(76)
East	0.9x	0.77	x	12	x	45.59	x	0.57	x	0.7	=	151.27	(76)
East	0.9x	0.77	x	12	x	24.49	x	0.57	x	0.7	=	81.26	(76)
East	0.9x	0.77	x	12	x	16.15	x	0.57	x	0.7	=	53.59	(76)
South	0.9x	0.77	x	9.7	x	46.75	x	0.57	x	0.7	=	125.39	(78)
South	0.9x	0.77	x	9.7	x	76.57	x	0.57	x	0.7	=	205.36	(78)
South	0.9x	0.77	x	9.7	x	97.53	x	0.57	x	0.7	=	261.6	(78)
South	0.9x	0.77	x	9.7	x	110.23	x	0.57	x	0.7	=	295.66	(78)
South	0.9x	0.77	x	9.7	x	114.87	x	0.57	x	0.7	=	308.1	(78)
South	0.9x	0.77	x	9.7	x	110.55	x	0.57	x	0.7	=	296.5	(78)
South	0.9x	0.77	x	9.7	x	108.01	x	0.57	x	0.7	=	289.7	(78)
South	0.9x	0.77	x	9.7	x	104.89	x	0.57	x	0.7	=	281.34	(78)
South	0.9x	0.77	x	9.7	x	101.89	x	0.57	x	0.7	=	273.27	(78)
South	0.9x	0.77	x	9.7	x	82.59	x	0.57	x	0.7	=	221.5	(78)
South	0.9x	0.77	x	9.7	x	55.42	x	0.57	x	0.7	=	148.64	(78)
South	0.9x	0.77	x	9.7	x	40.4	x	0.57	x	0.7	=	108.35	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	190.56	332.85	471.54	601.85	683.35	680.64	655.41	595.48	517.44	372.77	229.89	161.94	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	777.74	916	1034.7	1133.93	1183.62	1129.41	1087.32	1035.17	974.89	884.37	776.34	734.74	(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=	0.95	0.88	0.76	0.59	0.44	0.31	0.22	0.24	0.39	0.64	0.88	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.7	20.84	20.94	20.99	21	21	21	21	21	20.99	20.87	20.66	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.27	20.28	20.28	20.29	20.29	20.31	20.31	20.31	20.3	20.29	20.29	20.28	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.93	0.86	0.73	0.56	0.4	0.28	0.19	0.21	0.35	0.6	0.86	0.95	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.89	20.09	20.22	20.28	20.29	20.31	20.31	20.31	20.3	20.28	20.13	19.86	(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.29	20.46	20.58	20.63	20.64	20.65	20.65	20.65	20.65	20.63	20.5	20.26	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.29	20.46	20.58	20.63	20.64	20.65	20.65	20.65	20.65	20.63	20.5	20.26	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.93	0.86	0.74	0.57	0.42	0.29	0.2	0.22	0.37	0.62	0.86	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	726.8	789.73	767.84	651.09	498.14	331.02	221.62	231.74	360.84	551.41	669.64	696.42	(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=	918.67	890.63	802.83	656.82	498.74	331.06	221.62	231.74	361.02	559.4	752.76	908.94	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	142.76	67.81	26.03	4.13	0.45	0	0	0	0	5.95	59.85	158.11	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 465.08 (98)

Space heating requirement in kWh/m²/year 6.28 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	142.76	67.81	26.03	4.13	0.45	0	0	0	0	5.95	59.85	158.11	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	142.76	67.81	26.03	4.13	0.45	0	0	0	0	5.95	59.85	158.11	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 465.08 (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

Output from water heater (calculated above)

	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	124.11	109.64	115.72	104.53	103.01	80.77	77.47	85.14	85.03	108.35	113.57	121.4	

Total = Sum(219a)$_{1...12}$ = 1228.76 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		465.08
Water heating fuel used		1228.76
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		173.68	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	173.68	(231)
Electricity for lighting		325.04	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1501.65	(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 =		61.34	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		162.07	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		22.91	(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 =		42.87	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				198.07	(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] =	0.7 (257)
SAP rating (Section 12)		90.25 (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	=		241.37	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		637.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =				879.1	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=		90.14	(267)
Electricity for lighting	(232) x	0.519	=		168.69	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			779.36	(272)
CO2 emissions per m²	(272) ÷ (4) =			10.53	(273)
EI rating (section 14)				91	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	1427.79	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3772.28	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5200.07	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	533.19	(267)
Electricity for lighting	(232)	x	0	=	997.86	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				4610.07	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				62.3	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 427

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	230.77	**(P1)**
Transmission heat loss coefficient:	39	
Summer heat loss coefficient:	269.75	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	9.7	112.21	0.57	0.7	0.9	351.76	
East (E)	0.9 x	12	117.51	0.57	0.7	0.9	455.73	
						Total	807.48	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	448.78	431.91	439.69	
Total summer gains	1297.17	1239.4	1187.67	**(P5)**
Summer gain/loss ratio	4.81	4.59	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	21.06	22.74	22.45	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:16:01

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 47.3m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 428

Address :

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)	30.3 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.04 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	16.7m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 428

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	47.3 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	16.7	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	31.32	16.7	14.62	0.18	0	False	N/A
Corridor	35.64	0	35.64	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0634

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 428

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	47.3	(1a) x	2.7	(2a) =	127.71	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	47.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.71	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			16.7	x1/[1/(1.4)+ 0.04] =	22.14			(27)
Walls Type1	31.32	16.7	14.62	x 0.18 =	2.63			(29)
Walls Type2	35.64	0	35.64	x 0.2 =	7.16			(29)
Total area of elements, m²			66.96					(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) = 31.93 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7795 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.18 (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=	11.8	11.67	11.53	10.86	10.73	10.06	10.06	9.92	10.33	10.73	11	11.27	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	47.98	47.85	47.71	47.04	46.91	46.24	46.24	46.1	46.51	46.91	47.18	47.45	

Average = Sum(39)$_{1...12}$ /12= 47.01 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.01	1.01	1.01	0.99	0.99	0.98	0.98	0.97	0.98	0.99	1	1	

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

SAP WorkSheet: New dwelling design stage

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 1.61 (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 72.46 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	79.71	76.81	73.91	71.01	68.11	65.22	65.22	68.11	71.01	73.91	76.81	79.71	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 869.54 (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=	118.2	103.38	106.68	93.01	89.24	77.01	71.36	81.89	82.87	96.57	105.42	114.47	

Total = Sum(45)$_{1...12}$ = 1140.1 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	17.73	15.51	16	13.95	13.39	11.55	10.7	12.28	12.43	14.49	15.81	17.17	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05	(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=	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05	

Output from water heater (annual)$_{1...12}$ 1816.77 (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=	90.97	81.04	87.13	80.92	81.34	59.14	58.38	61.88	61.09	83.77	85.05	89.73	(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=	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	31.25	27.76	22.58	17.09	12.78	10.79	11.65	15.15	20.33	25.82	30.13	32.12	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	209.29	211.47	205.99	194.34	179.63	165.81	156.58	154.4	159.88	171.53	186.24	200.06	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	(71)

Water heating gains (Table 5)

(72)m=	122.27	120.59	117.12	112.39	109.32	82.14	78.46	83.17	84.84	112.6	118.12	120.6	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	441.31	438.31	424.18	402.32	380.23	337.23	325.19	331.22	343.55	388.44	412.99	431.28	(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)	
West	0.9x 0.77	x	16.7	x	19.64	x	0.57	x	0.7	=	90.69	(80)
West	0.9x 0.77	x	16.7	x	38.42	x	0.57	x	0.7	=	177.41	(80)
West	0.9x 0.77	x	16.7	x	63.27	x	0.57	x	0.7	=	292.17	(80)
West	0.9x 0.77	x	16.7	x	92.28	x	0.57	x	0.7	=	426.12	(80)
West	0.9x 0.77	x	16.7	x	113.09	x	0.57	x	0.7	=	522.22	(80)
West	0.9x 0.77	x	16.7	x	115.77	x	0.57	x	0.7	=	534.59	(80)
West	0.9x 0.77	x	16.7	x	110.22	x	0.57	x	0.7	=	508.95	(80)
West	0.9x 0.77	x	16.7	x	94.68	x	0.57	x	0.7	=	437.18	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	16.7	x	73.59	x	0.57	x	0.7	=	339.81	(80)
West	0.9x	0.77	x	16.7	x	45.59	x	0.57	x	0.7	=	210.52	(80)
West	0.9x	0.77	x	16.7	x	24.49	x	0.57	x	0.7	=	113.08	(80)
West	0.9x	0.77	x	16.7	x	16.15	x	0.57	x	0.7	=	74.58	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	90.69	177.41	292.17	426.12	522.22	534.59	508.95	437.18	339.81	210.52	113.08	74.58	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	532	615.73	716.36	828.44	902.45	871.82	834.14	768.4	683.36	598.96	526.07	505.86	(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=	0.96	0.93	0.83	0.66	0.48	0.34	0.24	0.28	0.47	0.75	0.93	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.41	20.59	20.81	20.95	20.99	21	21	21	21	20.92	20.66	20.37	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.07	20.07	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.08	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.91	0.8	0.62	0.43	0.29	0.19	0.22	0.41	0.7	0.91	0.96	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.33	19.58	19.86	20.04	20.08	20.1	20.1	20.1	20.09	20.02	19.68	19.28	(90)

fLA = Living area ÷ (4) = 0.78 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.17	20.36	20.59	20.75	20.79	20.8	20.8	20.8	20.79	20.72	20.44	20.13	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.17	20.36	20.59	20.75	20.79	20.8	20.8	20.8	20.79	20.72	20.44	20.13	(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=	0.95	0.91	0.82	0.65	0.47	0.33	0.23	0.26	0.45	0.74	0.91	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	507.91	562.84	587.55	536.49	423.12	286.25	194.1	202.74	309.37	441.23	480.9	486.99	(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=	761.43	739.93	672.48	557.38	426.35	286.58	194.13	202.81	311.28	474.68	629.18	755.83	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	188.62	119.01	63.19	15.04	2.4	0	0	0	0	24.89	106.76	200.02	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 719.92 (98)

Space heating requirement in kWh/m²/year 15.22 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	188.62	119.01	63.19	15.04	2.4	0	0	0	0	24.89	106.76	200.02	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	188.62	119.01	63.19	15.04	2.4	0	0	0	0	24.89	106.76	200.02	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 719.92 (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)	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	107.52	95.12	100.74	91.47	90.48	69.96	67.46	73.65	73.4	94.79	98.77	105.33	

Total = Sum(219a)$_{1...12}$ = 1068.69 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		719.92
Water heating fuel used		1068.69
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	111.01	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	111.01 (231)
Electricity for lighting		220.78 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1429.51 (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 =	94.96 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	140.96	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	14.64	(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 =	29.12	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			188.55	(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] =	0.86	(257)
SAP rating (Section 12)		88.03	(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	=	373.64	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	554.65	(264)
Space and water heating	(261) + (262) + (263) + (264) =				928.29	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	57.62	(267)
Electricity for lighting	(232) x		0.519	=	114.58	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				741.91	(272)
CO2 emissions per m²	(272) ÷ (4) =				15.69	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	2210.16	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	3280.88	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5491.04	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	340.81	(267)
Electricity for lighting	(232)	x	0	=	677.78	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		4388.58	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		92.78	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 428

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	147.51	**(P1)**
Transmission heat loss coefficient:	36.2	
Summer heat loss coefficient:	183.68	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	16.7	117.51	0.57	0.7	0.9	634.22	
						Total	634.22	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	337.23	325.19	331.22	
Total summer gains	1010.47	959.41	889.18	**(P5)**
Summer gain/loss ratio	5.5	5.22	4.84	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.75	23.37	22.89	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:57

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.2m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 429

Address :

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)	25.3 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.57 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	41.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	22.5m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 429

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	63.2 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	22.5	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	56.43	22.5	33.93	0.18	0	False	N/A
Corridor	5.94	0	5.94	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0681

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 429

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	63.2 (1a)	x	2.7 (2a)	=	170.64	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	170.64	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			22.5	x1/[1/(1.4)+ 0.04] =	29.83			(27)
Walls Type1	56.43	22.5	33.93	x 0.18 =	6.11			(29)
Walls Type2	5.94	0	5.94	x 0.2 =	1.19			(29)
Total area of elements, m²			62.37					(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) = 37.13 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3503.7 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 41.38 (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=	15.77	15.59	15.41	14.51	14.33	13.44	13.44	13.26	13.8	14.33	14.69	15.05	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	57.15	56.97	56.79	55.89	55.71	54.81	54.81	54.63	55.17	55.71	56.07	56.43	

Average = Sum(39)$_{1...12}$ /12= 55.85 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.9	0.9	0.9	0.88	0.88	0.87	0.87	0.86	0.87	0.88	0.89	0.89	

Average = Sum(40)$_{1...12}$ /12= 0.88 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.07 (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 83.37 (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=	91.71	88.38	85.04	81.71	78.37	75.04	75.04	78.37	81.71	85.04	88.38	91.71	

Total = Sum(44)$_{1...12}$ = 1000.5 (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=	136.01	118.95	122.75	107.01	102.68	88.61	82.11	94.22	95.35	111.12	121.29	131.72	

Total = Sum(45)$_{1...12}$ = 1311.81 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.4	17.84	18.41	16.05	15.4	13.29	12.32	14.13	14.3	16.67	18.19	19.76	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	200.59	177.28	187.33	169.51	167.26	130.52	125.42	137.53	137.26	175.7	183.79	196.29	(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=	200.59	177.28	187.33	169.51	167.26	130.52	125.42	137.53	137.26	175.7	183.79	196.29	

Output from water heater (annual)$_{1...12}$ 1988.49 (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=	96.89	86.22	92.48	85.58	85.81	62.99	61.95	65.98	65.24	88.61	90.33	95.46	(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=	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	40.33	35.82	29.13	22.05	16.48	13.92	15.04	19.55	26.24	33.31	38.88	41.45	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	270.06	272.86	265.8	250.77	231.79	213.95	202.04	199.23	206.3	221.33	240.31	258.14	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	(71)

Water heating gains (Table 5)

(72)m=	130.22	128.3	124.3	118.86	115.33	87.49	83.27	88.68	90.6	119.1	125.45	128.3	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	531.51	527.88	510.13	482.58	454.51	406.27	391.25	398.37	414.04	464.64	495.54	518.8	(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)	
West	0.9x 0.77	x	22.5	x	19.64	x	0.57	x	0.7	=	122.19	(80)
West	0.9x 0.77	x	22.5	x	38.42	x	0.57	x	0.7	=	239.03	(80)
West	0.9x 0.77	x	22.5	x	63.27	x	0.57	x	0.7	=	393.65	(80)
West	0.9x 0.77	x	22.5	x	92.28	x	0.57	x	0.7	=	574.11	(80)
West	0.9x 0.77	x	22.5	x	113.09	x	0.57	x	0.7	=	703.6	(80)
West	0.9x 0.77	x	22.5	x	115.77	x	0.57	x	0.7	=	720.26	(80)
West	0.9x 0.77	x	22.5	x	110.22	x	0.57	x	0.7	=	685.71	(80)
West	0.9x 0.77	x	22.5	x	94.68	x	0.57	x	0.7	=	589.02	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	22.5	x	73.59	x	0.57	x	0.7	=	457.83	(80)
West	0.9x	0.77	x	22.5	x	45.59	x	0.57	x	0.7	=	283.63	(80)
West	0.9x	0.77	x	22.5	x	24.49	x	0.57	x	0.7	=	152.36	(80)
West	0.9x	0.77	x	22.5	x	16.15	x	0.57	x	0.7	=	100.48	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	122.19	239.03	393.65	574.11	703.6	720.26	685.71	589.02	457.83	283.63	152.36	100.48	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	653.7	766.91	903.78	1056.69	1158.1	1126.52	1076.96	987.38	871.87	748.27	647.9	619.28	(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=	0.97	0.92	0.82	0.63	0.45	0.31	0.22	0.25	0.44	0.73	0.93	0.97	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.5	20.68	20.87	20.98	21	21	21	21	21	20.95	20.72	20.46	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.16	20.17	20.17	20.18	20.18	20.2	20.2	20.2	20.19	20.18	20.18	20.17	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.91	0.79	0.59	0.41	0.27	0.18	0.21	0.38	0.69	0.91	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.53	19.77	20.02	20.16	20.18	20.2	20.2	20.2	20.19	20.14	19.85	19.48	(90)

fLA = Living area ÷ (4) = 0.58 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.09	20.3	20.51	20.63	20.65	20.66	20.66	20.66	20.66	20.61	20.36	20.05	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.09	20.3	20.51	20.63	20.65	20.66	20.66	20.66	20.66	20.61	20.36	20.05	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Utilisation factor for gains, hm:

(94)m=	0.96	0.91	0.8	0.61	0.43	0.29	0.21	0.24	0.41	0.71	0.91	0.97	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	625.85	698.32	723.03	642.61	497.41	332.2	222.68	232.92	361.05	532.01	591.61	598.18	(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=	902.37	877.08	795.75	655.72	498.88	332.3	222.68	232.94	361.88	557.64	743.21	894.48	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	205.73	120.13	54.1	9.44	1.09	0	0	0	0	19.07	109.16	220.45	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 739.18 (98)

Space heating requirement in kWh/m²/year 11.7 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	205.73	120.13	54.1	9.44	1.09	0	0	0	0	19.07	109.16	220.45	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	205.73	120.13	54.1	9.44	1.09	0	0	0	0	19.07	109.16	220.45	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 739.18 (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

Output from water heater (calculated above)

	200.59	177.28	187.33	169.51	167.26	130.52	125.42	137.53	137.26	175.7	183.79	196.29	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	117.99	104.28	110.19	99.71	98.39	76.78	73.78	80.9	80.74	103.35	108.11	115.47	

Total = Sum(219a)$_{1...12}$ = 1169.7 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		739.18
Water heating fuel used		1169.7
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	148.33	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	148.33 (231)
Electricity for lighting		284.88 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1651.19 (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 =	97.5 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)		1			(243)
Low-rate fraction	1.0 – (243) =	0			(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	154.28	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	19.56	(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 =	37.58	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			217.79	(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] =	0.85	(257)
SAP rating (Section 12)		88.21	(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	=	383.64	(261)	
Space heating (secondary)	(215) x	0.519	=	0	(263)	
Water heating	(219) x	0.519	=	607.07	(264)	
Space and water heating	(261) + (262) + (263) + (264) =			990.71	(265)	
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	76.98	(267)	
Electricity for lighting	(232) x	0.519	=	147.85	(268)	
Energy saving/generation technologies						
Item 1		0.519	=	-358.57	(269)	
Total CO2, kg/year	sum of (265)…(271) =			856.97	(272)	
CO2 emissions per m²	(272) ÷ (4) =			13.56	(273)	
EI rating (section 14)				89	(274)	

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	2269.29	(261)	
Space heating (secondary)	(215) x	3.07	=	0	(263)	
Energy for water heating	(219) x	3.07	=	3590.97	(264)	
Space and water heating	(261) + (262) + (263) + (264) =			5860.26	(265)	

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	455.37	(267)
Electricity for lighting	(232)	x	0	=	874.57	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		5069.15	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		80.21	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 429

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	197.09	**(P1)**
Transmission heat loss coefficient:	41.4	
Summer heat loss coefficient:	238.47	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	22.5	117.51	0.57	0.7	0.9	854.49	
						Total	854.49	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	406.27	391.25	398.37	
Total summer gains	1313.32	1245.73	1150.11	**(P5)**
Summer gain/loss ratio	5.51	5.22	4.82	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.76	23.37	22.87	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:53

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 64m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 430

Address :

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)	24.52 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.56 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	37.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	33.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	9.9m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 430

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	64 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	9.9	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	37.53	9.9	27.63	0.18	0	False	N/A
Corridor	25.11	0	25.11	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0678

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 430

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	64	(1a) x	2.7	(2a) =	172.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	64	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		172.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			9.9	x1/[1/(1.4)+ 0.04] =	13.12			(27)
Walls Type1	37.53	9.9	27.63	x 0.18 =	4.97			(29)
Walls Type2	25.11	0	25.11	x 0.2 =	5.05			(29)
Total area of elements, m²			62.64					(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) = 23.15 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6705 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 27.39 (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=	15.97	15.79	15.61	14.7	14.52	13.61	13.61	13.43	13.97	14.52	14.88	15.24	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	43.36	43.18	43	42.09	41.91	41	41	40.82	41.36	41.91	42.27	42.63	

Average = Sum(39)$_{1...12}$ /12= 42.04 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.68	0.67	0.67	0.66	0.65	0.64	0.64	0.64	0.65	0.65	0.66	0.67	

Average = Sum(40)$_{1...12}$ /12= 0.66 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.09 (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 83.89 (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=	92.28	88.92	85.57	82.21	78.86	75.5	75.5	78.86	82.21	85.57	88.92	92.28	

Total = Sum(44)$_{1...12}$ = 1006.67 (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=	136.85	119.69	123.51	107.68	103.32	89.15	82.61	94.8	95.93	111.8	122.04	132.53	

Total = Sum(45)$_{1...12}$ = 1319.91 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.53	17.95	18.53	16.15	15.5	13.37	12.39	14.22	14.39	16.77	18.31	19.88	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	201.43	178.02	188.08	170.17	167.9	131.07	125.93	138.11	137.85	176.38	184.54	197.11	(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=	201.43	178.02	188.08	170.17	167.9	131.07	125.93	138.11	137.85	176.38	184.54	197.11	

Output from water heater (annual)$_{1...12}$ 1996.58 (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=	97.16	86.46	92.73	85.8	86.02	63.18	62.12	66.17	65.43	88.84	90.58	95.73	(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=	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	125.53	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	42.82	38.03	30.93	23.42	17.5	14.78	15.97	20.76	27.86	35.37	41.28	44.01	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	273	275.83	268.7	253.5	234.31	216.28	204.24	201.4	208.54	223.74	242.93	260.96	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	49.65	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	(71)

