RENEWABLE ENERGY STATEMENT LANGFORD, HORSEMERE GREEN LANE, CLYMPING, WEST SUSSEX.

January 2022

Matt Haskell i-therm Limited
Accredited Energy Assessor

ARUN DISTRICT COUNCIL CM/4/22/DOC

1.Site description

Langford sits on the south side of Horsemere Green Lane and links the B2233 Yapton Rd, Clymping. Horsemere Green Lane runs in an East-West orientation with the A259 running south of the site. It provides quick vehicular access connections to Bognor further along the coast and across the River Arun to Littlehampton. Clymping has been identified as a focus for strategic scale growth in the adopted Arun Local Plan – this includes a development of 300 dwellings to the south of the village (consented) and the delivery of a 1500-dwelling scheme on Ford Airfield to the North (allocated in the local plan)

Under the current local plan 'Langford' sits in a plot designated as Countryside, however, the site is a residential curtilage and as such is considered to be "previously developed land". Indeed, the house, neighbouring houses and residential estates form an unusual yet vivid residential outcrop that is the largest development cluster in Clymping, yet lie outside of any recognised centre or designated Built-Up Area and, quite distinct from the remaining more dispersed linear settlement pattern of the village. Langford, similar to its neighbouring plots, sits in a long/deep plot behind an established tree and hedgerow screening along with grass verges extending along much of Horse-mere Green Lane. The neighbouring estates including Apple tree Walk, Copthorne Drive and Woodridge Walk estates, that sit both east and west, were built between 1988 and 2003 and are laid out in more regular modern estate patterns, with houses built on smaller plots with open front gardens and pavements; typical of modern developments. Combined, this collective residential outcrop owes its current layout and shape to its former/historic use as nurseries.

The scheme is the redevelopment of Langford, an existing residential dwelling on Horsemere Green Lane, that currently contains a large 4 bedroom detached bungalow in extensive grounds. Langford has been demolished, with the site and its extensive garden replaced by a mix of 9 smaller detached and semi detached houses and bungalows at a scale and density more appropriate and compatible with the existing neighbouring dwellings surrounding the site. Total site size is approx 4 Hectares

The Gross internal area (G.I.A) of the dwellings are as follows (sq.m):

Plot 1 112m^2

Plot 2 91.1m^2

Plot 3 91.1m^2

Plot 4 78.7m^2

Plot 5 78.7m^2

Plot 6 137.5m^2

Plot 7 137.5m^2

Plot 8 134m^2

Plot 9 136m^2

The sizes of the proposed dwelling are comparable to that of other properties in the area and in some instances less significant than those in the surrounding area

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2. Baseline Energy Consumption Of The Building

The baseline energy consumption of the house has been calculated using the National Home Energy Rating Scheme and at 120 kwhrs per annum per square metre.

Plot 1 -The baseline energy consumption is assessed as the gross living area is 112m^2 x 120 kwhrs per annum per square meter which equals 13440 kwhrs per annum.

Plot 2 -The baseline energy consumption is assessed as the gross living area is 91.2m^2 x 120 kwhrs per annum per square meter which equals 10944 kwhrs per annum.

Plot 3 - The baseline energy consumption is assessed as the gross living area is 91.2m^2 x 120 kwhrs per annum per square meter which equals 10944 kwhrs per annum.

Plot 4 -The baseline energy consumption is assessed as the gross living area is 78.7m^2 x 120 kwhrs per annum per square meter which equals 9444 kwhrs per annum.

Plot 5 -The baseline energy consumption is assessed as the gross living area is 78.7m^2 x 120 kwhrs per annum per square meter which equals 9444 kwhrs per annum.

Plot 6 -The baseline energy consumption is assessed as the gross living area is 137.5m^2 x 120 kwhrs per annum per square meter which equals 16500 kwhrs per annum.

Plot 7 - The baseline energy consumption is assessed as the gross living area is 137.5m^2 x 120 kwhrs per annum per square meter which equals 16500 kwhrs per annum.

Plot 8 -The baseline energy consumption is assessed as the gross living area is 134m^2 x 120 kwhrs per annum per square meter which equals 16080 kwhrs per annum.

Plot 9 -The baseline energy consumption is assessed as the gross living area is 136m^2 x 120 kwhrs per annum per square meter which equals 16320 kwhrs per annum

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3.Actual Dwelling Performance

Dwelling	Address1	Postcode	SAP	DER	TER	DFEE	TFEE	% Improvement	TFA	Air permeability
Plot 1	1 Langford Close	BN17 5FG	B 85	16.5	17.37	46.2	58.6	5.07	116	3.96
Plot 2	2 Langford Close	BN17 5FG	B 85	16.2	16.85	41.8	47.8	3.62	93.1	3.79
Plot 3	3 Langford Close	BN17 5FG	B 85	16.3	16.85	41.9	47.8	3.44	93.1	3.95
Plot 4	4 Langford Close	BN17 5FG	B 84	18.1	18.54	47.1	52.6	2.16	79.7	3.9
Plot 5	5 Langford Close	BN17 5FG	B 84	18	18.29	46.8	51.4	1.64	79.7	3.81
Plot 6	6 Langford Close	BN17 5FG	B 85	16.2	16.54	49.5	56.6	2.06	139.5	3.76
Plot 7	7 Langford Close	BN17 5FG	B 85	16.2	16.54	49.5	56.6	2.06	139.5	3.76
Plot 8	8 Langford Close	BN17 5FG	B 85	16	16.51	48.5	55.8	2.91	135	3.87
Plot 9	9 Langford Close	BN17 5FG	B 85	15.4	15.72	45.4	51.6	2.04	139	3.83

The As-Built SAP calculations and EPCs show full compliance with building regulations by using high performance boilers, excellent thermal efficiency and new technologies such as Waste Water Heat Recovery Systems to improve the living conditions within the dwellings and also lower Co2 emissions.

Water Calculations for the 9 dwellings also show usage of less than 105 l/pp/pd. This is equivalent to CSH level 4 and substantially less the building regulations compliance of 125 l/pp/pd.

This will help lower running costs to the occupants and result in lower Co2 emissions.

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4.Measures Incorporated to Reduce The Energy Requirements Of The Building Using Energy Efficiency Measures

The dwellings have carbon emissions that are be considerably lower than current Building Regulations and will result in much more sustainable dwellings.

Part L of the Building Regulations has been complied with by using materials with low U values as set out below. The U values are in watts per square metre per degree Celsius of materials exceed the minimum requirements set by the Building Regulations;

Walls 0.27 W/m²K -

U-Value Calculation

Software:	Stroma U-value Calculator - Version 0.92
Date Printed:	19/01/2022 13:28
Construction Type:	Wall - Construction 2
Calculation Method:	BS EN ISO 6946

Wall Construction

No	Description	Main Element			Bridging Element		
		Thickness	λ	R-value	λ	R-value	Fraction
-	Internal Surface Resistance	-	-	0.13	-	-	-
1	Wallboard (12.5 mm)	12.5	0.19	0.065789	-	-	-
2	Plaster Dabs Cavity (15 mm)	15	-	0.17	0.43	0.035	0.2001
3	Thermalite - Shield (100 mm)	100	0.15	0.666667	-	-	-
4	Kooltherm K8 Cavity Board (50 mm)	50	0.02	2.5	-	-	-
5	Unventilated Cavity - (High Emissivity) (0 mm)	50	-	0.18	-	-	-
6	Brickwork Outer Leaf - BRE (102.5 mm)	102.5	0.77	0.133117	0.94	0.109	0.1712
-	External Surface Resistance	-	-	0.04	-	-	-
		Σ=330mm		Σ=3.885573			

Resistances

Lower Limit	Upper Limit	Average
3.806	3.854	3.83 m²K/W

Wall U-value Corrections

No Correction Values

Wall U-value

U-value	0.261
U-value rounded	0.26 W/m²K

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Ground Floor 0.12 W/m²K;

U-Value Calculation

Software: Stroma U-value Calculator - Version 0.92

Date Printed: 19/01/2022 13:33

Construction Type: Floor - Construction 1

Calculation Method: BS EN ISO 6946 / BS EN ISO 13370

Floor Construction

No	Description	Main Element			Bridging Element		
		Thickness	λ	R-value	λ	R-value	Fraction
-	Internal Surface Resistance	-	-	0.17	-	-	-
1	Thermafloor TF70 (150 mm)	150	0.022	6.818182	-	-	-
2	Screed (1200) (0 mm)	75	0.41	0.182927	-	-	-
3	Concrete Dense (0 mm)	150	2	0.075	-	-	-
4	Ventilated CAvity	225	-	0.23	-	-	-
5	Underfloor Resistance	0	-	0.17	-	-	-
		Σ=600mm		Σ=7.646109			

Resistances

Lower Limit	Upper Limit	Average
7.646	7.646	7.646 m²K/W

Calc Properties

Perimeter	41.9m
Area	95.19m²
Wall Thickness	300mm
Ground Type - Default λ=	2W/mK
Rse	0.04
Resistance on solum Rg	0m²K/W
The height of the floor above external ground level	0.2m
Depth of underfloor space below ground	0.2m
U-value of walls	1.5W/m²K
Mean wind speed	5m/s
Wind shielding factor	0.05
Ventilation openings per metre length	0.0015m²/m

Floor U-value Corrections

No Correction Values

Average Temperature - Underfloor Space

www.i-therm.co.uk [redacted] 19 Holmesland Drive, Botley, SO30 2SH

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Roof 0.14 W/m²K;

U Value Calculation

Software: Stroma U-value Calculator - Version 0.92

Date Printed: 19/01/2022 13:56

Construction Type: Roof - Construction 1

Calculation Method: BS EN ISO 6946

Roof Construction

No	Description	Main Element			Bridging Element		
		Thickness	λ	R-value	λ	R-value	Fraction
-	Internal Surface Resistance	-	-	0.1	-	-	-
1	Kooltherm K18 Insulated Plasterboard (Insulation) (30 mm)	30	0.021	1.428571	-	-	-
2	Unventilated Cavity - (Roof - Low Emissivity) (0 mm)	90	-	0.34	0.13	0.692	0.0833
3	Tiles (Clay) (0 mm)	10	1	0.01	-	-	-
4	Kooltherm K8 Cavity Board (140 mm)	100	0.02	5	-	-	-
-	External Surface Resistance	-	-	0.04	-	-	-
		Σ=230mm		Σ=6.918571			

Resistances

Lower Limit	Upper Limit	Average
6.934	6.947	6.94 m²K/W

Post U-value Corrections

No Correction Values

Roof U-value

U-value	0.144
U-value rounded	0.14 W/m²K

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Windows 1.2 W/m²K.

All of the double-glazed casement & five-sided bay windows and the French doors are fitted with Profile 22 Optima uPVC which conform to BS5750, BS7950, BS7412 & 3, BS6375 & 28mm 'Low E' glass units which conform to BS6262 & Fensa regulations Document L. This system offers a high performance & energy efficient installation.

Accredited Construction Details to limit the effects of Thermal Bridging have been used throughout

Door frames and windows are sealed to prevent heat loss. Double glazed windows have manual controlled air vents. Lighting to the house is designed to have adjustable output thereby saving energy when full lighting is not required. In accordance with Building Regulations low energy light fittings are installed.

The high levels of energy saving have increased costs to the developer however the energy saving will reflect in a saving of heating costs in the longer term and therefore be of benefit to the occupiers and the environment.

Modulating Boilers

Modulating boilers have been installed in all the properties which are the most energy-efficient boilers. These boilers do not turn off every time the heat has reached the house and do not turn on each time the temperature in the house needs to go up.

These boilers can operate as low as 3kW.

Zoned Heating

The heating within each property is zoned between the ground & first floors and each radiator has separate thermostatic radiator valves which allows heating control of individual rooms from the one boiler.

Weather compensation control systems

Weather compensation control systems have been fitted to each of the properties which helps the heating system to work more efficiently & therefore reduces fuel usage.

Water-Saving Basin Taps

All basins have water-saving basin taps mounted which reduces water consumption & can reduce the flow of water from the tap to just 5 litres of water per minute.

Smart Meters

Smart Meters are supplied to each property which means that usage can be tracked accurately & in real time. This allows the user to monitor their energy consumption & review their usage in line with any further personal energy-saving initiatives that they could consider.

Smart meters also allow suppliers to better predict demand which helps shape energy infrastructure to become more reliable & efficient.

Kitchen & Utility Rooms Appliances

All appliances connected within the properties have energy ratings of A+ which are energy efficient.

Low Energy Lighting

All of the lighting is low energy with Light Emitting Diodes (LEDs) bulbs installed throughout. This helps lower electricity bills whilst reducing carbon dioxide emissions.

A vast majority of the rooms have passive infrared (PIR) devices which detect movement & heat. This again adds to the energy efficiency & reduction in carbon monoxide emissions of the property.

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Water Consumption Calculations

Site: Langford, Horsemere Green Lane

Calculations carried out by: Matt Haskell

Date: January 2022

This report details the water efficiency calculations carried out in or der to assess the above dwelling under the Water Consumption credit for Code for Sustainable Homes (WAT1).

Code for Sustainable Homes

In order to be awarded credits under the Code for Sustainable Homes (WAT1), the following criteria must be met:

Criteria		
Water Consumption (litres/person/day)	**Credits**	**Mandatory Levels**
≤ 120 l/p/day	1	Levels 1 and 2
≤ 110 l/p/day	2	
≤ 105 l/p/day	3	Levels 3 and 4
≤ 90 l/p/day	4	
≤ 80 l/p/day	5	Levels 5 and 6

The Water Efficiency Calculator for New Dwellings is the Government's National calculation method for the assessment of water efficiency in new dwellings in support of Building Regulations Part G 2009 and the Code for Sustainable Homes April 2009 and subsequent versions.

The calculator assesses the contribution that each internal water fitting has on whole house water consumption, measured in litres per person per day based on research into typical water use.

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WATER EFFICIENCY CALCULATOR SUMMARY			
TAPS (excluding kitchen taps)	**Fitting Type**	**Flow rate (litres/min)**	**Number of fittings**
1	Bathroom/En-suite/Cloakroom Taps	5.00	3
BATHS	**Fitting Type**	**Capacity to overflow (litres)**	**Number of fittings**
1	Bath	175	1
SHOWERS	**Fitting Type**	**Flow rate (litres/min)**	**Number of fittings**
1	En-suite	9	1
1	Over Bath	9	1

WC's	Fitting Type	Flush Type	Volume	Number of fittings
1	**Dual flush**	**Full Flush**	4	**3**
		Part Flush	3	
		Full Flush		
		Part Flush		

KITCHEN SINK TAPS	Fitting Type	Flow rate (litres/min)	Number of fittings
1	Kitchen tap	4.5	1

INTERNAL WATER CONSUMPTION		
Dishwasher	(litres/person/day)	**2.63**
NET INTERNAL WATER CONSUMPTION	(litres/person/day)	**114.91**
NORMALISATION FACTOR	(litres/person/day)	**0.91**
TOTAL WATER CONSUMPTION	(litres/person/day)	**104.6**
	CSH CREDITS ACHIEVED	3
	CSH MANDATORY LEVEL	4

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5.Conclusion

MJH Executive Homes has made clear concise efforts for this development to be efficient in all aspects but predominantly in the use of energy, water and materials and has employed low carbon methods to reduce energy usage.

MJH Executive Homes has a very sustainable approach using 'fabric first' and 'low carbon technology using High performance Gas Boilers to achieve the required heating demand.

MJH Executive Homes has provided benefits to the occupants of the homes as their running costs are greatly reduced whilst their comfort within the homes is optimised.

MJH Executive Homes has committed to ensure that their development is a highly-sustainable one, not only upon completion and in operation but also throughout the construction process.

MJH Executive Homes have taken a holistic approach to ensure that the proposed development performs strongly across the sustainability spectrum and encompasses a high degree of energy efficiency ensuring the end user a better, energy efficient, comfortable, sustainable place to live

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i-Therm Limited
Matt Haskell
[redacted]

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8
Printed on 02 June 2021 at 18:59:39

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Detached Bungalow

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 116m²
Site Reference : Langford **Plot Reference:** Plot 1
Address : 1 Langford Close, CLIMPING, BN17 5FG

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)	17.37 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.49 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	58.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (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	3.96 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 477, product index 018047):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC SYSTEM
Model qualifier: s18
(Regular)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

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i-Therm Limited
Matt Haskell
[redacted]

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 2.26 kWh/day	
	Permitted by DBSCG: 2.30 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

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

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	6.4m²
Windows facing: South	13.95m²
Windows facing: East	2.84m²
Windows facing: West	2.44m²
Ventilation rate:	8.00

10 Key features

Thermal bridging	0.03 W/m²K
Air permeablility	4.0 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Floors U-value	0.12 W/m²K

i-Therm Limited
Matt Haskell

[redacted]

Thermal Bridge Report

Property Details: Plot 1

Address: 1 Langford Close, CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal Bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.0298

Extended Junctional Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	17.99	E1	[UD]
Sill	0.04	9.59	E3	[A]
Jamb	0.05	41.1	E4	[A]
Ground floor (normal)	0.076	48.83	E5	[UD]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	0	E6	[A]
Eaves (insulation at ceiling level)	0.06	43.83	E10	[A]
Gable (insulation at ceiling level)	0.24	0	E12	[A]
Corner (normal)	0.09	12	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	7.2	E17	[A]
Flat roof	0.08	0	E14	[D]

i-Therm Limited
Matt Haskell
[redacted]

Code for Sustainable Homes Report
For use with Nov 2010 addendum 2014 England

Assessor and House Details

Assessor Name: Matthew Haskell
Assessor Number: STRO006210
Property Address: 1 Langford Close
CLIMPING
BN17 5FG

Building regulation assessment

	kg/m²/year
TER	17.37
DER	16.49

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO_2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2012 DER Worksheet		16.49	*(ZC1)*
TER		17.37	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		16.49	
% improvement DER/TER	5.1		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	16.49	*(ZC1)*
CO2 emissions from appliances, equation (L14)	14.24	*(ZC2)*
CO2 emissions from cooking, equation (L16)	1.61	*(ZC3)*
Net CO2 emissions	33.4	*(ZC8)*

Result:

Credits awarded for ENE 1 = 0.8

Code Level = 3

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 46.24

Credits awarded for ENE 2 = 6.9

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		33.38	
Standard DER		17.52	
Actual Case CO2 emissions		33.38	
Actual DER		17.52	
Reduction in CO2 emissions	0		

Credits awarded for ENE 7 = 0

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

The following requirements must also be met:

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

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

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

i-Therm Limited
Matt Haskell
[redacted]

SAP Input

Property Details: Plot 1

Address:	1 Langford Close, CLIMPING, BN17 5FG
Located in:	England
Region:	South East England
UPRN:	UPRN-523100286824
Date of assessment:	27 May 2021
Date of certificate:	02 June 2021
Assessment type:	New dwelling as built
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:	477

Property description

Dwelling type:	Bungalow
Detachment:	Detached
Year Completed:	2021

Floor Location:	**Floor area:**	**Storey height:**
Floor 0	116 m²	2.4 m

Living area:	22.7 m² (fraction 0.196)
Front of dwelling faces:	North

Opening types

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Entrance	Manufacturer	Solid			PVC-U
Ext	Manufacturer	Half glazed			PVC-U
Ext	Manufacturer	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Entrance	mm	0.7	0	1	2.1	1
Ext	mm	0.7	0	1	1.95	1
Ext	16mm or more	0.7	0.72	1.2	6.4	1
Ext	16mm or more	0.7	0.72	1.2	13.95	1
Ext	16mm or more	0.7	0.72	1.2	2.84	1
Ext	16mm or more	0.7	0.72	1.2	2.44	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Entrance	Door (1)	External Wall	North	0	0
Ext	Door (2)	External Wall	West	0	0
Ext	Windows (1)	External Wall	North	0	0
Ext	Windows (2)	External Wall	South	0	0
Ext	Windows (2)	External Wall	East	0	0
Ext	Windows (2)	External Wall	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 Wall	117.21	29.68	87.53	0.27	0	False	N/A

SAP Input

Plane Roof	116	0	116	0.11	0	N/A
Ground floor	116			0.12		N/A

Internal Elements
Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0298

	Length	Psi-value		
	17.99	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	9.59	0.04	E3	Sill
[Approved]	41.1	0.05	E4	Jamb
	48.83	0.076	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	0	0.07	E6	Intermediate floor within a dwelling
[Approved]	43.83	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	0	0.24	E12	Gable (insulation at ceiling level)
[Approved]	12	0.09	E16	Corner (normal)
[Approved]	7.2	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 4
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3.96 (Assessed dwelling is tested)

Main heating system

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 477, product index 018047) Efficiency: Winter 79.9 % Summer: 90.6
Brand name: Ideal
Model: LOGIC SYSTEM
Model qualifier: s18
(Regular boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
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

SAP Input

Hot water cylinder
Cylinder volume: 210 litres
Cylinder insulation: Factory 65 mm
Primary pipework insulation: True
Cylinderstat: True
Cylinder in heated space: True
Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

i-Therm Limited
Matt Haskell
[redacted]

SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 1

Address : 1 Langford Close, CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	116	(1a) x	2.4	(2a) =	278.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	116	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =		278.4	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.14 (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			3.96000003814697 (17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.34 (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) =		0.29 (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

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

0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			6.4	x1/[1/(1.2)+ 0.04]		=	7.33			(27)
Windows Type 2			13.95	x1/[1/(1.2)+ 0.04]		=	15.97			(27)
Windows Type 3			2.84	x1/[1/(1.2)+ 0.04]		=	3.25			(27)
Windows Type 4			2.44	x1/[1/(1.2)+ 0.04]		=	2.79			(27)
Floor			116	x	0.12	=	13.92			(28)
Walls	117.21	29.68	87.53	x	0.27	=	23.63			(29)
Roof	116	0	116	x	0.11	=	12.76			(30)
Total area of elements, m²			349.21							(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) = 83.71 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 19055.8 (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 10.42 (36)

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

Total fabric heat loss (33) + (36) = 94.13 (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

SAP WorkSheet: New dwelling as built

(38)m=	52.23	51.99	51.75	50.62	50.41	49.43	49.43	49.25	49.81	50.41	50.84	51.29	(38)

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

(39)m=	146.36	146.12	145.88	144.75	144.54	143.56	143.56	143.38	143.94	144.54	144.97	145.41	

Average = Sum(39)$_{1...12}$ /12= 144.75 (39)

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

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

Average = Sum(40)$_{1...12}$ /12= 1.25 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement

Assumed occupancy, N 2.85 (42)

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

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 101.8 (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=	111.98	107.91	103.84	99.77	95.69	91.62	91.62	95.69	99.77	103.84	107.91	111.98	

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

Total = Sum(44)$_{1...12}$ = 1221.64 (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=	166.07	145.24	149.88	130.67	125.38	108.19	100.26	115.05	116.42	135.68	148.1	160.83	

Total = Sum(45)$_{1...12}$ = 1601.76 (45)

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

(46)m=	24.91	21.79	22.48	19.6	18.81	16.23	15.04	17.26	17.46	20.35	22.22	24.12	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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) = 210 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.01 (51)

If community heating see section 4.3

Volume factor from Table 2a 0.83 (52)

Temperature factor from Table 2b 0.54 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.22 (54)

Enter (50) or (54) in (55) 1.22 (55)

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

(56)m=	37.84	34.18	37.84	36.62	37.84	36.62	37.84	37.84	36.62	37.84	36.62	37.84	(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=	37.84	34.18	37.84	36.62	37.84	36.62	37.84	37.84	36.62	37.84	36.62	37.84	(57)

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

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

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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=	227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93	(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=	227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93	

Output from water heater (annual)$_{1,12}$ | 2321.17 | (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=	104.1	92.44	98.72	90.75	90.57	83.28	82.22	87.13	86.01	93.99	96.55	102.36	(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=	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	(66)

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

(67)m=	62.4	55.42	45.07	34.12	25.51	21.53	23.27	30.25	40.6	51.54	60.16	64.13	(67)

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

(68)m=	417.78	422.11	411.19	387.93	358.57	330.98	312.55	308.21	319.14	342.39	371.75	399.34	(68)

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

(69)m=	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	(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=	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	(71)

Water heating gains (Table 5)

(72)m=	139.92	137.57	132.68	126.04	121.73	115.66	110.51	117.11	119.46	126.33	134.09	137.58	(72)

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

(73)m=	734.95	729.95	703.8	662.95	620.67	583.03	561.17	570.42	594.05	635.13	680.86	715.91	(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	6.4	x	10.63	x	0.72	x	0.7	=	23.77 (74)
North	0.9x	0.77	x	6.4	x	20.32	x	0.72	x	0.7	=	45.42 (74)

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North	0.9x	0.77	x	6.4	x	34.53	x	0.72	x	0.7	=	77.19	(74)
North	0.9x	0.77	x	6.4	x	55.46	x	0.72	x	0.7	=	123.98	(74)
North	0.9x	0.77	x	6.4	x	74.72	x	0.72	x	0.7	=	167.02	(74)
North	0.9x	0.77	x	6.4	x	79.99	x	0.72	x	0.7	=	178.79	(74)
North	0.9x	0.77	x	6.4	x	74.68	x	0.72	x	0.7	=	166.93	(74)
North	0.9x	0.77	x	6.4	x	59.25	x	0.72	x	0.7	=	132.44	(74)
North	0.9x	0.77	x	6.4	x	41.52	x	0.72	x	0.7	=	92.8	(74)
North	0.9x	0.77	x	6.4	x	24.19	x	0.72	x	0.7	=	54.07	(74)
North	0.9x	0.77	x	6.4	x	13.12	x	0.72	x	0.7	=	29.32	(74)
North	0.9x	0.77	x	6.4	x	8.86	x	0.72	x	0.7	=	19.82	(74)
East	0.9x	0.77	x	2.84	x	19.64	x	0.72	x	0.7	=	19.48	(76)
East	0.9x	0.77	x	2.84	x	38.42	x	0.72	x	0.7	=	38.11	(76)
East	0.9x	0.77	x	2.84	x	63.27	x	0.72	x	0.7	=	62.76	(76)
East	0.9x	0.77	x	2.84	x	92.28	x	0.72	x	0.7	=	91.54	(76)
East	0.9x	0.77	x	2.84	x	113.09	x	0.72	x	0.7	=	112.18	(76)
East	0.9x	0.77	x	2.84	x	115.77	x	0.72	x	0.7	=	114.84	(76)
East	0.9x	0.77	x	2.84	x	110.22	x	0.72	x	0.7	=	109.33	(76)
East	0.9x	0.77	x	2.84	x	94.68	x	0.72	x	0.7	=	93.91	(76)
East	0.9x	0.77	x	2.84	x	73.59	x	0.72	x	0.7	=	73	(76)
East	0.9x	0.77	x	2.84	x	45.59	x	0.72	x	0.7	=	45.22	(76)
East	0.9x	0.77	x	2.84	x	24.49	x	0.72	x	0.7	=	24.29	(76)
East	0.9x	0.77	x	2.84	x	16.15	x	0.72	x	0.7	=	16.02	(76)
South	0.9x	0.77	x	13.95	x	46.75	x	0.72	x	0.7	=	227.79	(78)
South	0.9x	0.77	x	13.95	x	76.57	x	0.72	x	0.7	=	373.06	(78)
South	0.9x	0.77	x	13.95	x	97.53	x	0.72	x	0.7	=	475.22	(78)
South	0.9x	0.77	x	13.95	x	110.23	x	0.72	x	0.7	=	537.1	(78)
South	0.9x	0.77	x	13.95	x	114.87	x	0.72	x	0.7	=	559.69	(78)
South	0.9x	0.77	x	13.95	x	110.55	x	0.72	x	0.7	=	538.63	(78)
South	0.9x	0.77	x	13.95	x	108.01	x	0.72	x	0.7	=	526.27	(78)
South	0.9x	0.77	x	13.95	x	104.89	x	0.72	x	0.7	=	511.08	(78)
South	0.9x	0.77	x	13.95	x	101.89	x	0.72	x	0.7	=	496.42	(78)
South	0.9x	0.77	x	13.95	x	82.59	x	0.72	x	0.7	=	402.39	(78)
South	0.9x	0.77	x	13.95	x	55.42	x	0.72	x	0.7	=	270.01	(78)
South	0.9x	0.77	x	13.95	x	40.4	x	0.72	x	0.7	=	196.83	(78)
West	0.9x	0.77	x	2.44	x	19.64	x	0.72	x	0.7	=	16.74	(80)
West	0.9x	0.77	x	2.44	x	38.42	x	0.72	x	0.7	=	32.74	(80)
West	0.9x	0.77	x	2.44	x	63.27	x	0.72	x	0.7	=	53.92	(80)
West	0.9x	0.77	x	2.44	x	92.28	x	0.72	x	0.7	=	78.64	(80)
West	0.9x	0.77	x	2.44	x	113.09	x	0.72	x	0.7	=	96.38	(80)
West	0.9x	0.77	x	2.44	x	115.77	x	0.72	x	0.7	=	98.66	(80)
West	0.9x	0.77	x	2.44	x	110.22	x	0.72	x	0.7	=	93.93	(80)

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West	0.9x	0.77	x	2.44	x	94.68	x	0.72	x	0.7	=	80.69	(80)
West	0.9x	0.77	x	2.44	x	73.59	x	0.72	x	0.7	=	62.71	(80)
West	0.9x	0.77	x	2.44	x	45.59	x	0.72	x	0.7	=	38.85	(80)
West	0.9x	0.77	x	2.44	x	24.49	x	0.72	x	0.7	=	20.87	(80)
West	0.9x	0.77	x	2.44	x	16.15	x	0.72	x	0.7	=	13.76	(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=	287.78	489.34	669.09	831.26	935.27	930.92	896.46	818.12	724.94	540.53	344.5	246.43	(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=	1022.73	1219.3	1372.89	1494.21	1555.93	1513.95	1457.63	1388.54	1318.98	1175.66	1025.35	962.34	(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=	0.99	0.98	0.95	0.88	0.76	0.58	0.43	0.47	0.69	0.91	0.98	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=	19.86	20.08	20.36	20.66	20.87	20.97	20.99	20.99	20.94	20.65	20.2	19.82	(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=	19.87	19.87	19.87	19.88	19.88	19.89	19.89	19.89	19.89	19.88	19.88	19.88	(88)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(89)m=	0.99	0.97	0.93	0.85	0.7	0.49	0.32	0.36	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)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(90)m=	18.4	18.7	19.1	19.51	19.77	19.87	19.89	19.89	19.84	19.52	18.88	18.33	(90)

fLA = Living area ÷ (4) = 0.2 (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=	18.68	18.97	19.34	19.73	19.98	20.09	20.1	20.1	20.06	19.74	19.14	18.62	(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=	18.53	18.82	19.19	19.58	19.83	19.94	19.95	19.95	19.91	19.59	18.99	18.47	(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

Utilisation factor for gains, hm:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(94)m=	0.98	0.96	0.92	0.84	0.69	0.5	0.33	0.37	0.6	0.86	0.96	0.99	(94)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	1003.6	1172.11	1265.82	1253.24	1079.73	751	479.91	506.83	797.73	1015.35	987.31	948.16	(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=	2083.12	2034.42	1851.56	1546.42	1175.75	766.31	481.61	509.61	835.91	1299.5	1723.61	2075.53	(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=	803.16	579.48	435.8	211.09	71.44	0	0	0	0	211.41	530.14	838.76	

Total per year (kWh/year) = Sum(98)$_{1...12}$ = 3681.27 (98)

Space heating requirement in kWh/m²/year 31.74 (99)

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3a. 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		90.6 (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)													
	803.16	579.48	435.8	211.09	71.44	0	0	0	0	211.41	530.14	838.76	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	886.49	639.6	481.01	232.99	78.85	0	0	0	0	233.34	585.14	925.78	
Total (kWh/year) =Sum(211)$_{1...12}$ =													4063.21 (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)$_{1...12}$ =													0 (215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93	
Efficiency of water heater													79.9 (216)
(217)m =	88	87.59	86.81	85.2	82.6	79.9	79.9	79.9	79.9	85.11	87.31	88.13	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m =	258.14	228.84	243.04	222.77	225.76	209.42	201.95	220.46	219.71	231.21	237.34	251.82	
Total = Sum(219a)$_{1...12}$ =													2750.46 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		4063.21
Water heating fuel used		2750.46
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75 (231)
Electricity for lighting		440.79 (232)

3a. 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 =	141.4 (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 =	95.72 (247)

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Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	9.89	(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 =	58.14	(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) =			425.15	(255)

13a. SAP rating - individual heating systems

Energy cost deflator (Table 12)		0.42 (256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =	1.11 (257)
SAP rating (Section 12)		84.53 (258)

13a. 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	=	877.65	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	594.1	(264)
Space and water heating	(261) + (262) + (263) + (264) =					1471.75	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	38.93	(267)
Electricity for lighting	(232)	x		0.519	=	228.77	(268)
Total CO2, kg/year			sum of (265)...(271) =			1739.45	(272)
CO2 emissions per m²			(272) ÷ (4) =			15	(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	=	4957.12	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	3355.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =					8312.68	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	230.25	(267)
Electricity for lighting	(232)	x		0	=	1353.24	(268)
'Total Primary Energy			sum of (265)...(271) =			9896.17	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			85.31	(273)

EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 1

Address : 1 Langford Close, CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	116	(1a) x	2.4	(2a) =	278.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	116	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		278.4	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.14 (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			3.96000003814697 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.34 (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) =		0.29 (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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9
Wind Factor (22a)m = (22)m ÷ 4												
(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

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

0.38	0.35	0.33	0.31	0.32	0.3	0.3	0.29	0.3	0.33	0.33	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			6.4	x1/[1/(1.2)+ 0.04]		=	7.33			(27)
Windows Type 2			13.95	x1/[1/(1.2)+ 0.04]		=	15.97			(27)
Windows Type 3			2.84	x1/[1/(1.2)+ 0.04]		=	3.25			(27)
Windows Type 4			2.44	x1/[1/(1.2)+ 0.04]		=	2.79			(27)
Floor			116	x	0.12	=	13.92			(28)
Walls	117.21	29.68	87.53	x	0.27	=	23.63			(29)
Roof	116	0	116	x	0.11	=	12.76			(30)
Total area of elements, m²			349.21							(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) = 83.71 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 19055.8 (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 10.42 (36)

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

Total fabric heat loss (33) + (36) = 94.13 (37)

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

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

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(38)m=	52.74	51.52	51.06	50.41	50.62	50.01	50.21	49.81	50.21	51.06	51.06	51.75	(38)

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

(39)m=	146.87	145.64	145.19	144.54	144.75	144.13	144.33	143.94	144.33	145.19	145.19	145.88	

Average = Sum(39)$_{1...12}$ /12= 145 (39)

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

(40)m=	1.27	1.26	1.25	1.25	1.25	1.24	1.24	1.24	1.24	1.25	1.25	1.26	

Average = Sum(40)$_{1...12}$ /12= 1.25 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement [redacted]

Assumed occupancy, N 2.85 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 101.8 (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=	111.98	107.91	103.84	99.77	95.69	91.62	91.62	95.69	99.77	103.84	107.91	111.98	

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

Total = Sum(44)$_{1...12}$ = 1221.64 (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=	166.07	145.24	149.88	130.67	125.38	108.19	100.26	115.05	116.42	135.68	148.1	160.83	

Total = Sum(45)$_{1...12}$ = 1601.76 (45)

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

(46)m=	24.91	21.79	22.48	19.6	18.81	16.23	15.04	17.26	17.46	20.35	22.22	24.12	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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) = 210 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.01 (51)

If community heating see section 4.3

Volume factor from Table 2a 0.83 (52)

Temperature factor from Table 2b 0.54 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.22 (54)

Enter (50) or (54) in (55) 1.22 (55)

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

(56)m=	37.84	34.18	37.84	36.62	37.84	36.62	37.84	37.84	36.62	37.84	36.62	37.84	(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=	37.84	34.18	37.84	36.62	37.84	36.62	37.84	37.84	36.62	37.84	36.62	37.84	(57)

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

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

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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=	227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93	(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=	227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93	

Output from water heater (annual)$_{1,12}$ | 2321.17 | (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=	104.1	92.44	98.72	90.75	90.57	83.28	82.22	87.13	86.01	93.99	96.55	102.36	(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=	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	170.79	(66)

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

(67)m=	62.4	55.42	45.07	34.12	25.51	21.53	23.27	30.25	40.6	51.54	60.16	64.13	(67)

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

(68)m=	417.78	422.11	411.19	387.93	358.57	330.98	312.55	308.21	319.14	342.39	371.75	399.34	(68)

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

(69)m=	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	54.93	(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=	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	(71)

Water heating gains (Table 5)

(72)m=	139.92	137.57	132.68	126.04	121.73	115.66	110.51	117.11	119.46	126.33	134.09	137.58	(72)

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

(73)m=	734.95	729.95	703.8	662.95	620.67	583.03	561.17	570.42	594.05	635.13	680.86	715.91	(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	6.4	x	14.24	x	0.72	x	0.7	=	31.84 (74)
North	0.9x	0.77	x	6.4	x	23.27	x	0.72	x	0.7	=	52.01 (74)

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North	0.9x	0.77	x	6.4	x	39.95	x	0.72	x	0.7	=	89.31	(74)
North	0.9x	0.77	x	6.4	x	67.1	x	0.72	x	0.7	=	149.99	(74)
North	0.9x	0.77	x	6.4	x	87.09	x	0.72	x	0.7	=	194.68	(74)
North	0.9x	0.77	x	6.4	x	100.07	x	0.72	x	0.7	=	223.69	(74)
North	0.9x	0.77	x	6.4	x	92.85	x	0.72	x	0.7	=	207.56	(74)
North	0.9x	0.77	x	6.4	x	74.38	x	0.72	x	0.7	=	166.27	(74)
North	0.9x	0.77	x	6.4	x	51.63	x	0.72	x	0.7	=	115.41	(74)
North	0.9x	0.77	x	6.4	x	30.09	x	0.72	x	0.7	=	67.25	(74)
North	0.9x	0.77	x	6.4	x	16.99	x	0.72	x	0.7	=	37.98	(74)
North	0.9x	0.77	x	6.4	x	11.39	x	0.72	x	0.7	=	25.47	(74)
East	0.9x	0.77	x	2.84	x	26.63	x	0.72	x	0.7	=	26.42	(76)
East	0.9x	0.77	x	2.84	x	43.95	x	0.72	x	0.7	=	43.6	(76)
East	0.9x	0.77	x	2.84	x	71.91	x	0.72	x	0.7	=	71.33	(76)
East	0.9x	0.77	x	2.84	x	108.59	x	0.72	x	0.7	=	107.71	(76)
East	0.9x	0.77	x	2.84	x	128.14	x	0.72	x	0.7	=	127.11	(76)
East	0.9x	0.77	x	2.84	x	141.01	x	0.72	x	0.7	=	139.87	(76)
East	0.9x	0.77	x	2.84	x	133.32	x	0.72	x	0.7	=	132.24	(76)
East	0.9x	0.77	x	2.84	x	115.5	x	0.72	x	0.7	=	114.57	(76)
East	0.9x	0.77	x	2.84	x	89.42	x	0.72	x	0.7	=	88.7	(76)
East	0.9x	0.77	x	2.84	x	56.26	x	0.72	x	0.7	=	55.81	(76)
East	0.9x	0.77	x	2.84	x	31.99	x	0.72	x	0.7	=	31.73	(76)
East	0.9x	0.77	x	2.84	x	21.09	x	0.72	x	0.7	=	20.92	(76)
South	0.9x	0.77	x	13.95	x	59.74	x	0.72	x	0.7	=	291.05	(78)
South	0.9x	0.77	x	13.95	x	82.27	x	0.72	x	0.7	=	400.85	(78)
South	0.9x	0.77	x	13.95	x	104.17	x	0.72	x	0.7	=	507.54	(78)
South	0.9x	0.77	x	13.95	x	123.04	x	0.72	x	0.7	=	599.47	(78)
South	0.9x	0.77	x	13.95	x	125.05	x	0.72	x	0.7	=	609.27	(78)
South	0.9x	0.77	x	13.95	x	130.26	x	0.72	x	0.7	=	634.67	(78)
South	0.9x	0.77	x	13.95	x	126	x	0.72	x	0.7	=	613.91	(78)
South	0.9x	0.77	x	13.95	x	122	x	0.72	x	0.7	=	594.41	(78)
South	0.9x	0.77	x	13.95	x	116.65	x	0.72	x	0.7	=	568.37	(78)
South	0.9x	0.77	x	13.95	x	95.67	x	0.72	x	0.7	=	466.13	(78)
South	0.9x	0.77	x	13.95	x	68.13	x	0.72	x	0.7	=	331.94	(78)
South	0.9x	0.77	x	13.95	x	49.76	x	0.72	x	0.7	=	242.43	(78)
West	0.9x	0.77	x	2.44	x	26.63	x	0.72	x	0.7	=	22.7	(80)
West	0.9x	0.77	x	2.44	x	43.95	x	0.72	x	0.7	=	37.46	(80)
West	0.9x	0.77	x	2.44	x	71.91	x	0.72	x	0.7	=	61.28	(80)
West	0.9x	0.77	x	2.44	x	108.59	x	0.72	x	0.7	=	92.54	(80)
West	0.9x	0.77	x	2.44	x	128.14	x	0.72	x	0.7	=	109.21	(80)
West	0.9x	0.77	x	2.44	x	141.01	x	0.72	x	0.7	=	120.17	(80)
West	0.9x	0.77	x	2.44	x	133.32	x	0.72	x	0.7	=	113.61	(80)

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West	0.9x	0.77	x	2.44	x	115.5	x	0.72	x	0.7	=	98.43	(80)
West	0.9x	0.77	x	2.44	x	89.42	x	0.72	x	0.7	=	76.21	(80)
West	0.9x	0.77	x	2.44	x	56.26	x	0.72	x	0.7	=	47.95	(80)
West	0.9x	0.77	x	2.44	x	31.99	x	0.72	x	0.7	=	27.26	(80)
West	0.9x	0.77	x	2.44	x	21.09	x	0.72	x	0.7	=	17.97	(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=	372.01	533.92	729.46	949.72	1040.26	1118.4	1067.33	973.67	848.7	637.14	428.91	306.78	(83)

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

(84)m=	1106.96	1263.87	1433.25	1612.67	1660.93	1701.43	1628.5	1544.09	1442.74	1272.27	1109.77	1022.68	(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	0.83	0.67	0.47	0.34	0.33	0.57	0.83	0.96	0.99	(86)

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

(87)m=	20.08	20.22	20.49	20.77	20.93	20.99	21	21	20.98	20.82	20.42	20.04	(87)

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

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

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

(89)m=	0.97	0.96	0.91	0.79	0.6	0.38	0.24	0.23	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=	18.7	18.91	19.28	19.64	19.83	19.88	19.88	19.89	19.87	19.72	19.2	18.65	(90)

fLA = Living area ÷ (4) = 0.2 (91)

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

(92)m=	18.97	19.17	19.52	19.86	20.04	20.1	20.1	20.1	20.09	19.93	19.44	18.92	(92)

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

(93)m=	18.82	19.02	19.37	19.71	19.89	19.95	19.95	19.95	19.94	19.78	19.29	18.77	(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	0.78	0.6	0.38	0.24	0.24	0.48	0.76	0.93	0.97	(94)

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

(95)m=	1069.72	1195.75	1280.76	1254.12	995.07	651.09	396.87	367.39	686.34	967.03	1030.78	995.51	(95)

Monthly average external temperature from Table 8

(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)

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

(97)m=	1927.33	1910.89	1737.46	1447.36	1041.38	655.55	397.26	367.71	698.25	1100.78	1537.94	1892.61	(97)

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

(98)m=	638.07	480.58	339.78	139.14	34.46	0	0	0	0	99.51	365.16	667.44	

Total per year (kWh/year) = Sum(98)$_{1...12}$ = 2764.13 (98)

Space heating requirement in kWh/m²/year 23.83 (99)

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EPC Costs WorkSheet: New dwelling as built

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		90.6 (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)													
	638.07	480.58	339.78	139.14	34.46	0	0	0	0	99.51	365.16	667.44	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	704.27	530.44	375.04	153.57	38.03	0	0	0	0	109.84	403.04	736.68	
Total (kWh/year) =Sum(211)$_{1...12}$ =													3050.91 (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)$_{1...12}$ =													0 (215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93	
Efficiency of water heater													79.9 (216)
(217)m =	87.52	87.16	86.18	84.1	81.4	79.9	79.9	79.9	79.9	83.2	86.41	87.67	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m =	259.55	229.95	244.82	225.68	229.09	209.42	201.95	220.46	219.71	236.51	239.82	253.14	
Total = Sum(219a)$_{1...12}$ =													2770.09 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		3050.91
Water heating fuel used		2770.09
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75 (231)
Electricity for lighting		440.79 (232)

10a. Fuel costs – Individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year
Space heating - main system 1	(211) x	3.87 x 0.01 =	118.07 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	18.9 x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.87 x 0.01 =	107.2 (247)

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Pumps, fans and electric keep-hot	(231)	0	x 0.01 =	14.17	(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)	0	x 0.01 =	83.31	(250)
Additional standing charges (Table 12)				93	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)...(254) =			415.76	(255)

13a 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)		85.79	(258)

13a 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	=	659	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	598.34	(264)
Space and water heating	(261) + (262) + (263) + (264) =					1257.34	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	38.93	(267)
Electricity for lighting	(232)	x		0.519	=	228.77	(268)
Total CO2, kg/year			sum of (265)...(271) =			1525.03	(272)
Dwelling CO2 Emission Rate			(272) ÷ (4) =			13.15	(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	=	3722.11	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	3379.52	(264)
Space and water heating	(261) + (262) + (263) + (264) =					7101.63	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	230.25	(267)
Electricity for lighting	(232)	x		0	=	1353.24	(268)
'Total Primary Energy			sum of (265)...(271) =			8685.12	(272)
Primary energy kWh/m²/year			(272) ÷ (4) =			74.87	(273)

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TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 1

Address : 1 Langford Close, CLIMPING, BN17 5FG

1 Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	116	(1a) x	2.4	(2a) =	278.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	116	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =		278.4	(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							4	x 10 =	40	(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) = 40 ÷ (5) =	0.14	(8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.39	(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) =	0.33	(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

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

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			6.23	x1/[1/(1.4)+ 0.04]		=	8.26			(27)
Windows Type 2			13.58	x1/[1/(1.4)+ 0.04]		=	18			(27)
Windows Type 3			2.76	x1/[1/(1.4)+ 0.04]		=	3.66			(27)
Windows Type 4			2.38	x1/[1/(1.4)+ 0.04]		=	3.16			(27)
Floor			116	x	0.13	=	15.08			(28)
Walls	117.21	29	88.21	x	0.18	=	15.88			(29)
Roof	116	0	116	x	0.13	=	15.08			(30)
Total area of elements, m²			349.21							(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) = 83.56 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 19096.6 (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 14.31 (36)

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

Total fabric heat loss (33) + (36) = 97.86 (37)

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

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

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(38)m=	54.3	53.97	53.65	52.16	51.88	50.58	50.58	50.34	51.08	51.88	52.45	53.04	(38)

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

(39)m=	152.16	151.84	151.52	150.02	149.74	148.44	148.44	148.2	148.94	149.74	150.31	150.9	

Average = Sum(39)$_{1...12}$ /12= 150.02 (39)

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

(40)m=	1.31	1.31	1.31	1.29	1.29	1.28	1.28	1.28	1.28	1.29	1.3	1.3	

Average = Sum(40)$_{1...12}$ /12= 1.29 (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 [redacted]

Assumed occupancy, N 2.85 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 101.8 (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=	111.98	107.91	103.84	99.77	95.69	91.62	91.62	95.69	99.77	103.84	107.91	111.98	

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

Total = Sum(44)$_{1...12}$ = 1221.64 (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=	166.07	145.24	149.88	130.67	125.38	108.19	100.26	115.05	116.42	135.68	148.1	160.83	

Total = Sum(45)$_{1...12}$ = 1601.76 (45)

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

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (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) x (41)m

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

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

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

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

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

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

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

(61)m=	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=	141.16	123.46	127.4	111.07	106.57	91.96	85.22	97.79	98.96	115.32	125.89	136.7	(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=	141.16	123.46	127.4	111.07	106.57	91.96	85.22	97.79	98.96	115.32	125.89	136.7	

Output from water heater (annual)$_{1,12}$ | 1361.49 | (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=	35.29	30.86	31.85	27.77	26.64	22.99	21.3	24.45	24.74	28.83	31.47	34.18	(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=	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	(66)

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

(67)m=	24.95	22.16	18.03	13.65	10.2	8.61	9.31	12.1	16.23	20.61	24.06	25.65	(67)

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

(68)m=	279.91	282.81	275.5	259.91	240.24	221.76	209.41	206.5	213.82	229.4	249.07	267.56	(68)

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

(69)m=	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	(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=	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	(71)

Water heating gains (Table 5)

(72)m=	47.43	45.93	42.81	38.57	35.81	31.93	28.64	32.86	34.36	38.75	43.71	45.94	(72)

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

(73)m=	417.99	416.6	402.03	377.82	351.95	328	313.04	317.15	330.11	354.46	382.54	404.84	(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	6.23	x	10.63	x	0.63	x	0.7	=	20.25	(74)
North	0.9x 0.77	x	6.23	x	20.32	x	0.63	x	0.7	=	38.69	(74)

[redacted]

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North	0.9x	0.77	x	6.23	x	34.53	x	0.63	x	0.7	=	65.74	(74)
North	0.9x	0.77	x	6.23	x	55.46	x	0.63	x	0.7	=	105.6	(74)
North	0.9x	0.77	x	6.23	x	74.72	x	0.63	x	0.7	=	142.26	(74)
North	0.9x	0.77	x	6.23	x	79.99	x	0.63	x	0.7	=	152.29	(74)
North	0.9x	0.77	x	6.23	x	74.68	x	0.63	x	0.7	=	142.18	(74)
North	0.9x	0.77	x	6.23	x	59.25	x	0.63	x	0.7	=	112.8	(74)
North	0.9x	0.77	x	6.23	x	41.52	x	0.63	x	0.7	=	79.05	(74)
North	0.9x	0.77	x	6.23	x	24.19	x	0.63	x	0.7	=	46.06	(74)
North	0.9x	0.77	x	6.23	x	13.12	x	0.63	x	0.7	=	24.98	(74)
North	0.9x	0.77	x	6.23	x	8.86	x	0.63	x	0.7	=	16.88	(74)
East	0.9x	0.77	x	2.76	x	19.64	x	0.63	x	0.7	=	16.57	(76)
East	0.9x	0.77	x	2.76	x	38.42	x	0.63	x	0.7	=	32.41	(76)
East	0.9x	0.77	x	2.76	x	63.27	x	0.63	x	0.7	=	53.37	(76)
East	0.9x	0.77	x	2.76	x	92.28	x	0.63	x	0.7	=	77.84	(76)
East	0.9x	0.77	x	2.76	x	113.09	x	0.63	x	0.7	=	95.39	(76)
East	0.9x	0.77	x	2.76	x	115.77	x	0.63	x	0.7	=	97.65	(76)
East	0.9x	0.77	x	2.76	x	110.22	x	0.63	x	0.7	=	92.97	(76)
East	0.9x	0.77	x	2.76	x	94.68	x	0.63	x	0.7	=	79.86	(76)
East	0.9x	0.77	x	2.76	x	73.59	x	0.63	x	0.7	=	62.07	(76)
East	0.9x	0.77	x	2.76	x	45.59	x	0.63	x	0.7	=	38.45	(76)
East	0.9x	0.77	x	2.76	x	24.49	x	0.63	x	0.7	=	20.66	(76)
East	0.9x	0.77	x	2.76	x	16.15	x	0.63	x	0.7	=	13.62	(76)
South	0.9x	0.77	x	13.58	x	46.75	x	0.63	x	0.7	=	194.03	(78)
South	0.9x	0.77	x	13.58	x	76.57	x	0.63	x	0.7	=	317.77	(78)
South	0.9x	0.77	x	13.58	x	97.53	x	0.63	x	0.7	=	404.79	(78)
South	0.9x	0.77	x	13.58	x	110.23	x	0.63	x	0.7	=	457.5	(78)
South	0.9x	0.77	x	13.58	x	114.87	x	0.63	x	0.7	=	476.74	(78)
South	0.9x	0.77	x	13.58	x	110.55	x	0.63	x	0.7	=	458.8	(78)
South	0.9x	0.77	x	13.58	x	108.01	x	0.63	x	0.7	=	448.27	(78)
South	0.9x	0.77	x	13.58	x	104.89	x	0.63	x	0.7	=	435.34	(78)
South	0.9x	0.77	x	13.58	x	101.89	x	0.63	x	0.7	=	422.85	(78)
South	0.9x	0.77	x	13.58	x	82.59	x	0.63	x	0.7	=	342.75	(78)
South	0.9x	0.77	x	13.58	x	55.42	x	0.63	x	0.7	=	229.99	(78)
South	0.9x	0.77	x	13.58	x	40.4	x	0.63	x	0.7	=	167.66	(78)
West	0.9x	0.77	x	2.38	x	19.64	x	0.63	x	0.7	=	14.29	(80)
West	0.9x	0.77	x	2.38	x	38.42	x	0.63	x	0.7	=	27.95	(80)
West	0.9x	0.77	x	2.38	x	63.27	x	0.63	x	0.7	=	46.02	(80)
West	0.9x	0.77	x	2.38	x	92.28	x	0.63	x	0.7	=	67.12	(80)
West	0.9x	0.77	x	2.38	x	113.09	x	0.63	x	0.7	=	82.26	(80)
West	0.9x	0.77	x	2.38	x	115.77	x	0.63	x	0.7	=	84.21	(80)
West	0.9x	0.77	x	2.38	x	110.22	x	0.63	x	0.7	=	80.17	(80)

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West	0.9x	0.77	x	2.38	x	94.68	x	0.63	x	0.7	=	68.86	(80)
West	0.9x	0.77	x	2.38	x	73.59	x	0.63	x	0.7	=	53.53	(80)
West	0.9x	0.77	x	2.38	x	45.59	x	0.63	x	0.7	=	33.16	(80)
West	0.9x	0.77	x	2.38	x	24.49	x	0.63	x	0.7	=	17.81	(80)
West	0.9x	0.77	x	2.38	x	16.15	x	0.63	x	0.7	=	11.75	(80)

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

(83)m=	245.13	416.82	569.92	708.06	796.65	792.95	763.59	696.86	617.49	460.42	293.44	209.91	(83)

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

(84)m=	663.12	833.42	971.95	1085.88	1148.6	1120.94	1076.63	1014.01	947.6	814.88	675.98	614.75	(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=	1	0.99	0.99	0.96	0.89	0.75	0.58	0.63	0.85	0.97	1	1	(86)

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

(87)m=	19.52	19.73	20.02	20.39	20.71	20.91	20.98	20.97	20.83	20.4	19.88	19.49	(87)

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

(88)m=	19.83	19.83	19.84	19.85	19.85	19.86	19.86	19.86	19.85	19.85	19.84	19.84	(88)

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

(89)m=	1	0.99	0.98	0.94	0.84	0.65	0.44	0.49	0.78	0.96	0.99	1	(89)

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

(90)m=	18.49	18.7	19	19.36	19.65	19.82	19.85	19.85	19.76	19.37	18.86	18.46	(90)

fLA = Living area ÷ (4) = 0.2 (91)

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

(92)m=	18.69	18.9	19.2	19.56	19.86	20.03	20.07	20.07	19.97	19.57	19.06	18.66	(92)

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

(93)m=	18.69	18.9	19.2	19.56	19.86	20.03	20.07	20.07	19.97	19.57	19.06	18.66	(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=	1	0.99	0.98	0.94	0.85	0.67	0.47	0.52	0.79	0.96	0.99	1	(94)

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

(95)m=	661.06	826.14	949.84	1018.98	970.92	747.55	506.3	529.13	745.62	780.43	671.15	613.38	(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=	2190.32	2126.05	1923.88	1599.32	1221.57	806.14	515.4	543.69	873.97	1343.8	1798.17	2182.65	(97)

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

(98)m=	1137.77	873.53	724.68	417.85	186.48	0	0	0	0	419.15	811.46	1167.54	

Total per year (kWh/year) = Sum(98)$_{1...12}$ = 5738.46 (98)

Space heating requirement in kWh/m²/year 49.47 (99)