Water heating gains (Table 5)

(72)m=	130.6	128.66	124.64	119.16	115.61	87.75	83.49	88.94	90.88	119.41	125.8	128.67	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	537.91	534.02	515.75	487.57	458.92	410.29	395.19	402.59	418.77	470.01	501.5	525.12	(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)	
West	0.9x 0.77	x	9.9	x	19.64	x	0.57	x	0.7	=	53.76	(80)
West	0.9x 0.77	x	9.9	x	38.42	x	0.57	x	0.7	=	105.17	(80)
West	0.9x 0.77	x	9.9	x	63.27	x	0.57	x	0.7	=	173.21	(80)
West	0.9x 0.77	x	9.9	x	92.28	x	0.57	x	0.7	=	252.61	(80)
West	0.9x 0.77	x	9.9	x	113.09	x	0.57	x	0.7	=	309.58	(80)
West	0.9x 0.77	x	9.9	x	115.77	x	0.57	x	0.7	=	316.91	(80)
West	0.9x 0.77	x	9.9	x	110.22	x	0.57	x	0.7	=	301.71	(80)
West	0.9x 0.77	x	9.9	x	94.68	x	0.57	x	0.7	=	259.17	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	9.9	x	73.59	x	0.57	x	0.7	=	201.44	(80)
West	0.9x	0.77	x	9.9	x	45.59	x	0.57	x	0.7	=	124.8	(80)
West	0.9x	0.77	x	9.9	x	24.49	x	0.57	x	0.7	=	67.04	(80)
West	0.9x	0.77	x	9.9	x	16.15	x	0.57	x	0.7	=	44.21	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	53.76	105.17	173.21	252.61	309.58	316.91	301.71	259.17	201.44	124.8	67.04	44.21	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	591.67	639.19	688.96	740.18	768.5	727.21	696.9	661.76	620.21	594.8	568.53	569.34	(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=	0.95	0.92	0.84	0.68	0.51	0.36	0.26	0.28	0.46	0.72	0.9	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.74	20.83	20.93	20.99	21	21	21	21	21	20.98	20.88	20.73	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.36	20.36	20.37	20.38	20.38	20.39	20.39	20.4	20.39	20.38	20.38	20.37	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.91	0.81	0.65	0.47	0.33	0.22	0.25	0.42	0.68	0.88	0.95	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.04	20.15	20.28	20.37	20.38	20.39	20.39	20.4	20.39	20.37	20.24	20.03	(90)

fLA = Living area ÷ (4) = 0.57 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.44	20.54	20.65	20.72	20.73	20.74	20.74	20.74	20.74	20.72	20.61	20.43	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.44	20.54	20.65	20.72	20.73	20.74	20.74	20.74	20.74	20.72	20.61	20.43	(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=	0.95	0.91	0.83	0.66	0.49	0.35	0.24	0.27	0.44	0.7	0.89	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	559.95	581.66	568.59	490.67	377.98	251.75	169.78	177.24	274.39	415.77	506.47	543.4	(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=	699.97	675.35	608.48	497.55	378.61	251.78	169.78	177.24	274.59	424.09	570.89	691.89	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	104.18	62.96	29.68	4.96	0.47	0	0	0	0	6.19	46.38	110.48	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 365.3 (98)

Space heating requirement in kWh/m²/year 5.71 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	104.18	62.96	29.68	4.96	0.47	0	0	0	0	6.19	46.38	110.48	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	104.18	62.96	29.68	4.96	0.47	0	0	0	0	6.19	46.38	110.48	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 365.3 (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

Output from water heater (calculated above)

	201.43	178.02	188.08	170.17	167.9	131.07	125.93	138.11	137.85	176.38	184.54	197.11	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	118.49	104.72	110.64	100.1	98.76	77.1	74.08	81.24	81.09	103.75	108.55	115.95	

Total = Sum(219a)$_{1...12}$ = 1174.46 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		365.3
Water heating fuel used		1174.46
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	150.21	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	150.21 (231)
Electricity for lighting		302.49 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1301.56 (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 =	48.18 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	154.91	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	19.81	(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 =	39.9	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			171.68	(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] =	0.66	(257)
SAP rating (Section 12)		90.77	(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	=	189.59	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	609.54	(264)
Space and water heating	(261) + (262) + (263) + (264) =				799.13	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	77.96	(267)
Electricity for lighting	(232)	x	0.519	=	156.99	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				675.51	(272)
CO2 emissions per m²	(272) ÷ (4) =				10.55	(273)
EI rating (section 14)					92	(274)

13a. Primary Energy

		Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	1121.47	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3605.59	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4727.06	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	461.13	(267)
Electricity for lighting	(232)	x	0	=	928.64	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		3995.79	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		62.43	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 430

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	199.58	**(P1)**
Transmission heat loss coefficient:	27.4	
Summer heat loss coefficient:	226.97	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	9.9	117.51	0.57	0.7	0.9	375.97	
						Total	375.97	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	410.29	395.19	402.59	
Total summer gains	809.4	771.16	733.36	**(P5)**
Summer gain/loss ratio	3.57	3.4	3.23	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.82	21.55	21.28	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:49

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 42.8m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 501

Address :

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)	36.43 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	23.66 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	56.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	2.6m²
Windows facing: North	7.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 501

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	42.8 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	2.6	1
N	16mm or more	0.7	0.57	1.4	7.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
N		External	North	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	22.95	10	12.95	0.18	0	False	N/A
Corridor	21.33	0	21.33	0.22	0.43	False	N/A
Roof	42.8	0	42.8	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1034

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	8.5	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 501

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	42.8 (1a)	x	2.7 (2a)	=	115.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	42.8 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	115.56	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			2.6	x1/[1/(1.4)+ 0.04] =	3.45			(27)
Windows Type 2			7.4	x1/[1/(1.4)+ 0.04] =	9.81			(27)
Walls Type1	22.95	10	12.95	x 0.18 =	2.33			(29)
Walls Type2	21.33	0	21.33	x 0.2 =	4.29			(29)
Roof	42.8	0	42.8	x 0.13 =	5.56			(30)
Total area of elements, m²			87.08					(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) = 25.44 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5344.4 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.01 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.44 (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=	10.68	10.56	10.44	9.83	9.71	9.1	9.1	8.98	9.34	9.71	9.95	10.19	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	45.12	45	44.88	44.27	44.15	43.54	43.54	43.42	43.79	44.15	44.4	44.64	

Average = Sum(39)$_{1...12}$ /12= 44.24 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.05	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.04	1.04

Average = Sum(40)$_{1...12}$ /12= 1.03 (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 1.48 (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 69.41 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	76.35	73.58	70.8	68.02	65.25	62.47	62.47	65.25	68.02	70.8	73.58	76.35

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 832.94 (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=	113.23	99.03	102.19	89.09	85.49	73.77	68.36	78.44	79.38	92.51	100.98	109.66

Total = Sum(45)$_{1...12}$ = 1092.11 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	16.98	14.85	15.33	13.36	12.82	11.07	10.25	11.77	11.91	13.88	15.15	16.45

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	177.81	157.36	166.77	151.59	150.07	115.68	111.67	121.75	121.29	157.09	163.47	174.24	(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=	177.81	157.36	166.77	151.59	150.07	115.68	111.67	121.75	121.29	157.09	163.47	174.24	

Output from water heater (annual)$_{1...12}$ 1768.79 (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=	89.31	79.59	85.64	79.62	80.09	58.06	57.38	60.73	59.93	82.42	83.57	88.12	(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=	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	88.96	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.67	25.46	20.71	15.68	11.72	9.89	10.69	13.9	18.65	23.68	27.64	29.47	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	191.99	193.98	188.96	178.28	164.78	152.1	143.63	141.64	146.66	157.35	170.84	183.52	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	45.38	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	-59.3	(71)

Water heating gains (Table 5)

(72)m=	120.04	118.44	115.11	110.58	107.64	80.64	77.12	81.63	83.23	110.78	116.07	118.45	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	415.73	412.92	399.81	379.57	359.18	317.67	306.48	312.2	323.57	366.84	389.58	406.46	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	7.4	x	10.63	x	0.57	x	0.7	=	21.76	(74)
North	0.9x 0.77	x	7.4	x	20.32	x	0.57	x	0.7	=	41.58	(74)
North	0.9x 0.77	x	7.4	x	34.53	x	0.57	x	0.7	=	70.65	(74)
North	0.9x 0.77	x	7.4	x	55.46	x	0.57	x	0.7	=	113.49	(74)
North	0.9x 0.77	x	7.4	x	74.72	x	0.57	x	0.7	=	152.88	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	7.4	x	79.99	x	0.57	x	0.7	=	163.66	(74)
North	0.9x	0.77	x	7.4	x	74.68	x	0.57	x	0.7	=	152.8	(74)
North	0.9x	0.77	x	7.4	x	59.25	x	0.57	x	0.7	=	121.23	(74)
North	0.9x	0.77	x	7.4	x	41.52	x	0.57	x	0.7	=	84.95	(74)
North	0.9x	0.77	x	7.4	x	24.19	x	0.57	x	0.7	=	49.5	(74)
North	0.9x	0.77	x	7.4	x	13.12	x	0.57	x	0.7	=	26.84	(74)
North	0.9x	0.77	x	7.4	x	8.86	x	0.57	x	0.7	=	18.14	(74)
West	0.9x	0.77	x	2.6	x	19.64	x	0.57	x	0.7	=	14.12	(80)
West	0.9x	0.77	x	2.6	x	38.42	x	0.57	x	0.7	=	27.62	(80)
West	0.9x	0.77	x	2.6	x	63.27	x	0.57	x	0.7	=	45.49	(80)
West	0.9x	0.77	x	2.6	x	92.28	x	0.57	x	0.7	=	66.34	(80)
West	0.9x	0.77	x	2.6	x	113.09	x	0.57	x	0.7	=	81.3	(80)
West	0.9x	0.77	x	2.6	x	115.77	x	0.57	x	0.7	=	83.23	(80)
West	0.9x	0.77	x	2.6	x	110.22	x	0.57	x	0.7	=	79.24	(80)
West	0.9x	0.77	x	2.6	x	94.68	x	0.57	x	0.7	=	68.06	(80)
West	0.9x	0.77	x	2.6	x	73.59	x	0.57	x	0.7	=	52.9	(80)
West	0.9x	0.77	x	2.6	x	45.59	x	0.57	x	0.7	=	32.77	(80)
West	0.9x	0.77	x	2.6	x	24.49	x	0.57	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	2.6	x	16.15	x	0.57	x	0.7	=	11.61	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	35.88	69.2	116.14	179.83	234.18	246.89	232.04	189.29	137.85	82.27	44.45	29.75	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	451.61	482.12	515.95	559.4	593.36	564.56	538.51	501.49	461.43	449.11	434.03	436.21	(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=	0.97	0.96	0.92	0.83	0.66	0.49	0.36	0.4	0.63	0.86	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.3	20.42	20.61	20.84	20.96	20.99	21	21	20.98	20.83	20.54	20.28	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.04	20.04	20.04	20.05	20.06	20.07	20.07	20.07	20.06	20.06	20.05	20.05	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.95	0.9	0.79	0.6	0.42	0.28	0.32	0.56	0.81	0.94	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.14	19.31	19.58	19.88	20.02	20.07	20.07	20.07	20.05	19.89	19.5	19.12	(90)

fLA = Living area ÷ (4) = 0.86 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.13	20.26	20.46	20.7	20.83	20.86	20.87	20.87	20.84	20.7	20.39	20.11	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	20.13	20.26	20.46	20.7	20.83	20.86	20.87	20.87	20.84	20.7	20.39	20.11	(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	0.95	0.91	0.82	0.65	0.48	0.34	0.39	0.62	0.84	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	436.81	458.98	471.33	456.05	386.07	270.14	185.45	193.33	285.74	378.47	409.2	423.8	(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=	714.52	691.14	626.73	522.42	402.89	272.65	185.78	193.93	295.29	445.79	590.2	710.23	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	206.61	156.01	115.62	47.79	12.51	0	0	0	0	50.09	130.32	213.11	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 932.05 (98)

Space heating requirement in kWh/m²/year 21.78 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	206.61	156.01	115.62	47.79	12.51	0	0	0	0	50.09	130.32	213.11	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	206.61	156.01	115.62	47.79	12.51	0	0	0	0	50.09	130.32	213.11	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 932.05 (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

Output from water heater (calculated above)

	177.81	157.36	166.77	151.59	150.07	115.68	111.67	121.75	121.29	157.09	163.47	174.24

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	104.59	92.56	98.1	89.17	88.27	68.05	65.69	71.62	71.35	92.4	96.16	102.49	

Total = Sum(219a)$_{1...12}$ = 1040.46 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		932.05

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1040.46	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	100.45		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	100.45	(231)
Electricity for lighting		202.53	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1584.59	(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 =		122.94	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		137.24	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		13.25	(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 =		26.71	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				209.01	(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 (257)
SAP rating (Section 12)		86.05 (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	=		483.73	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		540	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1023.73	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	52.13	(267)
Electricity for lighting	(232)	x	0.519	=	105.11	(268)
Energy saving/generation technologies Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year			sum of (265)…(271) =		822.4	(272)
CO2 emissions per m²			(272) ÷ (4) =		19.22	(273)
EI rating (section 14)					87	(274)

13a. Primary Energy

			Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x			3.07	=	2861.39	(261)
Space heating (secondary)	(215)	x			3.07	=	0	(263)
Energy for water heating	(219)	x			3.07	=	3194.22	(264)
Space and water heating	(261) + (262) + (263) + (264) =						6055.61	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x			3.07	=	308.38	(267)
Electricity for lighting	(232)	x			0	=	621.75	(268)
Energy saving/generation technologies Item 1					3.07	=	-2121.05	(269)
'Total Primary Energy			sum of (265)…(271) =				4864.7	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =				113.66	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 501

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	133.47	**(P1)**
Transmission heat loss coefficient:	34.4	
Summer heat loss coefficient:	167.92	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	2.6	117.51	0.57	0.7	0.9	98.74	
North (N)	0.9 x	7.4	81.19	0.57	0.7	0.9	194.16	
						Total	292.9	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	317.67	306.48	312.2	
Total summer gains	632.54	599.38	556.93	**(P5)**
Summer gain/loss ratio	3.77	3.57	3.32	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.02	21.72	21.37	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:45

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 502

Address :

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)	25.32 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.91 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	38.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	2.6m²
Windows facing: North	7.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 502

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	61.7 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	2.6	1
N	16mm or more	0.7	0.57	1.4	7.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
N		External	North	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	26.46	10	16.46	0.18	0	False	N/A
Corridor	26.19	0	26.19	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0806

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 502

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.7	(1a) x	2.7	(2a) =	166.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		166.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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	0	0	0	0	0	0	0	0	0	0	0

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=

0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27

(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			2.6	x1/[1/(1.4)+ 0.04] =	3.45			(27)
Windows Type 2			7.4	x1/[1/(1.4)+ 0.04] =	9.81			(27)
Walls Type1	26.46	10	16.46	x 0.18 =	2.96			(29)
Walls Type2	26.19	0	26.19	x 0.2 =	5.26			(29)
Total area of elements, m²			52.65					(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) = 21.48 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 6128.3 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25.73 (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=	15.4	15.22	15.05	14.17	13.99	13.12	13.12	12.94	13.47	13.99	14.34	14.7	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	41.13	40.95	40.78	39.9	39.72	38.85	38.85	38.67	39.2	39.72	40.07	40.42	

Average = Sum(39)$_{1...12}$ /12= 39.86 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.67	0.66	0.66	0.65	0.64	0.63	0.63	0.63	0.64	0.64	0.65	0.66	

Average = Sum(40)$_{1...12}$ /12= 0.65 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.03 (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 82.4 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	90.63	87.34	84.04	80.75	77.45	74.16	74.16	77.45	80.75	84.04	87.34	90.63	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 988.74 (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=	134.41	117.55	121.31	105.76	101.48	87.57	81.14	93.11	94.23	109.81	119.87	130.17	

Total = Sum(45)$_{1...12}$ = 1296.4 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.16	17.63	18.2	15.86	15.22	13.14	12.17	13.97	14.13	16.47	17.98	19.53	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	198.99	175.88	185.89	168.25	166.06	129.48	124.46	136.43	136.14	174.39	182.36	194.75	(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=	198.99	175.88	185.89	168.25	166.06	129.48	124.46	136.43	136.14	174.39	182.36	194.75	

Output from water heater (annual)$_{1...12}$ 1973.07 (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=	96.35	85.75	92	85.16	85.4	62.65	61.63	65.61	64.86	88.18	89.85	94.94	(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=	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.1	36.51	29.69	22.48	16.8	14.18	15.33	19.92	26.74	33.95	39.63	42.24	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	264.5	267.24	260.33	245.6	227.01	209.55	197.88	195.13	202.05	216.77	235.36	252.83	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	(71)

Water heating gains (Table 5)

(72)m=	129.51	127.61	123.65	118.28	114.79	87.01	82.84	88.19	90.09	118.52	124.8	127.61	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	524.9	521.14	503.46	476.15	448.4	400.53	385.83	393.03	408.66	459.03	489.57	512.47	(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)	
North	0.9x 0.77	x	7.4	x	10.63	x	0.57	x	0.7	=	21.76	(74)
North	0.9x 0.77	x	7.4	x	20.32	x	0.57	x	0.7	=	41.58	(74)
North	0.9x 0.77	x	7.4	x	34.53	x	0.57	x	0.7	=	70.65	(74)
North	0.9x 0.77	x	7.4	x	55.46	x	0.57	x	0.7	=	113.49	(74)
North	0.9x 0.77	x	7.4	x	74.72	x	0.57	x	0.7	=	152.88	(74)
North	0.9x 0.77	x	7.4	x	79.99	x	0.57	x	0.7	=	163.66	(74)
North	0.9x 0.77	x	7.4	x	74.68	x	0.57	x	0.7	=	152.8	(74)
North	0.9x 0.77	x	7.4	x	59.25	x	0.57	x	0.7	=	121.23	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	7.4	x	41.52	x	0.57	x	0.7	=	84.95	(74)
North	0.9x	0.77	x	7.4	x	24.19	x	0.57	x	0.7	=	49.5	(74)
North	0.9x	0.77	x	7.4	x	13.12	x	0.57	x	0.7	=	26.84	(74)
North	0.9x	0.77	x	7.4	x	8.86	x	0.57	x	0.7	=	18.14	(74)
West	0.9x	0.77	x	2.6	x	19.64	x	0.57	x	0.7	=	14.12	(80)
West	0.9x	0.77	x	2.6	x	38.42	x	0.57	x	0.7	=	27.62	(80)
West	0.9x	0.77	x	2.6	x	63.27	x	0.57	x	0.7	=	45.49	(80)
West	0.9x	0.77	x	2.6	x	92.28	x	0.57	x	0.7	=	66.34	(80)
West	0.9x	0.77	x	2.6	x	113.09	x	0.57	x	0.7	=	81.3	(80)
West	0.9x	0.77	x	2.6	x	115.77	x	0.57	x	0.7	=	83.23	(80)
West	0.9x	0.77	x	2.6	x	110.22	x	0.57	x	0.7	=	79.24	(80)
West	0.9x	0.77	x	2.6	x	94.68	x	0.57	x	0.7	=	68.06	(80)
West	0.9x	0.77	x	2.6	x	73.59	x	0.57	x	0.7	=	52.9	(80)
West	0.9x	0.77	x	2.6	x	45.59	x	0.57	x	0.7	=	32.77	(80)
West	0.9x	0.77	x	2.6	x	24.49	x	0.57	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	2.6	x	16.15	x	0.57	x	0.7	=	11.61	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	35.88	69.2	116.14	179.83	234.18	246.89	232.04	189.29	137.85	82.27	44.45	29.75	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	560.78	590.34	619.6	655.98	682.58	647.42	617.87	582.32	546.52	541.3	534.02	542.22	(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=	0.96	0.93	0.87	0.72	0.54	0.38	0.28	0.31	0.49	0.74	0.91	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.75	20.82	20.91	20.98	21	21	21	21	21	20.98	20.88	20.74	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.37	20.37	20.38	20.39	20.39	20.4	20.4	20.41	20.4	20.39	20.39	20.38	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.95	0.92	0.84	0.69	0.5	0.35	0.24	0.27	0.45	0.7	0.89	0.95	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.05	20.15	20.27	20.37	20.39	20.4	20.4	20.41	20.4	20.37	20.24	20.05	(90)

fLA = Living area ÷ (4) = 0.59 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.47	20.55	20.65	20.73	20.75	20.76	20.76	20.76	20.76	20.73	20.62	20.46	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.47	20.55	20.65	20.73	20.75	20.76	20.76	20.76	20.76	20.73	20.62	20.46	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.85	0.71	0.53	0.37	0.26	0.29	0.48	0.73	0.9	0.96	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	531.75	543.93	529.64	462.63	358.66	239.19	161.54	168.58	260.59	392.79	478.93	517.84	(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=	664.86	640.7	577.01	472.14	359.55	239.23	161.54	168.58	260.89	402.55	541.89	657.17	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	99.03	65.03	35.25	6.85	0.67	0	0	0	0	7.27	45.33	103.66	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 363.08 (98)

Space heating requirement in kWh/m²/year 5.88 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	99.03	65.03	35.25	6.85	0.67	0	0	0	0	7.27	45.33	103.66	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	99.03	65.03	35.25	6.85	0.67	0	0	0	0	7.27	45.33	103.66	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 363.08 (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

Output from water heater (calculated above)

	198.99	175.88	185.89	168.25	166.06	129.48	124.46	136.43	136.14	174.39	182.36	194.75	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	117.05	103.46	109.34	98.97	97.68	76.17	73.21	80.25	80.08	102.58	107.27	114.56	