TFEE WorkSheet: New dwelling as built

9a. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1395.36	1098.47	1126.33	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.83	0.9	0.88	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1158.14	987.77	985.59	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1423.11	1368.81	1297.68	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	190.78	283.5	232.19	0	0	0	0	
									Total = Sum(104)	=	706.47		(104)
Cooled fraction									f C = cooled area ÷ (4) =		1		(105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	
									Total = Sum(104)	=	0		(106)

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

(107)m=	0	0	0	0	0	47.7	70.87	58.05	0	0	0	0	
									Total = Sum(107)	=	176.62		(107)
Space cooling requirement in kWh/m²/year									(107) ÷ (4) =		1.52		(108)

9b. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency	(99) + (108) =	50.99 (109)
Target Fabric Energy Efficiency (TFEE)		58.64 (109)

i-Therm Limited
Matt Haskell
[redacted]

DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 1

Address : 1 Langford Close, CLIMPING, BN17 5FG

1 Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	116	(1a) x	2.4	(2a) =	278.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	116	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =		278.4	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.14 (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			3.96000003814697 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.34 (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) =		0.29 (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

DFEE WorkSheet: New dwelling as built

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

0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			6.4	x	1/[1/(1.2)+ 0.04]	=	7.33			(27)
Windows Type 2			13.95	x	1/[1/(1.2)+ 0.04]	=	15.97			(27)
Windows Type 3			2.84	x	1/[1/(1.2)+ 0.04]	=	3.25			(27)
Windows Type 4			2.44	x	1/[1/(1.2)+ 0.04]	=	2.79			(27)
Floor			116	x	0.12	=	13.92			(28)
Walls	117.21	29.68	87.53	x	0.27	=	23.63			(29)
Roof	116	0	116	x	0.11	=	12.76			(30)
Total area of elements, m²			349.21							(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) = 83.71 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 19055.8 (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 10.42 (36)

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

Total fabric heat loss (33) + (36) = 94.13 (37)

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

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

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(38)m=	52.23	51.99	51.75	50.62	50.41	49.43	49.43	49.25	49.81	50.41	50.84	51.29	(38)

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

(39)m=	146.36	146.12	145.88	144.75	144.54	143.56	143.56	143.38	143.94	144.54	144.97	145.41	

Average = Sum(39)$_{1...12}$ /12= 144.75 (39)

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

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

Average = Sum(40)$_{1...12}$ /12= 1.25 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement

Assumed occupancy, N 2.85 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 101.8 (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=	111.98	107.91	103.84	99.77	95.69	91.62	91.62	95.69	99.77	103.84	107.91	111.98	

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

Total = Sum(44)$_{1...12}$ = 1221.64 (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=	166.07	145.24	149.88	130.67	125.38	108.19	100.26	115.05	116.42	135.68	148.1	160.83	

Total = Sum(45)$_{1...12}$ = 1601.76 (45)

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

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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) x (41)m

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

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

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

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

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

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

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

(61)m=	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=	141.16	123.46	127.4	111.07	106.57	91.96	85.22	97.79	98.96	115.32	125.89	136.7	(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=	141.16	123.46	127.4	111.07	106.57	91.96	85.22	97.79	98.96	115.32	125.89	136.7	

Output from water heater (annual)$_{1,12}$ | 1361.49 | (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=	35.29	30.86	31.85	27.77	26.64	22.99	21.3	24.45	24.74	28.83	31.47	34.18	(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=	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	(66)

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

(67)m=	24.96	22.17	18.03	13.65	10.2	8.61	9.31	12.1	16.24	20.62	24.06	25.65	(67)

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

(68)m=	279.91	282.81	275.5	259.91	240.24	221.76	209.41	206.5	213.82	229.4	249.07	267.56	(68)

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

(69)m=	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	(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=	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	(71)

Water heating gains (Table 5)

(72)m=	47.43	45.93	42.81	38.57	35.81	31.93	28.64	32.86	34.36	38.75	43.71	45.94	(72)

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

(73)m=	418	416.61	402.03	377.82	351.95	328	313.04	317.16	330.12	354.47	382.54	404.85	(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	6.4	x	10.63	x	0.72	x	0.7	=	23.77	(74)
North	0.9x 0.77	x	6.4	x	20.32	x	0.72	x	0.7	=	45.42	(74)

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North	0.9x	0.77	x	6.4	x	34.53	x	0.72	x	0.7	=	77.19	(74)
North	0.9x	0.77	x	6.4	x	55.46	x	0.72	x	0.7	=	123.98	(74)
North	0.9x	0.77	x	6.4	x	74.72	x	0.72	x	0.7	=	167.02	(74)
North	0.9x	0.77	x	6.4	x	79.99	x	0.72	x	0.7	=	178.79	(74)
North	0.9x	0.77	x	6.4	x	74.68	x	0.72	x	0.7	=	166.93	(74)
North	0.9x	0.77	x	6.4	x	59.25	x	0.72	x	0.7	=	132.44	(74)
North	0.9x	0.77	x	6.4	x	41.52	x	0.72	x	0.7	=	92.8	(74)
North	0.9x	0.77	x	6.4	x	24.19	x	0.72	x	0.7	=	54.07	(74)
North	0.9x	0.77	x	6.4	x	13.12	x	0.72	x	0.7	=	29.32	(74)
North	0.9x	0.77	x	6.4	x	8.86	x	0.72	x	0.7	=	19.82	(74)
East	0.9x	0.77	x	2.84	x	19.64	x	0.72	x	0.7	=	19.48	(76)
East	0.9x	0.77	x	2.84	x	38.42	x	0.72	x	0.7	=	38.11	(76)
East	0.9x	0.77	x	2.84	x	63.27	x	0.72	x	0.7	=	62.76	(76)
East	0.9x	0.77	x	2.84	x	92.28	x	0.72	x	0.7	=	91.54	(76)
East	0.9x	0.77	x	2.84	x	113.09	x	0.72	x	0.7	=	112.18	(76)
East	0.9x	0.77	x	2.84	x	115.77	x	0.72	x	0.7	=	114.84	(76)
East	0.9x	0.77	x	2.84	x	110.22	x	0.72	x	0.7	=	109.33	(76)
East	0.9x	0.77	x	2.84	x	94.68	x	0.72	x	0.7	=	93.91	(76)
East	0.9x	0.77	x	2.84	x	73.59	x	0.72	x	0.7	=	73	(76)
East	0.9x	0.77	x	2.84	x	45.59	x	0.72	x	0.7	=	45.22	(76)
East	0.9x	0.77	x	2.84	x	24.49	x	0.72	x	0.7	=	24.29	(76)
East	0.9x	0.77	x	2.84	x	16.15	x	0.72	x	0.7	=	16.02	(76)
South	0.9x	0.77	x	13.95	x	46.75	x	0.72	x	0.7	=	227.79	(78)
South	0.9x	0.77	x	13.95	x	76.57	x	0.72	x	0.7	=	373.06	(78)
South	0.9x	0.77	x	13.95	x	97.53	x	0.72	x	0.7	=	475.22	(78)
South	0.9x	0.77	x	13.95	x	110.23	x	0.72	x	0.7	=	537.1	(78)
South	0.9x	0.77	x	13.95	x	114.87	x	0.72	x	0.7	=	559.69	(78)
South	0.9x	0.77	x	13.95	x	110.55	x	0.72	x	0.7	=	538.63	(78)
South	0.9x	0.77	x	13.95	x	108.01	x	0.72	x	0.7	=	526.27	(78)
South	0.9x	0.77	x	13.95	x	104.89	x	0.72	x	0.7	=	511.08	(78)
South	0.9x	0.77	x	13.95	x	101.89	x	0.72	x	0.7	=	496.42	(78)
South	0.9x	0.77	x	13.95	x	82.59	x	0.72	x	0.7	=	402.39	(78)
South	0.9x	0.77	x	13.95	x	55.42	x	0.72	x	0.7	=	270.01	(78)
South	0.9x	0.77	x	13.95	x	40.4	x	0.72	x	0.7	=	196.83	(78)
West	0.9x	0.77	x	2.44	x	19.64	x	0.72	x	0.7	=	16.74	(80)
West	0.9x	0.77	x	2.44	x	38.42	x	0.72	x	0.7	=	32.74	(80)
West	0.9x	0.77	x	2.44	x	63.27	x	0.72	x	0.7	=	53.92	(80)
West	0.9x	0.77	x	2.44	x	92.28	x	0.72	x	0.7	=	78.64	(80)
West	0.9x	0.77	x	2.44	x	113.09	x	0.72	x	0.7	=	96.38	(80)
West	0.9x	0.77	x	2.44	x	115.77	x	0.72	x	0.7	=	98.66	(80)
West	0.9x	0.77	x	2.44	x	110.22	x	0.72	x	0.7	=	93.93	(80)

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West	0.9x	0.77	x	2.44	x	94.68	x	0.72	x	0.7	=	80.69	(80)
West	0.9x	0.77	x	2.44	x	73.59	x	0.72	x	0.7	=	62.71	(80)
West	0.9x	0.77	x	2.44	x	45.59	x	0.72	x	0.7	=	38.85	(80)
West	0.9x	0.77	x	2.44	x	24.49	x	0.72	x	0.7	=	20.87	(80)
West	0.9x	0.77	x	2.44	x	16.15	x	0.72	x	0.7	=	13.76	(80)

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

(83)m=	287.78	489.34	669.09	831.26	935.27	930.92	896.46	818.12	724.94	540.53	344.5	246.43	(83)

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

(84)m=	705.78	905.95	1071.12	1209.08	1287.22	1258.92	1209.5	1135.27	1055.05	895	727.04	651.28	(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=	1	0.99	0.98	0.94	0.84	0.68	0.51	0.56	0.8	0.96	0.99	1	(86)

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

(87)m=	19.62	19.85	20.15	20.51	20.79	20.95	20.99	20.98	20.88	20.49	19.97	19.58	(87)

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

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

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

(89)m=	1	0.99	0.97	0.92	0.79	0.58	0.39	0.44	0.72	0.95	0.99	1	(89)

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

(90)m=	18.62	18.85	19.15	19.5	19.75	19.87	19.89	19.89	19.83	19.49	18.98	18.58	(90)

fLA = Living area ÷ (4) = 0.2 (91)

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

(92)m=	18.82	19.04	19.35	19.7	19.95	20.08	20.1	20.1	20.03	19.68	19.18	18.78	(92)

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

(93)m=	18.82	19.04	19.35	19.7	19.95	20.08	20.1	20.1	20.03	19.68	19.18	18.78	(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=	1	0.99	0.97	0.91	0.79	0.6	0.41	0.46	0.73	0.94	0.99	1	(94)

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

(95)m=	703.03	895.09	1036.22	1102.83	1019.85	752.45	498.26	522.91	768.7	842.36	720.18	649.5	(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=	2124.64	2066.63	1874.18	1562.83	1193.03	786.46	502.88	530.66	853.89	1313.11	1750.48	2119.64	(97)

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

(98)m=	1057.68	787.28	623.44	331.2	128.84	0	0	0	0	350.23	741.82	1093.78	

Total per year (kWh/year) = Sum(98)$_{1...12}$ = 5114.27 (98)

Space heating requirement in kWh/m²/year 44.09 (99)

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9c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1349.46	1062.34	1089.68	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.88	0.94	0.92	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1194.16	995.82	1001.13	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1584.39	1524.11	1439.41	0	0	0	0	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m set (104)m to zero if (104)m < 3 × (98)m													
(104)m=	0	0	0	0	0	280.96	393.05	326.08	0	0	0	0	
									Total = Sum(104)	=	1000.09		(104)
Cooled fraction									f C = cooled area ÷ (4) =		1		(105)
Intermittency factor (Table 10b)													
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	
									Total = Sum(104)	=	0		(106)
Space cooling requirement for month = (104)m × (105) × (106)m													
(107)m=	0	0	0	0	0	70.24	98.26	81.52	0	0	0	0	
									Total = Sum(107)	=	250.02		(107)
Space cooling requirement in kWh/m²/year									(107) ÷ (4) =		2.16		(108)

9d. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency	(99) + (108) =	46.24 (109)

i-Therm Limited
Matt Haskell
[redacted]

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 1

Address : 1 Langford Close, CLIMPING, BN17 5FG

1 Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	116	(1a) x	2.4	(2a) =	278.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	116	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =		278.4	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.14 (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			3.96000003814697 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.34 (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) =		0.29 (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

DER WorkSheet: New dwelling as built

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

0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			6.4	x	1/[1/(1.2)+ 0.04]	=	7.33			(27)
Windows Type 2			13.95	x	1/[1/(1.2)+ 0.04]	=	15.97			(27)
Windows Type 3			2.84	x	1/[1/(1.2)+ 0.04]	=	3.25			(27)
Windows Type 4			2.44	x	1/[1/(1.2)+ 0.04]	=	2.79			(27)
Floor			116	x	0.12	=	13.92			(28)
Walls	117.21	29.68	87.53	x	0.27	=	23.63			(29)
Roof	116	0	116	x	0.11	=	12.76			(30)
Total area of elements, m²			349.21							(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) = 83.71 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 19055.8 (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 10.42 (36)

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

Total fabric heat loss (33) + (36) = 94.13 (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

DER WorkSheet: New dwelling as built

(38)m=	52.23	51.99	51.75	50.62	50.41	49.43	49.43	49.25	49.81	50.41	50.84	51.29	(38)

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

(39)m=	146.36	146.12	145.88	144.75	144.54	143.56	143.56	143.38	143.94	144.54	144.97	145.41	

Average = Sum(39)$_{1...12}$ /12= 144.75 (39)

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

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

Average = Sum(40)$_{1...12}$ /12= 1.25 (40)

Number of days in month (Table 1a)

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

4. Water heating energy requirement

Assumed occupancy, N 2.85 (42)

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

if TFA £ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 101.8 (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=	111.98	107.91	103.84	99.77	95.69	91.62	91.62	95.69	99.77	103.84	107.91	111.98	

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

Total = Sum(44)$_{1...12}$ = 1221.64 (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=	166.07	145.24	149.88	130.67	125.38	108.19	100.26	115.05	116.42	135.68	148.1	160.83	

Total = Sum(45)$_{1...12}$ = 1601.76 (45)

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

(46)m=	24.91	21.79	22.48	19.6	18.81	16.23	15.04	17.26	17.46	20.35	22.22	24.12	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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) = 210 (50)

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

Hot water storage loss factor from Table 2 (kWh/litre/day) 0.01 (51)

If community heating see section 4.3

Volume factor from Table 2a 0.83 (52)

Temperature factor from Table 2b 0.54 (53)

Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.22 (54)

Enter (50) or (54) in (55) 1.22 (55)

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

(56)m=	37.84	34.18	37.84	36.62	37.84	36.62	37.84	37.84	36.62	37.84	36.62	37.84	(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=	37.84	34.18	37.84	36.62	37.84	36.62	37.84	37.84	36.62	37.84	36.62	37.84	(57)

DER WorkSheet: New dwelling as built

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

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

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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=	227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93	(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=	227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93	

Output from water heater (annual)$_{1,12}$ | 2321.17 | (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=	104.1	92.44	98.72	90.75	90.57	83.28	82.22	87.13	86.01	93.99	96.55	102.36	(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=	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	(66)

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

(67)m=	24.96	22.17	18.03	13.65	10.2	8.61	9.31	12.1	16.24	20.62	24.06	25.65	(67)

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

(68)m=	279.91	282.81	275.5	259.91	240.24	221.76	209.41	206.5	213.82	229.4	249.07	267.56	(68)

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

(69)m=	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	(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=	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	(71)

Water heating gains (Table 5)

(72)m=	139.92	137.57	132.68	126.04	121.73	115.66	110.51	117.11	119.46	126.33	134.09	137.58	(72)

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

(73)m=	513.48	511.25	494.9	468.3	440.88	414.73	397.92	404.41	418.22	445.05	475.93	499.49	(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	6.4	x	10.63	x	0.72	x	0.7	=	23.77	(74)
North	0.9x 0.77	x	6.4	x	20.32	x	0.72	x	0.7	=	45.42	(74)

DER WorkSheet: New dwelling as built

North	0.9x	0.77	x	6.4	x	34.53	x	0.72	x	0.7	=	77.19	(74)
North	0.9x	0.77	x	6.4	x	55.46	x	0.72	x	0.7	=	123.98	(74)
North	0.9x	0.77	x	6.4	x	74.72	x	0.72	x	0.7	=	167.02	(74)
North	0.9x	0.77	x	6.4	x	79.99	x	0.72	x	0.7	=	178.79	(74)
North	0.9x	0.77	x	6.4	x	74.68	x	0.72	x	0.7	=	166.93	(74)
North	0.9x	0.77	x	6.4	x	59.25	x	0.72	x	0.7	=	132.44	(74)
North	0.9x	0.77	x	6.4	x	41.52	x	0.72	x	0.7	=	92.8	(74)
North	0.9x	0.77	x	6.4	x	24.19	x	0.72	x	0.7	=	54.07	(74)
North	0.9x	0.77	x	6.4	x	13.12	x	0.72	x	0.7	=	29.32	(74)
North	0.9x	0.77	x	6.4	x	8.86	x	0.72	x	0.7	=	19.82	(74)
East	0.9x	0.77	x	2.84	x	19.64	x	0.72	x	0.7	=	19.48	(76)
East	0.9x	0.77	x	2.84	x	38.42	x	0.72	x	0.7	=	38.11	(76)
East	0.9x	0.77	x	2.84	x	63.27	x	0.72	x	0.7	=	62.76	(76)
East	0.9x	0.77	x	2.84	x	92.28	x	0.72	x	0.7	=	91.54	(76)
East	0.9x	0.77	x	2.84	x	113.09	x	0.72	x	0.7	=	112.18	(76)
East	0.9x	0.77	x	2.84	x	115.77	x	0.72	x	0.7	=	114.84	(76)
East	0.9x	0.77	x	2.84	x	110.22	x	0.72	x	0.7	=	109.33	(76)
East	0.9x	0.77	x	2.84	x	94.68	x	0.72	x	0.7	=	93.91	(76)
East	0.9x	0.77	x	2.84	x	73.59	x	0.72	x	0.7	=	73	(76)
East	0.9x	0.77	x	2.84	x	45.59	x	0.72	x	0.7	=	45.22	(76)
East	0.9x	0.77	x	2.84	x	24.49	x	0.72	x	0.7	=	24.29	(76)
East	0.9x	0.77	x	2.84	x	16.15	x	0.72	x	0.7	=	16.02	(76)
South	0.9x	0.77	x	13.95	x	46.75	x	0.72	x	0.7	=	227.79	(78)
South	0.9x	0.77	x	13.95	x	76.57	x	0.72	x	0.7	=	373.06	(78)
South	0.9x	0.77	x	13.95	x	97.53	x	0.72	x	0.7	=	475.22	(78)
South	0.9x	0.77	x	13.95	x	110.23	x	0.72	x	0.7	=	537.1	(78)
South	0.9x	0.77	x	13.95	x	114.87	x	0.72	x	0.7	=	559.69	(78)
South	0.9x	0.77	x	13.95	x	110.55	x	0.72	x	0.7	=	538.63	(78)
South	0.9x	0.77	x	13.95	x	108.01	x	0.72	x	0.7	=	526.27	(78)
South	0.9x	0.77	x	13.95	x	104.89	x	0.72	x	0.7	=	511.08	(78)
South	0.9x	0.77	x	13.95	x	101.89	x	0.72	x	0.7	=	496.42	(78)
South	0.9x	0.77	x	13.95	x	82.59	x	0.72	x	0.7	=	402.39	(78)
South	0.9x	0.77	x	13.95	x	55.42	x	0.72	x	0.7	=	270.01	(78)
South	0.9x	0.77	x	13.95	x	40.4	x	0.72	x	0.7	=	196.83	(78)
West	0.9x	0.77	x	2.44	x	19.64	x	0.72	x	0.7	=	16.74	(80)
West	0.9x	0.77	x	2.44	x	38.42	x	0.72	x	0.7	=	32.74	(80)
West	0.9x	0.77	x	2.44	x	63.27	x	0.72	x	0.7	=	53.92	(80)
West	0.9x	0.77	x	2.44	x	92.28	x	0.72	x	0.7	=	78.64	(80)
West	0.9x	0.77	x	2.44	x	113.09	x	0.72	x	0.7	=	96.38	(80)
West	0.9x	0.77	x	2.44	x	115.77	x	0.72	x	0.7	=	98.66	(80)
West	0.9x	0.77	x	2.44	x	110.22	x	0.72	x	0.7	=	93.93	(80)

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West	0.9x	0.77	x	2.44	x	94.68	x	0.72	x	0.7	=	80.69	(80)
West	0.9x	0.77	x	2.44	x	73.59	x	0.72	x	0.7	=	62.71	(80)
West	0.9x	0.77	x	2.44	x	45.59	x	0.72	x	0.7	=	38.85	(80)
West	0.9x	0.77	x	2.44	x	24.49	x	0.72	x	0.7	=	20.87	(80)
West	0.9x	0.77	x	2.44	x	16.15	x	0.72	x	0.7	=	13.76	(80)

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

(83)m=	287.78	489.34	669.09	831.26	935.27	930.92	896.46	818.12	724.94	540.53	344.5	246.43	(83)

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

(84)m=	801.26	1000.59	1163.99	1299.56	1376.14	1345.65	1294.37	1222.53	1143.15	985.58	820.42	745.92	(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=	1	0.99	0.97	0.92	0.82	0.64	0.48	0.53	0.76	0.95	0.99	1	(86)

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

(87)m=	19.69	19.92	20.22	20.56	20.82	20.96	20.99	20.99	20.9	20.55	20.04	19.65	(87)

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

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

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

(89)m=	1	0.99	0.96	0.9	0.76	0.55	0.36	0.41	0.68	0.93	0.99	1	(89)

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

(90)m=	18.15	18.48	18.91	19.39	19.72	19.86	19.89	19.89	19.82	19.38	18.67	18.09	(90)

fLA = Living area ÷ (4) = 0.2 (91)

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

(92)m=	18.45	18.76	19.16	19.62	19.94	20.08	20.1	20.1	20.03	19.61	18.94	18.39	(92)

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

(93)m=	18.3	18.61	19.01	19.47	19.79	19.93	19.95	19.95	19.88	19.46	18.79	18.24	(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	0.98	0.95	0.88	0.75	0.55	0.37	0.41	0.68	0.91	0.98	0.99	(94)

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

(95)m=	795.15	980.69	1108.37	1149.8	1034.36	741.22	478.59	504.54	771.83	900.49	806.23	741.71	(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=	2049.26	2003.01	1825.52	1529.59	1168.68	764.81	481.38	509.22	831.91	1280.68	1694.1	2042.27	(97)

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

(98)m=	933.06	687	533.56	273.45	99.93	0	0	0	0	282.86	639.27	967.61	

Total per year (kWh/year) = Sum(98)$_{1...12}$ = 4416.73 (98)

Space heating requirement in kWh/m²/year 38.08 (99)

DER WorkSheet: New dwelling as built

2a 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		90.6 (206)
Efficiency of secondary/supplementary heating system, %		0 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement (calculated above)													kWh/year
	933.06	687	533.56	273.45	99.93	0	0	0	0	282.86	639.27	967.61	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1029.86	758.28	588.92	301.82	110.3	0	0	0	0	312.2	705.59	1068	

Total (kWh/year) =Sum(211)$_{1...12}$ = 4874.98 (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)$_{1...12}$ = 0 (215)

Water heating

Output from water heater (calculated above)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
227.17	200.43	210.98	189.8	186.48	167.32	161.36	176.15	175.55	196.78	207.23	221.93

Efficiency of water heater 79.9 (216)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(217)m=	88.29	87.94	87.29	85.89	83.33	79.9	79.9	79.9	79.9	85.88	87.72	88.39	(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=	257.31	227.92	241.71	220.98	223.77	209.42	201.95	220.46	219.71	229.13	236.23	251.07

Total = Sum(219a)$_{1...12}$ = 2739.66 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		4874.98
Water heating fuel used		2739.66
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75 (231)
Electricity for lighting		440.79 (232)

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	=	1053 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.216	=	591.77 (264)
Space and water heating	(261) + (262) + (263) + (264) =			1644.76 (265)

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Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93 (267)
Electricity for lighting	(232)	x	0.519	=	228.77 (268)
Total CO2, kg/year			sum of (265)...(271) =		1912.46 (272)
Dwelling CO2 Emission Rate			(272) ÷ (4) =		16.49 (273)
EI rating (section 14)					84 (274)

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User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 1

Address : 1 Langford Close, CLIMPING, BN17 5FG

1 Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	116	(1a) x	2.4	(2a) =	278.4	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	116	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =		278.4	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.14 (8)

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

Number of storeys in the dwelling (ns)		0	(9)
Additional infiltration	[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0	(12)
If no draught lobby, enter 0.05, else enter 0		0	(13)
Percentage of windows and doors draught stripped		0	(14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.39	(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) =	0.33	(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

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

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			6.23	x1/[1/(1.4)+ 0.04]		=	8.26			(27)
Windows Type 2			13.58	x1/[1/(1.4)+ 0.04]		=	18			(27)
Windows Type 3			2.76	x1/[1/(1.4)+ 0.04]		=	3.66			(27)
Windows Type 4			2.38	x1/[1/(1.4)+ 0.04]		=	3.16			(27)
Floor			116	x	0.13	=	15.08			(28)
Walls	117.21	29	88.21	x	0.18	=	15.88			(29)
Roof	116	0	116	x	0.13	=	15.08			(30)
Total area of elements, m²			349.21							(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) = 83.56 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 19096.6 (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 14.31 (36)

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

Total fabric heat loss (33) + (36) = 97.86 (37)

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

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

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(38)m=	54.3	53.97	53.65	52.16	51.88	50.58	50.58	50.34	51.08	51.88	52.45	53.04	(38)

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

(39)m=	152.16	151.84	151.52	150.02	149.74	148.44	148.44	148.2	148.94	149.74	150.31	150.9	

Average = Sum(39)$_{1...12}$ /12= 150.02 (39)

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

(40)m=	1.31	1.31	1.31	1.29	1.29	1.28	1.28	1.28	1.28	1.29	1.3	1.3	

Average = Sum(40)$_{1...12}$ /12= 1.29 (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

Assumed occupancy, N 2.85 (42)

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

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 101.8 (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=	111.98	107.91	103.84	99.77	95.69	91.62	91.62	95.69	99.77	103.84	107.91	111.98	

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

Total = Sum(44)$_{1...12}$ = 1221.64 (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=	166.07	145.24	149.88	130.67	125.38	108.19	100.26	115.05	116.42	135.68	148.1	160.83	

Total = Sum(45)$_{1...12}$ = 1601.76 (45)

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

(46)m=	24.91	21.79	22.48	19.6	18.81	16.23	15.04	17.26	17.46	20.35	22.22	24.12	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (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): 1.7 (48)

Temperature factor from Table 2b 0.54 (49)

Energy lost from water storage, kWh/year (48) x (49) = 0.92 (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) 0.92 (55)

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

(56)m=	28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48	(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=	28.48	25.73	28.48	27.57	28.48	27.57	28.48	28.48	27.57	28.48	27.57	28.48	(57)

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

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

(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)

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=	217.81	191.98	201.63	180.75	177.13	158.27	152	166.79	166.5	187.42	198.18	212.57	(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=	217.81	191.98	201.63	180.75	177.13	158.27	152	166.79	166.5	187.42	198.18	212.57	

Output from water heater (annual)$_{1,12}$ | 2211.03 | (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=	96.61	85.68	91.23	83.51	83.09	76.04	74.73	79.65	78.77	86.51	89.31	94.87	(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=	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	142.32	(66)

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

(67)m=	24.95	22.16	18.03	13.65	10.2	8.61	9.31	12.1	16.23	20.61	24.06	25.65	(67)

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

(68)m=	279.91	282.81	275.5	259.91	240.24	221.76	209.41	206.5	213.82	229.4	249.07	267.56	(68)

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

(69)m=	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	37.23	(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=	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	-113.86	(71)

Water heating gains (Table 5)

(72)m=	129.86	127.51	122.62	115.98	111.67	105.61	100.45	107.06	109.4	116.28	124.04	127.52	(72)

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

(73)m=	503.42	501.18	484.84	458.24	430.81	404.67	387.85	394.35	408.16	434.99	465.86	489.42	(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	6.23	x	10.63	x	0.63	x	0.7	=	20.25 (74)
North	0.9x	0.77	x	6.23	x	20.32	x	0.63	x	0.7	=	38.69 (74)