Total = Sum(219a)$_{1...12}$ = 1160.63 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		363.08
Water heating fuel used		1160.63
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		144.81	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	144.81	(231)
Electricity for lighting		290.35	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1267.97	(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 =		47.89	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		153.09	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		19.1	(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 =		38.3	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				167.25	(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] =	0.66	(257)
SAP rating (Section 12)		90.82	(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	=		188.44	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		602.37	(264)
Space and water heating	(261) + (262) + (263) + (264) =				790.8	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=		75.16	(267)
Electricity for lighting	(232) x	0.519	=		150.69	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			658.08	(272)
CO2 emissions per m²	(272) ÷ (4) =			10.67	(273)
EI rating (section 14)				92	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	1114.64	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3563.14	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4677.78	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	444.56	(267)
Electricity for lighting	(232)	x	0	=	891.38	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				3892.67	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				63.09	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 502

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	192.41	**(P1)**
Transmission heat loss coefficient:	25.7	
Summer heat loss coefficient:	218.14	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	2.6	117.51	0.57	0.7	0.9	98.74	
North (N)	0.9 x	7.4	81.19	0.57	0.7	0.9	194.16	
						Total	292.9	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	400.53	385.83	393.03	
Total summer gains	715.41	678.73	637.77	**(P5)**
Summer gain/loss ratio	3.28	3.11	2.92	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.53	21.26	20.97	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:41

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 503

Address :

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)	25.09 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	13.58 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	38.0 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	34.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	2.6m²
Windows facing: North	7.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 503

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 25 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 504

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	61.7 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	2.6	1
N	16mm or more	0.7	0.57	1.4	7.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0
N		External	North	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	25.65	10	15.65	0.18	0	False	N/A
Corridor	23.28	0	23.28	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0868

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 503

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.7 (1a)	x	2.7 (2a)	=	166.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	166.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			2.6	x1/[1/(1.4)+ 0.04] =	3.45			(27)
Windows Type 2			7.4	x1/[1/(1.4)+ 0.04] =	9.81			(27)
Walls Type1	25.65	10	15.65	x 0.18 =	2.82			(29)
Walls Type2	23.28	0	23.28	x 0.2 =	4.68			(29)
Total area of elements, m²			48.93					(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) = 20.75 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5518.7 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 25 (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=	15.4	15.22	15.05	14.17	13.99	13.12	13.12	12.94	13.47	13.99	14.34	14.7	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	40.39	40.22	40.04	39.17	38.99	38.12	38.12	37.94	38.47	38.99	39.34	39.69	

Average = Sum(39)$_{1...12}$ /12= 39.12 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.65	0.65	0.65	0.63	0.63	0.62	0.62	0.61	0.62	0.63	0.64	0.64	

Average = Sum(40)$_{1...12}$ /12= 0.63 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.03 (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 82.4 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	90.63	87.34	84.04	80.75	77.45	74.16	74.16	77.45	80.75	84.04	87.34	90.63	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 988.74 (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=	134.41	117.55	121.31	105.76	101.48	87.57	81.14	93.11	94.23	109.81	119.87	130.17	

Total = Sum(45)$_{1...12}$ = 1296.4 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.16	17.63	18.2	15.86	15.22	13.14	12.17	13.97	14.13	16.47	17.98	19.53	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	198.99	175.88	185.89	168.25	166.06	129.48	124.46	136.43	136.14	174.39	182.36	194.75	(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=	198.99	175.88	185.89	168.25	166.06	129.48	124.46	136.43	136.14	174.39	182.36	194.75	

Output from water heater (annual)$_{1...12}$ 1973.07 (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=	96.35	85.75	92	85.16	85.4	62.65	61.63	65.61	64.86	88.18	89.85	94.94	(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=	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	121.76	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.1	36.51	29.69	22.48	16.8	14.18	15.33	19.92	26.74	33.95	39.63	42.24	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	264.5	267.24	260.33	245.6	227.01	209.55	197.88	195.13	202.05	216.77	235.36	252.83	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	-81.17	(71)

Water heating gains (Table 5)

(72)m=	129.51	127.61	123.65	118.28	114.79	87.01	82.84	88.19	90.09	118.52	124.8	127.61	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	524.9	521.14	503.46	476.15	448.4	400.53	385.83	393.03	408.66	459.03	489.57	512.47	(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)	
North	0.9x 0.77	x	7.4	x	10.63	x	0.57	x	0.7	=	21.76	(74)
North	0.9x 0.77	x	7.4	x	20.32	x	0.57	x	0.7	=	41.58	(74)
North	0.9x 0.77	x	7.4	x	34.53	x	0.57	x	0.7	=	70.65	(74)
North	0.9x 0.77	x	7.4	x	55.46	x	0.57	x	0.7	=	113.49	(74)
North	0.9x 0.77	x	7.4	x	74.72	x	0.57	x	0.7	=	152.88	(74)
North	0.9x 0.77	x	7.4	x	79.99	x	0.57	x	0.7	=	163.66	(74)
North	0.9x 0.77	x	7.4	x	74.68	x	0.57	x	0.7	=	152.8	(74)
North	0.9x 0.77	x	7.4	x	59.25	x	0.57	x	0.7	=	121.23	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	7.4	x	41.52	x	0.57	x	0.7	=	84.95	(74)
North	0.9x	0.77	x	7.4	x	24.19	x	0.57	x	0.7	=	49.5	(74)
North	0.9x	0.77	x	7.4	x	13.12	x	0.57	x	0.7	=	26.84	(74)
North	0.9x	0.77	x	7.4	x	8.86	x	0.57	x	0.7	=	18.14	(74)
West	0.9x	0.77	x	2.6	x	19.64	x	0.57	x	0.7	=	14.12	(80)
West	0.9x	0.77	x	2.6	x	38.42	x	0.57	x	0.7	=	27.62	(80)
West	0.9x	0.77	x	2.6	x	63.27	x	0.57	x	0.7	=	45.49	(80)
West	0.9x	0.77	x	2.6	x	92.28	x	0.57	x	0.7	=	66.34	(80)
West	0.9x	0.77	x	2.6	x	113.09	x	0.57	x	0.7	=	81.3	(80)
West	0.9x	0.77	x	2.6	x	115.77	x	0.57	x	0.7	=	83.23	(80)
West	0.9x	0.77	x	2.6	x	110.22	x	0.57	x	0.7	=	79.24	(80)
West	0.9x	0.77	x	2.6	x	94.68	x	0.57	x	0.7	=	68.06	(80)
West	0.9x	0.77	x	2.6	x	73.59	x	0.57	x	0.7	=	52.9	(80)
West	0.9x	0.77	x	2.6	x	45.59	x	0.57	x	0.7	=	32.77	(80)
West	0.9x	0.77	x	2.6	x	24.49	x	0.57	x	0.7	=	17.61	(80)
West	0.9x	0.77	x	2.6	x	16.15	x	0.57	x	0.7	=	11.61	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	35.88	69.2	116.14	179.83	234.18	246.89	232.04	189.29	137.85	82.27	44.45	29.75	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	560.78	590.34	619.6	655.98	682.58	647.42	617.87	582.32	546.52	541.3	534.02	542.22	(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=	0.95	0.93	0.86	0.71	0.53	0.38	0.27	0.3	0.49	0.73	0.9	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.77	20.83	20.92	20.98	21	21	21	21	21	20.98	20.89	20.75	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.38	20.38	20.39	20.4	20.4	20.41	20.41	20.42	20.41	20.4	20.4	20.39	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.94	0.91	0.84	0.68	0.5	0.34	0.24	0.26	0.44	0.69	0.88	0.95	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.09	20.18	20.29	20.38	20.4	20.41	20.41	20.42	20.41	20.39	20.27	20.08	(90)

fLA = Living area ÷ (4) = 0.59 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.49	20.57	20.67	20.74	20.76	20.76	20.76	20.76	20.76	20.74	20.64	20.48	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.49	20.57	20.67	20.74	20.76	20.76	20.76	20.76	20.76	20.74	20.64	20.48	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.95	0.92	0.85	0.69	0.52	0.36	0.26	0.28	0.47	0.72	0.89	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	530.06	541.25	525.02	455.8	352.42	234.87	158.66	165.56	255.96	387.19	475.74	516.37	(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=	654	630.1	567.26	463.78	353.12	234.9	158.66	165.56	256.19	395.43	532.66	646.25	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	92.21	59.71	31.43	5.75	0.53	0	0	0	0	6.13	40.98	96.63	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 333.37 (98)

Space heating requirement in kWh/m²/year 5.4 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	92.21	59.71	31.43	5.75	0.53	0	0	0	0	6.13	40.98	96.63	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	92.21	59.71	31.43	5.75	0.53	0	0	0	0	6.13	40.98	96.63	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 333.37 (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

Output from water heater (calculated above)

	198.99	175.88	185.89	168.25	166.06	129.48	124.46	136.43	136.14	174.39	182.36	194.75	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	117.05	103.46	109.34	98.97	97.68	76.17	73.21	80.25	80.08	102.58	107.27	114.56	

Total = Sum(219a)$_{1...12}$ = 1160.63 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		333.37
Water heating fuel used		1160.63
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		144.81	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	144.81	(231)
Electricity for lighting		290.35	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1238.26	(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 =	43.97	(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 (electric off-peak tariff)							
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1			(243)
Low-rate fraction	1.0 – (243) =			0			(244)
High-rate cost	(219) x (243) x			13.19	x 0.01 =	153.09	(245)
Low-rate cost	(219) x (244) x			13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)			13.19	x 0.01 =	19.1	(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 =	38.3	(250)
Additional standing charges (Table 12)						0	(251)
	one of (233) to (235) x)			13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed							
Total energy cost	(245)...(247) + (250)…(254) =					163.33	(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] =	0.64	(257)
SAP rating (Section 12)	91.03	(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	=	173.02	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.519	=	602.37	(264)
Space and water heating	(261) + (262) + (263) + (264) =					775.39	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	75.16	(267)
Electricity for lighting	(232)	x		0.519	=	150.69	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			642.66	(272)
CO2 emissions per m²	(272) ÷ (4) =			10.42	(273)
EI rating (section 14)				92	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	1023.44	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3563.14	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4586.57	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	444.56	(267)
Electricity for lighting	(232)	x	0	=	891.38	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				3801.47	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				61.61	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 503

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	192.41	**(P1)**
Transmission heat loss coefficient:	25	
Summer heat loss coefficient:	217.41	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	2.6	117.51	0.57	0.7	0.9	98.74	
North (N)	0.9 x	7.4	81.19	0.57	0.7	0.9	194.16	
						Total	292.9	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	400.53	385.83	393.03	
Total summer gains	715.41	678.73	637.77	**(P5)**
Summer gain/loss ratio	3.29	3.12	2.93	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.54	21.27	20.98	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:38

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 85.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 504

Address :

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)	24.26 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.86 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	45.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	42.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	15.6m²
Windows facing: North	11.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 504

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 25 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 504

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	85.7 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
E	16mm or more	0.7	0.57	1.4	15.6	1
N	16mm or more	0.7	0.57	1.4	11.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
E		External	East	0	0
N		External	North	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.21	27	33.21	0.18	0	False	N/A
Corridor	38.88	0	38.88	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0428

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)

SAP Input

	[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 504

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.7	(1a) x	2.7	(2a) =	231.39	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	85.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		231.39	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			15.6	x1/[1/(1.4)+ 0.04] =	20.68			(27)
Windows Type 2			11.4	x1/[1/(1.4)+ 0.04] =	15.11			(27)
Walls Type1	60.21	27	33.21	x 0.18 =	5.98			(29)
Walls Type2	38.88	0	38.88	x 0.2 =	7.81			(29)
Total area of elements, m²			99.09					(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) = 49.59 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 9711.9 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 53.83 (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=	21.39	21.14	20.9	19.68	19.44	18.22	18.22	17.98	18.71	19.44	19.92	20.41	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	75.22	74.97	74.73	73.51	73.27	72.05	72.05	71.81	72.54	73.27	73.76	74.24	

Average = Sum(39)$_{1...12}$ /12= 73.45 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.88	0.87	0.87	0.86	0.85	0.84	0.84	0.84	0.85	0.85	0.86	0.87	

Average = Sum(40)$_{1...12}$ /12= 0.86 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.56 (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 95.05 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	104.56	100.75	96.95	93.15	89.35	85.55	85.55	89.35	93.15	96.95	100.75	104.56	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1140.62 (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=	155.05	135.61	139.94	122	117.06	101.02	93.61	107.42	108.7	126.68	138.28	150.16	

Total = Sum(45)$_{1...12}$ = 1495.53 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.26	20.34	20.99	18.3	17.56	15.15	14.04	16.11	16.3	19	20.74	22.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	219.63	193.94	204.52	184.5	181.64	142.93	136.92	150.73	150.62	191.26	200.78	214.74	(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=	219.63	193.94	204.52	184.5	181.64	142.93	136.92	150.73	150.62	191.26	200.78	214.74	

Output from water heater (annual)$_{1...12}$ 2172.21 (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=	103.22	91.75	98.19	90.56	90.59	67.12	65.78	70.37	69.68	93.78	95.97	101.59	(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=	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	51.47	45.72	37.18	28.15	21.04	17.76	19.19	24.95	33.49	42.52	49.62	52.9	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	344.69	348.26	339.25	320.06	295.84	273.08	257.87	254.29	263.3	282.49	306.71	329.48	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	(71)

Water heating gains (Table 5)

(72)m=	138.74	136.54	131.98	125.78	121.76	93.22	88.41	94.58	96.77	126.05	133.3	136.55	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	639.07	634.7	612.59	578.17	542.82	488.24	469.65	478	497.74	555.24	593.82	623.11	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	11.4	x	10.63	x	0.57	x	0.7	=	33.52	(74)
North	0.9x 0.77	x	11.4	x	20.32	x	0.57	x	0.7	=	64.06	(74)
North	0.9x 0.77	x	11.4	x	34.53	x	0.57	x	0.7	=	108.85	(74)
North	0.9x 0.77	x	11.4	x	55.46	x	0.57	x	0.7	=	174.83	(74)
North	0.9x 0.77	x	11.4	x	74.72	x	0.57	x	0.7	=	235.52	(74)
North	0.9x 0.77	x	11.4	x	79.99	x	0.57	x	0.7	=	252.13	(74)
North	0.9x 0.77	x	11.4	x	74.68	x	0.57	x	0.7	=	235.39	(74)
North	0.9x 0.77	x	11.4	x	59.25	x	0.57	x	0.7	=	186.76	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	11.4	x	41.52	x	0.57	x	0.7	=	130.87	(74)
North	0.9x	0.77	x	11.4	x	24.19	x	0.57	x	0.7	=	76.25	(74)
North	0.9x	0.77	x	11.4	x	13.12	x	0.57	x	0.7	=	41.35	(74)
North	0.9x	0.77	x	11.4	x	8.86	x	0.57	x	0.7	=	27.94	(74)
East	0.9x	0.77	x	15.6	x	19.64	x	0.57	x	0.7	=	84.72	(76)
East	0.9x	0.77	x	15.6	x	38.42	x	0.57	x	0.7	=	165.73	(76)
East	0.9x	0.77	x	15.6	x	63.27	x	0.57	x	0.7	=	272.93	(76)
East	0.9x	0.77	x	15.6	x	92.28	x	0.57	x	0.7	=	398.05	(76)
East	0.9x	0.77	x	15.6	x	113.09	x	0.57	x	0.7	=	487.83	(76)
East	0.9x	0.77	x	15.6	x	115.77	x	0.57	x	0.7	=	499.38	(76)
East	0.9x	0.77	x	15.6	x	110.22	x	0.57	x	0.7	=	475.43	(76)
East	0.9x	0.77	x	15.6	x	94.68	x	0.57	x	0.7	=	408.39	(76)
East	0.9x	0.77	x	15.6	x	73.59	x	0.57	x	0.7	=	317.43	(76)
East	0.9x	0.77	x	15.6	x	45.59	x	0.57	x	0.7	=	196.65	(76)
East	0.9x	0.77	x	15.6	x	24.49	x	0.57	x	0.7	=	105.63	(76)
East	0.9x	0.77	x	15.6	x	16.15	x	0.57	x	0.7	=	69.67	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	118.24	229.78	381.77	572.88	723.34	751.51	710.82	595.14	448.3	272.9	146.98	97.61	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	757.31	864.48	994.36	1151.05	1266.16	1239.75	1180.47	1073.14	946.04	828.14	740.8	720.72	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.98	0.96	0.9	0.73	0.53	0.37	0.27	0.31	0.52	0.83	0.96	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.41	20.57	20.78	20.95	20.99	21	21	21	21	20.91	20.64	20.38	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.19	20.19	20.19	20.2	20.21	20.22	20.22	20.22	20.21	20.21	20.2	20.2	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.95	0.88	0.69	0.49	0.33	0.22	0.26	0.47	0.79	0.95	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.42	19.64	19.93	20.15	20.2	20.22	20.22	20.22	20.21	20.12	19.76	19.39	(90)

fLA = Living area ÷ (4) = 0.43 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.84	20.04	20.3	20.49	20.54	20.55	20.55	20.55	20.55	20.46	20.13	19.81	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.84	20.04	20.3	20.49	20.54	20.55	20.55	20.55	20.55	20.46	20.13	19.81	(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

SAP WorkSheet: New dwelling design stage

Utilisation factor for gains, hm:

(94)m=	0.98	0.95	0.88	0.71	0.51	0.35	0.24	0.28	0.49	0.8	0.95	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	739.05	821.41	873.32	815.88	643.37	428.62	284.8	298.27	465.14	661.96	703.05	706.92	(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=	1169.17	1135.01	1030.93	852.13	647.7	428.9	284.82	298.32	467.64	722.16	961.35	1159.06	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	320.01	210.73	117.27	26.1	3.22	0	0	0	0	44.79	185.98	336.39	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1244.49 (98)

Space heating requirement in kWh/m²/year 14.52 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)	320.01	210.73	117.27	26.1	3.22	0	0	0	0	44.79	185.98	336.39	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	320.01	210.73	117.27	26.1	3.22	0	0	0	0	44.79	185.98	336.39	(211)

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1244.49 (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

Output from water heater (calculated above)

	219.63	193.94	204.52	184.5	181.64	142.93	136.92	150.73	150.62	191.26	200.78	214.74	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	129.2	114.08	120.3	108.53	106.85	84.08	80.54	88.66	88.6	112.5	118.1	126.32	

Total = Sum(219a)$_{1...12}$ = 1277.77 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1244.49
Water heating fuel used		1277.77
Electricity for pumps, fans and electric keep-hot		

SAP WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or positive input from outside		201.14	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	201.14	(231)
Electricity for lighting		363.6	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2396.1	(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 =	164.15	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)			1			(243)
Low-rate fraction	1.0 – (243) =		0			(244)
High-rate cost	(219) x (243) x		13.19	x 0.01 =	168.54	(245)
Low-rate cost	(219) x (244) x		13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	26.53	(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 =	47.96	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				316.05	(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] =	1.02	(257)
SAP rating (Section 12)		85.83	(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	=	645.89	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	663.16	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1309.05	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	104.39	(267)
Electricity for lighting	(232)	x	0.519	=	188.71	(268)

SAP WorkSheet: New dwelling design stage

Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			1243.57	(272)
CO2 emissions per m²	(272) ÷ (4) =			14.51	(273)
EI rating (section 14)				87	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	3820.58	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3922.75	(264)
Space and water heating	(261) + (262) + (263) + (264) =				7743.33	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	617.49	(267)
Electricity for lighting	(232)	x	0	=	1116.25	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =				7356.02	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				85.83	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 504

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	267.26	**(P1)**
Transmission heat loss coefficient:	53.8	
Summer heat loss coefficient:	321.09	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
East (E)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
East (E)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
East (E)	0.9 x	15.6	117.51	0.57	0.7	0.9	592.44	
North (N)	0.9 x	11.4	81.19	0.57	0.7	0.9	299.12	
						Total	891.56	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	488.24	469.65	478	
Total summer gains	1440.74	1361.21	1242.41	**(P5)**
Summer gain/loss ratio	4.49	4.24	3.87	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.74	22.39	21.92	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:36

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 41.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 505

Address :

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)	35.77 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	24.91 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	59.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	11m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 505

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	41.7 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	11	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	24.84	16.2	8.64	0.18	0	False	N/A
Corridor	33.75	0	33.75	0.22	0.43	False	N/A
Flat Roof	41.7	0	41.7	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0499

	Length	**Psi-value**		
[Approved]	6	0.3	E2	Other lintels (including other steel lintels)
[Approved]	6	0.04	E3	Sill
[Approved]	30	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	9.2	0.08	E14	Flat roof

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 505

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	41.7	(1a) x	2.7	(2a) =	112.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	41.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		112.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			11	x1/[1/(1.4)+ 0.04] =	14.58			(27)
Walls Type1	24.84	16.2	8.64	x 0.18 =	1.56			(29)
Walls Type2	33.75	0	33.75	x 0.2 =	6.78			(29)
Roof	41.7	0	41.7	x 0.13 =	5.42			(30)
Total area of elements, m²			100.29					(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) = 35.24 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7392.6 (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 5.01 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 40.24 (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=	10.41	10.29	10.17	9.58	9.46	8.87	8.87	8.75	9.1	9.46	9.7	9.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	50.65	50.53	50.41	49.82	49.7	49.11	49.11	48.99	49.34	49.7	49.94	50.17	

Average = Sum(39)$_{1...12}$ /12= 49.79 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.21	1.21	1.21	1.19	1.19	1.18	1.18	1.17	1.18	1.19	1.2	1.2

Average = Sum(40)$_{1...12}$ /12= 1.19 (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 1.45 (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 68.69 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	75.56	72.81	70.06	67.32	64.57	61.82	61.82	64.57	67.32	70.06	72.81	75.56

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 824.28 (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=	112.05	98	101.13	88.17	84.6	73	67.65	77.63	78.55	91.55	99.93	108.52