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North	0.9x	0.77	x	6.23	x	34.53	x	0.63	x	0.7	=	65.74	(74)
North	0.9x	0.77	x	6.23	x	55.46	x	0.63	x	0.7	=	105.6	(74)
North	0.9x	0.77	x	6.23	x	74.72	x	0.63	x	0.7	=	142.26	(74)
North	0.9x	0.77	x	6.23	x	79.99	x	0.63	x	0.7	=	152.29	(74)
North	0.9x	0.77	x	6.23	x	74.68	x	0.63	x	0.7	=	142.18	(74)
North	0.9x	0.77	x	6.23	x	59.25	x	0.63	x	0.7	=	112.8	(74)
North	0.9x	0.77	x	6.23	x	41.52	x	0.63	x	0.7	=	79.05	(74)
North	0.9x	0.77	x	6.23	x	24.19	x	0.63	x	0.7	=	46.06	(74)
North	0.9x	0.77	x	6.23	x	13.12	x	0.63	x	0.7	=	24.98	(74)
North	0.9x	0.77	x	6.23	x	8.86	x	0.63	x	0.7	=	16.88	(74)
East	0.9x	0.77	x	2.76	x	19.64	x	0.63	x	0.7	=	16.57	(76)
East	0.9x	0.77	x	2.76	x	38.42	x	0.63	x	0.7	=	32.41	(76)
East	0.9x	0.77	x	2.76	x	63.27	x	0.63	x	0.7	=	53.37	(76)
East	0.9x	0.77	x	2.76	x	92.28	x	0.63	x	0.7	=	77.84	(76)
East	0.9x	0.77	x	2.76	x	113.09	x	0.63	x	0.7	=	95.39	(76)
East	0.9x	0.77	x	2.76	x	115.77	x	0.63	x	0.7	=	97.65	(76)
East	0.9x	0.77	x	2.76	x	110.22	x	0.63	x	0.7	=	92.97	(76)
East	0.9x	0.77	x	2.76	x	94.68	x	0.63	x	0.7	=	79.86	(76)
East	0.9x	0.77	x	2.76	x	73.59	x	0.63	x	0.7	=	62.07	(76)
East	0.9x	0.77	x	2.76	x	45.59	x	0.63	x	0.7	=	38.45	(76)
East	0.9x	0.77	x	2.76	x	24.49	x	0.63	x	0.7	=	20.66	(76)
East	0.9x	0.77	x	2.76	x	16.15	x	0.63	x	0.7	=	13.62	(76)
South	0.9x	0.77	x	13.58	x	46.75	x	0.63	x	0.7	=	194.03	(78)
South	0.9x	0.77	x	13.58	x	76.57	x	0.63	x	0.7	=	317.77	(78)
South	0.9x	0.77	x	13.58	x	97.53	x	0.63	x	0.7	=	404.79	(78)
South	0.9x	0.77	x	13.58	x	110.23	x	0.63	x	0.7	=	457.5	(78)
South	0.9x	0.77	x	13.58	x	114.87	x	0.63	x	0.7	=	476.74	(78)
South	0.9x	0.77	x	13.58	x	110.55	x	0.63	x	0.7	=	458.8	(78)
South	0.9x	0.77	x	13.58	x	108.01	x	0.63	x	0.7	=	448.27	(78)
South	0.9x	0.77	x	13.58	x	104.89	x	0.63	x	0.7	=	435.34	(78)
South	0.9x	0.77	x	13.58	x	101.89	x	0.63	x	0.7	=	422.85	(78)
South	0.9x	0.77	x	13.58	x	82.59	x	0.63	x	0.7	=	342.75	(78)
South	0.9x	0.77	x	13.58	x	55.42	x	0.63	x	0.7	=	229.99	(78)
South	0.9x	0.77	x	13.58	x	40.4	x	0.63	x	0.7	=	167.66	(78)
West	0.9x	0.77	x	2.38	x	19.64	x	0.63	x	0.7	=	14.29	(80)
West	0.9x	0.77	x	2.38	x	38.42	x	0.63	x	0.7	=	27.95	(80)
West	0.9x	0.77	x	2.38	x	63.27	x	0.63	x	0.7	=	46.02	(80)
West	0.9x	0.77	x	2.38	x	92.28	x	0.63	x	0.7	=	67.12	(80)
West	0.9x	0.77	x	2.38	x	113.09	x	0.63	x	0.7	=	82.26	(80)
West	0.9x	0.77	x	2.38	x	115.77	x	0.63	x	0.7	=	84.21	(80)
West	0.9x	0.77	x	2.38	x	110.22	x	0.63	x	0.7	=	80.17	(80)

TER WorkSheet: New dwelling as built

West	0.9x	0.77	x	2.38	x	94.68	x	0.63	x	0.7	=	68.86	(80)
West	0.9x	0.77	x	2.38	x	73.59	x	0.63	x	0.7	=	53.53	(80)
West	0.9x	0.77	x	2.38	x	45.59	x	0.63	x	0.7	=	33.16	(80)
West	0.9x	0.77	x	2.38	x	24.49	x	0.63	x	0.7	=	17.81	(80)
West	0.9x	0.77	x	2.38	x	16.15	x	0.63	x	0.7	=	11.75	(80)

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

(83)m=	245.13	416.82	569.92	708.06	796.65	792.95	763.59	696.86	617.49	460.42	293.44	209.91	(83)

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

(84)m=	748.55	918	1054.77	1166.3	1227.46	1197.62	1151.45	1091.21	1025.65	895.41	759.3	699.33	(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=	1	0.99	0.98	0.95	0.87	0.72	0.55	0.6	0.82	0.96	0.99	1	(86)

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

(87)m=	19.59	19.79	20.09	20.44	20.74	20.93	20.98	20.98	20.85	20.45	19.95	19.55	(87)

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

(88)m=	19.83	19.83	19.84	19.85	19.85	19.86	19.86	19.86	19.85	19.85	19.84	19.84	(88)

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

(89)m=	1	0.99	0.97	0.93	0.82	0.62	0.42	0.46	0.74	0.95	0.99	1	(89)

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

(90)m=	17.97	18.27	18.69	19.2	19.6	19.81	19.85	19.85	19.74	19.23	18.5	17.92	(90)

fLA = Living area ÷ (4) = 0.2 (91)

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

(92)m=	18.29	18.57	18.96	19.44	19.82	20.03	20.07	20.07	19.96	19.47	18.78	18.24	(92)

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

(93)m=	18.29	18.57	18.96	19.44	19.82	20.03	20.07	20.07	19.96	19.47	18.78	18.24	(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	0.99	0.97	0.92	0.82	0.63	0.44	0.49	0.75	0.94	0.99	1	(94)

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

(95)m=	744.26	905.21	1020.41	1073.45	1003.12	758.3	508.41	532.66	768.81	841.6	749.9	696.33	(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=	2128.05	2075.1	1888.52	1581.72	1216.32	805.69	515.45	543.77	872.65	1327.86	1756.2	2118.72	(97)

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

(98)m=	1029.54	786.17	645.88	365.96	158.62	0	0	0	0	361.78	724.54	1058.26	

Total per year (kWh/year) = Sum(98)$_{1...12}$ = 5130.74 (98)

Space heating requirement in kWh/m²/year 44.23 (99)

TER WorkSheet: New dwelling as built

2a 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	93.5	(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)	1029.54	786.17	645.88	365.96	158.62	0	0	0	0	361.78	724.54	1058.26	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	1101.11	840.82	690.78	391.4	169.65	0	0	0	0	386.93	774.9	1131.82	(211)

Total (kWh/year) =Sum(211)$_{1...12}$ = 5487.42 (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)$_{1...12}$ = 0 (215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	217.81	191.98	201.63	180.75	177.13	158.27	152	166.79	166.5	187.42	198.18	212.57	
Efficiency of water heater													79.8 (216)
(217)m=	88.43	88.18	87.7	86.66	84.52	79.8	79.8	79.8	79.8	86.54	87.97	88.51	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	246.31	217.72	229.9	208.57	209.56	198.33	190.48	209.01	208.64	216.57	225.29	240.16	

Total = Sum(219a)$_{1...12}$ = 2600.55 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		5487.42
Water heating fuel used		2600.55
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		440.7 (232)

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	=	1185.28 (261)
Space heating (secondary)	(215) x	0.519	=	0 (263)
Water heating	(219) x	0.216	=	561.72 (264)
Space and water heating	(261) + (262) + (263) + (264) =			1747 (265)

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TER WorkSheet: New dwelling as built

Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	228.72	(268)
Total CO2, kg/year			sum of (265)...(271) =		2014.65	(272)

TER = 17.37 (273)

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SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 02 June 2021

Property Details: Plot 1

Dwelling type:	Detached Bungalow
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	1
Front of dwelling faces:	North
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	8 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	734.98	**(P1)**
Transmission heat loss coefficient:	94.1	
Summer heat loss coefficient:	829.1	**(P2)**

Overhangs

Orientation:	Ratio:	Z_overhangs:
North (Ext)	0	1
South (Ext)	0	1
East (Ext)	0	1
West (Ext)	0	1

Solar shading

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North (Ext)	1	0.9	1	0.9	**(P8)**
South (Ext)	1	0.9	1	0.9	**(P8)**
East (Ext)	1	0.9	1	0.9	**(P8)**
West (Ext)	1	0.9	1	0.9	**(P8)**

Solar gains

Orientation		Area	Flux	g_	FF	Shading	Gains	
North (Ext)	0.9 x	6.4	86.66	0.72	0.7	0.9	226.42	
South (Ext)	0.9 x	13.95	118.4	0.72	0.7	0.9	674.28	
East (Ext)	0.9 x	2.84	124.8	0.72	0.7	0.9	144.69	
West (Ext)	0.9 x	2.44	124.8	0.72	0.7	0.9	124.31	
						Total	1169.69	**(P3/P4)**

Internal gains

	June	July	August	
Internal gains	580.03	558.17	567.42	
Total summer gains	1810.53	1727.87	1639.32	**(P5)**
Summer gain/loss ratio	2.18	2.08	1.98	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	17.83	19.73	19.73	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Not significant

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Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8
Printed on 02 June 2021 at 18:59:37

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Semi-detached House

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 93.1m²
Site Reference : Langford **Plot Reference:** Plot 2
Address : 2 Langford Close , CLIMPING, BN17 5FG

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)	16.85 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.24 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	41.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (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	3.79 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 477, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

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Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Programmer, room thermostat and TRVs	OK
Hot water controls:	No cylinder	
	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	4.65m²
Windows facing: South	9.07m²
Windows facing: East	2.09m²
Ventilation rate:	6.00

10 Key features

Air permeablility	3.8 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K

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Thermal Bridge Report

Property Details: Plot 2

Address: 2 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.061

External Junctions Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	12.61	E1	[UD]
Sill	0.04	8.66	E3	[A]
Jamb	0.05	26	E4	[A]
Ground floor (normal)	0.076	19.34	E5	[UD]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	19.34	E6	[A]
Eaves (insulation at ceiling level)	0.06	19.34	E10	[A]
Gable (insulation at ceiling level)	0.24	0	E12	[A]
Corner (normal)	0.09	10	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	0	E17	[A]
Flat roof	0.08	0	E14	[D]
Party wall between dwellings	0.06	10	E18	[A]

Party Junctions Details

Ground floor	0.16	9	P1	[D]
Intermediate floor within a dwelling	0	9	P2	[D]
Roof (insulation at ceiling level)	0.24	9	P4	[D]

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Matt Haskell

Code for Sustainable Homes Report
For use with Nov 2010 addendum 2014 England

Assessor and House Details

Assessor Name: Matthew Haskell
Assessor Number: STRO006210
Property Address: 2 Langford Close
CLIMPING
BN17 5FG

Building regulation assessment

	kg/m²/year
TER	16.85
DER	16.24

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO_2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2012 DER Worksheet		16.24	*(ZC1)*
TER		16.85	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		16.24	
% improvement DER/TER	3.6		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	16.24	*(ZC1)*
CO2 emissions from appliances, equation (L14)	15.51	*(ZC2)*
CO2 emissions from cooking, equation (L16)	1.97	*(ZC3)*
Net CO2 emissions	35.4	*(ZC8)*

Result:

Credits awarded for ENE 1 = 0.6

Code Level = 3

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 41.75

Credits awarded for ENE 2 = 8.1

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		35.44	
Standard DER		17.96	
Actual Case CO2 emissions		35.44	
Actual DER		17.96	
Reduction in CO2 emissions	0		

Credits awarded for ENE 7 = 0

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

The following requirements must also be met:

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

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

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

i-Therm Limited
Matt Haskell
[redacted]

SAP Input

Property Details: Plot 2

Address:	2 Langford Close , CLIMPING, BN17 5FG
Located in:	England
Region:	South East England
UPRN:	UPRN-550142287949
Date of assessment:	27 May 2021
Date of certificate:	02 June 2021
Assessment type:	New dwelling as built
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:	477

Property description

Dwelling type:	House
Detachment:	Semi-detached
Year Completed:	2021

Floor Location:	**Floor area:**	**Storey height:**
Floor 0	46.55 m²	2.4 m
Floor 1	46.55 m²	2.6 m

Living area:	17.94 m² (fraction 0.193)
Front of dwelling faces:	North

Opening types

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Entrance	Manufacturer	Solid			PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Entrance	mm	0.7	0	1	2.1	1
Ext	16mm or more	0.7	0.72	1.2	4.65	1
Ext	16mm or more	0.7	0.72	1.2	9.07	1
Ext	16mm or more	0.7	0.72	1.2	2.09	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Entrance	Door (1)	External Wall	North	0	0
Ext	Windows (1)	External Wall	North	0	0
Ext	Windows (1)	External Wall	South	0	0
Ext	Windows (1)	External Wall	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 Wall	96.7	17.91	78.79	0.27	0	False	N/A
Plane Roof	46.55	0	46.55	0.11	0		N/A
Ground floor	46.55			0.12			N/A
Internal Elements							
Party Elements							
Party	45						N/A

SAP Input

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.061

	Length	Psi-value		
	12.61	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	8.66	0.04	E3	Sill
[Approved]	26	0.05	E4	Jamb
	19.34	0.076	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	19.34	0.07	E6	Intermediate floor within a dwelling
[Approved]	19.34	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	0	0.24	E12	Gable (insulation at ceiling level)
[Approved]	10	0.09	E16	Corner (normal)
[Approved]	0	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof
[Approved]	10	0.06	E18	Party wall between dwellings
	9	0.16	P1	Ground floor
	9	0	P2	Intermediate floor within a dwelling
	9	0.24	P4	Roof (insulation at ceiling level)

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 4
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3.79 (Assessed dwelling is tested)

Main heating system

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 477, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
Boiler interlock: Yes
Delayed start

Main heating Control

Main heating Control:
Programmer, room thermostat and TRVs
Control code: 2106

Secondary heating system

Secondary heating system: None

Water heating

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

SAP Input

Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

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SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 2

Address : 2 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55	(1a) x	2.4	(2a) =	111.72	(3a)
First floor	46.55	(1b) x	2.6	(2b) =	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	232.75	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.17 (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		3.78999996185303 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.36 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31 (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

SAP WorkSheet: New dwelling as built

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

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

0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.35	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.2)+ 0.04]		=	5.32			(27)
Windows Type 2			9.07	x1/[1/(1.2)+ 0.04]		=	10.39			(27)
Windows Type 3			2.09	x1/[1/(1.2)+ 0.04]		=	2.39			(27)
Floor			46.55	x	0.12	=	5.586			(28)
Walls	96.7	17.91	78.79	x	0.27	=	21.27			(29)
Roof	46.55	0	46.55	x	0.11	=	5.12			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 52.18 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 11.58 (36)

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

Total fabric heat loss (33) + (36) = 63.76 (37)

SAP WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.29	44.06	43.84	42.79	42.59	41.67	41.67	41.5	42.03	42.59	42.99	43.41	(38)

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

(39)m=	108.05	107.82	107.6	106.55	106.35	105.43	105.43	105.26	105.79	106.35	106.75	107.16	

Average = Sum(39)$_{1...12}$ /12= 106.54 (39)

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

(40)m=	1.16	1.16	1.16	1.14	1.14	1.13	1.13	1.13	1.14	1.14	1.15	1.15	

Average = Sum(40)$_{1...12}$ /12= 1.14 (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 2.67 (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 97.51 (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	
(44)m=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	

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

Total = Sum(44)$_{1...12}$ = 1170.16 (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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	

Total = Sum(45)$_{1...12}$ = 1534.26 (45)

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

(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11	(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) x (41)m

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

SAP WorkSheet: New dwelling as built

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=	14.14	12.76	14.1	13.6	14.02	13.53	13.96	14	13.57	14.07	13.65	14.13	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	

Output from water heater (annual) — 1699.78 — (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=	56.43	49.45	51.26	45.02	43.44	37.84	35.42	40.14	40.47	46.73	50.58	54.75	(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=	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	(66)

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

(67)m=	56.25	49.96	40.63	30.76	22.99	19.41	20.98	27.27	36.6	46.47	54.23	57.82	(67)

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

(68)m=	365.17	368.96	359.41	339.09	313.42	289.31	273.19	269.4	278.95	299.28	324.94	349.06	(68)

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

(69)m=	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	75.84	73.58	68.9	62.52	58.38	52.56	47.61	53.95	56.21	62.81	70.25	73.59	(72)

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

(73)m=	607.24	602.49	578.92	542.35	504.78	471.25	451.75	460.6	481.74	518.53	559.41	590.45	(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)

SAP WorkSheet: New dwelling as built

North	0.9x	0.77	x	4.65	x	10.63	x	0.72	x	0.7	=	17.27	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.72	x	0.7	=	33	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.72	x	0.7	=	56.08	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.72	x	0.7	=	90.08	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.72	x	0.7	=	121.35	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.72	x	0.7	=	129.91	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.72	x	0.7	=	121.28	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.72	x	0.7	=	96.22	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.72	x	0.7	=	67.43	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.72	x	0.7	=	39.29	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.72	x	0.7	=	21.3	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.72	x	0.7	=	14.4	(74)
East	0.9x	0.77	x	2.09	x	19.64	x	0.72	x	0.7	=	14.34	(76)
East	0.9x	0.77	x	2.09	x	38.42	x	0.72	x	0.7	=	28.05	(76)
East	0.9x	0.77	x	2.09	x	63.27	x	0.72	x	0.7	=	46.19	(76)
East	0.9x	0.77	x	2.09	x	92.28	x	0.72	x	0.7	=	67.36	(76)
East	0.9x	0.77	x	2.09	x	113.09	x	0.72	x	0.7	=	82.56	(76)
East	0.9x	0.77	x	2.09	x	115.77	x	0.72	x	0.7	=	84.51	(76)
East	0.9x	0.77	x	2.09	x	110.22	x	0.72	x	0.7	=	80.46	(76)
East	0.9x	0.77	x	2.09	x	94.68	x	0.72	x	0.7	=	69.11	(76)
East	0.9x	0.77	x	2.09	x	73.59	x	0.72	x	0.7	=	53.72	(76)
East	0.9x	0.77	x	2.09	x	45.59	x	0.72	x	0.7	=	33.28	(76)
East	0.9x	0.77	x	2.09	x	24.49	x	0.72	x	0.7	=	17.88	(76)
East	0.9x	0.77	x	2.09	x	16.15	x	0.72	x	0.7	=	11.79	(76)
South	0.9x	0.77	x	9.07	x	46.75	x	0.72	x	0.7	=	148.11	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.72	x	0.7	=	242.56	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.72	x	0.7	=	308.98	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.72	x	0.7	=	349.21	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.72	x	0.7	=	363.9	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.72	x	0.7	=	350.2	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.72	x	0.7	=	342.17	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.72	x	0.7	=	332.3	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.72	x	0.7	=	322.76	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.72	x	0.7	=	261.62	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.72	x	0.7	=	175.56	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.72	x	0.7	=	127.98	(78)

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=	179.71	303.61	411.25	506.65	567.8	564.62	543.91	497.63	443.91	334.19	214.74	154.16	(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=	786.96	906.1	990.17	1049	1072.58	1035.87	995.67	958.23	925.64	852.72	774.14	744.61	(84)

7a. Mean internal temperature (heating season)

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

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

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

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(86)m=	0.99	0.98	0.96	0.91	0.8	0.62	0.46	0.5	0.72	0.92	0.98	0.99	(86)

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

(87)m=	19.97	20.15	20.39	20.66	20.87	20.97	20.99	20.99	20.94	20.68	20.27	19.93	(87)

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

(88)m=	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.98	19.97	19.97	19.96	19.96	(88)

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

(89)m=	0.99	0.98	0.95	0.88	0.74	0.54	0.36	0.39	0.64	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=	19.03	19.21	19.44	19.71	19.88	19.96	19.97	19.97	19.94	19.73	19.34	19	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.21	19.39	19.62	19.89	20.07	20.16	20.17	20.17	20.13	19.91	19.52	19.18	(92)

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

(93)m=	19.06	19.24	19.47	19.74	19.92	20.01	20.02	20.02	19.98	19.76	19.37	19.03	(93)

8. Space heating requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.97	0.94	0.87	0.74	0.54	0.36	0.4	0.64	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	775.04	879.04	931.08	914.71	793.32	557.41	359.27	378.97	592.51	754.73	750.77	735.73	(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=	1595.09	1546.14	1395.97	1154.9	874.43	570.01	360.58	381.07	622.4	974.33	1309.59	1589.17	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	610.12	448.29	345.87	172.94	60.35	0	0	0	0	163.38	402.35	634.96	

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 2838.26 (98)

Space heating requirement in kWh/m²/year 30.49 (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 90.5 (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)													
	610.12	448.29	345.87	172.94	60.35	0	0	0	0	163.38	402.35	634.96	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	674.17	495.35	382.18	191.09	66.69	0	0	0	0	180.53	444.59	701.61	

Total (kWh/year) =Sum(211)$_{1..5,10..12}$ = 3136.2 (211)

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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)

	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18

Efficiency of water heater 87.3 (216)

(217)m=	89.77	89.67	89.47	89.05	88.27	87.3	87.3	87.3	87.3	88.97	89.58	89.81

(217)

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

(219)m=	192.94	169.38	176.21	155.83	151.94	134.21	125.99	142.26	143.28	161.88	173.59	187.26

Total = Sum(219a)$_{1...12}$ = 1914.78 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3136.2	
Water heating fuel used		1914.78	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		397.37	(232)

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 =	109.14	(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 =	66.63	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(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 =	52.41	(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) =					358.08	(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] =	1.09	(257)
SAP rating (Section 12)	84.81	(258)

12a. CO2 emissions - individual heating systems including micro-CHP:

SAP WorkSheet: New dwelling as built

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	677.42	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	413.59	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1091.01	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	206.24	(268)
Total CO2, kg/year		sum of (265)...(271) =			1336.17	(272)
CO2 emissions per m²		(272) ÷ (4) =			14.35	(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	=	3826.16	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.22	=	2336.03	(264)
Space and water heating	(261) + (262) + (263) + (264) =				6162.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	230.25	(267)
Electricity for lighting	(232) x		0	=	1219.93	(268)
'Total Primary Energy		sum of (265)...(271) =			7612.37	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			81.77	(273)

i-Therm Limited
Matt Haskell
[redacted]

EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 2

Address : 2 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55 (1a)	x	2.4 (2a)	=	111.72	(3a)
First floor	46.55 (1b)	x	2.6 (2b)	=	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		232.75	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.17 (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		3.78999996185303 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.36 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31 (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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

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

0.41	0.37	0.35	0.33	0.34	0.31	0.32	0.31	0.32	0.35	0.35	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.2)+ 0.04]		=	5.32			(27)
Windows Type 2			9.07	x1/[1/(1.2)+ 0.04]		=	10.39			(27)
Windows Type 3			2.09	x1/[1/(1.2)+ 0.04]		=	2.39			(27)
Floor			46.55	x	0.12	=	5.586			(28)
Walls	96.7	17.91	78.79	x	0.27	=	21.27			(29)
Roof	46.55	0	46.55	x	0.11	=	5.12			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 52.18 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 11.58 (36)

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

Total fabric heat loss (33) + (36) = 63.76 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.76	43.62	43.2	42.59	42.79	42.21	42.4	42.03	42.4	43.2	43.2	43.84	(38)

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

(39)m=	108.52	107.38	106.95	106.35	106.55	105.97	106.16	105.79	106.16	106.95	106.95	107.6	

Average = Sum(39)$_{1...12}$ /12= 106.78 (39)

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

(40)m=	1.17	1.15	1.15	1.14	1.14	1.14	1.14	1.14	1.14	1.15	1.15	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.15 (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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	

Total = Sum(44)$_{1...12}$ = 1170.16 (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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	

Total = Sum(45)$_{1...12}$ = 1534.26 (45)

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

(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11	(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) x (41)m

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

EPC Costs WorkSheet: New dwelling as built

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=	14.14	12.76	14.1	13.6	14.02	13.53	13.96	14	13.57	14.07	13.65	14.13	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	

Output from water heater (annual)... 1699.78 (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=	56.43	49.45	51.26	45.02	43.44	37.84	35.42	40.14	40.47	46.73	50.58	54.75	(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=	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	(66)

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

(67)m=	56.25	49.96	40.63	30.76	22.99	19.41	20.98	27.27	36.6	46.47	54.23	57.82	(67)

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

(68)m=	365.17	368.96	359.41	339.09	313.42	289.31	273.19	269.4	278.95	299.28	324.94	349.06	(68)

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

(69)m=	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	75.84	73.58	68.9	62.52	58.38	52.56	47.61	53.95	56.21	62.81	70.25	73.59	(72)

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

(73)m=	607.24	602.49	578.92	542.35	504.78	471.25	451.75	460.6	481.74	518.53	559.41	590.45	(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)

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North	0.9x	0.77	x	4.65	x	14.24	x	0.72	x	0.7	=	23.13	(74)
North	0.9x	0.77	x	4.65	x	23.27	x	0.72	x	0.7	=	37.79	(74)
North	0.9x	0.77	x	4.65	x	39.95	x	0.72	x	0.7	=	64.89	(74)
North	0.9x	0.77	x	4.65	x	67.1	x	0.72	x	0.7	=	108.98	(74)
North	0.9x	0.77	x	4.65	x	87.09	x	0.72	x	0.7	=	141.45	(74)
North	0.9x	0.77	x	4.65	x	100.07	x	0.72	x	0.7	=	162.52	(74)
North	0.9x	0.77	x	4.65	x	92.85	x	0.72	x	0.7	=	150.8	(74)
North	0.9x	0.77	x	4.65	x	74.38	x	0.72	x	0.7	=	120.8	(74)
North	0.9x	0.77	x	4.65	x	51.63	x	0.72	x	0.7	=	83.85	(74)
North	0.9x	0.77	x	4.65	x	30.09	x	0.72	x	0.7	=	48.86	(74)
North	0.9x	0.77	x	4.65	x	16.99	x	0.72	x	0.7	=	27.59	(74)
North	0.9x	0.77	x	4.65	x	11.39	x	0.72	x	0.7	=	18.5	(74)
East	0.9x	0.77	x	2.09	x	26.63	x	0.72	x	0.7	=	19.44	(76)
East	0.9x	0.77	x	2.09	x	43.95	x	0.72	x	0.7	=	32.08	(76)
East	0.9x	0.77	x	2.09	x	71.91	x	0.72	x	0.7	=	52.49	(76)
East	0.9x	0.77	x	2.09	x	108.59	x	0.72	x	0.7	=	79.27	(76)
East	0.9x	0.77	x	2.09	x	128.14	x	0.72	x	0.7	=	93.54	(76)
East	0.9x	0.77	x	2.09	x	141.01	x	0.72	x	0.7	=	102.93	(76)
East	0.9x	0.77	x	2.09	x	133.32	x	0.72	x	0.7	=	97.32	(76)
East	0.9x	0.77	x	2.09	x	115.5	x	0.72	x	0.7	=	84.31	(76)
East	0.9x	0.77	x	2.09	x	89.42	x	0.72	x	0.7	=	65.28	(76)
East	0.9x	0.77	x	2.09	x	56.26	x	0.72	x	0.7	=	41.07	(76)
East	0.9x	0.77	x	2.09	x	31.99	x	0.72	x	0.7	=	23.35	(76)
East	0.9x	0.77	x	2.09	x	21.09	x	0.72	x	0.7	=	15.39	(76)
South	0.9x	0.77	x	9.07	x	59.74	x	0.72	x	0.7	=	189.24	(78)
South	0.9x	0.77	x	9.07	x	82.27	x	0.72	x	0.7	=	260.63	(78)
South	0.9x	0.77	x	9.07	x	104.17	x	0.72	x	0.7	=	329.99	(78)
South	0.9x	0.77	x	9.07	x	123.04	x	0.72	x	0.7	=	389.76	(78)
South	0.9x	0.77	x	9.07	x	125.05	x	0.72	x	0.7	=	396.13	(78)
South	0.9x	0.77	x	9.07	x	130.26	x	0.72	x	0.7	=	412.65	(78)
South	0.9x	0.77	x	9.07	x	126	x	0.72	x	0.7	=	399.15	(78)
South	0.9x	0.77	x	9.07	x	122	x	0.72	x	0.7	=	386.47	(78)
South	0.9x	0.77	x	9.07	x	116.65	x	0.72	x	0.7	=	369.54	(78)
South	0.9x	0.77	x	9.07	x	95.67	x	0.72	x	0.7	=	303.07	(78)
South	0.9x	0.77	x	9.07	x	68.13	x	0.72	x	0.7	=	215.82	(78)
South	0.9x	0.77	x	9.07	x	49.76	x	0.72	x	0.7	=	157.62	(78)

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

(83)m=	231.81	330.5	447.37	578.01	631.12	678.1	647.27	591.58	518.68	393	266.76	191.52	(83)

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

(84)m=	839.06	932.99	1026.29	1120.36	1135.9	1149.36	1099.03	1052.18	1000.41	911.54	826.17	781.96	(84)

7a. Mean internal temperature (heating season)

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

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

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

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(86)m=	0.98	0.97	0.94	0.86	0.72	0.51	0.37	0.36	0.6	0.85	0.96	0.99	(86)

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

(87)m=	20.16	20.28	20.51	20.76	20.93	20.99	21	21	20.98	20.83	20.47	20.13	(87)

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

(88)m=	19.95	19.96	19.96	19.97	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.96	(88)

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

(89)m=	0.98	0.96	0.92	0.82	0.65	0.42	0.27	0.26	0.51	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=	19.22	19.34	19.56	19.8	19.92	19.97	19.97	19.97	19.96	19.85	19.54	19.19	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.4	19.52	19.74	19.98	20.12	20.16	20.17	20.17	20.16	20.04	19.72	19.37	(92)

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

(93)m=	19.25	19.37	19.59	19.83	19.97	20.01	20.02	20.02	20.01	19.89	19.57	19.22	(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	0.92	0.82	0.65	0.42	0.27	0.26	0.51	0.79	0.94	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	816.1	893.43	940.58	916.57	734.82	485.16	298.68	276.83	511.36	718.83	776.97	764.92	(95)
Monthly average external temperature from Table 8													
(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1470.36	1446.71	1304.27	1077.54	774.4	488.87	298.98	277.06	520.71	822.58	1162.22	1444.51	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	486.77	371.81	270.58	115.9	29.44	0	0	0	0	77.19	277.38	505.61	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 2134.68 (98)

Space heating requirement in kWh/m²/year 22.93 (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 90.5 (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)													
	486.77	371.81	270.58	115.9	29.44	0	0	0	0	77.19	277.38	505.61	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	537.87	410.84	298.99	128.06	32.53	0	0	0	0	85.29	306.5	558.69	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 2358.76 (211)

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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)

	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18

Efficiency of water heater 87.3 (216)

(217)m=	89.64	89.55	89.29	88.73	87.86	87.3	87.3	87.3	87.3	88.39	89.32	89.68

(217)

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

(219)m=	193.23	169.61	176.56	156.39	152.65	134.21	125.99	142.26	143.28	162.94	174.1	187.53

Total = Sum(219a)$_{1...12}$ = 1918.76 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2358.76	
Water heating fuel used		1918.76	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		397.37	(232)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x		3.87	x 0.01 =	91.28	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		18.9	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.87	x 0.01 =	74.26	(247)
Pumps, fans and electric keep-hot	(231)		0	x 0.01 =	14.17	(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)		0	x 0.01 =	75.1	(250)
Additional standing charges (Table 12)					93	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost (245)...(247) + (250)...(254) =					347.82	(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)	85.95	(258)

12a. CO2 emissions - individual heating systems including micro-CHP:

i-Therm Limited
Matt Haskell
[redacted]

EPC Costs WorkSheet: New dwelling as built

	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	509.49	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	414.45	(264)
Space and water heating	(261) + (262) + (263) + (264) =				923.95	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	206.24	(268)
Total CO2, kg/year		sum of (265)...(271) =			1169.11	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			12.56	(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		1.22	=	2877.69	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.22	=	2340.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5218.59	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	230.25	(267)
Electricity for lighting	(232) x		0	=	1219.93	(268)
'Total Primary Energy		sum of (265)...(271) =			6668.76	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			71.63	(273)

[redacted]

TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 2

Address : 2 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55 (1a)	x	2.4 (2a)	=	111.72	(3a)
First floor	46.55 (1b)	x	2.6 (2b)	=	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		232.75	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.13 (8)

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

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.38 (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) =	0.32 (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

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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

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

0.41	0.4	0.39	0.35	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.4)+ 0.04]		=	6.16			(27)
Windows Type 2			9.07	x1/[1/(1.4)+ 0.04]		=	12.02			(27)
Windows Type 3			2.09	x1/[1/(1.4)+ 0.04]		=	2.77			(27)
Floor			46.55	x	0.13	=	6.0515			(28)
Walls	96.7	17.91	78.79	x	0.18	=	14.18			(29)
Roof	46.55	0	46.55	x	0.13	=	6.05			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 49.35 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 9.92 (36)

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

Total fabric heat loss (33) + (36) = 59.26 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.88	44.63	44.38	43.22	43.01	42	42	41.81	42.39	43.01	43.45	43.9	(38)

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

(39)m=	104.14	103.89	103.64	102.49	102.27	101.26	101.26	101.08	101.65	102.27	102.71	103.17	
										Average = Sum(39)$_{1...12}$ /12=		102.49	(39)

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

(40)m=	1.12	1.12	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11	
											Average = Sum(40)$_{1...12}$ /12=	1.1	(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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	
											Total = Sum(44)$_{1...12}$ =	1170.16	(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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	
											Total = Sum(45)$_{1...12}$ =	1534.26	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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) x (41)m

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

TFEE WorkSheet: New dwelling as built

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=	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=	135.21	118.26	122.03	106.39	102.08	88.09	81.63	93.67	94.79	110.46	120.58	130.94	(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=	135.21	118.26	122.03	106.39	102.08	88.09	81.63	93.67	94.79	110.46	120.58	130.94	

Output from water heater (annual)... 1304.12 (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=	33.8	29.56	30.51	26.6	25.52	22.02	20.41	23.42	23.7	27.62	30.15	32.74	(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=	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	(66)

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

(67)m=	22.5	19.98	16.25	12.3	9.2	7.77	8.39	10.91	14.64	18.59	21.69	23.13	(67)

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

(68)m=	244.67	247.21	240.81	227.19	209.99	193.83	183.04	180.5	186.9	200.52	217.71	233.87	(68)

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

(69)m=	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	45.43	43.99	41	36.94	34.3	30.59	27.43	31.47	32.91	37.12	41.87	44	(72)

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

(73)m=	375.59	374.17	361.05	339.42	316.48	295.17	281.85	285.87	297.44	319.21	344.26	363.98	(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)

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North	0.9x	0.77	x	4.65	x	10.63	x	0.63	x	0.7	=	15.11	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.63	x	0.7	=	28.88	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.63	x	0.7	=	49.07	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.63	x	0.7	=	78.82	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.63	x	0.7	=	106.18	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.63	x	0.7	=	113.67	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.63	x	0.7	=	106.12	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.63	x	0.7	=	84.19	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.63	x	0.7	=	59	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.63	x	0.7	=	34.38	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.63	x	0.7	=	18.64	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.63	x	0.7	=	12.6	(74)
East	0.9x	0.77	x	2.09	x	19.64	x	0.63	x	0.7	=	12.54	(76)
East	0.9x	0.77	x	2.09	x	38.42	x	0.63	x	0.7	=	24.54	(76)
East	0.9x	0.77	x	2.09	x	63.27	x	0.63	x	0.7	=	40.41	(76)
East	0.9x	0.77	x	2.09	x	92.28	x	0.63	x	0.7	=	58.94	(76)
East	0.9x	0.77	x	2.09	x	113.09	x	0.63	x	0.7	=	72.24	(76)
East	0.9x	0.77	x	2.09	x	115.77	x	0.63	x	0.7	=	73.95	(76)
East	0.9x	0.77	x	2.09	x	110.22	x	0.63	x	0.7	=	70.4	(76)
East	0.9x	0.77	x	2.09	x	94.68	x	0.63	x	0.7	=	60.47	(76)
East	0.9x	0.77	x	2.09	x	73.59	x	0.63	x	0.7	=	47	(76)
East	0.9x	0.77	x	2.09	x	45.59	x	0.63	x	0.7	=	29.12	(76)
East	0.9x	0.77	x	2.09	x	24.49	x	0.63	x	0.7	=	15.64	(76)
East	0.9x	0.77	x	2.09	x	16.15	x	0.63	x	0.7	=	10.32	(76)
South	0.9x	0.77	x	9.07	x	46.75	x	0.63	x	0.7	=	129.59	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.63	x	0.7	=	212.24	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.63	x	0.7	=	270.36	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.63	x	0.7	=	305.56	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.63	x	0.7	=	318.41	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.63	x	0.7	=	306.43	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.63	x	0.7	=	299.4	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.63	x	0.7	=	290.76	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.63	x	0.7	=	282.42	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.63	x	0.7	=	228.92	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.63	x	0.7	=	153.61	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.63	x	0.7	=	111.98	(78)

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=	157.25	265.66	359.84	443.32	496.83	494.04	475.92	435.43	388.42	292.41	187.89	134.89	(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=	532.84	639.83	720.89	782.74	813.31	789.22	757.77	721.29	685.86	611.63	532.16	498.88	(84)

7. Mean internal temperature (heating season)

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

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

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

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(86)m=	1	1	0.99	0.96	0.9	0.75	0.57	0.62	0.85	0.98	1	1	(86)

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

(87)m=	19.78	19.95	20.2	20.51	20.77	20.94	20.99	20.98	20.88	20.52	20.09	19.74	(87)

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

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

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

(89)m=	1	0.99	0.98	0.95	0.86	0.66	0.45	0.5	0.78	0.96	0.99	1	(89)

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

(90)m=	18.87	19.04	19.29	19.6	19.85	19.98	20.01	20.01	19.94	19.62	19.19	18.84	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.04	19.22	19.47	19.77	20.03	20.17	20.2	20.2	20.12	19.8	19.36	19.02	(92)

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

(93)m=	19.04	19.22	19.47	19.77	20.03	20.17	20.2	20.2	20.12	19.8	19.36	19.02	(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=	1	0.99	0.98	0.95	0.86	0.67	0.48	0.52	0.79	0.96	0.99	1	(94)

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

(95)m=	531.32	635.07	707.14	741.06	697.56	532.48	360.15	377.01	540.73	587.27	528.64	497.86	(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=	1535.34	1487.42	1343.77	1114.47	851.46	563.78	364.21	383.6	612.04	940.55	1259.41	1528.7	(97)

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

(98)m=	746.99	572.78	473.65	268.86	114.5	0	0	0	0	262.84	526.15	766.95	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 3732.72 (98)

Space heating requirement in kWh/m²/year 40.09 (99)

9a. Space cooling requirement

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

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

Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	951.87	749.34	768.18	0	0	0	0	(100)

Utilisation factor for loss hm

(101)m=	0	0	0	0	0	0.87	0.93	0.91	0	0	0	0	(101)

Useful loss, hmLm (Watts) = (100)m x (101)m

(102)m=	0	0	0	0	0	827.27	697.33	701.51	0	0	0	0	(102)

Gains (solar gains calculated for applicable weather region, see Table 10)

(103)m=	0	0	0	0	0	1023.73	984.85	944.06	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	141.46	213.91	180.46	0	0	0	0	

Total = Sum(104)$_{5,6,7,8}$ = 535.83 (104)

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[redacted]

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

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104) = 0 (106)

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

(107)m=	0	0	0	0	0	35.36	53.48	45.11	0	0	0	0

Total = Sum(107) = 133.96 (107)

Space cooling requirement in kWh/m²/year — (107) ÷ (4) = 1.44 (108)

Fabric Energy Efficiency is calculated only if under Specific conditions. See Section 11.

Fabric Energy Efficiency — (99) + (108) = 41.53 (109)

Target Fabric Energy Efficiency (TFEE) 47.76 (109)

DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 2

Address : 2 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55 (1a)	x	2.4 (2a)	=	111.72	(3a)
First floor	46.55 (1b)	x	2.6 (2b)	=	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	232.75	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.13 (8)

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

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.78999996185303 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.32 (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) =	0.27 (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

DFEE WorkSheet: New dwelling as built

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

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

0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.3	0.32

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.2)+ 0.04]		=	5.32			(27)
Windows Type 2			9.07	x1/[1/(1.2)+ 0.04]		=	10.39			(27)
Windows Type 3			2.09	x1/[1/(1.2)+ 0.04]		=	2.39			(27)
Floor			46.55	x	0.12	=	5.586			(28)
Walls	96.7	17.91	78.79	x	0.27	=	21.27			(29)
Roof	46.55	0	46.55	x	0.11	=	5.12			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 52.18 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 11.58 (36)

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

Total fabric heat loss (33) + (36) = 63.76 (37)

DFEE WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	42.98	42.8	42.62	41.81	41.65	40.94	40.94	40.81	41.22	41.65	41.96	42.29	(38)

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

(39)m=	106.73	106.56	106.38	105.57	105.41	104.7	104.7	104.57	104.97	105.41	105.72	106.05	
										Average = Sum(39)$_{1...12}$ /12=		105.56	(39)

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

(40)m=	1.15	1.14	1.14	1.13	1.13	1.12	1.12	1.12	1.13	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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	
											Total = Sum(44)$_{1...12}$ =	1170.16	(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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	
											Total = Sum(45)$_{1...12}$ =	1534.26	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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) x (41)m

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

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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=	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=	135.21	118.26	122.03	106.39	102.08	88.09	81.63	93.67	94.79	110.46	120.58	130.94	(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=	135.21	118.26	122.03	106.39	102.08	88.09	81.63	93.67	94.79	110.46	120.58	130.94	

Output from water heater (annual)... 1304.12 (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=	33.8	29.56	30.51	26.6	25.52	22.02	20.41	23.42	23.7	27.62	30.15	32.74	(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=	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	(66)

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

(67)m=	22.5	19.98	16.25	12.3	9.2	7.77	8.39	10.91	14.64	18.59	21.69	23.13	(67)

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

(68)m=	244.67	247.21	240.81	227.19	209.99	193.83	183.04	180.5	186.9	200.52	217.71	233.87	(68)

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

(69)m=	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	45.43	43.99	41	36.94	34.3	30.59	27.43	31.47	32.91	37.12	41.87	44	(72)

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

(73)m=	375.59	374.17	361.05	339.42	316.48	295.17	281.85	285.87	297.44	319.21	344.26	363.98	(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)

[redacted]

DFEE WorkSheet: New dwelling as built

North	0.9x	0.77	x	4.65	x	10.63	x	0.72	x	0.7	=	17.27	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.72	x	0.7	=	33	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.72	x	0.7	=	56.08	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.72	x	0.7	=	90.08	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.72	x	0.7	=	121.35	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.72	x	0.7	=	129.91	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.72	x	0.7	=	121.28	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.72	x	0.7	=	96.22	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.72	x	0.7	=	67.43	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.72	x	0.7	=	39.29	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.72	x	0.7	=	21.3	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.72	x	0.7	=	14.4	(74)
East	0.9x	0.77	x	2.09	x	19.64	x	0.72	x	0.7	=	14.34	(76)
East	0.9x	0.77	x	2.09	x	38.42	x	0.72	x	0.7	=	28.05	(76)
East	0.9x	0.77	x	2.09	x	63.27	x	0.72	x	0.7	=	46.19	(76)
East	0.9x	0.77	x	2.09	x	92.28	x	0.72	x	0.7	=	67.36	(76)
East	0.9x	0.77	x	2.09	x	113.09	x	0.72	x	0.7	=	82.56	(76)
East	0.9x	0.77	x	2.09	x	115.77	x	0.72	x	0.7	=	84.51	(76)
East	0.9x	0.77	x	2.09	x	110.22	x	0.72	x	0.7	=	80.46	(76)
East	0.9x	0.77	x	2.09	x	94.68	x	0.72	x	0.7	=	69.11	(76)
East	0.9x	0.77	x	2.09	x	73.59	x	0.72	x	0.7	=	53.72	(76)
East	0.9x	0.77	x	2.09	x	45.59	x	0.72	x	0.7	=	33.28	(76)
East	0.9x	0.77	x	2.09	x	24.49	x	0.72	x	0.7	=	17.88	(76)
East	0.9x	0.77	x	2.09	x	16.15	x	0.72	x	0.7	=	11.79	(76)
South	0.9x	0.77	x	9.07	x	46.75	x	0.72	x	0.7	=	148.11	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.72	x	0.7	=	242.56	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.72	x	0.7	=	308.98	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.72	x	0.7	=	349.21	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.72	x	0.7	=	363.9	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.72	x	0.7	=	350.2	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.72	x	0.7	=	342.17	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.72	x	0.7	=	332.3	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.72	x	0.7	=	322.76	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.72	x	0.7	=	261.62	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.72	x	0.7	=	175.56	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.72	x	0.7	=	127.98	(78)

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

(83)m=	179.71	303.61	411.25	506.65	567.8	564.62	543.91	497.63	443.91	334.19	214.74	154.16	(83)

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

(84)m=	555.3	677.78	772.3	846.07	884.28	859.79	825.76	783.5	741.35	653.4	559	518.15	(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

DFEE WorkSheet: New dwelling as built

(86)m=	1	0.99	0.98	0.95	0.88	0.72	0.55	0.59	0.83	0.97	1	1	(86)

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

(87)m=	19.76	19.95	20.21	20.52	20.79	20.95	20.99	20.98	20.89	20.53	20.08	19.72	(87)

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

(88)m=	19.96	19.96	19.97	19.97	19.97	19.98	19.98	19.98	19.98	19.97	19.97	19.97	(88)

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

(89)m=	1	0.99	0.98	0.94	0.83	0.63	0.43	0.47	0.75	0.96	0.99	1	(89)

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

(90)m=	18.83	19.02	19.28	19.59	19.83	19.96	19.98	19.98	19.92	19.61	19.16	18.8	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.01	19.2	19.46	19.77	20.02	20.15	20.17	20.17	20.1	19.78	19.33	18.98	(92)

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

(93)m=	19.01	19.2	19.46	19.77	20.02	20.15	20.17	20.17	20.1	19.78	19.33	18.98	(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	

Utilisation factor for gains, hm:

(94)m=	1	0.99	0.98	0.93	0.83	0.64	0.45	0.5	0.76	0.95	0.99	1	(94)

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

(95)m=	553.39	671.42	753.56	790.13	735.95	552.94	370.5	388.45	564.72	621.79	554.48	516.87	(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=	1570.38	1523.9	1378.89	1147.8	876.93	580.79	374.09	394.36	630.3	968.15	1293.44	1567.24	(97)

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

(98)m=	756.64	572.87	465.24	257.52	104.89	0	0	0	0	257.69	532.05	781.48	

Total per year (kWh/year) = Sum(98)$_{1,...,12}$ = 3728.38 (98)

Space heating requirement in kWh/m²/year 40.05 (99)

9a. Space cooling requirement

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

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

Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	984.18	774.78	794.72	0	0	0	0	(100)

Utilisation factor for loss hm

(101)m=	0	0	0	0	0	0.88	0.94	0.92	0	0	0	0	(101)

Useful loss, hmLm (Watts) = (100)m x (101)m

(102)m=	0	0	0	0	0	867.31	726.31	731.63	0	0	0	0	(102)

Gains (solar gains calculated for applicable weather region, see Table 10)

(103)m=	0	0	0	0	0	1106.23	1064.32	1016.77	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	172.02	251.47	212.14	0	0	0	0	

Total = Sum(104) = 635.64 (104)

DFEE WorkSheet: New dwelling as built

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

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104) = 0 (106)

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

(107)m=	0	0	0	0	0	43	62.87	53.04	0	0	0	0

Total = Sum(107) = 158.91 (107)

Space cooling requirement in kWh/m²/year — (107) ÷ (4) = 1.71 (108)

9a. Energy Efficiency rating (assessed only under specified conditions, see section 11)

Fabric Energy Efficiency — (99) + (108) = 41.75 (109)

i-Therm Limited
Matt Haskell
[redacted]

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 2

Address : 2 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55 (1a)	x	2.4 (2a)	=	111.72	(3a)
First floor	46.55 (1b)	x	2.6 (2b)	=	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n)	=	232.75	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.17 (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		3.78999996185303 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.36 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31 (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

DER WorkSheet: New dwelling as built

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

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

0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.35	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.2)+ 0.04]		=	5.32			(27)
Windows Type 2			9.07	x1/[1/(1.2)+ 0.04]		=	10.39			(27)
Windows Type 3			2.09	x1/[1/(1.2)+ 0.04]		=	2.39			(27)
Floor			46.55	x	0.12	=	5.586			(28)
Walls	96.7	17.91	78.79	x	0.27	=	21.27			(29)
Roof	46.55	0	46.55	x	0.11	=	5.12			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 52.18 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 11.58 (36)

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

Total fabric heat loss (33) + (36) = 63.76 (37)

DER WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.29	44.06	43.84	42.79	42.59	41.67	41.67	41.5	42.03	42.59	42.99	43.41	(38)

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

(39)m=	108.05	107.82	107.6	106.55	106.35	105.43	105.43	105.26	105.79	106.35	106.75	107.16	

Average = Sum(39)$_{1...12}$ /12= 106.54 (39)

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

(40)m=	1.16	1.16	1.16	1.14	1.14	1.13	1.13	1.13	1.14	1.14	1.15	1.15	

Average = Sum(40)$_{1...12}$ /12= 1.14 (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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	

Total = Sum(44)$_{1...12}$ = 1170.16 (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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	

Total = Sum(45)$_{1...12}$ = 1534.26 (45)

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

(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11	(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) x (41)m

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

DER WorkSheet: New dwelling as built

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=	14.14	12.76	14.1	13.6	14.02	13.53	13.96	14	13.57	14.07	13.65	14.13	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	

Output from water heater (annual) ... 1699.78 (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=	56.43	49.45	51.26	45.02	43.44	37.84	35.42	40.14	40.47	46.73	50.58	54.75	(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=	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	(66)

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

(67)m=	22.5	19.98	16.25	12.3	9.2	7.77	8.39	10.91	14.64	18.59	21.69	23.13	(67)

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

(68)m=	244.67	247.21	240.81	227.19	209.99	193.83	183.04	180.5	186.9	200.52	217.71	233.87	(68)

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

(69)m=	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	75.84	73.58	68.9	62.52	58.38	52.56	47.61	53.95	56.21	62.81	70.25	73.59	(72)

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

(73)m=	409	406.76	391.95	368	343.56	320.14	305.03	311.35	323.73	347.9	375.65	396.58	(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)

DER WorkSheet: New dwelling as built

North	0.9x	0.77	x	4.65	x	10.63	x	0.72	x	0.7	=	17.27	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.72	x	0.7	=	33	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.72	x	0.7	=	56.08	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.72	x	0.7	=	90.08	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.72	x	0.7	=	121.35	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.72	x	0.7	=	129.91	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.72	x	0.7	=	121.28	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.72	x	0.7	=	96.22	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.72	x	0.7	=	67.43	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.72	x	0.7	=	39.29	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.72	x	0.7	=	21.3	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.72	x	0.7	=	14.4	(74)
East	0.9x	0.77	x	2.09	x	19.64	x	0.72	x	0.7	=	14.34	(76)
East	0.9x	0.77	x	2.09	x	38.42	x	0.72	x	0.7	=	28.05	(76)
East	0.9x	0.77	x	2.09	x	63.27	x	0.72	x	0.7	=	46.19	(76)
East	0.9x	0.77	x	2.09	x	92.28	x	0.72	x	0.7	=	67.36	(76)
East	0.9x	0.77	x	2.09	x	113.09	x	0.72	x	0.7	=	82.56	(76)
East	0.9x	0.77	x	2.09	x	115.77	x	0.72	x	0.7	=	84.51	(76)
East	0.9x	0.77	x	2.09	x	110.22	x	0.72	x	0.7	=	80.46	(76)
East	0.9x	0.77	x	2.09	x	94.68	x	0.72	x	0.7	=	69.11	(76)
East	0.9x	0.77	x	2.09	x	73.59	x	0.72	x	0.7	=	53.72	(76)
East	0.9x	0.77	x	2.09	x	45.59	x	0.72	x	0.7	=	33.28	(76)
East	0.9x	0.77	x	2.09	x	24.49	x	0.72	x	0.7	=	17.88	(76)
East	0.9x	0.77	x	2.09	x	16.15	x	0.72	x	0.7	=	11.79	(76)
South	0.9x	0.77	x	9.07	x	46.75	x	0.72	x	0.7	=	148.11	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.72	x	0.7	=	242.56	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.72	x	0.7	=	308.98	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.72	x	0.7	=	349.21	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.72	x	0.7	=	363.9	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.72	x	0.7	=	350.2	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.72	x	0.7	=	342.17	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.72	x	0.7	=	332.3	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.72	x	0.7	=	322.76	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.72	x	0.7	=	261.62	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.72	x	0.7	=	175.56	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.72	x	0.7	=	127.98	(78)

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=	179.71	303.61	411.25	506.65	567.8	564.62	543.91	497.63	443.91	334.19	214.74	154.16	(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=	588.71	710.37	803.19	874.66	911.36	884.76	848.94	808.98	767.64	682.09	590.38	550.74	(84)

7a. Mean internal temperature (heating season)

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

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

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

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(86)m=	1	0.99	0.98	0.95	0.87	0.71	0.53	0.58	0.81	0.96	0.99	1	(86)

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

(87)m=	19.77	19.96	20.22	20.54	20.8	20.95	20.99	20.98	20.89	20.55	20.09	19.74	(87)

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

(88)m=	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.98	19.97	19.97	19.96	19.96	(88)

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

(89)m=	1	0.99	0.98	0.93	0.82	0.61	0.42	0.46	0.74	0.95	0.99	1	(89)

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

(90)m=	18.84	19.03	19.29	19.6	19.83	19.95	19.97	19.97	19.91	19.61	19.17	18.81	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.02	19.21	19.47	19.78	20.02	20.14	20.17	20.17	20.1	19.79	19.35	18.99	(92)

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

(93)m=	18.87	19.06	19.32	19.63	19.87	19.99	20.02	20.02	19.95	19.64	19.2	18.84	(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=	1	0.99	0.97	0.92	0.81	0.62	0.42	0.47	0.73	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	585.98	701.98	779.88	808.26	742.01	545.69	357.71	376.35	564	642.15	584.11	548.88	(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=	1574.29	1526.53	1379.09	1143.04	868.76	568.68	360.37	380.73	619.2	961.77	1291.28	1568.78	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	735.31	554.1	445.81	241.04	94.3	0	0	0	0	237.79	509.16	758.81	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 3576.33 (98)

Space heating requirement in kWh/m²/year 38.41 (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 90.5 (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)													
	735.31	554.1	445.81	241.04	94.3	0	0	0	0	237.79	509.16	758.81	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	812.49	612.26	492.61	266.34	104.2	0	0	0	0	262.76	562.61	838.47	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 3951.74 (211)

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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)

	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18

Efficiency of water heater 87.3 (216)

(217)m=	89.87	89.79	89.64	89.3	88.59	87.3	87.3	87.3	87.3	89.27	89.73	89.9

(217)

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

(219)m=	192.73	169.15	175.88	155.38	151.38	134.21	125.99	142.26	143.28	161.34	173.31	187.07

Total = Sum(219a)$_{1...12}$ = 1911.99 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3951.74	
Water heating fuel used		1911.99	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		397.37	(232)