Total = Sum(45)$_{1...12}$ = 1080.76 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	16.81	14.7	15.17	13.22	12.69	10.95	10.15	11.64	11.78	13.73	14.99	16.28

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	(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=	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	

Output from water heater (annual)$_{1...12}$ 1757.44 (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=	88.92	79.25	85.29	79.31	79.79	57.81	57.14	60.46	59.65	82.1	83.22	87.75	(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=	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	87.13	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.04	24.91	20.26	15.34	11.46	9.68	10.46	13.59	18.25	23.17	27.04	28.82	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	187.81	189.76	184.85	174.39	161.19	148.79	140.5	138.55	143.46	153.92	167.12	179.52	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	-58.09	(71)

Water heating gains (Table 5)

(72)m=	119.52	117.93	114.64	110.16	107.25	80.29	76.81	81.26	82.85	110.35	115.59	117.94	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	409.58	406.81	393.95	374.09	354.11	312.96	301.98	307.62	318.77	361.65	383.95	400.49	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x	0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x	0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)
North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	11	x	19.64	x	0.57	x	0.7	=	59.74	(76)
East	0.9x	0.77	x	11	x	38.42	x	0.57	x	0.7	=	116.86	(76)
East	0.9x	0.77	x	11	x	63.27	x	0.57	x	0.7	=	192.45	(76)
East	0.9x	0.77	x	11	x	92.28	x	0.57	x	0.7	=	280.68	(76)
East	0.9x	0.77	x	11	x	113.09	x	0.57	x	0.7	=	343.98	(76)
East	0.9x	0.77	x	11	x	115.77	x	0.57	x	0.7	=	352.12	(76)
East	0.9x	0.77	x	11	x	110.22	x	0.57	x	0.7	=	335.24	(76)
East	0.9x	0.77	x	11	x	94.68	x	0.57	x	0.7	=	287.96	(76)
East	0.9x	0.77	x	11	x	73.59	x	0.57	x	0.7	=	223.83	(76)
East	0.9x	0.77	x	11	x	45.59	x	0.57	x	0.7	=	138.66	(76)
East	0.9x	0.77	x	11	x	24.49	x	0.57	x	0.7	=	74.49	(76)
East	0.9x	0.77	x	11	x	16.15	x	0.57	x	0.7	=	49.13	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	75.03	146.08	242.1	360.43	451.41	467.13	442.61	373.15	283.52	173.44	93.35	61.87

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	484.61	552.88	636.05	734.52	805.52	780.09	744.59	680.77	602.29	535.09	477.3	462.36

(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=	0.97	0.94	0.88	0.74	0.56	0.4	0.29	0.33	0.55	0.82	0.94	0.97

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.16	20.35	20.62	20.87	20.97	21	21	21	20.98	20.82	20.46	20.13

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.91	19.91	19.91	19.92	19.93	19.94	19.94	19.94	19.93	19.93	19.92	19.92

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.93	0.85	0.69	0.5	0.33	0.22	0.25	0.47	0.77	0.93	0.97

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.85	19.11	19.48	19.79	19.9	19.94	19.94	19.94	19.92	19.75	19.27	18.8

(90)

fLA = Living area ÷ (4) = 0.88 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.01	20.2	20.48	20.74	20.84	20.87	20.87	20.87	20.85	20.69	20.31	19.97

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	20.01	20.2	20.48	20.74	20.84	20.87	20.87	20.87	20.85	20.69	20.31	19.97	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.93	0.87	0.73	0.55	0.39	0.28	0.32	0.54	0.8	0.93	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	466.12	516.44	552.13	534.71	441.83	305.91	209.49	218.51	324.81	429.21	445.19	447.5	(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=	795.45	773.23	704.85	589.69	454.34	307.81	209.79	219.06	333.18	501.55	659.84	791.06	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	245.02	172.56	113.62	39.59	9.31	0	0	0	0	53.83	154.55	255.61	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1044.09 (98)

Space heating requirement in kWh/m²/year 25.04 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	245.02	172.56	113.62	39.59	9.31	0	0	0	0	53.83	154.55	255.61	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	245.02	172.56	113.62	39.59	9.31	0	0	0	0	53.83	154.55	255.61	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1044.09 (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

Output from water heater (calculated above)

	176.63	156.33	165.71	150.66	149.18	114.92	110.96	120.94	120.47	156.12	162.43	173.1	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	103.9	91.96	97.48	88.62	87.75	67.6	65.27	71.14	70.86	91.84	95.54	101.82	

Total = Sum(219a)$_{1...12}$ = 1033.79 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1044.09

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1033.79	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	97.87		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	97.87	(231)
Electricity for lighting		198.11	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1682.97	(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 =	137.72		(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 (electric off-peak tariff)							
High-rate fraction (Table 13, or Appendix F for electric CPSU)			1				(243)
Low-rate fraction	1.0 – (243) =		0				(244)
High-rate cost	(219) x (243) x		13.19	x 0.01 =	136.36		(245)
Low-rate cost	(219) x (244) x		13.19	x 0.01 =	0		(246)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	12.91		(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 =	26.13		(250)
Additional standing charges (Table 12)					0		(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13		(252)
Appendix Q items: repeat lines (253) and (254) as needed							
Total energy cost	(245)...(247) + (250)…(254) =				221.98		(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] =	1.08	(257)
SAP rating (Section 12)		85	(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	=	541.88		(261)
Space heating (secondary)	(215)	x	0.519	=	0		(263)
Water heating	(219)	x	0.519	=	536.54		(264)
Space and water heating	(261) + (262) + (263) + (264) =				1078.42		(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	50.79	(267)
Electricity for lighting	(232) x	0.519	=	102.82	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			873.46	(272)
CO2 emissions per m²	(272) ÷ (4) =			20.95	(273)
EI rating (section 14)				87	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	3205.36	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3173.73	(264)
Space and water heating	(261) + (262) + (263) + (264) =			6379.09	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	300.46	(267)
Electricity for lighting	(232) x	0	=	608.21	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
‘Total Primary Energy	sum of (265)…(271) =			5166.71	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			123.9	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 505

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	130.04	**(P1)**
Transmission heat loss coefficient:	40.2	
Summer heat loss coefficient:	170.28	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	11	117.51	0.57	0.7	0.9	417.75	
						Total	554.19	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	312.96	301.98	307.62	
Total summer gains	904.02	856.16	786.08	**(P5)**
Summer gain/loss ratio	5.31	5.03	4.62	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.56	23.18	22.67	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:33

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 44m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 506

Address :

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)	35.65 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.41 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	61.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	54.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	5.2m²
Windows facing: East	5.2m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 506

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 25 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 504

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	44 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	5.2	1
E	16mm or more	0.7	0.57	1.4	5.2	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	29.97	10.4	19.57	0.18	0	False	N/A
Corridor	10.26	0	10.26	0.22	0.43	False	N/A
Roof	44	0	44	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1105

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	11.1	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 506

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	44	(1a) x	2.7	(2a) =	118.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	44	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		118.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Windows Type 2			5.2	x1/[1/(1.4)+ 0.04] =	6.89			(27)
Walls Type1	29.97	10.4	19.57	x 0.18 =	3.52			(29)
Walls Type2	10.26	0	10.26	x 0.2 =	2.06			(29)
Roof	44	0	44	x 0.13 =	5.72			(30)
Total area of elements, m²			84.23					(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) = 25.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3715.3 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 9.31 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 34.4 (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=	10.98	10.85	10.73	10.1	9.98	9.36	9.36	9.23	9.6	9.98	10.23	10.48	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	45.38	45.25	45.13	44.5	44.38	43.75	43.75	43.63	44	44.38	44.63	44.88	

Average = Sum(39)$_{1...12}$ /12= 44.47 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.03	1.01	1.01	0.99	0.99	0.99	1	1.01	1.01	1.02

Average = Sum(40)$_{1...12}$ /12= 1.01 (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 1.52 (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 70.21 (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=	77.23	74.42	71.61	68.81	66	63.19	63.19	66	68.81	71.61	74.42	77.23

Total = Sum(44)$_{1...12}$ = 842.53 (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=	114.53	100.17	103.37	90.12	86.47	74.62	69.14	79.34	80.29	93.57	102.14	110.92

Total = Sum(45)$_{1...12}$ = 1104.69 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	17.18	15.03	15.51	13.52	12.97	11.19	10.37	11.9	12.04	14.04	15.32	16.64

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5	(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=	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5	

Output from water heater (annual)$_{1...12}$ 1781.36 (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=	89.75	79.97	86.03	79.96	80.41	58.34	57.64	61.03	60.23	82.78	83.96	88.54	(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=	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	90.97	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.35	26.07	21.2	16.05	12	10.13	10.95	14.23	19.1	24.25	28.3	30.17	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	196.58	198.62	193.48	182.54	168.72	155.74	147.06	145.02	150.17	161.11	174.92	187.91	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	45.61	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	-60.65	(71)

Water heating gains (Table 5)

(72)m=	120.63	119	115.64	111.06	108.08	81.03	77.47	82.03	83.65	111.26	116.61	119.01	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	422.5	419.63	406.26	385.58	364.74	322.84	311.42	317.22	328.85	372.55	395.77	413.03	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	5.2	x	10.63	x	0.57	x	0.7	=	15.29	(74)
North	0.9x 0.77	x	5.2	x	20.32	x	0.57	x	0.7	=	29.22	(74)
North	0.9x 0.77	x	5.2	x	34.53	x	0.57	x	0.7	=	49.65	(74)
North	0.9x 0.77	x	5.2	x	55.46	x	0.57	x	0.7	=	79.75	(74)
North	0.9x 0.77	x	5.2	x	74.72	x	0.57	x	0.7	=	107.43	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	5.2	x	79.99	x	0.57	x	0.7	=	115.01	(74)
North	0.9x	0.77	x	5.2	x	74.68	x	0.57	x	0.7	=	107.37	(74)
North	0.9x	0.77	x	5.2	x	59.25	x	0.57	x	0.7	=	85.19	(74)
North	0.9x	0.77	x	5.2	x	41.52	x	0.57	x	0.7	=	59.69	(74)
North	0.9x	0.77	x	5.2	x	24.19	x	0.57	x	0.7	=	34.78	(74)
North	0.9x	0.77	x	5.2	x	13.12	x	0.57	x	0.7	=	18.86	(74)
North	0.9x	0.77	x	5.2	x	8.86	x	0.57	x	0.7	=	12.75	(74)
East	0.9x	0.77	x	5.2	x	19.64	x	0.57	x	0.7	=	28.24	(76)
East	0.9x	0.77	x	5.2	x	38.42	x	0.57	x	0.7	=	55.24	(76)
East	0.9x	0.77	x	5.2	x	63.27	x	0.57	x	0.7	=	90.98	(76)
East	0.9x	0.77	x	5.2	x	92.28	x	0.57	x	0.7	=	132.68	(76)
East	0.9x	0.77	x	5.2	x	113.09	x	0.57	x	0.7	=	162.61	(76)
East	0.9x	0.77	x	5.2	x	115.77	x	0.57	x	0.7	=	166.46	(76)
East	0.9x	0.77	x	5.2	x	110.22	x	0.57	x	0.7	=	158.48	(76)
East	0.9x	0.77	x	5.2	x	94.68	x	0.57	x	0.7	=	136.13	(76)
East	0.9x	0.77	x	5.2	x	73.59	x	0.57	x	0.7	=	105.81	(76)
East	0.9x	0.77	x	5.2	x	45.59	x	0.57	x	0.7	=	65.55	(76)
East	0.9x	0.77	x	5.2	x	24.49	x	0.57	x	0.7	=	35.21	(76)
East	0.9x	0.77	x	5.2	x	16.15	x	0.57	x	0.7	=	23.22	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	43.53	84.46	140.63	212.43	270.04	281.46	265.85	221.31	165.5	100.33	54.07	35.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	466.03	504.09	546.88	598.02	634.78	604.3	577.27	538.54	494.36	472.88	449.84	448.99	(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=	0.97	0.96	0.91	0.8	0.63	0.46	0.33	0.37	0.6	0.84	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.34	20.46	20.66	20.87	20.97	21	21	21	20.98	20.86	20.58	20.31	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.06	20.06	20.06	20.07	20.08	20.09	20.09	20.09	20.08	20.08	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.96	0.94	0.89	0.76	0.57	0.4	0.26	0.3	0.53	0.79	0.93	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.21	19.39	19.66	19.94	20.05	20.09	20.09	20.09	20.07	19.93	19.56	19.18	(90)

fLA = Living area ÷ (4) = 0.83 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.15	20.28	20.49	20.71	20.82	20.84	20.85	20.85	20.83	20.7	20.41	20.12	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	20.15	20.28	20.49	20.71	20.82	20.84	20.85	20.85	20.83	20.7	20.41	20.12	(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	0.95	0.9	0.79	0.62	0.45	0.32	0.36	0.59	0.82	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	449.9	477.25	492.38	471.54	392.13	271.53	185.66	193.68	289.34	390.03	422.11	435.63	(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=	719.15	696.1	631.5	525.76	404.6	273.22	185.87	194.06	296.21	448.36	593.86	714.57	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	200.32	147.07	103.5	39.04	9.28	0	0	0	0	43.4	123.66	207.53	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 873.81 (98)

Space heating requirement in kWh/m²/year 19.86 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	200.32	147.07	103.5	39.04	9.28	0	0	0	0	43.4	123.66	207.53	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	200.32	147.07	103.5	39.04	9.28	0	0	0	0	43.4	123.66	207.53	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 873.81 (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

Output from water heater (calculated above)

	179.11	158.5	167.95	152.61	151.05	116.53	112.46	122.66	122.21	158.15	164.64	175.5

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	105.36	93.24	98.79	89.77	88.85	68.55	66.15	72.15	71.89	93.03	96.85	103.23	

Total = Sum(219a)$_{1...12}$ = 1047.86 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		873.81

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1047.86	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	103.27		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	103.27	(231)
Electricity for lighting		207.37	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1541.4	(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 =		115.26	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		138.21	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		13.62	(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 =		27.35	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				203.31	(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] =	0.96 (257)
SAP rating (Section 12)		86.62 (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	=		453.51	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		543.84	(264)
Space and water heating	(261) + (262) + (263) + (264) =				997.35	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	53.6	(267)
Electricity for lighting	(232) x	0.519	=	107.62	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			799.99	(272)
CO2 emissions per m²	(272) ÷ (4) =			18.18	(273)
EI rating (section 14)				88	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	2682.59	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3216.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5899.52	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	317.03	(267)
Electricity for lighting	(232) x	0	=	636.61	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =			4732.11	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			107.55	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 506

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	137.21	**(P1)**
Transmission heat loss coefficient:	34.4	
Summer heat loss coefficient:	171.61	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	5.2	81.19	0.57	0.7	0.9	136.44	
East (E)	0.9 x	5.2	117.51	0.57	0.7	0.9	197.48	
						Total	333.92	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	322.84	311.42	317.22	
Total summer gains	680.08	645.34	601.9	**(P5)**
Summer gain/loss ratio	3.96	3.76	3.51	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.21	21.91	21.56	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:31

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 78.9m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 507

Address :

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)	25.59 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.34 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	9.7m²
Windows facing: East	6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 507

Address:
Located in: England
Region: Thames valley
UPRN:
Date of assessment: 08 August 2022
Date of certificate: 25 August 2022
Assessment type: New dwelling design stage
Transaction type: New dwelling
Tenure type: Unknown
Related party disclosure: No related party
Thermal Mass Parameter: Indicative Value Medium
Water use <= 125 litres/person/day: True
PCDF Version: 504

Property description:

Dwelling type: Flat
Detachment:
Year Completed: 2022

Floor Location:	Floor area:	Storey height:
Floor 0	78.9 m²	2.7 m

Living area: 36.7 m² (fraction 0.586)
Front of dwelling faces: East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	9.7	1
E	16mm or more	0.7	0.57	1.4	6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	47.52	15.7	31.82	0.18	0	False	N/A
Corridor	4.05	0	4.05	0.22	0.43	False	N/A
Roof	78.9	0	78.9	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0992

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	17.6	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 507

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	78.9	(1a) x	2.7	(2a) =	213.03	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	78.9	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		213.03	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			6	x1/[1/(1.4)+ 0.04] =	7.95			(27)
Walls Type1	47.52	15.7	31.82	x 0.18 =	5.73			(29)
Walls Type2	4.05	0	4.05	x 0.2 =	0.81			(29)
Roof	78.9	0	78.9	x 0.13 =	10.26			(30)
Total area of elements, m²			130.47					(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) = 37.61 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 3707 (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 12.94 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 50.56 (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=	19.69	19.46	19.24	18.12	17.9	16.78	16.78	16.55	17.22	17.9	18.34	18.79	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	70.25	70.02	69.8	68.68	68.45	67.33	67.33	67.11	67.78	68.45	68.9	69.35	

Average = Sum(39)$_{1...12}$ /12= 68.62 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.89	0.89	0.88	0.87	0.87	0.85	0.85	0.85	0.86	0.87	0.87	0.88

Average = Sum(40)$_{1...12}$ /12= 0.87 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.44 (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 92.19 (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=	101.41	97.72	94.03	90.35	86.66	82.97	82.97	86.66	90.35	94.03	97.72	101.41

Total = Sum(44)$_{1...12}$ = 1106.27 (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=	150.39	131.53	135.73	118.33	113.54	97.98	90.79	104.18	105.43	122.86	134.12	145.64

Total = Sum(45)$_{1...12}$ = 1450.5 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.56	19.73	20.36	17.75	17.03	14.7	13.62	15.63	15.81	18.43	20.12	21.85

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	214.96	189.86	200.3	180.82	178.12	139.89	134.1	147.49	147.34	187.44	196.61	210.22	(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=	214.96	189.86	200.3	180.82	178.12	139.89	134.1	147.49	147.34	187.44	196.61	210.22	

Output from water heater (annual)$_{1...12}$ 2127.17 (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=	101.67	90.4	96.79	89.34	89.42	66.11	64.84	69.29	68.59	92.52	94.59	100.09	(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=	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	146.5	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	48.76	43.31	35.22	26.66	19.93	16.83	18.18	23.63	31.72	40.28	47.01	50.11	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	324.07	327.43	318.96	300.92	278.14	256.74	242.44	239.08	247.55	265.59	288.37	309.77	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	52.09	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	-97.67	(71)

Water heating gains (Table 5)

(72)m=	136.65	134.52	130.1	124.08	120.18	91.82	87.15	93.13	95.26	124.35	131.38	134.53	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	610.4	606.18	585.2	552.59	519.18	466.31	448.7	456.77	475.46	531.15	567.68	595.34	(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)	
East	0.9x 0.77	x	6	x	19.64	x	0.57	x	0.7	=	32.58	(76)
East	0.9x 0.77	x	6	x	38.42	x	0.57	x	0.7	=	63.74	(76)
East	0.9x 0.77	x	6	x	63.27	x	0.57	x	0.7	=	104.97	(76)
East	0.9x 0.77	x	6	x	92.28	x	0.57	x	0.7	=	153.1	(76)
East	0.9x 0.77	x	6	x	113.09	x	0.57	x	0.7	=	187.63	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	6	x	115.77	x	0.57	x	0.7	=	192.07	(76)
East	0.9x	0.77	x	6	x	110.22	x	0.57	x	0.7	=	182.86	(76)
East	0.9x	0.77	x	6	x	94.68	x	0.57	x	0.7	=	157.07	(76)
East	0.9x	0.77	x	6	x	73.59	x	0.57	x	0.7	=	122.09	(76)
East	0.9x	0.77	x	6	x	45.59	x	0.57	x	0.7	=	75.63	(76)
East	0.9x	0.77	x	6	x	24.49	x	0.57	x	0.7	=	40.63	(76)
East	0.9x	0.77	x	6	x	16.15	x	0.57	x	0.7	=	26.8	(76)
South	0.9x	0.77	x	9.7	x	46.75	x	0.57	x	0.7	=	125.39	(78)
South	0.9x	0.77	x	9.7	x	76.57	x	0.57	x	0.7	=	205.36	(78)
South	0.9x	0.77	x	9.7	x	97.53	x	0.57	x	0.7	=	261.6	(78)
South	0.9x	0.77	x	9.7	x	110.23	x	0.57	x	0.7	=	295.66	(78)
South	0.9x	0.77	x	9.7	x	114.87	x	0.57	x	0.7	=	308.1	(78)
South	0.9x	0.77	x	9.7	x	110.55	x	0.57	x	0.7	=	296.5	(78)
South	0.9x	0.77	x	9.7	x	108.01	x	0.57	x	0.7	=	289.7	(78)
South	0.9x	0.77	x	9.7	x	104.89	x	0.57	x	0.7	=	281.34	(78)
South	0.9x	0.77	x	9.7	x	101.89	x	0.57	x	0.7	=	273.27	(78)
South	0.9x	0.77	x	9.7	x	82.59	x	0.57	x	0.7	=	221.5	(78)
South	0.9x	0.77	x	9.7	x	55.42	x	0.57	x	0.7	=	148.64	(78)
South	0.9x	0.77	x	9.7	x	40.4	x	0.57	x	0.7	=	108.35	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	157.98	269.11	366.57	448.76	495.72	488.57	472.56	438.41	395.36	297.14	189.26	135.15	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	768.38	875.29	951.77	1001.35	1014.91	954.88	921.25	895.18	870.82	828.28	756.94	730.49	(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=	0.97	0.94	0.89	0.77	0.61	0.45	0.32	0.34	0.53	0.79	0.94	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.47	20.62	20.79	20.93	20.98	21	21	21	20.99	20.93	20.69	20.44	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.18	20.18	20.18	20.19	20.2	20.21	20.21	20.21	20.2	20.2	20.19	20.19	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.93	0.86	0.73	0.57	0.39	0.26	0.29	0.47	0.75	0.93	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.49	19.71	19.94	20.12	20.18	20.21	20.21	20.21	20.2	20.12	19.82	19.46	(90)

fLA = Living area ÷ (4) = 0.47 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.95	20.14	20.33	20.49	20.55	20.57	20.58	20.58	20.57	20.5	20.23	19.91	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.95	20.14	20.33	20.49	20.55	20.57	20.58	20.58	20.57	20.5	20.23	19.91	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.93	0.87	0.75	0.59	0.42	0.29	0.31	0.5	0.76	0.93	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	741.2	814.9	826	749.1	596.61	401.39	267.64	280.22	435.75	632.78	701.68	709.71	(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=	1099.2	1066.91	965.54	796.23	606.14	402.29	267.71	280.32	438.49	677.59	904.47	1089.68	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	266.35	169.35	103.81	33.93	7.09	0	0	0	0	33.34	146.01	282.7	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1042.59 (98)