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	=	853.58	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	412.99	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1266.57	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	206.24	(268)
Total CO2, kg/year	sum of (265)...(271) =				1511.73	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				16.24	(273)
EI rating (section 14)					85	(274)

i-Therm Limited
Matt Haskell

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TER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 2

Address : 2 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55 (1a)	x	2.4 (2a)	=	111.72	(3a)
First floor	46.55 (1b)	x	2.6 (2b)	=	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		232.75	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.13 (8)

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

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.38 (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) =	0.32 (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

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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

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

0.41	0.4	0.39	0.35	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.4)+ 0.04]		=	6.16			(27)
Windows Type 2			9.07	x1/[1/(1.4)+ 0.04]		=	12.02			(27)
Windows Type 3			2.09	x1/[1/(1.4)+ 0.04]		=	2.77			(27)
Floor			46.55	x	0.13	=	6.0515			(28)
Walls	96.7	17.91	78.79	x	0.18	=	14.18			(29)
Roof	46.55	0	46.55	x	0.13	=	6.05			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 49.35 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 9.92 (36)

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

Total fabric heat loss (33) + (36) = 59.26 (37)

TER WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.88	44.63	44.38	43.22	43.01	42	42	41.81	42.39	43.01	43.45	43.9	(38)

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

(39)m=	104.14	103.89	103.64	102.49	102.27	101.26	101.26	101.08	101.65	102.27	102.71	103.17	
										Average = Sum(39)$_{1...12}$ /12=		102.49	(39)

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

(40)m=	1.12	1.12	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11	
											Average = Sum(40)$_{1...12}$ /12=	1.1	(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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	
											Total = Sum(44)$_{1...12}$ =	1170.16	(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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	
											Total = Sum(45)$_{1...12}$ =	1534.26	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11	(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) x (41)m

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

TER WorkSheet: New dwelling as built

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

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

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

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

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

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

(61)m=	50.96	46.03	50.69	47.13	46.71	43.28	44.72	46.71	47.13	50.69	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=	210.03	185.15	194.25	172.29	166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01	(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=	210.03	185.15	194.25	172.29	166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01	

Output from water heater (annual) — 2108.57 — (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=	65.63	57.77	60.41	53.4	51.61	45.28	43.11	48.32	48.86	55.88	59.5	63.96	(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=	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	(66)

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

(67)m=	22.5	19.98	16.25	12.3	9.2	7.77	8.39	10.91	14.64	18.59	21.69	23.13	(67)

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

(68)m=	244.67	247.21	240.81	227.19	209.99	193.83	183.04	180.5	186.9	200.52	217.71	233.87	(68)

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

(69)m=	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	88.21	85.96	81.19	74.16	69.37	62.89	57.95	64.94	67.86	75.11	82.64	85.97	(72)

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

(73)m=	421.37	419.14	404.24	379.64	354.55	330.47	315.36	322.34	335.39	360.2	388.03	408.95	(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)

TER WorkSheet: New dwelling as built

North	0.9x	0.77	x	4.65	x	10.63	x	0.63	x	0.7	=	15.11	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.63	x	0.7	=	28.88	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.63	x	0.7	=	49.07	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.63	x	0.7	=	78.82	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.63	x	0.7	=	106.18	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.63	x	0.7	=	113.67	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.63	x	0.7	=	106.12	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.63	x	0.7	=	84.19	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.63	x	0.7	=	59	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.63	x	0.7	=	34.38	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.63	x	0.7	=	18.64	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.63	x	0.7	=	12.6	(74)
East	0.9x	0.77	x	2.09	x	19.64	x	0.63	x	0.7	=	12.54	(76)
East	0.9x	0.77	x	2.09	x	38.42	x	0.63	x	0.7	=	24.54	(76)
East	0.9x	0.77	x	2.09	x	63.27	x	0.63	x	0.7	=	40.41	(76)
East	0.9x	0.77	x	2.09	x	92.28	x	0.63	x	0.7	=	58.94	(76)
East	0.9x	0.77	x	2.09	x	113.09	x	0.63	x	0.7	=	72.24	(76)
East	0.9x	0.77	x	2.09	x	115.77	x	0.63	x	0.7	=	73.95	(76)
East	0.9x	0.77	x	2.09	x	110.22	x	0.63	x	0.7	=	70.4	(76)
East	0.9x	0.77	x	2.09	x	94.68	x	0.63	x	0.7	=	60.47	(76)
East	0.9x	0.77	x	2.09	x	73.59	x	0.63	x	0.7	=	47	(76)
East	0.9x	0.77	x	2.09	x	45.59	x	0.63	x	0.7	=	29.12	(76)
East	0.9x	0.77	x	2.09	x	24.49	x	0.63	x	0.7	=	15.64	(76)
East	0.9x	0.77	x	2.09	x	16.15	x	0.63	x	0.7	=	10.32	(76)
South	0.9x	0.77	x	9.07	x	46.75	x	0.63	x	0.7	=	129.59	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.63	x	0.7	=	212.24	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.63	x	0.7	=	270.36	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.63	x	0.7	=	305.56	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.63	x	0.7	=	318.41	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.63	x	0.7	=	306.43	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.63	x	0.7	=	299.4	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.63	x	0.7	=	290.76	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.63	x	0.7	=	282.42	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.63	x	0.7	=	228.92	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.63	x	0.7	=	153.61	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.63	x	0.7	=	111.98	(78)

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

(83)m=	157.25	265.66	359.84	443.32	496.83	494.04	475.92	435.43	388.42	292.41	187.89	134.89	(83)

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

(84)m=	578.62	684.8	764.08	822.97	851.37	824.52	791.28	757.76	723.81	652.62	575.92	543.85	(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

TER WorkSheet: New dwelling as built

(86)m=	1	0.99	0.98	0.96	0.88	0.73	0.55	0.59	0.83	0.97	0.99	1	(86)

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

(87)m=	19.82	19.99	20.24	20.54	20.8	20.95	20.99	20.99	20.89	20.56	20.13	19.79	(87)

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

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

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

(89)m=	1	0.99	0.98	0.94	0.84	0.64	0.43	0.48	0.75	0.95	0.99	1	(89)

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

(90)m=	18.42	18.67	19.02	19.46	19.8	19.98	20.01	20.01	19.92	19.5	18.88	18.38	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	18.69	18.92	19.26	19.67	19.99	20.16	20.2	20.2	20.11	19.7	19.12	18.65	(92)

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

(93)m=	18.69	18.92	19.26	19.67	19.99	20.16	20.2	20.2	20.11	19.7	19.12	18.65	(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=	1	0.99	0.97	0.93	0.84	0.65	0.46	0.5	0.76	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	575.93	677.28	744.35	768.73	712.95	536.83	360.84	378.25	550.97	618.2	570.02	541.98	(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=	1498.23	1456.86	1322.25	1103.45	848	563.38	364.2	383.59	611.03	930.75	1234.31	1490.61	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	686.18	523.87	429.95	241	100.47	0	0	0	0	232.54	478.29	705.78	

Total per year (kWh/year) = Sum(98)$_{1,5,8,...12}$ = 3398.1 (98)

Space heating requirement in kWh/m²/year 36.5 (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 93.4 (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)													
	686.18	523.87	429.95	241	100.47	0	0	0	0	232.54	478.29	705.78	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	734.67	560.89	460.33	258.03	107.57	0	0	0	0	248.97	512.09	755.66	

Total (kWh/year) =Sum(211)$_{1,5,8,...12}$ = 3638.22 (211)

[redacted]

TER WorkSheet: New dwelling as built

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)

	210.03	185.15	194.25	172.29	166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01

Efficiency of water heater 80.3 (216)

(217)m=	87.81	87.53	86.99	85.9	83.82	80.3	80.3	80.3	80.3	85.69	87.27	87.91	(217)

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

(219)m=	239.18	211.54	223.29	200.58	199	182.96	175.29	195.4	197.56	210.82	219.07	233.2	

Total = Sum(219a)$_{1...12}$ = 2487.89 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3638.22	
Water heating fuel used		2487.89	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		397.37	(232)

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	=	785.86	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	537.38	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1323.24	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	206.24	(268)
Total CO2, kg/year	sum of (265)...(271) =				1568.4	(272)

TER = 16.85 (273)

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[redacted]

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 02 June 2021

Property Details: Plot 2

Dwelling type:	Semi-detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	North
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	6 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	460.84	**(P1)**
Transmission heat loss coefficient:	63.8	
Summer heat loss coefficient:	524.6	**(P2)**

Overhangs

Orientation:	Ratio:	Z_overhangs:
North (Ext)	0	1
South (Ext)	0	1
East (Ext)	0	1

Solar shading

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

Solar gains

Orientation		Area	Flux	g_	FF	Shading	Gains	
North (Ext)	0.9 x	4.65	86.66	0.72	0.7	0.9	164.51	
South (Ext)	0.9 x	9.07	118.4	0.72	0.7	0.9	438.4	
East (Ext)	0.9 x	2.09	124.8	0.72	0.7	0.9	106.48	
						Total	709.39	**(P3/P4)**

Internal gains

	June	July	August	
Internal gains	468.25	448.75	457.6	
Total summer gains	1214.35	1158.14	1108.94	**(P5)**
Summer gain/loss ratio	2.31	2.21	2.11	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	17.96	19.86	19.86	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

Assessment of likelihood of high internal temperature: Not significant

i-Therm Limited
Matt Haskell

Regulations Compliance Report

[redacted]013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8

Printed on 02 June 2021 at 18:59:34

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Semi-detached House

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 93.1m²

Site Reference : Langford **Plot Reference:** Plot 3

Address : 3 Langford Close , CLIMPING, BN17 5FG

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)	16.85 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.27 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	47.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	41.9 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (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	3.95 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 477, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

Regulations Compliance Report

5 Cylinder / Storage

Hot water Storage: No cylinder

6 Controls

Space heating controls	Programmer, room thermostat and TRVs	OK
Hot water controls:	No cylinder	
	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	4.65m²
Windows facing: South	9.07m²
Windows facing: West	2.09m²
Ventilation rate:	6.00

10 Key features

Air permeablility	4.0 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K

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[redacted]

Thermal Bridge Report

Property Details: Plot 3

Address: 3 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.061

External Junctions Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	12.61	E1	[UD]
Sill	0.04	8.66	E3	[A]
Jamb	0.05	26	E4	[A]
Ground floor (normal)	0.076	19.34	E5	[UD]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	19.34	E6	[A]
Eaves (insulation at ceiling level)	0.06	19.34	E10	[A]
Gable (insulation at ceiling level)	0.24	0	E12	[A]
Corner (normal)	0.09	10	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	0	E17	[A]
Flat roof	0.08	0	E14	[D]
Party wall between dwellings	0.06	10	E18	[A]

Party Junctions Details

Ground floor	0.16	9	P1	[D]
Intermediate floor within a dwelling	0	9	P2	[D]
Roof (insulation at ceiling level)	0.24	9	P4	[D]

i-Therm Limited
Matt Haskell

Code for Sustainable Homes Report
For use with Nov 2010 addendum 2014 England

Assessor and Home details

Assessor Name: Matthew Haskell
Assessor Number: STRO006210
Property Address: 3 Langford Close
CLIMPING
BN17 5FG

Building regulation assessment

	kg/m²/year
TER	16.85
DER	16.27

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO_2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2012 DER Worksheet		16.27	*(ZC1)*
TER		16.85	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		16.27	
% improvement DER/TER	3.4		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	16.27	*(ZC1)*
CO2 emissions from appliances, equation (L14)	15.51	*(ZC2)*
CO2 emissions from cooking, equation (L16)	1.97	*(ZC3)*
Net CO2 emissions	35.5	*(ZC8)*

Result:

Credits awarded for ENE 1 = 0.5

Code Level = 3

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 41.87

Credits awarded for ENE 2 = 8

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		35.48	
Standard DER		18	
Actual Case CO2 emissions		35.48	
Actual DER		18	
Reduction in CO2 emissions	0		

Credits awarded for ENE 7 = 0

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

The following requirements must also be met:

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

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

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

i-Therm Limited
Matt Haskell
[redacted]

SAP Input

Property Details: Plot 3

Address:	3 Langford Close , CLIMPING, BN17 5FG
Located in:	England
Region:	South East England
UPRN:	UPRN-514152787952
Date of assessment:	27 May 2021
Date of certificate:	02 June 2021
Assessment type:	New dwelling as built
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:	477

Property description

Dwelling type:	House
Detachment:	Semi-detached
Year Completed:	2021

Floor Location:	**Floor area:**	**Storey height:**
Floor 0	46.55 m²	2.4 m
Floor 1	46.55 m²	2.6 m

Living area:	17.94 m² (fraction 0.193)
Front of dwelling faces:	North

Opening types

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Entrance	Manufacturer	Solid			PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Entrance	mm	0.7	0	1	2.1	1
Ext	16mm or more	0.7	0.72	1.2	4.65	1
Ext	16mm or more	0.7	0.72	1.2	9.07	1
Ext	16mm or more	0.7	0.72	1.2	2.09	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Entrance	Door (1)	External Wall	North	0	0
Ext	Windows (1)	External Wall	North	0	0
Ext	Windows (1)	External Wall	South	0	0
Ext	Windows (1)	External Wall	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 Wall	96.7	17.91	78.79	0.27	0	False	N/A
Plane Roof	46.55	0	46.55	0.11	0		N/A
Ground floor	46.55			0.12			N/A
Internal Elements							
Party Elements							
Party	45						N/A

SAP Input

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.061

	Length	Psi-value		
	12.61	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	8.66	0.04	E3	Sill
[Approved]	26	0.05	E4	Jamb
	19.34	0.076	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	19.34	0.07	E6	Intermediate floor within a dwelling
[Approved]	19.34	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	0	0.24	E12	Gable (insulation at ceiling level)
[Approved]	10	0.09	E16	Corner (normal)
[Approved]	0	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof
[Approved]	10	0.06	E18	Party wall between dwellings
	9	0.16	P1	Ground floor
	9	0	P2	Intermediate floor within a dwelling
	9	0.24	P4	Roof (insulation at ceiling level)

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 4
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3.95 (Assessed dwelling is tested)

Main heating system

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 477, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
Boiler interlock: Yes
Delayed start

Main heating Control

Main heating Control:
Programmer, room thermostat and TRVs
Control code: 2106

Secondary heating system

Secondary heating system: None

Water heating

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

SAP Input

Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 3

Address : 3 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55	(1a) x	2.4	(2a) =	111.72	(3a)
First floor	46.55	(1b) x	2.6	(2b) =	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	232.75	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.17 (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			3.95000004768372 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.37 (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) =	0.31 (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

SAP WorkSheet: New dwelling as built

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

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

0.4	0.39	0.38	0.35	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.2)+ 0.04]		=	5.32			(27)
Windows Type 2			9.07	x1/[1/(1.2)+ 0.04]		=	10.39			(27)
Windows Type 3			2.09	x1/[1/(1.2)+ 0.04]		=	2.39			(27)
Floor			46.55	x	0.12	=	5.586			(28)
Walls	96.7	17.91	78.79	x	0.27	=	21.27			(29)
Roof	46.55	0	46.55	x	0.11	=	5.12			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 52.18 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 11.58 (36)

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

Total fabric heat loss (33) + (36) = 63.76 (37)

SAP WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.56	44.32	44.08	42.98	42.78	41.82	41.82	41.64	42.19	42.78	43.19	43.63	(38)

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

(39)m=	108.32	108.08	107.84	106.74	106.54	105.58	105.58	105.4	105.95	106.54	106.95	107.39	
										Average = Sum(39)$_{1...12}$ /12=		106.74	(39)

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

(40)m=	1.16	1.16	1.16	1.15	1.14	1.13	1.13	1.13	1.14	1.14	1.15	1.15	
										Average = Sum(40)$_{1...12}$ /12=		1.15	(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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	
											Total = Sum(44)$_{1...12}$ =	1170.16	(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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	
											Total = Sum(45)$_{1...12}$ =	1534.26	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11	(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) x (41)m

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

SAP WorkSheet: New dwelling as built

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=	14.14	12.76	14.1	13.6	14.02	13.53	13.96	14	13.57	14.07	13.65	14.13	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	

Output from water heater (annual) — 1699.78 — (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=	56.43	49.45	51.26	45.02	43.44	37.84	35.42	40.14	40.47	46.73	50.58	54.75	(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=	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	(66)

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

(67)m=	56.25	49.96	40.63	30.76	22.99	19.41	20.98	27.27	36.6	46.47	54.23	57.82	(67)

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

(68)m=	365.17	368.96	359.41	339.09	313.42	289.31	273.19	269.4	278.95	299.28	324.94	349.06	(68)

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

(69)m=	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	75.84	73.58	68.9	62.52	58.38	52.56	47.61	53.95	56.21	62.81	70.25	73.59	(72)

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

(73)m=	607.24	602.49	578.92	542.35	504.78	471.25	451.75	460.6	481.74	518.53	559.41	590.45	(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)

[redacted]

SAP WorkSheet: New dwelling as built

North	0.9x	0.77	x	4.65	x	10.63	x	0.72	x	0.7	=	17.27	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.72	x	0.7	=	33	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.72	x	0.7	=	56.08	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.72	x	0.7	=	90.08	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.72	x	0.7	=	121.35	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.72	x	0.7	=	129.91	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.72	x	0.7	=	121.28	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.72	x	0.7	=	96.22	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.72	x	0.7	=	67.43	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.72	x	0.7	=	39.29	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.72	x	0.7	=	21.3	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.72	x	0.7	=	14.4	(74)
South	0.9x	0.77	x	9.07	x	46.75	x	0.72	x	0.7	=	148.11	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.72	x	0.7	=	242.56	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.72	x	0.7	=	308.98	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.72	x	0.7	=	349.21	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.72	x	0.7	=	363.9	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.72	x	0.7	=	350.2	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.72	x	0.7	=	342.17	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.72	x	0.7	=	332.3	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.72	x	0.7	=	322.76	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.72	x	0.7	=	261.62	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.72	x	0.7	=	175.56	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.72	x	0.7	=	127.98	(78)
West	0.9x	0.77	x	2.09	x	19.64	x	0.72	x	0.7	=	14.34	(80)
West	0.9x	0.77	x	2.09	x	38.42	x	0.72	x	0.7	=	28.05	(80)
West	0.9x	0.77	x	2.09	x	63.27	x	0.72	x	0.7	=	46.19	(80)
West	0.9x	0.77	x	2.09	x	92.28	x	0.72	x	0.7	=	67.36	(80)
West	0.9x	0.77	x	2.09	x	113.09	x	0.72	x	0.7	=	82.56	(80)
West	0.9x	0.77	x	2.09	x	115.77	x	0.72	x	0.7	=	84.51	(80)
West	0.9x	0.77	x	2.09	x	110.22	x	0.72	x	0.7	=	80.46	(80)
West	0.9x	0.77	x	2.09	x	94.68	x	0.72	x	0.7	=	69.11	(80)
West	0.9x	0.77	x	2.09	x	73.59	x	0.72	x	0.7	=	53.72	(80)
West	0.9x	0.77	x	2.09	x	45.59	x	0.72	x	0.7	=	33.28	(80)
West	0.9x	0.77	x	2.09	x	24.49	x	0.72	x	0.7	=	17.88	(80)
West	0.9x	0.77	x	2.09	x	16.15	x	0.72	x	0.7	=	11.79	(80)

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

(83)m=	179.71	303.61	411.25	506.65	567.8	564.62	543.91	497.63	443.91	334.19	214.74	154.16	(83)

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

(84)m=	786.96	906.1	990.17	1049	1072.58	1035.87	995.67	958.23	925.64	852.72	774.14	744.61	(84)

7a. 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

SAP WorkSheet: New dwelling as built

(86)m=	0.99	0.98	0.96	0.91	0.8	0.62	0.46	0.5	0.72	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	20.38	20.66	20.87	20.97	20.99	20.99	20.94	20.68	20.27	19.93	(87)

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

(88)m=	19.95	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.96	(88)

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

(89)m=	0.99	0.98	0.95	0.88	0.74	0.54	0.36	0.39	0.64	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=	19.03	19.2	19.44	19.7	19.88	19.96	19.97	19.97	19.94	19.73	19.33	19	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.21	19.38	19.62	19.89	20.07	20.16	20.17	20.17	20.13	19.91	19.51	19.17	(92)

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

(93)m=	19.06	19.23	19.47	19.74	19.92	20.01	20.02	20.02	19.98	19.76	19.36	19.02	(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	0.87	0.74	0.54	0.36	0.4	0.64	0.89	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	775.06	879.1	931.26	915.08	793.97	557.96	359.64	379.34	593.05	754.99	750.81	735.74	(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=	1598.41	1549.23	1398.65	1156.71	875.76	570.68	360.97	381.46	623.2	975.76	1311.71	1592	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	612.57	450.32	347.73	173.97	60.85	0	0	0	0	164.26	403.85	637.06	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 2850.62 (98)

Space heating requirement in kWh/m²/year 30.62 (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 90.5 (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)													
	612.57	450.32	347.73	173.97	60.85	0	0	0	0	164.26	403.85	637.06	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	676.88	497.6	384.24	192.24	67.24	0	0	0	0	181.5	446.24	703.93	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 3149.85 (211)

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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)

	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18

Efficiency of water heater — 87.3 (216)

(217)m=	89.77	89.67	89.48	89.05	88.27	87.3	87.3	87.3	87.3	88.98	89.59	89.81	(217)

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

(219)m=	192.94	169.38	176.2	155.82	151.93	134.21	125.99	142.26	143.28	161.87	173.59	187.25	
Total = Sum(219a)$_{1...12}$ =												1914.73	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3149.85	
Water heating fuel used		1914.73	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year — sum of (230a)...(230g) =		75	(231)
Electricity for lighting		397.37	(232)

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 =	109.61	(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 =	66.63	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(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 =	52.41	(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) =				358.55	(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] =	1.09 (257)
SAP rating (Section 12)		84.79 (258)

12a. CO2 emissions - individual heating systems including micro-CHP:

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	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	680.37	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	413.58	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1093.95	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	206.24	(268)
Total CO2, kg/year		sum of (265)...(271) =			1339.11	(272)
CO2 emissions per m²		(272) ÷ (4) =			14.38	(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	=	3842.82	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.22	=	2335.97	(264)
Space and water heating	(261) + (262) + (263) + (264) =				6178.79	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	230.25	(267)
Electricity for lighting	(232) x		0	=	1219.93	(268)
'Total Primary Energy		sum of (265)...(271) =			7628.97	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			81.94	(273)

i-Therm Limited
Matt Haskell
[redacted]

EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 3

Address : 3 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55	(1a) x	2.4	(2a) =	111.72	(3a)
First floor	46.55	(1b) x	2.6	(2b) =	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	232.75	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.17 (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		3.95000004768372 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.37 (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) =	0.31 (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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

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

0.42	0.38	0.36	0.34	0.35	0.32	0.33	0.31	0.33	0.36	0.36	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.2)+ 0.04]		=	5.32			(27)
Windows Type 2			9.07	x1/[1/(1.2)+ 0.04]		=	10.39			(27)
Windows Type 3			2.09	x1/[1/(1.2)+ 0.04]		=	2.39			(27)
Floor			46.55	x	0.12	=	5.586			(28)
Walls	96.7	17.91	78.79	x	0.27	=	21.27			(29)
Roof	46.55	0	46.55	x	0.11	=	5.12			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 52.18 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 11.58 (36)

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

Total fabric heat loss (33) + (36) = 63.76 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	45.05	43.85	43.41	42.78	42.98	42.38	42.58	42.19	42.58	43.41	43.41	44.08	(38)

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

(39)m=	108.81	107.61	107.17	106.54	106.74	106.14	106.34	105.95	106.34	107.17	107.17	107.84	

Average = Sum(39)$_{1...12}$ /12= 106.98 (39)

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

(40)m=	1.17	1.16	1.15	1.14	1.15	1.14	1.14	1.14	1.14	1.15	1.15	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.15 (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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	

Total = Sum(44)$_{1...12}$ = 1170.16 (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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	

Total = Sum(45)$_{1...12}$ = 1534.26 (45)

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

(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11	(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) x (41)m

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

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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=	14.14	12.76	14.1	13.6	14.02	13.53	13.96	14	13.57	14.07	13.65	14.13	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	

Output from water heater (annual) — 1699.78 — (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=	56.43	49.45	51.26	45.02	43.44	37.84	35.42	40.14	40.47	46.73	50.58	54.75	(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=	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	159.95	(66)

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

(67)m=	56.25	49.96	40.63	30.76	22.99	19.41	20.98	27.27	36.6	46.47	54.23	57.82	(67)

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

(68)m=	365.17	368.96	359.41	339.09	313.42	289.31	273.19	269.4	278.95	299.28	324.94	349.06	(68)

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

(69)m=	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	53.66	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	75.84	73.58	68.9	62.52	58.38	52.56	47.61	53.95	56.21	62.81	70.25	73.59	(72)

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

(73)m=	607.24	602.49	578.92	542.35	504.78	471.25	451.75	460.6	481.74	518.53	559.41	590.45	(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)

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North	0.9x	0.77	x	4.65	x	14.24	x	0.72	x	0.7	=	23.13	(74)
North	0.9x	0.77	x	4.65	x	23.27	x	0.72	x	0.7	=	37.79	(74)
North	0.9x	0.77	x	4.65	x	39.95	x	0.72	x	0.7	=	64.89	(74)
North	0.9x	0.77	x	4.65	x	67.1	x	0.72	x	0.7	=	108.98	(74)
North	0.9x	0.77	x	4.65	x	87.09	x	0.72	x	0.7	=	141.45	(74)
North	0.9x	0.77	x	4.65	x	100.07	x	0.72	x	0.7	=	162.52	(74)
North	0.9x	0.77	x	4.65	x	92.85	x	0.72	x	0.7	=	150.8	(74)
North	0.9x	0.77	x	4.65	x	74.38	x	0.72	x	0.7	=	120.8	(74)
North	0.9x	0.77	x	4.65	x	51.63	x	0.72	x	0.7	=	83.85	(74)
North	0.9x	0.77	x	4.65	x	30.09	x	0.72	x	0.7	=	48.86	(74)
North	0.9x	0.77	x	4.65	x	16.99	x	0.72	x	0.7	=	27.59	(74)
North	0.9x	0.77	x	4.65	x	11.39	x	0.72	x	0.7	=	18.5	(74)
South	0.9x	0.77	x	9.07	x	59.74	x	0.72	x	0.7	=	189.24	(78)
South	0.9x	0.77	x	9.07	x	82.27	x	0.72	x	0.7	=	260.63	(78)
South	0.9x	0.77	x	9.07	x	104.17	x	0.72	x	0.7	=	329.99	(78)
South	0.9x	0.77	x	9.07	x	123.04	x	0.72	x	0.7	=	389.76	(78)
South	0.9x	0.77	x	9.07	x	125.05	x	0.72	x	0.7	=	396.13	(78)
South	0.9x	0.77	x	9.07	x	130.26	x	0.72	x	0.7	=	412.65	(78)
South	0.9x	0.77	x	9.07	x	126	x	0.72	x	0.7	=	399.15	(78)
South	0.9x	0.77	x	9.07	x	122	x	0.72	x	0.7	=	386.47	(78)
South	0.9x	0.77	x	9.07	x	116.65	x	0.72	x	0.7	=	369.54	(78)
South	0.9x	0.77	x	9.07	x	95.67	x	0.72	x	0.7	=	303.07	(78)
South	0.9x	0.77	x	9.07	x	68.13	x	0.72	x	0.7	=	215.82	(78)
South	0.9x	0.77	x	9.07	x	49.76	x	0.72	x	0.7	=	157.62	(78)
West	0.9x	0.77	x	2.09	x	26.63	x	0.72	x	0.7	=	19.44	(80)
West	0.9x	0.77	x	2.09	x	43.95	x	0.72	x	0.7	=	32.08	(80)
West	0.9x	0.77	x	2.09	x	71.91	x	0.72	x	0.7	=	52.49	(80)
West	0.9x	0.77	x	2.09	x	108.59	x	0.72	x	0.7	=	79.27	(80)
West	0.9x	0.77	x	2.09	x	128.14	x	0.72	x	0.7	=	93.54	(80)
West	0.9x	0.77	x	2.09	x	141.01	x	0.72	x	0.7	=	102.93	(80)
West	0.9x	0.77	x	2.09	x	133.32	x	0.72	x	0.7	=	97.32	(80)
West	0.9x	0.77	x	2.09	x	115.5	x	0.72	x	0.7	=	84.31	(80)
West	0.9x	0.77	x	2.09	x	89.42	x	0.72	x	0.7	=	65.28	(80)
West	0.9x	0.77	x	2.09	x	56.26	x	0.72	x	0.7	=	41.07	(80)
West	0.9x	0.77	x	2.09	x	31.99	x	0.72	x	0.7	=	23.35	(80)
West	0.9x	0.77	x	2.09	x	21.09	x	0.72	x	0.7	=	15.39	(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=	231.81	330.5	447.37	578.01	631.12	678.1	647.27	591.58	518.68	393	266.76	191.52	(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=	839.06	932.99	1026.29	1120.36	1135.9	1149.36	1099.03	1052.18	1000.41	911.54	826.17	781.96	(84)