Space heating requirement in kWh/m²/year 13.21 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	266.35	169.35	103.81	33.93	7.09	0	0	0	0	33.34	146.01	282.7	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	266.35	169.35	103.81	33.93	7.09	0	0	0	0	33.34	146.01	282.7	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1042.59 (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

Output from water heater (calculated above)

	214.96	189.86	200.3	180.82	178.12	139.89	134.1	147.49	147.34	187.44	196.61	210.22

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	126.45	111.68	117.83	106.37	104.78	82.29	78.88	86.76	86.67	110.26	115.65	123.66	

Total = Sum(219a)$_{1...12}$ = 1251.28 (219)

Annual totals **kWh/year** **kWh/year**

Space heating fuel used, main system 1 1042.59

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1251.28	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	185.18		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	185.18	(231)
Electricity for lighting		344.44	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2132.59	(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 =	137.52		(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 (electric off-peak tariff)							
High-rate fraction (Table 13, or Appendix F for electric CPSU)			1				(243)
Low-rate fraction	1.0 – (243) =		0				(244)
High-rate cost	(219) x (243) x		13.19	x 0.01 =	165.04		(245)
Low-rate cost	(219) x (244) x		13.19	x 0.01 =	0		(246)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	24.42		(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 =	45.43		(250)
Additional standing charges (Table 12)					0		(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13		(252)
Appendix Q items: repeat lines (253) and (254) as needed							
Total energy cost	(245)...(247) + (250)…(254) =				281.29		(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] =	0.95	(257)
SAP rating (Section 12)		86.7	(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	13.19	0.519	=	541.1	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.519	=	649.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =					1190.52	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	96.11	(267)
Electricity for lighting	(232)	x	0.519	=	178.77	(268)
Energy saving/generation technologies Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year			sum of (265)…(271) =		1106.81	(272)
CO2 emissions per m²			(272) ÷ (4) =		14.03	(273)
EI rating (section 14)					88	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	3200.74	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3841.43	(264)
Space and water heating	(261) + (262) + (263) + (264) =				7042.17	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	568.49	(267)
Electricity for lighting	(232)	x	0	=	1057.44	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy			sum of (265)…(271) =		6547.05	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		82.98	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 507

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	246.05	**(P1)**
Transmission heat loss coefficient:	50.6	
Summer heat loss coefficient:	296.61	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	9.7	112.21	0.57	0.7	0.9	351.76	
East (E)	0.9 x	6	117.51	0.57	0.7	0.9	227.86	
						Total	579.62	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	466.31	448.7	456.77	
Total summer gains	1072.82	1028.32	1004.29	**(P5)**
Summer gain/loss ratio	3.62	3.47	3.39	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	19.87	21.62	21.44	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:28

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 74m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 508

Address :

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)	27.24 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.55 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	9.7m²
Windows facing: East	12m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 508

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	74 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	9.7	1
E	16mm or more	0.7	0.57	1.4	12	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0
E		External	East	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	48.33	21.7	26.63	0.18	0	False	N/A
Corridor	11.61	0	11.61	0.22	0.43	False	N/A
Roof	74	0	74	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0954

	Length	**Psi-value**		
[Approved]	4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	17.3	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 508

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	74 (1a)	x	2.7 (2a)	=	199.8	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	74 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	199.8	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			12	x1/[1/(1.4)+ 0.04] =	15.91			(27)
Walls Type1	48.33	21.7	26.63	x 0.18 =	4.79			(29)
Walls Type2	11.61	0	11.61	x 0.2 =	2.33			(29)
Roof	74	0	74	x 0.13 =	9.62			(30)
Total area of elements, m²			133.94					(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) = 45.52 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4736 (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 12.78 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.29 (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=	18.47	18.26	18.05	16.99	16.78	15.73	15.73	15.52	16.15	16.78	17.2	17.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	76.76	76.55	76.34	75.29	75.08	74.03	74.03	73.82	74.45	75.08	75.5	75.92	

Average = Sum(39)$_{1...12}$ /12= 75.23 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.04	1.03	1.03	1.02	1.01	1	1	1	1.01	1.01	1.02	1.03

Average = Sum(40)$_{1...12}$ /12= 1.02 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.34 (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 89.76 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(44)m=	98.73	95.14	91.55	87.96	84.37	80.78	80.78	84.37	87.96	91.55	95.14	98.73

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1077.07 (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=	146.42	128.06	132.14	115.21	110.54	95.39	88.39	101.43	102.64	119.62	130.57	141.8

Total = Sum(45)$_{1...12}$ = 1412.21 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.96	19.21	19.82	17.28	16.58	14.31	13.26	15.21	15.4	17.94	19.59	21.27

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	(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=	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	

Output from water heater (annual)$_{1...12}$ 2088.89 (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=	100.35	89.24	95.6	88.3	88.42	65.25	64.04	68.38	67.66	91.44	93.41	98.81	(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=	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	140.35	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	46.01	40.87	33.24	25.16	18.81	15.88	17.16	22.3	29.93	38.01	44.36	47.29	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.13	311.33	303.27	286.12	264.46	244.11	230.52	227.32	235.38	252.53	274.18	294.53	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	-93.57	(71)

Water heating gains (Table 5)

(72)m=	134.87	132.8	128.5	122.64	118.84	90.62	86.08	91.9	93.97	122.9	129.74	132.81	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	587.18	583.15	563.16	532.08	500.27	448.78	431.91	439.69	457.44	511.6	546.44	572.79	(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)	
East	0.9x 0.77	x	12	x	19.64	x	0.57	x	0.7	=	65.17	(76)
East	0.9x 0.77	x	12	x	38.42	x	0.57	x	0.7	=	127.48	(76)
East	0.9x 0.77	x	12	x	63.27	x	0.57	x	0.7	=	209.95	(76)
East	0.9x 0.77	x	12	x	92.28	x	0.57	x	0.7	=	306.19	(76)
East	0.9x 0.77	x	12	x	113.09	x	0.57	x	0.7	=	375.25	(76)

SAP WorkSheet: New dwelling design stage

East	0.9x	0.77	x	12	x	115.77	x	0.57	x	0.7	=	384.14	(76)
East	0.9x	0.77	x	12	x	110.22	x	0.57	x	0.7	=	365.71	(76)
East	0.9x	0.77	x	12	x	94.68	x	0.57	x	0.7	=	314.14	(76)
East	0.9x	0.77	x	12	x	73.59	x	0.57	x	0.7	=	244.18	(76)
East	0.9x	0.77	x	12	x	45.59	x	0.57	x	0.7	=	151.27	(76)
East	0.9x	0.77	x	12	x	24.49	x	0.57	x	0.7	=	81.26	(76)
East	0.9x	0.77	x	12	x	16.15	x	0.57	x	0.7	=	53.59	(76)
South	0.9x	0.77	x	9.7	x	46.75	x	0.57	x	0.7	=	125.39	(78)
South	0.9x	0.77	x	9.7	x	76.57	x	0.57	x	0.7	=	205.36	(78)
South	0.9x	0.77	x	9.7	x	97.53	x	0.57	x	0.7	=	261.6	(78)
South	0.9x	0.77	x	9.7	x	110.23	x	0.57	x	0.7	=	295.66	(78)
South	0.9x	0.77	x	9.7	x	114.87	x	0.57	x	0.7	=	308.1	(78)
South	0.9x	0.77	x	9.7	x	110.55	x	0.57	x	0.7	=	296.5	(78)
South	0.9x	0.77	x	9.7	x	108.01	x	0.57	x	0.7	=	289.7	(78)
South	0.9x	0.77	x	9.7	x	104.89	x	0.57	x	0.7	=	281.34	(78)
South	0.9x	0.77	x	9.7	x	101.89	x	0.57	x	0.7	=	273.27	(78)
South	0.9x	0.77	x	9.7	x	82.59	x	0.57	x	0.7	=	221.5	(78)
South	0.9x	0.77	x	9.7	x	55.42	x	0.57	x	0.7	=	148.64	(78)
South	0.9x	0.77	x	9.7	x	40.4	x	0.57	x	0.7	=	108.35	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	190.56	332.85	471.54	601.85	683.35	680.64	655.41	595.48	517.44	372.77	229.89	161.94

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	777.74	916	1034.7	1133.93	1183.62	1129.41	1087.32	1035.17	974.89	884.37	776.34	734.74

(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=	0.97	0.94	0.87	0.74	0.58	0.42	0.3	0.33	0.52	0.79	0.94	0.98

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.32	20.52	20.74	20.91	20.98	21	21	21	20.99	20.89	20.59	20.28

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.05	20.05	20.06	20.07	20.07	20.08	20.08	20.09	20.08	20.07	20.07	20.06

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.93	0.85	0.7	0.52	0.36	0.24	0.26	0.45	0.74	0.93	0.97

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.18	19.46	19.75	19.98	20.05	20.08	20.08	20.09	20.07	19.97	19.57	19.13

(90)

fLA = Living area ÷ (4) = 0.5 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.75	19.99	20.24	20.44	20.51	20.54	20.54	20.54	20.53	20.43	20.08	19.7

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.75	19.99	20.24	20.44	20.51	20.54	20.54	20.54	20.53	20.43	20.08	19.7	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.96	0.93	0.85	0.72	0.55	0.39	0.27	0.29	0.49	0.76	0.93	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	749.14	847.44	881.14	812.65	649.93	438.07	291.35	305.28	473.99	673.62	719.47	713.16	(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=	1185.69	1154.88	1048.95	868.77	661.67	439.4	291.48	305.5	478.55	737.76	979.64	1176.74	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	324.8	206.6	124.85	40.41	8.73	0	0	0	0	47.72	187.32	344.9	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1285.33 (98)

Space heating requirement in kWh/m²/year 17.37 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	324.8	206.6	124.85	40.41	8.73	0	0	0	0	47.72	187.32	344.9	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	324.8	206.6	124.85	40.41	8.73	0	0	0	0	47.72	187.32	344.9	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1285.33 (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

Output from water heater (calculated above)

	211	186.39	196.72	177.7	175.12	137.31	131.71	144.74	144.56	184.2	193.07	206.38	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	124.11	109.64	115.72	104.53	103.01	80.77	77.47	85.14	85.03	108.35	113.57	121.4	

Total = Sum(219a)$_{1...12}$ = 1228.76 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1285.33

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1228.76	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	173.68		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	173.68	(231)
Electricity for lighting		325.04	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2321.9	(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 =		169.53	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		162.07	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		22.91	(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 =		42.87	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)…(254) =	306.26	(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] =	1.08	(257)
SAP rating (Section 12)		84.92	(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	=		667.09	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		637.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1304.81	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	90.14	(267)
Electricity for lighting	(232) x	0.519	=	168.69	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			1205.07	(272)
CO2 emissions per m²	(272) ÷ (4) =			16.28	(273)
EI rating (section 14)				86	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	3945.96	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3772.28	(264)
Space and water heating	(261) + (262) + (263) + (264) =			7718.24	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	533.19	(267)
Electricity for lighting	(232) x	0	=	997.86	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =			7128.24	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			96.33	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 508

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	230.77	**(P1)**
Transmission heat loss coefficient:	58.3	
Summer heat loss coefficient:	289.06	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1
East (E)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**
East (E)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	9.7	112.21	0.57	0.7	0.9	351.76	
East (E)	0.9 x	12	117.51	0.57	0.7	0.9	455.73	
						Total	807.48	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	448.78	431.91	439.69	
Total summer gains	1297.17	1239.4	1187.67	**(P5)**
Summer gain/loss ratio	4.49	4.29	4.11	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.74	22.44	22.16	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:26

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 47.3m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 509

Address :

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)	35.92 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	26.70 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	62.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: West	16.7m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 509

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	47.3 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
W	16mm or more	0.7	0.57	1.4	16.7	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
W		External	West	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	31.32	16.7	14.62	0.18	0	False	N/A
Corridor	35.64	0	35.64	0.22	0.43	False	N/A
Flat	47.3	0	47.3	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.094

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof

SAP Input

11.6	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30°

SAP Input

	Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 509

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	47.3	(1a) x	2.7	(2a) =	127.71	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	47.3	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		127.71	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			16.7	x1/[1/(1.4)+ 0.04] =	22.14			(27)
Walls Type1	31.32	16.7	14.62	x 0.18 =	2.63			(29)
Walls Type2	35.64	0	35.64	x 0.2 =	7.16			(29)
Roof	47.3	0	47.3	x 0.13 =	6.15			(30)
Total area of elements, m²			114.26					(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) = 38.08 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 8220.7 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.74 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 48.82 (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=	11.8	11.67	11.53	10.86	10.73	10.06	10.06	9.92	10.33	10.73	11	11.27	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	60.63	60.49	60.36	59.69	59.55	58.88	58.88	58.75	59.15	59.55	59.82	60.09	

Average = Sum(39)$_{1...12}$ /12= 59.65 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.28	1.28	1.28	1.26	1.26	1.24	1.24	1.24	1.25	1.26	1.26	1.27	

Average = Sum(40)$_{1...12}$ /12= 1.26 (40)

SAP WorkSheet: New dwelling design stage

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 1.61 (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 72.46 (43)

Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(44)m=	79.71	76.81	73.91	71.01	68.11	65.22	65.22	68.11	71.01	73.91	76.81	79.71	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 869.54 (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=	118.2	103.38	106.68	93.01	89.24	77.01	71.36	81.89	82.87	96.57	105.42	114.47	

Total = Sum(45)$_{1...12}$ = 1140.1 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	17.73	15.51	16	13.95	13.39	11.55	10.7	12.28	12.43	14.49	15.81	17.17	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05	(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=	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05	

Output from water heater (annual)$_{1...12}$ 1816.77 (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=	90.97	81.04	87.13	80.92	81.34	59.14	58.38	61.88	61.09	83.77	85.05	89.73	(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=	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	96.66	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	31.25	27.76	22.58	17.09	12.78	10.79	11.65	15.15	20.33	25.82	30.13	32.12	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	209.29	211.47	205.99	194.34	179.63	165.81	156.58	154.4	159.88	171.53	186.24	200.06	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	46.28	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	-64.44	(71)

Water heating gains (Table 5)

(72)m=	122.27	120.59	117.12	112.39	109.32	82.14	78.46	83.17	84.84	112.6	118.12	120.6	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	441.31	438.31	424.18	402.32	380.23	337.23	325.19	331.22	343.55	388.44	412.99	431.28	(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)	
West	0.9x 0.77	x	16.7	x	19.64	x	0.57	x	0.7	=	90.69	(80)
West	0.9x 0.77	x	16.7	x	38.42	x	0.57	x	0.7	=	177.41	(80)
West	0.9x 0.77	x	16.7	x	63.27	x	0.57	x	0.7	=	292.17	(80)
West	0.9x 0.77	x	16.7	x	92.28	x	0.57	x	0.7	=	426.12	(80)
West	0.9x 0.77	x	16.7	x	113.09	x	0.57	x	0.7	=	522.22	(80)
West	0.9x 0.77	x	16.7	x	115.77	x	0.57	x	0.7	=	534.59	(80)
West	0.9x 0.77	x	16.7	x	110.22	x	0.57	x	0.7	=	508.95	(80)
West	0.9x 0.77	x	16.7	x	94.68	x	0.57	x	0.7	=	437.18	(80)

SAP WorkSheet: New dwelling design stage

West	0.9x	0.77	x	16.7	x	73.59	x	0.57	x	0.7	=	339.81	(80)
West	0.9x	0.77	x	16.7	x	45.59	x	0.57	x	0.7	=	210.52	(80)
West	0.9x	0.77	x	16.7	x	24.49	x	0.57	x	0.7	=	113.08	(80)
West	0.9x	0.77	x	16.7	x	16.15	x	0.57	x	0.7	=	74.58	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	90.69	177.41	292.17	426.12	522.22	534.59	508.95	437.18	339.81	210.52	113.08	74.58	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	532	615.73	716.36	828.44	902.45	871.82	834.14	768.4	683.36	598.96	526.07	505.86	(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=	0.97	0.95	0.89	0.76	0.59	0.43	0.31	0.35	0.57	0.84	0.95	0.98	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.04	20.25	20.54	20.82	20.95	20.99	21	21	20.97	20.77	20.36	20	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.86	19.86	19.86	19.87	19.87	19.88	19.88	19.89	19.88	19.87	19.87	19.86	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.97	0.94	0.87	0.72	0.53	0.36	0.23	0.27	0.49	0.79	0.94	0.97	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.64	18.93	19.33	19.69	19.84	19.88	19.88	19.89	19.86	19.65	19.1	18.59	(90)

fLA = Living area ÷ (4) = 0.78 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.73	19.95	20.27	20.57	20.7	20.74	20.75	20.75	20.72	20.52	20.08	19.68	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.73	19.95	20.27	20.57	20.7	20.74	20.75	20.75	20.72	20.52	20.08	19.68	(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	0.94	0.88	0.75	0.57	0.41	0.29	0.33	0.55	0.82	0.94	0.97	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	514.26	578.94	628.66	617.72	516.11	358.34	243.76	254.52	378.92	489.99	494.97	491.79	(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=	935.36	910.57	831.31	696.61	536.22	361.69	244.29	255.46	391.66	590.68	776.22	930.46	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	313.3	222.86	150.77	56.8	14.97	0	0	0	0	74.91	202.5	326.37	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1362.48 (98)

Space heating requirement in kWh/m²/year 28.81 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	313.3	222.86	150.77	56.8	14.97	0	0	0	0	74.91	202.5	326.37	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	313.3	222.86	150.77	56.8	14.97	0	0	0	0	74.91	202.5	326.37	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 1362.48 (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

Output from water heater (calculated above)

	182.78	161.71	171.26	155.5	153.82	118.93	114.67	125.2	124.78	161.15	167.91	179.05

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month

(219)m = (64)m x 100 ÷ (217)m

(219)m=	107.52	95.12	100.74	91.47	90.48	69.96	67.46	73.65	73.4	94.79	98.77	105.33	

Total = Sum(219a)$_{1...12}$ = 1068.69 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1362.48
Water heating fuel used		1068.69
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	111.01	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	111.01 (231)
Electricity for lighting		220.78 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2072.06 (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 =	179.71	(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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	140.96	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	14.64	(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 =	29.12	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			273.31	(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] =	1.24	(257)
SAP rating (Section 12)		82.65	(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	=	707.13	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	554.65	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1261.78	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	57.62	(267)
Electricity for lighting	(232) x		0.519	=	114.58	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				1075.4	(272)
CO2 emissions per m²	(272) ÷ (4) =				22.74	(273)
EI rating (section 14)					84	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	4182.81	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	3280.88	(264)
Space and water heating	(261) + (262) + (263) + (264) =				7463.69	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	340.81	(267)
Electricity for lighting	(232)	x	0	=	677.78	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		6361.24	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		134.49	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 509

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	147.51	**(P1)**
Transmission heat loss coefficient:	48.8	
Summer heat loss coefficient:	196.33	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (W)	0.9 x	16.7	117.51	0.57	0.7	0.9	634.22	
						Total	634.22	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	337.23	325.19	331.22	
Total summer gains	1010.47	959.41	889.18	**(P5)**
Summer gain/loss ratio	5.15	4.89	4.53	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	21.4	23.04	22.58	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:24

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 66m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 510

Address :

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)	21.9 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.89 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	29.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	28.0 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	19.5m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 510

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	66 m²	2.7 m

Living area:	36.7 m² (fraction 0.586)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	19.5	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	30.78	19.5	11.28	0.18	0	False	N/A
Corridor	23.04	0	23.04	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0789

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 510

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	66 (1a)	x	2.7 (2a)	=	178.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	66 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	178.2	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			19.5	x1/[1/(1.4)+ 0.04] =	25.85			(27)
Walls Type1	30.78	19.5	11.28	x 0.18 =	2.03			(29)
Walls Type2	23.04	0	23.04	x 0.2 =	4.63			(29)
Total area of elements, m²			53.82					(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) = 32.51 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5167.2 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 36.76 (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=	16.47	16.28	16.09	15.16	14.97	14.03	14.03	13.85	14.41	14.97	15.34	15.72	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	53.23	53.04	52.85	51.92	51.73	50.79	50.79	50.6	51.17	51.73	52.1	52.48	

Average = Sum(39)$_{1...12}$ /12= 51.87 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.81	0.8	0.8	0.79	0.78	0.77	0.77	0.77	0.78	0.78	0.79	0.8	

Average = Sum(40)$_{1...12}$ /12= 0.79 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.15 (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 85.15 (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=	93.66	90.26	86.85	83.45	80.04	76.63	76.63	80.04	83.45	86.85	90.26	93.66	

Total = Sum(44)$_{1...12}$ = 1021.79 (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=	138.9	121.48	125.36	109.29	104.87	90.49	83.86	96.23	97.38	113.48	123.87	134.52	

Total = Sum(45)$_{1...12}$ = 1339.73 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.84	18.22	18.8	16.39	15.73	13.57	12.58	14.43	14.61	17.02	18.58	20.18	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	203.48	179.81	189.94	171.79	169.45	132.41	127.17	139.54	139.29	178.06	186.37	199.1	(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=	203.48	179.81	189.94	171.79	169.45	132.41	127.17	139.54	139.29	178.06	186.37	199.1	