7a. Mean internal temperature (heating season)

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

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

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

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(86)m=	0.98	0.97	0.94	0.86	0.72	0.51	0.37	0.36	0.6	0.85	0.96	0.99	(86)

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

(87)m=	20.16	20.28	20.51	20.76	20.93	20.99	21	21	20.98	20.83	20.47	20.13	(87)

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

(88)m=	19.95	19.96	19.96	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.95	(88)

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

(89)m=	0.98	0.96	0.92	0.82	0.65	0.42	0.27	0.26	0.51	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=	19.21	19.34	19.56	19.79	19.92	19.96	19.97	19.97	19.96	19.85	19.53	19.19	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.39	19.52	19.74	19.98	20.12	20.16	20.17	20.17	20.15	20.04	19.71	19.37	(92)

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

(93)m=	19.24	19.37	19.59	19.83	19.97	20.01	20.02	20.02	20	19.89	19.56	19.22	(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	0.92	0.82	0.65	0.42	0.27	0.26	0.51	0.79	0.94	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	816.16	893.53	940.83	917.1	735.64	485.77	299.04	277.13	511.98	719.36	777.1	764.96	(95)
Monthly average external temperature from Table 8													
(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1473.63	1449.38	1306.49	1079.17	775.63	489.53	299.35	277.37	521.44	823.97	1164.18	1447.28	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	489.16	373.53	272.05	116.69	29.75	0	0	0	0	77.83	278.7	507.65	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 2145.35 (98)

Space heating requirement in kWh/m²/year 23.04 (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 90.5 (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)													
	489.16	373.53	272.05	116.69	29.75	0	0	0	0	77.83	278.7	507.65	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	540.5	412.74	300.61	128.94	32.87	0	0	0	0	86	307.95	560.94	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 2370.55 (211)

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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)

	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18

Efficiency of water heater 87.3 (216)

(217)m=	89.64	89.55	89.3	88.73	87.86	87.3	87.3	87.3	87.3	88.4	89.33	89.68

(217)

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

(219)m=	193.23	169.6	176.56	156.38	152.64	134.21	125.99	142.26	143.28	162.93	174.09	187.53

Total = Sum(219a)$_{1...12}$ = 1918.7 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2370.55	
Water heating fuel used		1918.7	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		397.37	(232)

10a. Fuel costs - individual heating systems:

	Fuel kWh/year		**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x		3.87	x 0.01 =	91.74	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		18.9	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.87	x 0.01 =	74.25	(247)
Pumps, fans and electric keep-hot	(231)		0	x 0.01 =	14.17	(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)		0	x 0.01 =	75.1	(250)
Additional standing charges (Table 12)					93	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				348.27	(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)		85.93 (258)

12a. CO2 emissions - individual heating systems including micro-CHP:

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	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	512.04	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	414.44	(264)
Space and water heating	(261) + (262) + (263) + (264) =				926.48	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	206.24	(268)
Total CO2, kg/year		sum of (265)...(271) =			1171.64	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			12.58	(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	=	2892.07	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.22	=	2340.82	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5232.89	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	230.25	(267)
Electricity for lighting	(232) x		0	=	1219.93	(268)
'Total Primary Energy		sum of (265)...(271) =			6683.07	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			71.78	(273)

[redacted]

TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 3

Address : 3 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55	(1a) x	2.4	(2a) =	111.72	(3a)
First floor	46.55	(1b) x	2.6	(2b) =	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	232.75	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.13 (8)

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

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.38 (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) =	0.32 (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

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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

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

0.41	0.4	0.39	0.35	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.4)+ 0.04]		=	6.16			(27)
Windows Type 2			9.07	x1/[1/(1.4)+ 0.04]		=	12.02			(27)
Windows Type 3			2.09	x1/[1/(1.4)+ 0.04]		=	2.77			(27)
Floor			46.55	x	0.13	=	6.0515			(28)
Walls	96.7	17.91	78.79	x	0.18	=	14.18			(29)
Roof	46.55	0	46.55	x	0.13	=	6.05			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 49.35 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 9.92 (36)

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

Total fabric heat loss (33) + (36) = 59.26 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.88	44.63	44.38	43.22	43.01	42	42	41.81	42.39	43.01	43.45	43.9	(38)

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

(39)m=	104.14	103.89	103.64	102.49	102.27	101.26	101.26	101.08	101.65	102.27	102.71	103.17	
										Average = Sum(39)$_{1...12}$ /12=		102.49	(39)

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

(40)m=	1.12	1.12	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11	
											Average = Sum(40)$_{1...12}$ /12=	1.1	(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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	
											Total = Sum(44)$_{1...12}$ =	1170.16	(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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	
											Total = Sum(45)$_{1...12}$ =	1534.26	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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) x (41)m

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

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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=	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=	135.21	118.26	122.03	106.39	102.08	88.09	81.63	93.67	94.79	110.46	120.58	130.94	(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=	135.21	118.26	122.03	106.39	102.08	88.09	81.63	93.67	94.79	110.46	120.58	130.94	

Output from water heater (annual) — 1304.12 — (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=	33.8	29.56	30.51	26.6	25.52	22.02	20.41	23.42	23.7	27.62	30.15	32.74	(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=	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	(66)

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

(67)m=	22.5	19.98	16.25	12.3	9.2	7.77	8.39	10.91	14.64	18.59	21.69	23.13	(67)

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

(68)m=	244.67	247.21	240.81	227.19	209.99	193.83	183.04	180.5	186.9	200.52	217.71	233.87	(68)

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

(69)m=	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	45.43	43.99	41	36.94	34.3	30.59	27.43	31.47	32.91	37.12	41.87	44	(72)

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

(73)m=	375.59	374.17	361.05	339.42	316.48	295.17	281.85	285.87	297.44	319.21	344.26	363.98	(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)

[redacted]

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North	0.9x	0.77	x	4.65	x	10.63	x	0.63	x	0.7	=	15.11	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.63	x	0.7	=	28.88	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.63	x	0.7	=	49.07	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.63	x	0.7	=	78.82	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.63	x	0.7	=	106.18	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.63	x	0.7	=	113.67	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.63	x	0.7	=	106.12	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.63	x	0.7	=	84.19	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.63	x	0.7	=	59	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.63	x	0.7	=	34.38	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.63	x	0.7	=	18.64	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.63	x	0.7	=	12.6	(74)
South	0.9x	0.77	x	9.07	x	46.75	x	0.63	x	0.7	=	129.59	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.63	x	0.7	=	212.24	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.63	x	0.7	=	270.36	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.63	x	0.7	=	305.56	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.63	x	0.7	=	318.41	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.63	x	0.7	=	306.43	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.63	x	0.7	=	299.4	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.63	x	0.7	=	290.76	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.63	x	0.7	=	282.42	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.63	x	0.7	=	228.92	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.63	x	0.7	=	153.61	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.63	x	0.7	=	111.98	(78)
West	0.9x	0.77	x	2.09	x	19.64	x	0.63	x	0.7	=	12.54	(80)
West	0.9x	0.77	x	2.09	x	38.42	x	0.63	x	0.7	=	24.54	(80)
West	0.9x	0.77	x	2.09	x	63.27	x	0.63	x	0.7	=	40.41	(80)
West	0.9x	0.77	x	2.09	x	92.28	x	0.63	x	0.7	=	58.94	(80)
West	0.9x	0.77	x	2.09	x	113.09	x	0.63	x	0.7	=	72.24	(80)
West	0.9x	0.77	x	2.09	x	115.77	x	0.63	x	0.7	=	73.95	(80)
West	0.9x	0.77	x	2.09	x	110.22	x	0.63	x	0.7	=	70.4	(80)
West	0.9x	0.77	x	2.09	x	94.68	x	0.63	x	0.7	=	60.47	(80)
West	0.9x	0.77	x	2.09	x	73.59	x	0.63	x	0.7	=	47	(80)
West	0.9x	0.77	x	2.09	x	45.59	x	0.63	x	0.7	=	29.12	(80)
West	0.9x	0.77	x	2.09	x	24.49	x	0.63	x	0.7	=	15.64	(80)
West	0.9x	0.77	x	2.09	x	16.15	x	0.63	x	0.7	=	10.32	(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=	157.25	265.66	359.84	443.32	496.83	494.04	475.92	435.43	388.42	292.41	187.89	134.89	(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=	532.84	639.83	720.89	782.74	813.31	789.22	757.77	721.29	685.86	611.63	532.16	498.88	(84)

7a. Mean internal temperature (heating season)

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

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

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

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(86)m=	1	1	0.99	0.96	0.9	0.75	0.57	0.62	0.85	0.98	1	1	(86)

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

(87)m=	19.78	19.95	20.2	20.51	20.77	20.94	20.99	20.98	20.88	20.52	20.09	19.74	(87)

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

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

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

(89)m=	1	0.99	0.98	0.95	0.86	0.66	0.45	0.5	0.78	0.96	0.99	1	(89)

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

(90)m=	18.87	19.04	19.29	19.6	19.85	19.98	20.01	20.01	19.94	19.62	19.19	18.84	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.04	19.22	19.47	19.77	20.03	20.17	20.2	20.2	20.12	19.8	19.36	19.02	(92)

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

(93)m=	19.04	19.22	19.47	19.77	20.03	20.17	20.2	20.2	20.12	19.8	19.36	19.02	(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=	1	0.99	0.98	0.95	0.86	0.67	0.48	0.52	0.79	0.96	0.99	1	(94)

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

(95)m=	531.32	635.07	707.14	741.06	697.56	532.48	360.15	377.01	540.73	587.27	528.64	497.86	(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=	1535.34	1487.42	1343.77	1114.47	851.46	563.78	364.21	383.6	612.04	940.55	1259.41	1528.7	(97)

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

(98)m=	746.99	572.78	473.65	268.86	114.5	0	0	0	0	262.84	526.15	766.95	

Total per year (kWh/year) = Sum(98)$_{1,...,12}$ = 3732.72 (98)

Space heating requirement in kWh/m²/year 40.09 (99)

9a. Space cooling requirement

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

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

Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	951.87	749.34	768.18	0	0	0	0	(100)

Utilisation factor for loss hm

(101)m=	0	0	0	0	0	0.87	0.93	0.91	0	0	0	0	(101)

Useful loss, hmLm (Watts) = (100)m x (101)m

(102)m=	0	0	0	0	0	827.27	697.33	701.51	0	0	0	0	(102)

Gains (solar gains calculated for applicable weather region, see Table 10)

(103)m=	0	0	0	0	0	1023.73	984.85	944.06	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	141.46	213.91	180.46	0	0	0	0	

Total = Sum(104) = 535.83 (104)

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f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104) = 0 (106)

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

(107)m=	0	0	0	0	0	35.36	53.48	45.11	0	0	0	0

Total = Sum(107) = 133.96 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 1.44 (108)

Fabric Energy Efficiency is calculated only if under Specific conditions. See Section 11.

Fabric Energy Efficiency (99) + (108) = 41.53 (109)

Target Fabric Energy Efficiency (TFEE) 47.76 (109)

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[redacted]

DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 3

Address : 3 Langford Close , CLIMPING, BN17 5FG

1 Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55	(1a) x	2.4	(2a) =	111.72	(3a)
First floor	46.55	(1b) x	2.6	(2b) =	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	232.75	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.13 (8)

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

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.95000004768372 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.33 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.28 (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

DFEE WorkSheet: New dwelling as built

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

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

0.35	0.35	0.34	0.31	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.33

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.2)+ 0.04]		=	5.32			(27)
Windows Type 2			9.07	x1/[1/(1.2)+ 0.04]		=	10.39			(27)
Windows Type 3			2.09	x1/[1/(1.2)+ 0.04]		=	2.39			(27)
Floor			46.55	x	0.12	=	5.586			(28)
Walls	96.7	17.91	78.79	x	0.27	=	21.27			(29)
Roof	46.55	0	46.55	x	0.11	=	5.12			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 52.18 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 11.58 (36)

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

Total fabric heat loss (33) + (36) = 63.76 (37)

DFEE WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	43.21	43.02	42.84	41.98	41.82	41.07	41.07	40.93	41.36	41.82	42.14	42.48	(38)

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

(39)m=	106.97	106.78	106.6	105.74	105.58	104.83	104.83	104.69	105.12	105.58	105.9	106.24	
										Average = Sum(39)$_{1...12}$ /12=		105.74	(39)

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

(40)m=	1.15	1.15	1.14	1.14	1.13	1.13	1.13	1.12	1.13	1.13	1.14	1.14	
										Average = Sum(40)$_{1...12}$ /12=		1.14	(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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	
											Total = Sum(44)$_{1...12}$ =	1170.16	(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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	
											Total = Sum(45)$_{1...12}$ =	1534.26	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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) x (41)m

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

DFEE WorkSheet: New dwelling as built

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=	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=	135.21	118.26	122.03	106.39	102.08	88.09	81.63	93.67	94.79	110.46	120.58	130.94	(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=	135.21	118.26	122.03	106.39	102.08	88.09	81.63	93.67	94.79	110.46	120.58	130.94	

Output from water heater (annual) — 1304.12 — (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=	33.8	29.56	30.51	26.6	25.52	22.02	20.41	23.42	23.7	27.62	30.15	32.74	(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=	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	(66)

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

(67)m=	22.5	19.98	16.25	12.3	9.2	7.77	8.39	10.91	14.64	18.59	21.69	23.13	(67)

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

(68)m=	244.67	247.21	240.81	227.19	209.99	193.83	183.04	180.5	186.9	200.52	217.71	233.87	(68)

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

(69)m=	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	45.43	43.99	41	36.94	34.3	30.59	27.43	31.47	32.91	37.12	41.87	44	(72)

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

(73)m=	375.59	374.17	361.05	339.42	316.48	295.17	281.85	285.87	297.44	319.21	344.26	363.98	(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)

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North	0.9x	0.77	x	4.65	x	10.63	x	0.72	x	0.7	=	17.27	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.72	x	0.7	=	33	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.72	x	0.7	=	56.08	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.72	x	0.7	=	90.08	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.72	x	0.7	=	121.35	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.72	x	0.7	=	129.91	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.72	x	0.7	=	121.28	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.72	x	0.7	=	96.22	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.72	x	0.7	=	67.43	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.72	x	0.7	=	39.29	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.72	x	0.7	=	21.3	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.72	x	0.7	=	14.4	(74)
South	0.9x	0.77	x	9.07	x	46.75	x	0.72	x	0.7	=	148.11	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.72	x	0.7	=	242.56	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.72	x	0.7	=	308.98	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.72	x	0.7	=	349.21	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.72	x	0.7	=	363.9	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.72	x	0.7	=	350.2	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.72	x	0.7	=	342.17	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.72	x	0.7	=	332.3	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.72	x	0.7	=	322.76	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.72	x	0.7	=	261.62	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.72	x	0.7	=	175.56	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.72	x	0.7	=	127.98	(78)
West	0.9x	0.77	x	2.09	x	19.64	x	0.72	x	0.7	=	14.34	(80)
West	0.9x	0.77	x	2.09	x	38.42	x	0.72	x	0.7	=	28.05	(80)
West	0.9x	0.77	x	2.09	x	63.27	x	0.72	x	0.7	=	46.19	(80)
West	0.9x	0.77	x	2.09	x	92.28	x	0.72	x	0.7	=	67.36	(80)
West	0.9x	0.77	x	2.09	x	113.09	x	0.72	x	0.7	=	82.56	(80)
West	0.9x	0.77	x	2.09	x	115.77	x	0.72	x	0.7	=	84.51	(80)
West	0.9x	0.77	x	2.09	x	110.22	x	0.72	x	0.7	=	80.46	(80)
West	0.9x	0.77	x	2.09	x	94.68	x	0.72	x	0.7	=	69.11	(80)
West	0.9x	0.77	x	2.09	x	73.59	x	0.72	x	0.7	=	53.72	(80)
West	0.9x	0.77	x	2.09	x	45.59	x	0.72	x	0.7	=	33.28	(80)
West	0.9x	0.77	x	2.09	x	24.49	x	0.72	x	0.7	=	17.88	(80)
West	0.9x	0.77	x	2.09	x	16.15	x	0.72	x	0.7	=	11.79	(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=	179.71	303.61	411.25	506.65	567.8	564.62	543.91	497.63	443.91	334.19	214.74	154.16	(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=	555.3	677.78	772.3	846.07	884.28	859.79	825.76	783.5	741.35	653.4	559	518.15	(84)

7a. Mean internal temperature (heating season)

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

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

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

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(86)m=	1	0.99	0.98	0.95	0.88	0.72	0.55	0.59	0.83	0.97	1	1	(86)

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

(87)m=	19.76	19.95	20.21	20.52	20.79	20.95	20.99	20.98	20.89	20.53	20.07	19.72	(87)

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

(88)m=	19.96	19.96	19.96	19.97	19.97	19.98	19.98	19.98	19.98	19.97	19.97	19.97	(88)

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

(89)m=	1	0.99	0.98	0.94	0.83	0.63	0.43	0.47	0.75	0.96	0.99	1	(89)

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

(90)m=	18.83	19.02	19.28	19.59	19.83	19.96	19.98	19.98	19.92	19.6	19.15	18.8	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.01	19.2	19.46	19.77	20.02	20.15	20.17	20.17	20.1	19.78	19.33	18.98	(92)

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

(93)m=	19.01	19.2	19.46	19.77	20.02	20.15	20.17	20.17	20.1	19.78	19.33	18.98	(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	
Utilisation factor for gains, hm:													
(94)m=	1	0.99	0.98	0.93	0.83	0.64	0.45	0.5	0.76	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	553.39	671.42	753.6	790.26	736.29	553.34	370.83	388.77	565.04	621.86	554.49	516.87	(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=	1573.31	1526.63	1381.25	1149.39	878.09	581.39	374.45	394.72	631.01	969.42	1295.31	1569.74	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	758.82	574.7	466.97	258.58	105.5	0	0	0	0	258.58	533.4	783.34	

Total per year (kWh/year) = Sum(98)$_{1,...,12}$ = 3739.88 (98)

Space heating requirement in kWh/m²/year 40.17 (99)

9a. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	985.4	775.74	795.65	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.88	0.94	0.92	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	867.83	726.91	732.15	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1106.23	1064.32	1016.77	0	0	0	0	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m set (104)m to zero if (104)m < 3 × (98)m													
(104)m=	0	0	0	0	0	171.65	251.03	211.76	0	0	0	0	

Total = Sum(104) = 634.44 (104)

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[redacted]

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

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104) = 0 (106)

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

(107)m=	0	0	0	0	0	42.91	62.76	52.94	0	0	0	0

Total = Sum(107) = 158.61 (107)

Space cooling requirement in kWh/m²/year — (107) ÷ (4) = 1.7 (108)

9a. Energy Efficiency rating (calculated only if under-floor heating, see section 11)

Fabric Energy Efficiency — (99) + (108) = 41.87 (109)

i-Therm Limited
Matt Haskell
[redacted]

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 3

Address : 3 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55	(1a) x	2.4	(2a) =	111.72	(3a)
First floor	46.55	(1b) x	2.6	(2b) =	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	232.75	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.17 (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		3.95000004768372 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.37 (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) =	0.31 (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

DER WorkSheet: New dwelling as built

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

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

0.4	0.39	0.38	0.35	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.2)+ 0.04]		=	5.32			(27)
Windows Type 2			9.07	x1/[1/(1.2)+ 0.04]		=	10.39			(27)
Windows Type 3			2.09	x1/[1/(1.2)+ 0.04]		=	2.39			(27)
Floor			46.55	x	0.12	=	5.586			(28)
Walls	96.7	17.91	78.79	x	0.27	=	21.27			(29)
Roof	46.55	0	46.55	x	0.11	=	5.12			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 52.18 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 11.58 (36)

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

Total fabric heat loss (33) + (36) = 63.76 (37)

DER WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.56	44.32	44.08	42.98	42.78	41.82	41.82	41.64	42.19	42.78	43.19	43.63	(38)

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

(39)m=	108.32	108.08	107.84	106.74	106.54	105.58	105.58	105.4	105.95	106.54	106.95	107.39	
											Average = Sum(39)$_{1...12}$ /12=	106.74	(39)

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

(40)m=	1.16	1.16	1.16	1.15	1.14	1.13	1.13	1.13	1.14	1.14	1.15	1.15	
											Average = Sum(40)$_{1...12}$ /12=	1.15	(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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	
											Total = Sum(44)$_{1...12}$ =	1170.16	(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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	
											Total = Sum(45)$_{1...12}$ =	1534.26	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11	(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) x (41)m

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

DER WorkSheet: New dwelling as built

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=	14.14	12.76	14.1	13.6	14.02	13.53	13.96	14	13.57	14.07	13.65	14.13	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	(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=	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18	

Output from water heater (annual)... 1699.78 (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=	56.43	49.45	51.26	45.02	43.44	37.84	35.42	40.14	40.47	46.73	50.58	54.75	(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=	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	(66)

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

(67)m=	22.5	19.98	16.25	12.3	9.2	7.77	8.39	10.91	14.64	18.59	21.69	23.13	(67)

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

(68)m=	244.67	247.21	240.81	227.19	209.99	193.83	183.04	180.5	186.9	200.52	217.71	233.87	(68)

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

(69)m=	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	75.84	73.58	68.9	62.52	58.38	52.56	47.61	53.95	56.21	62.81	70.25	73.59	(72)

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

(73)m=	409	406.76	391.95	368	343.56	320.14	305.03	311.35	323.73	347.9	375.65	396.58	(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)

DER WorkSheet: New dwelling as built

North	0.9x	0.77	x	4.65	x	10.63	x	0.72	x	0.7	=	17.27	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.72	x	0.7	=	33	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.72	x	0.7	=	56.08	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.72	x	0.7	=	90.08	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.72	x	0.7	=	121.35	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.72	x	0.7	=	129.91	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.72	x	0.7	=	121.28	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.72	x	0.7	=	96.22	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.72	x	0.7	=	67.43	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.72	x	0.7	=	39.29	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.72	x	0.7	=	21.3	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.72	x	0.7	=	14.4	(74)
South	0.9x	0.77	x	9.07	x	46.75	x	0.72	x	0.7	=	148.11	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.72	x	0.7	=	242.56	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.72	x	0.7	=	308.98	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.72	x	0.7	=	349.21	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.72	x	0.7	=	363.9	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.72	x	0.7	=	350.2	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.72	x	0.7	=	342.17	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.72	x	0.7	=	332.3	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.72	x	0.7	=	322.76	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.72	x	0.7	=	261.62	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.72	x	0.7	=	175.56	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.72	x	0.7	=	127.98	(78)
West	0.9x	0.77	x	2.09	x	19.64	x	0.72	x	0.7	=	14.34	(80)
West	0.9x	0.77	x	2.09	x	38.42	x	0.72	x	0.7	=	28.05	(80)
West	0.9x	0.77	x	2.09	x	63.27	x	0.72	x	0.7	=	46.19	(80)
West	0.9x	0.77	x	2.09	x	92.28	x	0.72	x	0.7	=	67.36	(80)
West	0.9x	0.77	x	2.09	x	113.09	x	0.72	x	0.7	=	82.56	(80)
West	0.9x	0.77	x	2.09	x	115.77	x	0.72	x	0.7	=	84.51	(80)
West	0.9x	0.77	x	2.09	x	110.22	x	0.72	x	0.7	=	80.46	(80)
West	0.9x	0.77	x	2.09	x	94.68	x	0.72	x	0.7	=	69.11	(80)
West	0.9x	0.77	x	2.09	x	73.59	x	0.72	x	0.7	=	53.72	(80)
West	0.9x	0.77	x	2.09	x	45.59	x	0.72	x	0.7	=	33.28	(80)
West	0.9x	0.77	x	2.09	x	24.49	x	0.72	x	0.7	=	17.88	(80)
West	0.9x	0.77	x	2.09	x	16.15	x	0.72	x	0.7	=	11.79	(80)

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

(83)m=	179.71	303.61	411.25	506.65	567.8	564.62	543.91	497.63	443.91	334.19	214.74	154.16	(83)

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

(84)m=	588.71	710.37	803.19	874.66	911.36	884.76	848.94	808.98	767.64	682.09	590.38	550.74	(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

DER WorkSheet: New dwelling as built

(86)m=	1	0.99	0.98	0.95	0.87	0.71	0.54	0.58	0.81	0.96	0.99	1	(86)

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

(87)m=	19.77	19.96	20.22	20.53	20.8	20.95	20.99	20.98	20.89	20.55	20.09	19.74	(87)

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

(88)m=	19.95	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.96	(88)

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

(89)m=	1	0.99	0.98	0.93	0.82	0.62	0.42	0.46	0.74	0.95	0.99	1	(89)

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

(90)m=	18.83	19.02	19.28	19.59	19.83	19.95	19.97	19.97	19.91	19.61	19.16	18.81	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	19.01	19.2	19.46	19.77	20.02	20.14	20.17	20.17	20.1	19.79	19.34	18.98	(92)

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

(93)m=	18.86	19.05	19.31	19.62	19.87	19.99	20.02	20.02	19.95	19.64	19.19	18.83	(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=	1	0.99	0.97	0.92	0.81	0.62	0.42	0.47	0.74	0.94	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	585.97	701.99	779.93	808.43	742.44	546.16	358.07	376.7	564.39	642.24	584.12	548.88	(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=	1577.56	1529.58	1381.73	1144.81	870.05	569.34	360.76	381.12	619.98	963.17	1293.37	1571.58	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	737.74	556.14	447.73	242.19	94.94	0	0	0	0	238.77	510.67	760.89	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 3589.08 (98)

Space heating requirement in kWh/m²/year 38.55 (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 90.5 (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)													
	737.74	556.14	447.73	242.19	94.94	0	0	0	0	238.77	510.67	760.89	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	815.18	614.52	494.73	267.62	104.91	0	0	0	0	263.83	564.27	840.76	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 3965.83 (211)

DER WorkSheet: New dwelling as built

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)

	173.21	151.88	157.66	138.76	134.12	117.16	109.99	124.2	125.08	144.03	155.51	168.18

Efficiency of water heater 87.3 (216)

(217)m=	89.87	89.79	89.64	89.31	88.6	87.3	87.3	87.3	87.3	89.27	89.73	89.9	(217)

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

(219)m=	192.72	169.15	175.88	155.38	151.38	134.21	125.99	142.26	143.28	161.34	173.31	187.06	

Total = Sum(219a)$_{1,...12}$ = 1911.95 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3965.83	
Water heating fuel used		1911.95	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		397.37	(232)

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	=	856.62	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	412.98	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1269.6	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	206.24	(268)
Total CO2, kg/year	sum of (265)...(271) =				1514.76	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				16.27	(273)
EI rating (section 14)					85	(274)

TER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 3

Address : 3 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	46.55 (1a)	x	2.4 (2a)	=	111.72	(3a)
First floor	46.55 (1b)	x	2.6 (2b)	=	121.03	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	93.1 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		232.75	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.13 (8)

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

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.38 (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) =	0.32 (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

TER WorkSheet: New dwelling as built

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

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

0.41	0.4	0.39	0.35	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			4.65	x1/[1/(1.4)+ 0.04]		=	6.16			(27)
Windows Type 2			9.07	x1/[1/(1.4)+ 0.04]		=	12.02			(27)
Windows Type 3			2.09	x1/[1/(1.4)+ 0.04]		=	2.77			(27)
Floor			46.55	x	0.13	=	6.0515			(28)
Walls	96.7	17.91	78.79	x	0.18	=	14.18			(29)
Roof	46.55	0	46.55	x	0.13	=	6.05			(30)
Total area of elements, m²			189.8							(31)
Party wall			45	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 49.35 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15216.85 (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 9.92 (36)