Output from water heater (annual)$_{1...12}$ 2016.41 (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=	97.85	87.06	93.35	86.34	86.53	63.62	62.53	66.65	65.91	89.4	91.18	96.39	(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=	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.85	37.17	30.23	22.89	17.11	14.44	15.61	20.29	27.23	34.57	40.35	43.02	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	280.28	283.19	275.86	260.26	240.56	222.05	209.68	206.77	214.1	229.71	249.4	267.91	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	(71)

Water heating gains (Table 5)

(72)m=	131.52	129.55	125.46	119.91	116.31	88.36	84.05	89.58	91.54	120.16	126.65	129.56	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	546.57	542.83	524.48	495.98	466.9	417.78	402.26	409.56	425.8	477.36	509.32	533.41	(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)	
South	0.9x 0.77	x	19.5	x	46.75	x	0.57	x	0.7	=	252.08	(78)
South	0.9x 0.77	x	19.5	x	76.57	x	0.57	x	0.7	=	412.85	(78)
South	0.9x 0.77	x	19.5	x	97.53	x	0.57	x	0.7	=	525.89	(78)
South	0.9x 0.77	x	19.5	x	110.23	x	0.57	x	0.7	=	594.37	(78)
South	0.9x 0.77	x	19.5	x	114.87	x	0.57	x	0.7	=	619.37	(78)
South	0.9x 0.77	x	19.5	x	110.55	x	0.57	x	0.7	=	596.06	(78)
South	0.9x 0.77	x	19.5	x	108.01	x	0.57	x	0.7	=	582.39	(78)
South	0.9x 0.77	x	19.5	x	104.89	x	0.57	x	0.7	=	565.58	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	19.5	x	101.89	x	0.57	x	0.7	=	549.36	(78)
South	0.9x	0.77	x	19.5	x	82.59	x	0.57	x	0.7	=	445.29	(78)
South	0.9x	0.77	x	19.5	x	55.42	x	0.57	x	0.7	=	298.8	(78)
South	0.9x	0.77	x	19.5	x	40.4	x	0.57	x	0.7	=	217.82	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	252.08	412.85	525.89	594.37	619.37	596.06	582.39	565.58	549.36	445.29	298.8	217.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	798.65	955.68	1050.37	1090.35	1086.27	1013.84	984.65	975.14	975.15	922.65	808.12	751.23	(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=	0.91	0.82	0.7	0.57	0.44	0.32	0.23	0.24	0.36	0.58	0.82	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.76	20.89	20.96	20.99	21	21	21	21	21	20.99	20.91	20.72	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.25	20.25	20.25	20.26	20.27	20.28	20.28	20.28	20.27	20.27	20.26	20.26	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.9	0.79	0.67	0.54	0.41	0.28	0.19	0.2	0.32	0.54	0.79	0.92	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.95	20.12	20.21	20.26	20.27	20.28	20.28	20.28	20.27	20.26	20.16	19.91	(90)

fLA = Living area ÷ (4) = 0.56 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.4	20.55	20.63	20.66	20.67	20.68	20.68	20.68	20.68	20.67	20.57	20.36	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.4	20.55	20.63	20.66	20.67	20.68	20.68	20.68	20.68	20.67	20.57	20.36	(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=	0.9	0.8	0.69	0.56	0.43	0.3	0.21	0.22	0.35	0.56	0.8	0.92	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	718.25	766.76	723.67	605.75	463.43	308.77	207.24	216.65	336.43	516.33	649.66	690.05	(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=	856.92	830.02	746.62	610.77	464.18	308.82	207.24	216.65	336.56	520.74	702.07	848.22	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	103.17	42.51	17.07	3.61	0.56	0	0	0	0	3.28	37.74	117.68	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 325.62 (98)

Space heating requirement in kWh/m²/year 4.93 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	103.17	42.51	17.07	3.61	0.56	0	0	0	0	3.28	37.74	117.68	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	103.17	42.51	17.07	3.61	0.56	0	0	0	0	3.28	37.74	117.68	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 325.62 (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

Output from water heater (calculated above)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
203.48	179.81	189.94	171.79	169.45	132.41	127.17	139.54	139.29	178.06	186.37	199.1

Efficiency of water heater 170 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	170	170	170	170	170	170	170	170	170	170	170	170

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	119.69	105.77	111.73	101.05	99.68	77.89	74.81	82.08	81.94	104.74	109.63	117.12

Total = Sum(219a)$_{1...12}$ = 1186.12 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		325.62
Water heating fuel used		1186.12
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	154.9	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	154.9 (231)
Electricity for lighting		295.66 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1271.4 (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 =	42.95 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	156.45	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	20.43	(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 =	39	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			167.7	(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] =	0.63	(257)
SAP rating (Section 12)		91.15	(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	=	168.99	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	615.6	(264)
Space and water heating	(261) + (262) + (263) + (264) =				784.59	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	80.39	(267)
Electricity for lighting	(232) x		0.519	=	153.45	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				659.86	(272)
CO2 emissions per m²	(272) ÷ (4) =				10	(273)
EI rating (section 14)					92	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	999.64	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	3641.4	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4641.04	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	475.54	(267)
Electricity for lighting	(232)	x	0	=	907.67	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		3903.2	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		59.14	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 510

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	205.82	**(P1)**
Transmission heat loss coefficient:	36.8	
Summer heat loss coefficient:	242.58	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	19.5	112.21	0.57	0.7	0.9	707.15	
						Total	707.15	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	417.78	402.26	409.56	
Total summer gains	1150.79	1109.41	1107.25	**(P5)**
Summer gain/loss ratio	4.74	4.57	4.56	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.99	22.72	22.61	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:22

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.2m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 511

Address :

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)	22.39 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.67 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	30.1 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	27.6 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters
Secondary heating system:	None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	15.6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 511

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	63.2 m²	2.7 m
Living area:	36.7 m² (fraction 0.586)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	15.6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	28.08	15.6	12.48	0.18	0	False	N/A
Corridor	24.96	0	24.96	0.22	0.43	False	N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.08

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)

Ventilation:

Pressure test: Yes (As designed)

SAP Input

Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 511

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	63.2 (1a)	x	2.7 (2a)	=	170.64	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	63.2 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	170.64	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			15.6	x1/[1/(1.4)+ 0.04] =	20.68			(27)
Walls Type1	28.08	15.6	12.48	x 0.18 =	2.25			(29)
Walls Type2	24.96	0	24.96	x 0.2 =	5.02			(29)
Total area of elements, m²			53.04					(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) = 27.94 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5616 (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 4.24 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 32.19 (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=	15.77	15.59	15.41	14.51	14.33	13.44	13.44	13.26	13.8	14.33	14.69	15.05	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	47.96	47.78	47.6	46.7	46.52	45.63	45.63	45.45	45.99	46.52	46.88	47.24	

Average = Sum(39)$_{1...12}$ /12= 46.66 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	0.76	0.76	0.75	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74	0.75	

Average = Sum(40)$_{1...12}$ /12= 0.74 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.07 (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 83.37 (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=	91.71	88.38	85.04	81.71	78.37	75.04	75.04	78.37	81.71	85.04	88.38	91.71	

Total = Sum(44)$_{1...12}$ = 1000.5 (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=	136.01	118.95	122.75	107.01	102.68	88.61	82.11	94.22	95.35	111.12	121.29	131.72	

Total = Sum(45)$_{1...12}$ = 1311.81 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.4	17.84	18.41	16.05	15.4	13.29	12.32	14.13	14.3	16.67	18.19	19.76	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	200.59	177.28	187.33	169.51	167.26	130.52	125.42	137.53	137.26	175.7	183.79	196.29	(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=	200.59	177.28	187.33	169.51	167.26	130.52	125.42	137.53	137.26	175.7	183.79	196.29	

Output from water heater (annual)$_{1...12}$ 1988.49 (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=	96.89	86.22	92.48	85.58	85.81	62.99	61.95	65.98	65.24	88.61	90.33	95.46	(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=	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	124.23	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	40.33	35.82	29.13	22.05	16.48	13.92	15.04	19.55	26.24	33.31	38.88	41.45	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	270.06	272.86	265.8	250.77	231.79	213.95	202.04	199.23	206.3	221.33	240.31	258.14	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	49.49	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	-82.82	(71)

Water heating gains (Table 5)

(72)m=	130.22	128.3	124.3	118.86	115.33	87.49	83.27	88.68	90.6	119.1	125.45	128.3	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	531.51	527.88	510.13	482.58	454.51	406.27	391.25	398.37	414.04	464.64	495.54	518.8	(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)	
South	0.9x 0.77	x	15.6	x	46.75	x	0.57	x	0.7	=	201.67	(78)
South	0.9x 0.77	x	15.6	x	76.57	x	0.57	x	0.7	=	330.28	(78)
South	0.9x 0.77	x	15.6	x	97.53	x	0.57	x	0.7	=	420.71	(78)
South	0.9x 0.77	x	15.6	x	110.23	x	0.57	x	0.7	=	475.5	(78)
South	0.9x 0.77	x	15.6	x	114.87	x	0.57	x	0.7	=	495.5	(78)
South	0.9x 0.77	x	15.6	x	110.55	x	0.57	x	0.7	=	476.85	(78)
South	0.9x 0.77	x	15.6	x	108.01	x	0.57	x	0.7	=	465.91	(78)
South	0.9x 0.77	x	15.6	x	104.89	x	0.57	x	0.7	=	452.46	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	15.6	x	101.89	x	0.57	x	0.7	=	439.48	(78)
South	0.9x	0.77	x	15.6	x	82.59	x	0.57	x	0.7	=	356.23	(78)
South	0.9x	0.77	x	15.6	x	55.42	x	0.57	x	0.7	=	239.04	(78)
South	0.9x	0.77	x	15.6	x	40.4	x	0.57	x	0.7	=	174.26	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	201.67	330.28	420.71	475.5	495.5	476.85	465.91	452.46	439.48	356.23	239.04	174.26	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	733.18	858.16	930.84	958.08	950	883.11	857.16	850.83	853.52	820.88	734.59	693.06	(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=	0.91	0.82	0.72	0.58	0.45	0.33	0.23	0.25	0.37	0.58	0.82	0.93	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.79	20.9	20.96	20.99	21	21	21	21	21	20.99	20.92	20.76	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.29	20.29	20.29	20.31	20.31	20.32	20.32	20.32	20.32	20.31	20.3	20.3	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.9	0.8	0.69	0.55	0.42	0.3	0.2	0.21	0.33	0.55	0.79	0.91	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	20.03	20.18	20.25	20.3	20.31	20.32	20.32	20.32	20.32	20.3	20.22	20	(90)

fLA = Living area ÷ (4) = 0.58 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	20.47	20.6	20.67	20.7	20.71	20.72	20.72	20.72	20.71	20.7	20.63	20.44	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	20.47	20.6	20.67	20.7	20.71	20.72	20.72	20.72	20.71	20.7	20.63	20.44	(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=	0.9	0.81	0.7	0.57	0.44	0.32	0.22	0.23	0.36	0.57	0.81	0.92	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	659.66	695.59	654.31	546.9	418.54	278.99	187.78	196.17	304.02	466.58	591.55	636.04	(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=	775.54	750.02	674.32	551.16	419.15	279.03	187.78	196.18	304.12	470.07	634.12	767.3	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	86.21	36.58	14.88	3.07	0.45	0	0	0	0	2.59	30.65	97.66	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 272.09 (98)

Space heating requirement in kWh/m²/year 4.31 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	86.21	36.58	14.88	3.07	0.45	0	0	0	0	2.59	30.65	97.66	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	86.21	36.58	14.88	3.07	0.45	0	0	0	0	2.59	30.65	97.66	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 272.09 (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

Output from water heater (calculated above)

	200.59	177.28	187.33	169.51	167.26	130.52	125.42	137.53	137.26	175.7	183.79	196.29

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	117.99	104.28	110.19	99.71	98.39	76.78	73.78	80.9	80.74	103.35	108.11	115.47	

Total = Sum(219a)$_{1...12}$ = 1169.7 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		272.09
Water heating fuel used		1169.7
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	148.33	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	148.33 (231)
Electricity for lighting		284.88 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1184.1 (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 =	35.89 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	154.28	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	19.56	(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 =	37.58	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			156.18	(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] =	0.61	(257)
SAP rating (Section 12)		91.54	(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	=	141.22	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	607.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =				748.29	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	76.98	(267)
Electricity for lighting	(232) x		0.519	=	147.85	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				614.55	(272)
CO2 emissions per m²	(272) ÷ (4) =				9.72	(273)
EI rating (section 14)					92	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	835.32	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	3590.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =				4426.29	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	455.37	(267)
Electricity for lighting	(232)	x	0	=	874.57	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		3635.18	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		57.52	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 511

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	197.09	**(P1)**
Transmission heat loss coefficient:	32.2	
Summer heat loss coefficient:	229.28	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	15.6	112.21	0.57	0.7	0.9	565.72	
						Total	565.72	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	406.27	391.25	398.37	
Total summer gains	992.68	956.96	956.52	**(P5)**
Summer gain/loss ratio	4.33	4.17	4.17	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.58	22.32	22.22	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:20

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 601

Address :

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)	30.07 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	23.25 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	53.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	14m²
Windows facing: West	5.6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 601

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	70.7 m²	2.7 m

Living area:	24.4 m² (fraction 0.345)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	14	1
W	16mm or more	0.7	0.57	1.4	5.6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
W		External	West	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	46.17	19.6	26.57	0.18	0	False	N/A
Corridor	12.48	0	12.48	0.22	0.43	False	N/A
Roof	70.7	0	70.7	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1068

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	17.1	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 601

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.7	(1a) x	2.7	(2a) =	190.89	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	70.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		190.89	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			14	x1/[1/(1.4)+ 0.04] =	18.56			(27)
Windows Type 2			5.6	x1/[1/(1.4)+ 0.04] =	7.42			(27)
Walls Type1	46.17	19.6	26.57	x 0.18 =	4.78			(29)
Walls Type2	12.48	0	12.48	x 0.2 =	2.51			(29)
Roof	70.7	0	70.7	x 0.13 =	9.19			(30)
Total area of elements, m²			129.35					(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) = 42.47 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4867.4 (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 13.82 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 56.29 (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=	17.64	17.44	17.24	16.24	16.04	15.03	15.03	14.83	15.43	16.04	16.44	16.84	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	73.93	73.73	73.53	72.52	72.32	71.32	71.32	71.12	71.72	72.32	72.73	73.13	

Average = Sum(39)$_{1...12}$ /12= 72.47 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.05	1.04	1.04	1.03	1.02	1.01	1.01	1.01	1.01	1.02	1.03	1.03

Average = Sum(40)$_{1...12}$ /12= 1.03 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.26 (42)

if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 87.95 (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=	96.74	93.22	89.71	86.19	82.67	79.15	79.15	82.67	86.19	89.71	93.22	96.74

Total = Sum(44)$_{1...12}$ = 1055.35 (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=	143.46	125.47	129.48	112.88	108.31	93.47	86.61	99.39	100.57	117.21	127.94	138.94

Total = Sum(45)$_{1...12}$ = 1383.74 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.52	18.82	19.42	16.93	16.25	14.02	12.99	14.91	15.09	17.58	19.19	20.84

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	208.04	183.8	194.06	175.38	172.89	135.38	129.92	142.7	142.49	181.79	190.44	203.52	(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=	208.04	183.8	194.06	175.38	172.89	135.38	129.92	142.7	142.49	181.79	190.44	203.52	

Output from water heater (annual)$_{1...12}$ 2060.41 (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=	99.37	88.38	94.71	87.53	87.68	64.61	63.45	67.7	66.97	90.64	92.54	97.86	(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=	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	44.34	39.38	32.02	24.24	18.12	15.3	16.53	21.49	28.84	36.62	42.75	45.57	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	296.9	299.98	292.22	275.69	254.83	235.22	222.12	219.04	226.8	243.33	264.19	283.8	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	50.84	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	-90.52	(71)

Water heating gains (Table 5)

(72)m=	133.56	131.52	127.3	121.57	117.85	89.74	85.28	90.99	93.02	121.82	128.52	131.53	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	570.9	566.99	547.65	517.61	486.9	436.36	420.03	427.62	444.76	497.88	531.56	557	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	14	x	10.63	x	0.57	x	0.7	=	41.16	(74)
North	0.9x 0.77	x	14	x	20.32	x	0.57	x	0.7	=	78.66	(74)
North	0.9x 0.77	x	14	x	34.53	x	0.57	x	0.7	=	133.67	(74)
North	0.9x 0.77	x	14	x	55.46	x	0.57	x	0.7	=	214.71	(74)
North	0.9x 0.77	x	14	x	74.72	x	0.57	x	0.7	=	289.23	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	14	x	79.99	x	0.57	x	0.7	=	309.63	(74)
North	0.9x	0.77	x	14	x	74.68	x	0.57	x	0.7	=	289.08	(74)
North	0.9x	0.77	x	14	x	59.25	x	0.57	x	0.7	=	229.35	(74)
North	0.9x	0.77	x	14	x	41.52	x	0.57	x	0.7	=	160.71	(74)
North	0.9x	0.77	x	14	x	24.19	x	0.57	x	0.7	=	93.64	(74)
North	0.9x	0.77	x	14	x	13.12	x	0.57	x	0.7	=	50.78	(74)
North	0.9x	0.77	x	14	x	8.86	x	0.57	x	0.7	=	34.32	(74)
West	0.9x	0.77	x	5.6	x	19.64	x	0.57	x	0.7	=	30.41	(80)
West	0.9x	0.77	x	5.6	x	38.42	x	0.57	x	0.7	=	59.49	(80)
West	0.9x	0.77	x	5.6	x	63.27	x	0.57	x	0.7	=	97.97	(80)
West	0.9x	0.77	x	5.6	x	92.28	x	0.57	x	0.7	=	142.89	(80)
West	0.9x	0.77	x	5.6	x	113.09	x	0.57	x	0.7	=	175.12	(80)
West	0.9x	0.77	x	5.6	x	115.77	x	0.57	x	0.7	=	179.26	(80)
West	0.9x	0.77	x	5.6	x	110.22	x	0.57	x	0.7	=	170.67	(80)
West	0.9x	0.77	x	5.6	x	94.68	x	0.57	x	0.7	=	146.6	(80)
West	0.9x	0.77	x	5.6	x	73.59	x	0.57	x	0.7	=	113.95	(80)
West	0.9x	0.77	x	5.6	x	45.59	x	0.57	x	0.7	=	70.59	(80)
West	0.9x	0.77	x	5.6	x	24.49	x	0.57	x	0.7	=	37.92	(80)
West	0.9x	0.77	x	5.6	x	16.15	x	0.57	x	0.7	=	25.01	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	71.57	138.16	231.64	357.6	464.35	488.89	459.75	375.95	274.66	164.23	88.7	59.32

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	642.47	705.14	779.3	875.21	951.25	925.25	879.78	803.57	719.43	662.11	620.26	616.33

(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	0.94	0.85	0.67	0.49	0.36	0.41	0.66	0.9	0.97	0.99

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.19	20.32	20.55	20.82	20.96	20.99	21	21	20.97	20.78	20.45	20.16

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.05	20.05	20.05	20.06	20.06	20.08	20.08	20.08	20.07	20.06	20.06	20.05

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.81	0.62	0.42	0.28	0.33	0.58	0.86	0.96	0.99

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.99	19.19	19.51	19.86	20.03	20.07	20.08	20.08	20.05	19.84	19.37	18.96

(90)

fLA = Living area ÷ (4) = 0.35 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.4	19.58	19.87	20.19	20.35	20.39	20.39	20.4	20.37	20.16	19.74	19.37

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.4	19.58	19.87	20.19	20.35	20.39	20.39	20.4	20.37	20.16	19.74	19.37	(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=	0.98	0.96	0.92	0.82	0.63	0.44	0.31	0.35	0.61	0.86	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	628.48	679.63	720.64	715.07	602.82	410.44	270.36	283.61	436.69	572.45	595.17	605.13	(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=	1116.44	1082.25	982.95	818.99	625.39	412.97	270.62	284.15	449.61	691.61	919.5	1109.49	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	363.04	270.56	195.16	74.83	16.79	0	0	0	0	88.65	233.52	375.25	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1617.8 (98)

Space heating requirement in kWh/m²/year 22.88 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	363.04	270.56	195.16	74.83	16.79	0	0	0	0	88.65	233.52	375.25	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	363.04	270.56	195.16	74.83	16.79	0	0	0	0	88.65	233.52	375.25	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1617.8 (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

Output from water heater (calculated above)

	208.04	183.8	194.06	175.38	172.89	135.38	129.92	142.7	142.49	181.79	190.44	203.52

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	122.38	108.12	114.15	103.16	101.7	79.64	76.43	83.94	83.82	106.93	112.02	119.72	

Total = Sum(219a)$_{1...12}$ = 1212.01 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1617.8

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1212.01	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	165.93		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	165.93	(231)
Electricity for lighting		313.19	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2618.04	(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 =		213.39	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		159.86	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		21.89	(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 =		41.31	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)

Appendix Q items: repeat lines (253) and (254) as needed

Total energy cost	(245)...(247) + (250)…(254) =	345.32	(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] =	1.25	(257)
SAP rating (Section 12)		82.51	(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	=		839.64	(261)
Space heating (secondary)	(215) x	0.519	=		0	(263)
Water heating	(219) x	0.519	=		629.03	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1468.67	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	86.12	(267)
Electricity for lighting	(232)	x	0.519	=	162.55	(268)
Energy saving/generation technologies Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year			sum of (265)…(271) =		1358.76	(272)
CO2 emissions per m²			(272) ÷ (4) =		19.22	(273)
EI rating (section 14)					84	(274)

13a. Primary Energy

	Energy kWh/year		**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211)	x	3.07	=	4966.65	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	3.07	=	3720.86	(264)
Space and water heating	(261) + (262) + (263) + (264) =				8687.51	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	509.41	(267)
Electricity for lighting	(232)	x	0	=	961.51	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
'Total Primary Energy			sum of (265)…(271) =		8037.37	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		113.68	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 601

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	220.48	**(P1)**
Transmission heat loss coefficient:	56.3	
Summer heat loss coefficient:	276.77	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	14	81.19	0.57	0.7	0.9	367.34	
West (W)	0.9 x	5.6	117.51	0.57	0.7	0.9	212.67	
						Total	580.01	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	436.36	420.03	427.62	
Total summer gains	1059.52	1000.04	913.39	**(P5)**
Summer gain/loss ratio	3.83	3.61	3.3	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.08	21.76	21.35	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:19

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 71.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 602

Address :

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)	29.34 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	22.47 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	57.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	51.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Slight	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: North	14m²
Windows facing: West	5.6m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 602

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	71.7 m²	2.7 m

Living area:	24.4 m² (fraction 0.345)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
W	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
N	16mm or more	0.7	0.57	1.4	14	1
W	16mm or more	0.7	0.57	1.4	5.6	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
N		External	North	0	0
W		External	West	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	31.05	19.6	11.45	0.18	0	False	N/A
Corridor	34.08	0	34.08	0.22	0.43	False	N/A
Roof	71.7	0	71.7	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0781

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	11.5	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 602

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	71.7 (1a)	x	2.7 (2a)	=	193.59	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	71.7 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	193.59	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			14	x1/[1/(1.4)+ 0.04] =	18.56			(27)
Windows Type 2			5.6	x1/[1/(1.4)+ 0.04] =	7.42			(27)
Walls Type1	31.05	19.6	11.45	x 0.18 =	2.06			(29)
Walls Type2	34.08	0	34.08	x 0.2 =	6.85			(29)
Roof	71.7	0	71.7	x 0.13 =	9.32			(30)
Total area of elements, m²			136.83					(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) = 44.22 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 7922 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.69 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 54.9 (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=	17.89	17.69	17.48	16.47	16.26	15.24	15.24	15.04	15.65	16.26	16.67	17.08	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	72.79	72.59	72.39	71.37	71.16	70.15	70.15	69.94	70.55	71.16	71.57	71.98	

Average = Sum(39)$_{1...12}$ /12= 71.32 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.02	1.01	1.01	1	0.99	0.98	0.98	0.98	0.98	0.99	1	1

Average = Sum(40)$_{1...12}$ /12= 0.99 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.29 (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 88.51 (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=	97.36	93.82	90.28	86.74	83.2	79.66	79.66	83.2	86.74	90.28	93.82	97.36

Total = Sum(44)$_{1...12}$ = 1062.1 (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=	144.38	126.28	130.31	113.6	109.01	94.06	87.16	100.02	101.22	117.96	128.76	139.83

Total = Sum(45)$_{1...12}$ = 1392.59 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	21.66	18.94	19.55	17.04	16.35	14.11	13.07	15	15.18	17.69	19.31	20.97

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	208.96	184.61	194.89	176.1	173.59	135.98	130.48	143.34	143.13	182.54	191.26	204.4	(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=	208.96	184.61	194.89	176.1	173.59	135.98	130.48	143.34	143.13	182.54	191.26	204.4	

Output from water heater (annual)$_{1...12}$ 2069.26 (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=	99.67	88.65	94.99	87.77	87.91	64.81	63.63	67.91	67.19	90.88	92.81	98.16	(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=	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	137.2	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	44.85	39.84	32.4	24.53	18.33	15.48	16.72	21.74	29.18	37.05	43.24	46.1	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	300.35	303.46	295.61	278.89	257.78	237.95	224.69	221.58	229.43	246.15	267.26	287.09	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	51.01	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	-91.47	(71)

Water heating gains (Table 5)

(72)m=	133.97	131.92	127.68	121.9	118.16	90.01	85.53	91.27	93.32	122.16	128.9	131.93	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	575.9	571.96	552.42	522.06	491.01	440.18	423.69	431.33	448.67	502.1	536.14	561.86	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	14	x	10.63	x	0.57	x	0.7	=	41.16	(74)
North	0.9x 0.77	x	14	x	20.32	x	0.57	x	0.7	=	78.66	(74)
North	0.9x 0.77	x	14	x	34.53	x	0.57	x	0.7	=	133.67	(74)
North	0.9x 0.77	x	14	x	55.46	x	0.57	x	0.7	=	214.71	(74)
North	0.9x 0.77	x	14	x	74.72	x	0.57	x	0.7	=	289.23	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	14	x	79.99	x	0.57	x	0.7	=	309.63	(74)
North	0.9x	0.77	x	14	x	74.68	x	0.57	x	0.7	=	289.08	(74)
North	0.9x	0.77	x	14	x	59.25	x	0.57	x	0.7	=	229.35	(74)
North	0.9x	0.77	x	14	x	41.52	x	0.57	x	0.7	=	160.71	(74)
North	0.9x	0.77	x	14	x	24.19	x	0.57	x	0.7	=	93.64	(74)
North	0.9x	0.77	x	14	x	13.12	x	0.57	x	0.7	=	50.78	(74)
North	0.9x	0.77	x	14	x	8.86	x	0.57	x	0.7	=	34.32	(74)
West	0.9x	0.77	x	5.6	x	19.64	x	0.57	x	0.7	=	30.41	(80)
West	0.9x	0.77	x	5.6	x	38.42	x	0.57	x	0.7	=	59.49	(80)
West	0.9x	0.77	x	5.6	x	63.27	x	0.57	x	0.7	=	97.97	(80)
West	0.9x	0.77	x	5.6	x	92.28	x	0.57	x	0.7	=	142.89	(80)
West	0.9x	0.77	x	5.6	x	113.09	x	0.57	x	0.7	=	175.12	(80)
West	0.9x	0.77	x	5.6	x	115.77	x	0.57	x	0.7	=	179.26	(80)
West	0.9x	0.77	x	5.6	x	110.22	x	0.57	x	0.7	=	170.67	(80)
West	0.9x	0.77	x	5.6	x	94.68	x	0.57	x	0.7	=	146.6	(80)
West	0.9x	0.77	x	5.6	x	73.59	x	0.57	x	0.7	=	113.95	(80)
West	0.9x	0.77	x	5.6	x	45.59	x	0.57	x	0.7	=	70.59	(80)
West	0.9x	0.77	x	5.6	x	24.49	x	0.57	x	0.7	=	37.92	(80)
West	0.9x	0.77	x	5.6	x	16.15	x	0.57	x	0.7	=	25.01	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	71.57	138.16	231.64	357.6	464.35	488.89	459.75	375.95	274.66	164.23	88.7	59.32

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	647.48	710.12	784.06	879.66	955.36	929.07	883.43	807.28	723.33	666.33	624.84	621.18

(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	0.97	0.94	0.84	0.66	0.48	0.35	0.4	0.65	0.89	0.97	0.99

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.22	20.36	20.58	20.83	20.96	21	21	21	20.98	20.8	20.48	20.2

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.07	20.07	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.08	20.08

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.81	0.61	0.41	0.28	0.32	0.57	0.86	0.96	0.98

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.06	19.26	19.57	19.91	20.06	20.1	20.1	20.1	20.08	19.88	19.44	19.03

(90)

fLA = Living area ÷ (4) = 0.34 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.46	19.63	19.91	20.22	20.37	20.4	20.41	20.41	20.38	20.2	19.79	19.43

(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.46	19.63	19.91	20.22	20.37	20.4	20.41	20.41	20.38	20.2	19.79	19.43	(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=	0.98	0.96	0.92	0.81	0.63	0.44	0.3	0.35	0.6	0.86	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	633.24	683.98	723.55	713.78	597.3	405.07	266.84	279.91	432.48	573.14	599.03	609.81	(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=	1103.41	1069.43	971.02	808.2	616.66	407.1	267.04	280.33	443.41	682.82	908.35	1096.22	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	349.81	259.02	184.11	67.98	14.4	0	0	0	0	81.61	222.72	361.89	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 1541.54 (98)

Space heating requirement in kWh/m²/year 21.5 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	349.81	259.02	184.11	67.98	14.4	0	0	0	0	81.61	222.72	361.89	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	349.81	259.02	184.11	67.98	14.4	0	0	0	0	81.61	222.72	361.89	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 1541.54 (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

Output from water heater (calculated above)

	208.96	184.61	194.89	176.1	173.59	135.98	130.48	143.34	143.13	182.54	191.26	204.4

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	122.92	108.59	114.64	103.59	102.11	79.99	76.75	84.31	84.2	107.37	112.5	120.24	

Total = Sum(219a)$_{1...12}$ = 1217.21 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1541.54

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1217.21	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	168.28		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	168.28	(231)
Electricity for lighting		316.83	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		2552.96	(338)

10a. Fuel costs - individual heating systems:

		Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211)	x	13.19	x 0.01 =	203.33	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)			1			(243)
Low-rate fraction	1.0 – (243) =		0			(244)
High-rate cost	(219) x (243) x		13.19	x 0.01 =	160.55	(245)
Low-rate cost	(219) x (244) x		13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	22.2	(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 =	41.79	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)		13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				336.74	(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] =	1.21	(257)
SAP rating (Section 12)	83.09	(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	=	800.06	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.519	=	631.73	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1431.79	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	87.34	(267)
Electricity for lighting	(232) x	0.519	=	164.43	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			1324.99	(272)
CO2 emissions per m²	(272) ÷ (4) =			18.48	(273)
EI rating (section 14)				85	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	4732.52	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3736.84	(264)
Space and water heating	(261) + (262) + (263) + (264) =			8469.37	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	516.61	(267)
Electricity for lighting	(232) x	0	=	972.65	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =			7837.58	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			109.31	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 602

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	223.6	**(P1)**
Transmission heat loss coefficient:	54.9	
Summer heat loss coefficient:	278.5	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
North (N)	0	1
West (W)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (N)	1	0.9	1	0.9	**(P8)**
West (W)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (N)	0.9 x	14	81.19	0.57	0.7	0.9	367.34	
West (W)	0.9 x	5.6	117.51	0.57	0.7	0.9	212.67	
						Total	580.01	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	440.18	423.69	431.33	
Total summer gains	1063.34	1003.69	917.1	**(P5)**
Summer gain/loss ratio	3.82	3.6	3.29	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.07	21.75	21.34	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Slight**	**Slight**	

Assessment of likelihood of high internal temperature: Slight

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:17

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 85.7m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 603

Address :

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)	29.65 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	25.67 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.2 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	57.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: East	15.6m²
Windows facing: North	11.4m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 603

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	85.7 m²	2.7 m

Living area:	36.7 m² (fraction 0.428)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
E	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	
N	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
E	16mm or more	0.7	0.57	1.4	15.6	1
N	16mm or more	0.7	0.57	1.4	11.4	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
E		External	East	0	0
N		External	North	0	0

Overshading:	Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	60.21	27	33.21	0.18	0	False	N/A
Corridor	38.88	0	38.88	0.22	0.43	False	N/A
Flat	85.7	0	85.7	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0906

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb

SAP Input

[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	22.3	0.56	E15	Flat roof with parapet

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1

SAP Input

	Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 603

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.7	(1a) x	2.7	(2a) =	231.39	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	85.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		231.39	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			15.6	x1/[1/(1.4)+ 0.04] =	20.68			(27)
Windows Type 2			11.4	x1/[1/(1.4)+ 0.04] =	15.11			(27)
Walls Type1	60.21	27	33.21	x 0.18 =	5.98			(29)
Walls Type2	38.88	0	38.88	x 0.2 =	7.81			(29)
Roof	85.7	0	85.7	x 0.13 =	11.14			(30)
Total area of elements, m²			184.79					(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) = 60.73 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 10483.2 (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 16.73 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 77.46 (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=	21.39	21.14	20.9	19.68	19.44	18.22	18.22	17.98	18.71	19.44	19.92	20.41	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	98.85	98.6	98.36	97.14	96.9	95.68	95.68	95.44	96.17	96.9	97.39	97.87	

Average = Sum(39)$_{1...12}$ /12= 97.08 (39)

SAP WorkSheet: New dwelling design stage

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.15	1.15	1.15	1.13	1.13	1.12	1.12	1.11	1.12	1.13	1.14	1.14

Average = Sum(40)$_{1...12}$ /12= 1.13 (40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31

(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.56 (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 95.05 (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=	104.56	100.75	96.95	93.15	89.35	85.55	85.55	89.35	93.15	96.95	100.75	104.56

Total = Sum(44)$_{1...12}$ = 1140.62 (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=	155.05	135.61	139.94	122	117.06	101.02	93.61	107.42	108.7	126.68	138.28	150.16

Total = Sum(45)$_{1...12}$ = 1495.53 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	23.26	20.34	20.99	18.3	17.56	15.15	14.04	16.11	16.3	19	20.74	22.52

(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58

(59)

SAP WorkSheet: New dwelling design stage

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=	219.63	193.94	204.52	184.5	181.64	142.93	136.92	150.73	150.62	191.26	200.78	214.74	(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=	219.63	193.94	204.52	184.5	181.64	142.93	136.92	150.73	150.62	191.26	200.78	214.74	

Output from water heater (annual)$_{1...12}$ 2172.21 (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=	103.22	91.75	98.19	90.56	90.59	67.12	65.78	70.37	69.68	93.78	95.97	101.59	(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=	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	153.73	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	51.47	45.72	37.18	28.15	21.04	17.76	19.19	24.95	33.49	42.52	49.62	52.9	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	344.69	348.26	339.25	320.06	295.84	273.08	257.87	254.29	263.3	282.49	306.71	329.48	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	52.94	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	(71)

Water heating gains (Table 5)

(72)m=	138.74	136.54	131.98	125.78	121.76	93.22	88.41	94.58	96.77	126.05	133.3	136.55	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	639.07	634.7	612.59	578.17	542.82	488.24	469.65	478	497.74	555.24	593.82	623.11	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	11.4	x	10.63	x	0.57	x	0.7	=	33.52	(74)
North	0.9x 0.77	x	11.4	x	20.32	x	0.57	x	0.7	=	64.06	(74)
North	0.9x 0.77	x	11.4	x	34.53	x	0.57	x	0.7	=	108.85	(74)
North	0.9x 0.77	x	11.4	x	55.46	x	0.57	x	0.7	=	174.83	(74)
North	0.9x 0.77	x	11.4	x	74.72	x	0.57	x	0.7	=	235.52	(74)

SAP WorkSheet: New dwelling design stage

North	0.9x	0.77	x	11.4	x	79.99	x	0.57	x	0.7	=	252.13	(74)
North	0.9x	0.77	x	11.4	x	74.68	x	0.57	x	0.7	=	235.39	(74)
North	0.9x	0.77	x	11.4	x	59.25	x	0.57	x	0.7	=	186.76	(74)
North	0.9x	0.77	x	11.4	x	41.52	x	0.57	x	0.7	=	130.87	(74)
North	0.9x	0.77	x	11.4	x	24.19	x	0.57	x	0.7	=	76.25	(74)
North	0.9x	0.77	x	11.4	x	13.12	x	0.57	x	0.7	=	41.35	(74)
North	0.9x	0.77	x	11.4	x	8.86	x	0.57	x	0.7	=	27.94	(74)
East	0.9x	0.77	x	15.6	x	19.64	x	0.57	x	0.7	=	84.72	(76)
East	0.9x	0.77	x	15.6	x	38.42	x	0.57	x	0.7	=	165.73	(76)
East	0.9x	0.77	x	15.6	x	63.27	x	0.57	x	0.7	=	272.93	(76)
East	0.9x	0.77	x	15.6	x	92.28	x	0.57	x	0.7	=	398.05	(76)
East	0.9x	0.77	x	15.6	x	113.09	x	0.57	x	0.7	=	487.83	(76)
East	0.9x	0.77	x	15.6	x	115.77	x	0.57	x	0.7	=	499.38	(76)
East	0.9x	0.77	x	15.6	x	110.22	x	0.57	x	0.7	=	475.43	(76)
East	0.9x	0.77	x	15.6	x	94.68	x	0.57	x	0.7	=	408.39	(76)
East	0.9x	0.77	x	15.6	x	73.59	x	0.57	x	0.7	=	317.43	(76)
East	0.9x	0.77	x	15.6	x	45.59	x	0.57	x	0.7	=	196.65	(76)
East	0.9x	0.77	x	15.6	x	24.49	x	0.57	x	0.7	=	105.63	(76)
East	0.9x	0.77	x	15.6	x	16.15	x	0.57	x	0.7	=	69.67	(76)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	118.24	229.78	381.77	572.88	723.34	751.51	710.82	595.14	448.3	272.9	146.98	97.61	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	757.31	864.48	994.36	1151.05	1266.16	1239.75	1180.47	1073.14	946.04	828.14	740.8	720.72	(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	0.94	0.84	0.67	0.49	0.36	0.41	0.66	0.91	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.01	20.19	20.47	20.78	20.94	20.99	21	21	20.96	20.72	20.31	19.98	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.96	19.96	19.96	19.97	19.98	19.99	19.99	19.99	19.98	19.98	19.97	19.97	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.97	0.93	0.81	0.61	0.41	0.27	0.32	0.58	0.87	0.97	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.67	18.92	19.32	19.74	19.93	19.98	19.99	19.99	19.96	19.68	19.11	18.63	(90)

fLA = Living area ÷ (4) = 0.43 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.25	19.46	19.81	20.18	20.36	20.41	20.42	20.42	20.39	20.12	19.62	19.21	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

SAP WorkSheet: New dwelling design stage

(93)m=	19.25	19.46	19.81	20.18	20.36	20.41	20.42	20.42	20.39	20.12	19.62	19.21	(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=	0.98	0.97	0.93	0.81	0.63	0.44	0.31	0.36	0.61	0.88	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	744.13	836.29	920.41	937.49	801.37	551.31	364.91	382.49	581	726.75	716.45	710.54	(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=	1477.38	1436.15	1309.14	1095.89	839.3	556.3	365.52	383.72	604.48	922.64	1219.67	1468.95	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	545.53	403.11	289.22	114.05	28.22	0	0	0	0	145.74	362.32	564.26	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2452.45 (98)

Space heating requirement in kWh/m²/year 28.62 (99)

9a. Energy requirements – Individual heating systems including micro-CHP)

Space heating:

Fraction of space heat from secondary/supplementary system 0 (201)

Fraction of space heat from main system(s) (202) = 1 – (201) = 1 (202)

Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 100 (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)													
	545.53	403.11	289.22	114.05	28.22	0	0	0	0	145.74	362.32	564.26	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	545.53	403.11	289.22	114.05	28.22	0	0	0	0	145.74	362.32	564.26	

Total (kWh/year) =Sum(211)$_{1...5,10....12}$= 2452.45 (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

Output from water heater (calculated above)

	219.63	193.94	204.52	184.5	181.64	142.93	136.92	150.73	150.62	191.26	200.78	214.74

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	129.2	114.08	120.3	108.53	106.85	84.08	80.54	88.66	88.6	112.5	118.1	126.32	

Total = Sum(219a)$_{1...12}$ = 1277.77 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2452.45

SAP WorkSheet: New dwelling design stage

Water heating fuel used		1277.77	
Electricity for pumps, fans and electric keep-hot			
mechanical ventilation - balanced, extract or positive input from outside	201.14		(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	201.14	(231)
Electricity for lighting		363.6	(232)
Electricity generated by PVs		-690.9	(233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		3604.06	(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 =		323.48	(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 (electric off-peak tariff)						
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1		(243)
Low-rate fraction	1.0 – (243) =			0		(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =		168.54	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =		0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =		26.53	(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 =		47.96	(250)
Additional standing charges (Table 12)					0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =		-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)…(254) =				475.38	(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] =	1.53	(257)
SAP rating (Section 12)	78.69	(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	13.19	0.519	=	1272.82	(261)
Space heating (secondary)	(215) x	13.19	0.519	=	0	(263)
Water heating	(219) x	13.19	0.519	=	663.16	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1935.98	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	104.39	(267)
Electricity for lighting	(232) x	0.519	=	188.71	(268)
Energy saving/generation technologies Item 1		0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =			1870.51	(272)
CO2 emissions per m²	(272) ÷ (4) =			21.83	(273)
EI rating (section 14)				81	(274)

13a. Primary Energy

	Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x	3.07	=	7529.02	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	3.07	=	3922.75	(264)
Space and water heating	(261) + (262) + (263) + (264) =			11451.77	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	617.49	(267)
Electricity for lighting	(232) x	0	=	1116.25	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
'Total Primary Energy	sum of (265)…(271) =			11064.46	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			129.11	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 603

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	267.26	**(P1)**
Transmission heat loss coefficient:	77.5	
Summer heat loss coefficient:	344.72	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
East (E)	0	1
North (N)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
East (E)	1	0.9	1	0.9	**(P8)**
North (N)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
East (E)	0.9 x	15.6	117.51	0.57	0.7	0.9	592.44	
North (N)	0.9 x	11.4	81.19	0.57	0.7	0.9	299.12	
						Total	891.56	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	488.24	469.65	478	
Total summer gains	1440.74	1361.21	1242.41	**(P5)**
Summer gain/loss ratio	4.18	3.95	3.6	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.43	22.1	21.65	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Medium**	**Slight**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:16

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 66m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 604

Address :

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)	25.99 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.23 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.5 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	40.7 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	19.5m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 604

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat
Detachment:	
Year Completed:	2022

Floor Location:	Floor area:	Storey height:
Floor 0	66 m²	2.7 m

Living area:	36.7 m² (fraction 0.428)
Front of dwelling faces:	East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
S	16mm or more	0.7	0.57	1.4	19.5	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	30.78	19.5	11.28	0.18	0	False	N/A
Corridor	23.04	0	23.04	0.22	0.43	False	N/A
Flat	66	0	66	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0887

	Length	Psi-value		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	11.4	0.56	E15	Flat roof with parapet

SAP Input

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little

SAP Input

	Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 604

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	66 (1a)	x	2.7 (2a)	=	178.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	66 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	178.2	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0	(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			3	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15	(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) =	0.13	(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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			19.5	x1/[1/(1.4)+ 0.04] =	25.85			(27)
Walls Type1	30.78	19.5	11.28	x 0.18 =	2.03			(29)
Walls Type2	23.04	0	23.04	x 0.2 =	4.63			(29)
Roof	66	0	66	x 0.13 =	8.58			(30)
Total area of elements, m²			119.82					(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) = 41.09 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 5761.2 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K 10.63 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 51.72 (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=	16.47	16.28	16.09	15.16	14.97	14.03	14.03	13.85	14.41	14.97	15.34	15.72	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	68.19	68	67.82	66.88	66.69	65.75	65.75	65.57	66.13	66.69	67.07	67.44	

Average = Sum(39)$_{1...12}$ /12= 66.83 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.03	1.03	1.03	1.01	1.01	1	1	0.99	1	1.01	1.02	1.02	

Average = Sum(40)$_{1...12}$ /12= 1.01 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.15 (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 85.15 (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=	93.66	90.26	86.85	83.45	80.04	76.63	76.63	80.04	83.45	86.85	90.26	93.66	

Total = Sum(44)$_{1...12}$ = 1021.79 (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=	138.9	121.48	125.36	109.29	104.87	90.49	83.86	96.23	97.38	113.48	123.87	134.52	

Total = Sum(45)$_{1...12}$ = 1339.73 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.84	18.22	18.8	16.39	15.73	13.57	12.58	14.43	14.61	17.02	18.58	20.18	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	203.48	179.81	189.94	171.79	169.45	132.41	127.17	139.54	139.29	178.06	186.37	199.1	(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=	203.48	179.81	189.94	171.79	169.45	132.41	127.17	139.54	139.29	178.06	186.37	199.1	

Output from water heater (annual)$_{1...12}$ 2016.41 (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=	97.85	87.06	93.35	86.34	86.53	63.62	62.53	66.65	65.91	89.4	91.18	96.39	(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=	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	128.71	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	41.85	37.17	30.23	22.89	17.11	14.44	15.61	20.29	27.23	34.57	40.35	43.02	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	280.28	283.19	275.86	260.26	240.56	222.05	209.68	206.77	214.1	229.71	249.4	267.91	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	50.02	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	-85.81	(71)

Water heating gains (Table 5)

(72)m=	131.52	129.55	125.46	119.91	116.31	88.36	84.05	89.58	91.54	120.16	126.65	129.56	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	546.57	542.83	524.48	495.98	466.9	417.78	402.26	409.56	425.8	477.36	509.32	533.41	(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)	
South	0.9x 0.77	x	19.5	x	46.75	x	0.57	x	0.7	=	252.08	(78)
South	0.9x 0.77	x	19.5	x	76.57	x	0.57	x	0.7	=	412.85	(78)
South	0.9x 0.77	x	19.5	x	97.53	x	0.57	x	0.7	=	525.89	(78)
South	0.9x 0.77	x	19.5	x	110.23	x	0.57	x	0.7	=	594.37	(78)
South	0.9x 0.77	x	19.5	x	114.87	x	0.57	x	0.7	=	619.37	(78)
South	0.9x 0.77	x	19.5	x	110.55	x	0.57	x	0.7	=	596.06	(78)
South	0.9x 0.77	x	19.5	x	108.01	x	0.57	x	0.7	=	582.39	(78)
South	0.9x 0.77	x	19.5	x	104.89	x	0.57	x	0.7	=	565.58	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	19.5	x	101.89	x	0.57	x	0.7	=	549.36	(78)
South	0.9x	0.77	x	19.5	x	82.59	x	0.57	x	0.7	=	445.29	(78)
South	0.9x	0.77	x	19.5	x	55.42	x	0.57	x	0.7	=	298.8	(78)
South	0.9x	0.77	x	19.5	x	40.4	x	0.57	x	0.7	=	217.82	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	252.08	412.85	525.89	594.37	619.37	596.06	582.39	565.58	549.36	445.29	298.8	217.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	798.65	955.68	1050.37	1090.35	1086.27	1013.84	984.65	975.14	975.15	922.65	808.12	751.23	(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=	0.95	0.9	0.82	0.7	0.56	0.41	0.29	0.31	0.46	0.71	0.9	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.45	20.65	20.82	20.93	20.98	21	21	21	20.99	20.94	20.7	20.4	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.06	20.06	20.06	20.07	20.07	20.09	20.09	20.09	20.08	20.07	20.07	20.07	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.94	0.88	0.78	0.66	0.51	0.36	0.23	0.25	0.4	0.66	0.88	0.95	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.37	19.65	19.86	20.01	20.06	20.08	20.09	20.09	20.08	20.02	19.73	19.31	(90)

fLA = Living area ÷ (4) = 0.56 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.97	20.21	20.39	20.52	20.57	20.59	20.59	20.6	20.59	20.53	20.27	19.92	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.97	20.21	20.39	20.52	20.57	20.59	20.59	20.6	20.59	20.53	20.27	19.92	(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=	0.94	0.88	0.8	0.68	0.54	0.39	0.27	0.28	0.44	0.68	0.88	0.95	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	750.44	840.73	836.91	739.22	582.52	392.87	262.53	274.92	426.67	629.19	713.13	714.8	(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=	1068.55	1040.93	942.09	777.21	591.77	394.03	262.64	275.07	429.06	662.3	883.18	1060.04	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	236.67	134.53	78.25	27.35	6.88	0	0	0	0	24.63	122.44	256.86	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 887.62 (98)

Space heating requirement in kWh/m²/year 13.45 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	236.67	134.53	78.25	27.35	6.88	0	0	0	0	24.63	122.44	256.86	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	236.67	134.53	78.25	27.35	6.88	0	0	0	0	24.63	122.44	256.86	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 887.62 (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

Output from water heater (calculated above)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
203.48	179.81	189.94	171.79	169.45	132.41	127.17	139.54	139.29	178.06	186.37	199.1

Efficiency of water heater 170 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(217)m=	170	170	170	170	170	170	170	170	170	170	170	170

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(219)m=	119.69	105.77	111.73	101.05	99.68	77.89	74.81	82.08	81.94	104.74	109.63	117.12

Total = Sum(219a)$_{1...12}$ = 1186.12 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		887.62
Water heating fuel used		1186.12
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	154.9	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	154.9 (231)
Electricity for lighting		295.66 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1833.41 (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 =	117.08 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	156.45	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	20.43	(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 =	39	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			241.83	(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] =	0.92	(257)
SAP rating (Section 12)		87.24	(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	=	460.68	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	615.6	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1076.27	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	80.39	(267)
Electricity for lighting	(232) x		0.519	=	153.45	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				951.54	(272)
CO2 emissions per m²	(272) ÷ (4) =				14.42	(273)
EI rating (section 14)					89	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	2725	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	3641.4	(264)
Space and water heating	(261) + (262) + (263) + (264) =				6366.4	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	475.54	(267)
Electricity for lighting	(232)	x	0	=	907.67	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		5628.56	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		85.28	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 604

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	205.82	**(P1)**
Transmission heat loss coefficient:	51.7	
Summer heat loss coefficient:	257.54	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	19.5	112.21	0.57	0.7	0.9	707.15	
						Total	707.15	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	417.78	402.26	409.56	
Total summer gains	1150.79	1109.41	1107.25	**(P5)**
Summer gain/loss ratio	4.47	4.31	4.3	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.72	22.46	22.35	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.53
Printed on 25 August 2022 at 17:15:15

Project Information:

Assessed By: Samuel Westover (STRO012073) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 61.4m²

Site Reference : 6 - 8 Market Place - Be Green **Plot Reference:** 605

Address :

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)	28.05 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	19.13 kg/m²	**OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.3 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.20 (max. 0.70)	**OK**
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	**OK**
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	**OK**

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	**OK**

4 Heating efficiency

Main Heating system:	Room heaters - electric Panel, convector or radiant heaters	
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.49 kWh/day	
	Permitted by DBSCG: 3.14 kWh/day	**OK**
Primary pipework insulated:	No primary pipework	**N/A**

Regulations Compliance Report

6 Controls

Space heating controls	Programmer and room thermostats	**OK**
Hot water controls:	Cylinderstat	**OK**

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	**OK**

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.57	
Maximum	1.5	**OK**
MVHR efficiency:	90%	
Minimum	70%	**OK**

9 Summertime temperature

Overheating risk (Thames valley):	Medium	**OK**

Based on:

Overshading:	Average or unknown
Windows facing: South	19.5m²
Ventilation rate:	3.50

10 Key features

Air permeablility	3.0 m³/m²h
Photovoltaic array	

SAP Input

Property Details: 605

Address:	
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	08 August 2022
Date of certificate:	25 August 2022
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Water use <= 125 litres/person/day:	True
PCDF Version:	504

Property description:

Dwelling type:	Flat	
Detachment:		
Year Completed:	2022	
Floor Location:	Floor area:	Storey height:
Floor 0	61.4 m²	2.7 m
Living area:	36.7 m² (fraction 0.428)	
Front of dwelling faces:	East	

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
S	Manufacturer	Windows	low-E, En = 0.05, soft coat	Yes	

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
S	16mm or more	0.7	0.57	1.4	19.5	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
S		External	South	0	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External	44.28	19.5	24.78	0.18	0	False	N/A
Corridor	11.76	0	11.76	0.22	0.43	False	N/A
Flat	61.4	0	61.4	0.13	0		N/A
Internal Elements							
Party Elements							

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1143

	Length	**Psi-value**		
[Approved]	7.4	0.3	E2	Other lintels (including other steel lintels)
[Approved]	7.4	0.04	E3	Sill
[Approved]	20	0.05	E4	Jamb
[Approved]	13.5	0.09	E16	Corner (normal)
[Approved]	5.4	-0.09	E17	Corner (inverted internal area greater than external area)
	16.4	0.56	E15	Flat roof with parapet

SAP Input

Ventilation:

Pressure test:	Yes (As designed)
Ventilation:	Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, Rigid Approved Installation Scheme: True
Number of chimneys:	0
Number of open flues:	0
Number of fans:	0
Number of passive stacks:	0
Number of sides sheltered:	2
Pressure test:	3

Main heating system:

Main heating system:	Room heaters Electric (direct acting) room heaters Fuel: Electricity Info Source: SAP Tables SAP Table: 691 Panel, convector or radiant heaters Central heating pump : 2013 or later Design flow temperature: Unknown Unknown Boiler interlock: Yes MCS Installation Certificate

Main heating Control:

Main heating Control:	Programmer and room thermostats Control code: 2605

Secondary heating system:

Secondary heating system:	None

Water heating:

Water heating:	941 From DHW-only community scheme Heat source: Electric heat pump for water heating only Electricity, heat fraction 0, efficiency 0 Hot water cylinder Cylinder volume: 350 litres Cylinder insulation: Measured loss, 1.49kWh/day Primary pipework insulation: False 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:	Photovoltaic 1 Installed Peak power: 0.8 Tilt of collector: 30° Overshading: None or very little

SAP Input

	Collector Orientation: South
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling design stage

User Details:

Assessor Name:	Samuel Westover	**Stroma Number:**	STRO012073
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.53

Property Address: 605

Address :

1. Overall dwelling dimensions:

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	61.4	(1a) x	2.7	(2a) =	165.78	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	61.4	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		165.78	(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							0	x 10 =	0	(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) =	0	÷ (5) =	0 (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				3 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.15 (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) =			0.13 (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 dwelling design stage

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0.5 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0.5 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 76.5 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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	0	0	0	0	0	0	0	0	0	0	0	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	(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			19.5	x1/[1/(1.4)+ 0.04] =	25.85			(27)
Walls Type1	44.28	19.5	24.78	x 0.18 =	4.46			(29)
Walls Type2	11.76	0	11.76	x 0.2 =	2.36			(29)
Roof	61.4	0	61.4	x 0.13 =	7.98			(30)
Total area of elements, m²			117.44					(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) = 40.66 (33)

Heat capacity Cm = S(A x k) ((28)…(30) + (32) + (32a)…(32e) = 4521.6 (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 13.43 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 54.09 (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=	15.32	15.15	14.97	14.1	13.93	13.05	13.05	12.88	13.4	13.93	14.28	14.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	69.41	69.23	69.06	68.19	68.01	67.14	67.14	66.97	67.49	68.01	68.36	68.71	

Average = Sum(39)$_{1...12}$ /12= 68.14 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.13	1.13	1.12	1.11	1.11	1.09	1.09	1.09	1.1	1.11	1.11	1.12	

Average = Sum(40)$_{1...12}$ /12= 1.11 (40)

SAP WorkSheet: New dwelling design stage

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirement: kWh/year:

Assumed occupancy, N 2.02 (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 82.2 (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=	90.42	87.13	83.84	80.55	77.27	73.98	73.98	77.27	80.55	83.84	87.13	90.42	

Total = Sum(44)$_{1...12}$ = 986.36 (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=	134.09	117.27	121.01	105.5	101.23	87.36	80.95	92.89	94	109.55	119.58	129.85	

Total = Sum(45)$_{1...12}$ = 1293.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	20.11	17.59	18.15	15.83	15.18	13.1	12.14	13.93	14.1	16.43	17.94	19.48	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 350 (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): 1.49 (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=	64.58	58.33	64.58	62.5	64.58	41.92	43.31	43.31	41.92	64.58	62.5	64.58	(59)

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)

SAP WorkSheet: New dwelling design stage

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=	198.66	175.6	185.59	168	165.81	129.27	124.26	136.2	135.91	174.13	182.07	194.43	(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=	198.66	175.6	185.59	168	165.81	129.27	124.26	136.2	135.91	174.13	182.07	194.43	

Output from water heater (annual)$_{1...12}$ 1969.96 (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=	96.25	85.66	91.9	85.08	85.32	62.58	61.57	65.54	64.79	88.09	89.76	94.84	(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=	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	121.26	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	39.33	34.93	28.41	21.51	16.08	13.57	14.67	19.06	25.59	32.49	37.92	40.42	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	263.38	266.11	259.22	244.56	226.05	208.66	197.04	194.31	201.19	215.85	234.36	251.76	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	49.15	(69)

Pumps and fans gains (Table 5a)

(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)

Losses e.g. evaporation (negative values) (Table 5)

(71)m=	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	-80.84	(71)

Water heating gains (Table 5)

(72)m=	129.36	127.47	123.52	118.16	114.68	86.91	82.75	88.09	89.98	118.4	124.66	127.47	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	521.64	518.07	500.72	473.8	446.38	398.71	384.02	391.02	406.33	456.3	486.51	509.22	(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)	
South	0.9x 0.77	x	19.5	x	46.75	x	0.57	x	0.7	=	252.08	(78)
South	0.9x 0.77	x	19.5	x	76.57	x	0.57	x	0.7	=	412.85	(78)
South	0.9x 0.77	x	19.5	x	97.53	x	0.57	x	0.7	=	525.89	(78)
South	0.9x 0.77	x	19.5	x	110.23	x	0.57	x	0.7	=	594.37	(78)
South	0.9x 0.77	x	19.5	x	114.87	x	0.57	x	0.7	=	619.37	(78)
South	0.9x 0.77	x	19.5	x	110.55	x	0.57	x	0.7	=	596.06	(78)
South	0.9x 0.77	x	19.5	x	108.01	x	0.57	x	0.7	=	582.39	(78)
South	0.9x 0.77	x	19.5	x	104.89	x	0.57	x	0.7	=	565.58	(78)

SAP WorkSheet: New dwelling design stage

South	0.9x	0.77	x	19.5	x	101.89	x	0.57	x	0.7	=	549.36	(78)
South	0.9x	0.77	x	19.5	x	82.59	x	0.57	x	0.7	=	445.29	(78)
South	0.9x	0.77	x	19.5	x	55.42	x	0.57	x	0.7	=	298.8	(78)
South	0.9x	0.77	x	19.5	x	40.4	x	0.57	x	0.7	=	217.82	(78)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	252.08	412.85	525.89	594.37	619.37	596.06	582.39	565.58	549.36	445.29	298.8	217.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	773.72	930.92	1026.61	1068.17	1065.75	994.77	966.41	956.6	955.68	901.6	785.31	727.04	(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=	0.95	0.9	0.83	0.71	0.58	0.43	0.31	0.32	0.48	0.72	0.91	0.96	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.35	20.58	20.76	20.9	20.97	21	21	21	20.99	20.91	20.63	20.3	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.98	19.98	19.98	19.99	19.99	20.01	20.01	20.01	20	19.99	19.99	19.99	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.94	0.88	0.79	0.67	0.52	0.36	0.24	0.25	0.41	0.67	0.88	0.95	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	19.17	19.47	19.72	19.9	19.97	20	20.01	20.01	20	19.91	19.56	19.1	(90)

fLA = Living area ÷ (4) = 0.6 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.88	20.13	20.34	20.5	20.57	20.6	20.6	20.6	20.59	20.51	20.2	19.82	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.88	20.13	20.34	20.5	20.57	20.6	20.6	20.6	20.59	20.51	20.2	19.82	(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=	0.94	0.88	0.81	0.69	0.55	0.4	0.28	0.29	0.45	0.7	0.89	0.95	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	727.74	822.61	826.74	739.43	589.11	400.49	268.31	280.97	433.97	628.91	696.85	692.12	(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=	1081.15	1054.64	956.01	790.93	603.27	402.6	268.55	281.3	438.07	674.14	895.73	1073.26	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	262.94	155.92	96.18	37.08	10.53	0	0	0	0	33.65	143.19	283.57	

Total per year (kWh/year) = Sum(98)$_{1…5,9…12}$ = 1023.07 (98)

Space heating requirement in kWh/m²/year 16.66 (99)

SAP WorkSheet: New dwelling design stage

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		100 (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)													
	262.94	155.92	96.18	37.08	10.53	0	0	0	0	33.65	143.19	283.57	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	262.94	155.92	96.18	37.08	10.53	0	0	0	0	33.65	143.19	283.57	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 1023.07 (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

Output from water heater (calculated above)

	198.66	175.6	185.59	168	165.81	129.27	124.26	136.2	135.91	174.13	182.07	194.43	

Efficiency of water heater 170 (216)

(217)m=	170	170	170	170	170	170	170	170	170	170	170	170	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	116.86	103.3	109.17	98.82	97.54	76.04	73.1	80.12	79.95	102.43	107.1	114.37	

Total = Sum(219a)$_{1...12}$ = 1158.8 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		1023.07
Water heating fuel used		1158.8
Electricity for pumps, fans and electric keep-hot		
mechanical ventilation - balanced, extract or positive input from outside	144.1	(230a)
Total electricity for the above, kWh/year	sum of (230a)…(230g) =	144.1 (231)
Electricity for lighting		277.83 (232)
Electricity generated by PVs		-690.9 (233)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		1912.9 (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 =	134.94 (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)

SAP WorkSheet: New dwelling design stage

Water heating (electric off-peak tariff)					
High-rate fraction (Table 13, or Appendix F for electric CPSU)				1	(243)
Low-rate fraction	1.0 – (243) =			0	(244)
High-rate cost	(219) x (243) x	13.19	x 0.01 =	152.85	(245)
Low-rate cost	(219) x (244) x	13.19	x 0.01 =	0	(246)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	19.01	(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 =	36.65	(250)
Additional standing charges (Table 12)				0	(251)
	one of (233) to (235) x)	13.19	x 0.01 =	-91.13	(252)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)…(254) =			252.31	(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	(257)
SAP rating (Section 12)		86.11	(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	=	530.97	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.519	=	601.42	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1132.39	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	74.79	(267)
Electricity for lighting	(232) x		0.519	=	144.19	(268)
Energy saving/generation technologies						
Item 1			0.519	=	-358.57	(269)
Total CO2, kg/year	sum of (265)…(271) =				992.8	(272)
CO2 emissions per m²	(272) ÷ (4) =				16.17	(273)
EI rating (section 14)					87	(274)

13a. Primary Energy

		Energy kWh/year	**Primary** factor		**P. Energy** kWh/year	
Space heating (main system 1)	(211) x		3.07	=	3140.82	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		3.07	=	3557.51	(264)
Space and water heating	(261) + (262) + (263) + (264) =				6698.33	(265)

SAP WorkSheet: New dwelling design stage

Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	442.4	(267)
Electricity for lighting	(232)	x	0	=	852.94	(268)
Energy saving/generation technologies Item 1			3.07	=	-2121.05	(269)
‘Total Primary Energy			sum of (265)…(271) =		5872.62	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =		95.65	(273)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 25 August 2022

Property Details: 605

Dwelling type:	Flat
Located in:	England
Region:	Thames valley
Cross ventilation possible:	No
Number of storeys:	1
Front of dwelling faces:	East
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	False
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	3.5 (Windows open half the time)

Overheating Details:

Summer ventilation heat loss coefficient:	191.48	**(P1)**
Transmission heat loss coefficient:	54.1	
Summer heat loss coefficient:	245.56	**(P2)**

Overhangs:

Orientation:	**Ratio:**	**Z_overhangs:**
South (S)	0	1

Solar shading:

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
South (S)	1	0.9	1	0.9	**(P8)**

Solar gains:

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
South (S)	0.9 x	19.5	112.21	0.57	0.7	0.9	707.15	
						Total	707.15	**(P3/P4)**

Internal gains:

	June	**July**	**August**	
Internal gains	398.71	384.02	391.02	
Total summer gains	1131.73	1091.16	1088.71	**(P5)**
Summer gain/loss ratio	4.61	4.44	4.43	**(P6)**
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	20.86	22.59	22.48	**(P7)**
Likelihood of high internal temperature	**Slight**	**Medium**	**Medium**	

Assessment of likelihood of high internal temperature: Medium