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

Total fabric heat loss (33) + (36) = 59.26 (37)

TER WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	44.88	44.63	44.38	43.22	43.01	42	42	41.81	42.39	43.01	43.45	43.9	(38)

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

(39)m=	104.14	103.89	103.64	102.49	102.27	101.26	101.26	101.08	101.65	102.27	102.71	103.17	
										Average = Sum(39)$_{1...12}$ /12=		102.49	(39)

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

(40)m=	1.12	1.12	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11	
											Average = Sum(40)$_{1...12}$ /12=	1.1	(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 2.67 (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 97.51 (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=	107.26	103.36	99.46	95.56	91.66	87.76	87.76	91.66	95.56	99.46	103.36	107.26	
											Total = Sum(44)$_{1...12}$ =	1170.16	(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=	159.07	139.12	143.56	125.16	120.1	103.63	96.03	110.2	111.51	129.96	141.86	154.05	
											Total = Sum(45)$_{1...12}$ =	1534.26	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	23.86	20.87	21.53	18.77	18.01	15.55	14.4	16.53	16.73	19.49	21.28	23.11	(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) x (41)m

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

TER WorkSheet: New dwelling as built

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

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

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

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

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

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

(61)m=	50.96	46.03	50.69	47.13	46.71	43.28	44.72	46.71	47.13	50.69	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=	210.03	185.15	194.25	172.29	166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01	(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=	210.03	185.15	194.25	172.29	166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01	

Output from water heater (annual)... 2108.57 (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=	65.63	57.77	60.41	53.4	51.61	45.28	43.11	48.32	48.86	55.88	59.5	63.96	(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=	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	133.29	(66)

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

(67)m=	22.5	19.98	16.25	12.3	9.2	7.77	8.39	10.91	14.64	18.59	21.69	23.13	(67)

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

(68)m=	244.67	247.21	240.81	227.19	209.99	193.83	183.04	180.5	186.9	200.52	217.71	233.87	(68)

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

(69)m=	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	36.33	(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=	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	-106.63	(71)

Water heating gains (Table 5)

(72)m=	88.21	85.96	81.19	74.16	69.37	62.89	57.95	64.94	67.86	75.11	82.64	85.97	(72)

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

(73)m=	421.37	419.14	404.24	379.64	354.55	330.47	315.36	322.34	335.39	360.2	388.03	408.95	(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)

TER WorkSheet: New dwelling as built

North	0.9x	0.77	x	4.65	x	10.63	x	0.63	x	0.7	=	15.11	(74)
North	0.9x	0.77	x	4.65	x	20.32	x	0.63	x	0.7	=	28.88	(74)
North	0.9x	0.77	x	4.65	x	34.53	x	0.63	x	0.7	=	49.07	(74)
North	0.9x	0.77	x	4.65	x	55.46	x	0.63	x	0.7	=	78.82	(74)
North	0.9x	0.77	x	4.65	x	74.72	x	0.63	x	0.7	=	106.18	(74)
North	0.9x	0.77	x	4.65	x	79.99	x	0.63	x	0.7	=	113.67	(74)
North	0.9x	0.77	x	4.65	x	74.68	x	0.63	x	0.7	=	106.12	(74)
North	0.9x	0.77	x	4.65	x	59.25	x	0.63	x	0.7	=	84.19	(74)
North	0.9x	0.77	x	4.65	x	41.52	x	0.63	x	0.7	=	59	(74)
North	0.9x	0.77	x	4.65	x	24.19	x	0.63	x	0.7	=	34.38	(74)
North	0.9x	0.77	x	4.65	x	13.12	x	0.63	x	0.7	=	18.64	(74)
North	0.9x	0.77	x	4.65	x	8.86	x	0.63	x	0.7	=	12.6	(74)
South	0.9x	0.77	x	9.07	x	46.75	x	0.63	x	0.7	=	129.59	(78)
South	0.9x	0.77	x	9.07	x	76.57	x	0.63	x	0.7	=	212.24	(78)
South	0.9x	0.77	x	9.07	x	97.53	x	0.63	x	0.7	=	270.36	(78)
South	0.9x	0.77	x	9.07	x	110.23	x	0.63	x	0.7	=	305.56	(78)
South	0.9x	0.77	x	9.07	x	114.87	x	0.63	x	0.7	=	318.41	(78)
South	0.9x	0.77	x	9.07	x	110.55	x	0.63	x	0.7	=	306.43	(78)
South	0.9x	0.77	x	9.07	x	108.01	x	0.63	x	0.7	=	299.4	(78)
South	0.9x	0.77	x	9.07	x	104.89	x	0.63	x	0.7	=	290.76	(78)
South	0.9x	0.77	x	9.07	x	101.89	x	0.63	x	0.7	=	282.42	(78)
South	0.9x	0.77	x	9.07	x	82.59	x	0.63	x	0.7	=	228.92	(78)
South	0.9x	0.77	x	9.07	x	55.42	x	0.63	x	0.7	=	153.61	(78)
South	0.9x	0.77	x	9.07	x	40.4	x	0.63	x	0.7	=	111.98	(78)
West	0.9x	0.77	x	2.09	x	19.64	x	0.63	x	0.7	=	12.54	(80)
West	0.9x	0.77	x	2.09	x	38.42	x	0.63	x	0.7	=	24.54	(80)
West	0.9x	0.77	x	2.09	x	63.27	x	0.63	x	0.7	=	40.41	(80)
West	0.9x	0.77	x	2.09	x	92.28	x	0.63	x	0.7	=	58.94	(80)
West	0.9x	0.77	x	2.09	x	113.09	x	0.63	x	0.7	=	72.24	(80)
West	0.9x	0.77	x	2.09	x	115.77	x	0.63	x	0.7	=	73.95	(80)
West	0.9x	0.77	x	2.09	x	110.22	x	0.63	x	0.7	=	70.4	(80)
West	0.9x	0.77	x	2.09	x	94.68	x	0.63	x	0.7	=	60.47	(80)
West	0.9x	0.77	x	2.09	x	73.59	x	0.63	x	0.7	=	47	(80)
West	0.9x	0.77	x	2.09	x	45.59	x	0.63	x	0.7	=	29.12	(80)
West	0.9x	0.77	x	2.09	x	24.49	x	0.63	x	0.7	=	15.64	(80)
West	0.9x	0.77	x	2.09	x	16.15	x	0.63	x	0.7	=	10.32	(80)

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

(83)m=	157.25	265.66	359.84	443.32	496.83	494.04	475.92	435.43	388.42	292.41	187.89	134.89	(83)

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

(84)m=	578.62	684.8	764.08	822.97	851.37	824.52	791.28	757.76	723.81	652.62	575.92	543.85	(84)

7a. Mean internal temperature (heating season)

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

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

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

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(86)m=	1	0.99	0.98	0.96	0.88	0.73	0.55	0.59	0.83	0.97	0.99	1	(86)

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

(87)m=	19.82	19.99	20.24	20.54	20.8	20.95	20.99	20.99	20.89	20.56	20.13	19.79	(87)

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

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

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

(89)m=	1	0.99	0.98	0.94	0.84	0.64	0.43	0.48	0.75	0.95	0.99	1	(89)

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

(90)m=	18.42	18.67	19.02	19.46	19.8	19.98	20.01	20.01	19.92	19.5	18.88	18.38	(90)

fLA = Living area ÷ (4) = 0.19 (91)

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

(92)m=	18.69	18.92	19.26	19.67	19.99	20.16	20.2	20.2	20.11	19.7	19.12	18.65	(92)

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

(93)m=	18.69	18.92	19.26	19.67	19.99	20.16	20.2	20.2	20.11	19.7	19.12	18.65	(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=	1	0.99	0.97	0.93	0.84	0.65	0.46	0.5	0.76	0.95	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	575.93	677.28	744.35	768.73	712.95	536.83	360.84	378.25	550.97	618.2	570.02	541.98	(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=	1498.23	1456.86	1322.25	1103.45	848	563.38	364.2	383.59	611.03	930.75	1234.31	1490.61	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	686.18	523.87	429.95	241	100.47	0	0	0	0	232.54	478.29	705.78	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 3398.1 (98)

Space heating requirement in kWh/m²/year 36.5 (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 93.4 (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)													
	686.18	523.87	429.95	241	100.47	0	0	0	0	232.54	478.29	705.78	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	734.67	560.89	460.33	258.03	107.57	0	0	0	0	248.97	512.09	755.66	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 3638.22 (211)

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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)

	210.03	185.15	194.25	172.29	166.81	146.91	140.75	156.91	158.64	180.64	191.18	205.01

Efficiency of water heater	80.3	(216)

(217)m=	87.81	87.53	86.99	85.9	83.82	80.3	80.3	80.3	80.3	85.69	87.27	87.91	(217)

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

(219)m=	239.18	211.54	223.29	200.58	199	182.96	175.29	195.4	197.56	210.82	219.07	233.2	
Total = Sum(219a)$_{1...12}$ =												2487.89	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3638.22	
Water heating fuel used		2487.89	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		397.37	(232)

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	=	785.86	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	537.38	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1323.24	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	206.24	(268)
Total CO2, kg/year	sum of (265)...(271) =			1568.4	(272)

TER = 16.85 (273)

i-Therm Limited
Matt Haskell
[redacted]

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 02 June 2021

Property Address: [redacted]

Dwelling type:	Semi-detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	North
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	6 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	460.84	**(P1)**
Transmission heat loss coefficient:	63.8	
Summer heat loss coefficient:	524.6	**(P2)**

Overhangs

Orientation:	**Ratio:**	**Z_overhangs:**
North (Ext)	0	1
South (Ext)	0	1
West (Ext)	0	1

Solar shading

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
North (Ext)	1	0.9	1	0.9	**(P8)**
South (Ext)	1	0.9	1	0.9	**(P8)**
West (Ext)	1	0.9	1	0.9	**(P8)**

Solar gains

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
North (Ext)	0.9 x	4.65	86.66	0.72	0.7	0.9	164.51	
South (Ext)	0.9 x	9.07	118.4	0.72	0.7	0.9	438.4	
West (Ext)	0.9 x	2.09	124.8	0.72	0.7	0.9	106.48	
						Total	709.39	**(P3/P4)**

Internal gains

	June	**July**	**August**	
Internal gains	468.25	448.75	457.6	
Total summer gains	1214.35	1158.14	1108.94	**(P5)**
Summer gain/loss ratio	2.31	2.21	2.11	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	17.96	19.86	19.86	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

Assessment of likelihood of high internal temperature: Not significant

i-Therm Limited
Matt Haskell
[redacted]

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8
Printed on 02 June 2021 at 18:59:31

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Semi-detached House

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 79.7m²
Site Reference : Langford **Plot Reference:** Plot 4
Address : 4 Langford Close , CLIMPING, BN17 5FG

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)	18.54 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.14 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	52.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	47.1 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (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	3.90 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 477, product index 017929):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi)
Efficiency 89.6 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

ARUN DISTRICT COUNCIL CM/4/22/DOC

[redacted]

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Programmer, room thermostat and TRVs	OK
Hot water controls:	No cylinder	
	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: West	3.42m²
Windows facing: East	8.35m²
Windows facing: North	1.43m²
Ventilation rate:	6.00

10 Key features

Air permeablility	3.9 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K

i-Therm Limited
Matt Haskell

[redacted]

Thermal Bridge Report

Property Details: Plot 4

Address: 4 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.0631

External Junctions Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	10.12	E1	[UD]
Sill	0.04	6.17	E3	[A]
Jamb	0.05	19.5	E4	[A]
Ground floor (normal)	0.076	17.86	E5	[UD]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	17.86	E6	[A]
Eaves (insulation at ceiling level)	0.06	17.86	E10	[A]
Gable (insulation at ceiling level)	0.24	0	E12	[A]
Corner (normal)	0.09	10	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	0	E17	[A]
Flat roof	0.08	0	E14	[D]
Party wall between dwellings	0.06	10	E18	[A]

Party Junctions Details

Ground floor	0.16	8.96	P1	[D]
Intermediate floor within a dwelling	0	8.96	P2	[D]
Roof (insulation at ceiling level)	0.24	8.96	P4	[D]

i-Therm Limited
Matt Haskell
[redacted]

Code for Sustainable Homes Report
For use with Nov 2010 addendum 2014 England

Assessor and House Details

Assessor Name: Matthew Haskell
Assessor Number: STRO006210
Property Address: 4 Langford Close
CLIMPING
BN17 5FG

Building regulation assessment

	kg/m²/year
TER	18.54
DER	18.14

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO_2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2012 DER Worksheet		18.14	*(ZC1)*
TER		18.54	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		18.14	
% improvement DER/TER	2.2		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	18.14	*(ZC1)*
CO2 emissions from appliances, equation (L14)	16.21	*(ZC2)*
CO2 emissions from cooking, equation (L16)	2.23	*(ZC3)*
Net CO2 emissions	38.5	*(ZC8)*

Result:

Credits awarded for ENE 1 = 0.3

Code Level = 3

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 47.06

Credits awarded for ENE 2 = 6.6

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		38.52	
Standard DER		20.08	
Actual Case CO2 emissions		38.52	
Actual DER		20.08	
Reduction in CO2 emissions	0		

Credits awarded for ENE 7 = 0

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

The following requirements must also be met:

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

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

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

i-Therm Limited
Matt Haskell
[redacted]

SAP Input

Property Details: Plot 4

Address:	4 Langford Close , CLIMPING, BN17 5FG
Located in:	England
Region:	South East England
UPRN:	UPRN-584166687951
Date of assessment:	27 May 2021
Date of certificate:	02 June 2021
Assessment type:	New dwelling as built
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:	477

Property description

Dwelling type:	House
Detachment:	Semi-detached
Year Completed:	2021

Floor Location:	**Floor area:**	**Storey height:**
Floor 0	39.85 m²	2.4 m
Floor 1	39.85 m²	2.6 m

Living area:	21.54 m² (fraction 0.27)
Front of dwelling faces:	West

Opening types

Name:	**Source:**	**Type:**	**Glazing:**	**Argon:**	**Frame:**
Entrance	Manufacturer	Solid			PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Entrance	mm	0.7	0	1	2.1	1
Ext	16mm or more	0.7	0.72	1.2	3.42	1
Ext	16mm or more	0.7	0.72	1.2	8.35	1
Ext	16mm or more	0.7	0.72	1.2	1.43	1

Name:	**Type-Name:**	**Location:**	**Orient:**	**Width:**	**Height:**
Entrance	Door (1)	External Wall	West	0	0
Ext	Windows (1)	External Wall	West	0	0
Ext	Windows (1)	External Wall	East	0	0
Ext	Windows (1)	External Wall	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 Wall	89.3	15.3	74	0.27	0	False	N/A
Plane Roof	39.85	0	39.85	0.11	0		N/A
Ground floor	39.85			0.12			N/A
Internal Elements							
Party Elements							
Party	44.8						N/A

SAP Input

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0631

	Length	Psi-value		
	10.12	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	6.17	0.04	E3	Sill
[Approved]	19.5	0.05	E4	Jamb
	17.86	0.076	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	17.86	0.07	E6	Intermediate floor within a dwelling
[Approved]	17.86	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	0	0.24	E12	Gable (insulation at ceiling level)
[Approved]	10	0.09	E16	Corner (normal)
[Approved]	0	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof
[Approved]	10	0.06	E18	Party wall between dwellings
	8.96	0.16	P1	Ground floor
	8.96	0	P2	Intermediate floor within a dwelling
	8.96	0.24	P4	Roof (insulation at ceiling level)

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 4
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3.9 (Assessed dwelling is tested)

Main heating system

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 477, product index 017929) Efficiency: Winter 87.3 % Summer: 90.5
Brand name: Ideal
Model: LOGIC COMBI
Model qualifier: ESP1 35
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
Boiler interlock: Yes
Delayed start

Main heating Control

Main heating Control:
Programmer, room thermostat and TRVs
Control code: 2106

Secondary heating system

Secondary heating system: None

Water heating

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

SAP Input

Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 4

Address : 4 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.2 (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			3.90000009536743 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.4 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.34 (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

SAP WorkSheet: New dwelling as built

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

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

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.2)+ 0.04]		=	3.92			(27)
Windows Type 2			8.35	x1/[1/(1.2)+ 0.04]		=	9.56			(27)
Windows Type 3			1.43	x1/[1/(1.2)+ 0.04]		=	1.64			(27)
Floor			39.85	x	0.12	=	4.782			(28)
Walls	89.3	15.3	74	x	0.27	=	19.98			(29)
Roof	39.85	0	39.85	x	0.11	=	4.38			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 46.36 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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 10.66 (36)

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

Total fabric heat loss (33) + (36) = 57.02 (37)

SAP WorkSheet: New dwelling as built

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	38.92	38.69	38.46	37.38	37.18	36.23	36.23	36.06	36.6	37.18	37.58	38.01	(38)

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

(39)m=	95.95	95.71	95.48	94.4	94.2	93.26	93.26	93.08	93.62	94.2	94.61	95.04	

Average = Sum(39)$_{1...12}$ /12= 94.4 (39)

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

(40)m=	1.2	1.2	1.2	1.18	1.18	1.17	1.17	1.17	1.17	1.18	1.19	1.19	

Average = Sum(40)$_{1...12}$ /12= 1.18 (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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	

Total = Sum(44)$_{1...12}$ = 1110.69 (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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	

Total = Sum(45)$_{1...12}$ = 1456.28 (45)

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

(46)m=	22.65	19.81	20.44	17.82	17.1	14.75	13.67	15.69	15.88	18.5	20.2	21.93	(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) x (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=	14.12	12.74	14.07	13.57	13.99	13.51	13.94	13.97	13.54	14.04	13.63	14.11	(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=	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33	(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=	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33	

Output from water heater (annual)... 1621.51 (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=	53.73	47.09	48.83	42.89	41.4	36.08	33.79	38.27	38.58	44.52	48.18	52.15	(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=	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	(66)

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

(67)m=	50.54	44.89	36.51	27.64	20.66	17.44	18.85	24.5	32.88	41.75	48.73	51.95	(67)

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

(68)m=	326.59	329.97	321.43	303.25	280.3	258.73	244.32	240.94	249.48	267.66	290.61	312.18	(68)

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

(69)m=	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	72.22	70.08	65.63	59.58	55.65	50.12	45.42	51.44	53.58	59.84	66.91	70.09	(72)

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

(73)m=	553.69	549.28	527.91	494.81	460.95	430.64	412.93	421.22	440.28	473.59	510.59	538.55	(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)

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North	0.9x	0.77	x	1.43	x	10.63	x	0.72	x	0.7	=	5.31	(74)
North	0.9x	0.77	x	1.43	x	20.32	x	0.72	x	0.7	=	10.15	(74)
North	0.9x	0.77	x	1.43	x	34.53	x	0.72	x	0.7	=	17.25	(74)
North	0.9x	0.77	x	1.43	x	55.46	x	0.72	x	0.7	=	27.7	(74)
North	0.9x	0.77	x	1.43	x	74.72	x	0.72	x	0.7	=	37.32	(74)
North	0.9x	0.77	x	1.43	x	79.99	x	0.72	x	0.7	=	39.95	(74)
North	0.9x	0.77	x	1.43	x	74.68	x	0.72	x	0.7	=	37.3	(74)
North	0.9x	0.77	x	1.43	x	59.25	x	0.72	x	0.7	=	29.59	(74)
North	0.9x	0.77	x	1.43	x	41.52	x	0.72	x	0.7	=	20.74	(74)
North	0.9x	0.77	x	1.43	x	24.19	x	0.72	x	0.7	=	12.08	(74)
North	0.9x	0.77	x	1.43	x	13.12	x	0.72	x	0.7	=	6.55	(74)
North	0.9x	0.77	x	1.43	x	8.86	x	0.72	x	0.7	=	4.43	(74)
East	0.9x	0.77	x	8.35	x	19.64	x	0.72	x	0.7	=	57.28	(76)
East	0.9x	0.77	x	8.35	x	38.42	x	0.72	x	0.7	=	112.05	(76)
East	0.9x	0.77	x	8.35	x	63.27	x	0.72	x	0.7	=	184.53	(76)
East	0.9x	0.77	x	8.35	x	92.28	x	0.72	x	0.7	=	269.13	(76)
East	0.9x	0.77	x	8.35	x	113.09	x	0.72	x	0.7	=	329.83	(76)
East	0.9x	0.77	x	8.35	x	115.77	x	0.72	x	0.7	=	337.64	(76)
East	0.9x	0.77	x	8.35	x	110.22	x	0.72	x	0.7	=	321.44	(76)
East	0.9x	0.77	x	8.35	x	94.68	x	0.72	x	0.7	=	276.11	(76)
East	0.9x	0.77	x	8.35	x	73.59	x	0.72	x	0.7	=	214.62	(76)
East	0.9x	0.77	x	8.35	x	45.59	x	0.72	x	0.7	=	132.96	(76)
East	0.9x	0.77	x	8.35	x	24.49	x	0.72	x	0.7	=	71.42	(76)
East	0.9x	0.77	x	8.35	x	16.15	x	0.72	x	0.7	=	47.1	(76)
West	0.9x	0.77	x	3.42	x	19.64	x	0.72	x	0.7	=	23.46	(80)
West	0.9x	0.77	x	3.42	x	38.42	x	0.72	x	0.7	=	45.89	(80)
West	0.9x	0.77	x	3.42	x	63.27	x	0.72	x	0.7	=	75.58	(80)
West	0.9x	0.77	x	3.42	x	92.28	x	0.72	x	0.7	=	110.23	(80)
West	0.9x	0.77	x	3.42	x	113.09	x	0.72	x	0.7	=	135.09	(80)
West	0.9x	0.77	x	3.42	x	115.77	x	0.72	x	0.7	=	138.29	(80)
West	0.9x	0.77	x	3.42	x	110.22	x	0.72	x	0.7	=	131.66	(80)
West	0.9x	0.77	x	3.42	x	94.68	x	0.72	x	0.7	=	113.09	(80)
West	0.9x	0.77	x	3.42	x	73.59	x	0.72	x	0.7	=	87.9	(80)
West	0.9x	0.77	x	3.42	x	45.59	x	0.72	x	0.7	=	54.46	(80)
West	0.9x	0.77	x	3.42	x	24.49	x	0.72	x	0.7	=	29.25	(80)
West	0.9x	0.77	x	3.42	x	16.15	x	0.72	x	0.7	=	19.29	(80)

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

(83)m=	86.05	168.09	277.36	407.06	502.23	515.87	490.4	418.8	323.26	199.5	107.22	70.82	(83)

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

(84)m=	639.74	717.38	805.27	901.87	963.19	946.51	903.33	840.01	763.54	673.09	617.82	609.38	(84)

7. Mean internal temperature (heating season)

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

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

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

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(86)m=	0.99	0.99	0.97	0.91	0.79	0.61	0.45	0.5	0.76	0.94	0.99	0.99	(86)

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

(87)m=	19.87	20.03	20.29	20.63	20.86	20.97	20.99	20.99	20.92	20.6	20.17	19.84	(87)

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

(88)m=	19.92	19.92	19.92	19.93	19.93	19.94	19.94	19.95	19.94	19.93	19.93	19.93	(88)

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

(89)m=	0.99	0.98	0.96	0.88	0.73	0.52	0.34	0.39	0.67	0.92	0.98	0.99	(89)

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

(90)m=	18.91	19.06	19.33	19.65	19.85	19.93	19.94	19.94	19.9	19.63	19.22	18.89	(90)

fLA = Living area ÷ (4) = 0.27 (91)

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

(92)m=	19.17	19.32	19.59	19.91	20.12	20.21	20.23	20.23	20.18	19.89	19.48	19.14	(92)

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

(93)m=	19.02	19.17	19.44	19.76	19.97	20.06	20.08	20.08	20.03	19.74	19.33	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	0.98	0.95	0.88	0.73	0.53	0.36	0.4	0.68	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	632.12	702.1	767.2	793.02	705.9	498.28	322.96	339.87	517.92	616.04	604.16	603.51	(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=	1412.18	1366.22	1235.32	1025.34	779.41	509.48	324.26	342.23	554.72	861.13	1156.82	1405.96	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	580.36	446.29	348.28	167.27	54.7	0	0	0	0	182.34	397.91	597.02	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 2774.19 (98)

Space heating requirement in kWh/m²/year 34.81 (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 90.5 (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)													
	580.36	446.29	348.28	167.27	54.7	0	0	0	0	182.34	397.91	597.02	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	641.29	493.14	384.84	184.83	60.44	0	0	0	0	201.48	439.68	659.7	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 3065.4 (211)

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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)

	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33

Efficiency of water heater 87.3 (216)

(217)m=	89.77	89.69	89.51	89.06	88.23	87.3	87.3	87.3	87.3	89.1	89.61	89.8

(217)

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

(219)m=	183.92	161.42	167.95	148.64	145.05	128.15	120.38	135.82	136.76	154.2	165.48	178.53

Total = Sum(219a)$_{1...12}$ = 1826.3 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3065.4	
Water heating fuel used		1826.3	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		357.03	(232)

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 =	106.68	(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)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	63.56	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(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 =	47.09	(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) =				347.22	(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)		83.69 (258)

12a. CO2 emissions - individual heating systems including micro-CHP:

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	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	662.13	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	394.48	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1056.61	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	185.3	(268)
Total CO2, kg/year		sum of (265)...(271) =			1280.83	(272)
CO2 emissions per m²		(272) ÷ (4) =			16.07	(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	=	3739.79	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.22	=	2228.09	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5967.87	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	230.25	(267)
Electricity for lighting	(232) x		0	=	1096.07	(268)
'Total Primary Energy		sum of (265)...(271) =			7294.2	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			91.52	(273)

i-Therm Limited
Matt Haskell
[redacted]

EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 4

Address : 4 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							4	x 10 =	40	(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) = 40 ÷ (5) =	0.2	(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		3.90000009536743	(17)
If based on air permeability value, then	(18) = [(17) ÷ 20]+(8), otherwise (18) = (16)	0.4	(18)

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

Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34	(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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

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

0.45	0.4	0.39	0.36	0.37	0.34	0.35	0.34	0.35	0.39	0.39	0.41

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

(24d)m=	0.6	0.58	0.57	0.57	0.57	0.56	0.56	0.56	0.56	0.57	0.57	0.58	(24d)

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

(25)m=	0.6	0.58	0.57	0.57	0.57	0.56	0.56	0.56	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.2)+ 0.04]		=	3.92			(27)
Windows Type 2			8.35	x1/[1/(1.2)+ 0.04]		=	9.56			(27)
Windows Type 3			1.43	x1/[1/(1.2)+ 0.04]		=	1.64			(27)
Floor			39.85	x	0.12	=	4.782			(28)
Walls	89.3	15.3	74	x	0.27	=	19.98			(29)
Roof	39.85	0	39.85	x	0.11	=	4.38			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 46.36 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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 10.66 (36)

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

Total fabric heat loss (33) + (36) = 57.02 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.41	38.23	37.8	37.18	37.38	36.78	36.98	36.6	36.98	37.8	37.8	38.46	(38)

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

(39)m=	96.43	95.26	94.82	94.2	94.4	93.81	94	93.62	94	94.82	94.82	95.48	
										Average = Sum(39)$_{1...12}$ /12=		94.64	(39)

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

(40)m=	1.21	1.2	1.19	1.18	1.18	1.18	1.18	1.17	1.18	1.19	1.19	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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	
											Total = Sum(44)$_{1...12}$ =	1110.69	(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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	
											Total = Sum(45)$_{1...12}$ =	1456.28	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	22.65	19.81	20.44	17.82	17.1	14.75	13.67	15.69	15.88	18.5	20.2	21.93	(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) x (41)m

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

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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=	14.12	12.74	14.07	13.57	13.99	13.51	13.94	13.97	13.54	14.04	13.63	14.11	(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=	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33	(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=	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33	

Output from water heater (annual)... 1621.51 (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=	53.73	47.09	48.83	42.89	41.4	36.08	33.79	38.27	38.58	44.52	48.18	52.15	(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=	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	(66)

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

(67)m=	50.54	44.89	36.51	27.64	20.66	17.44	18.85	24.5	32.88	41.75	48.73	51.95	(67)

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

(68)m=	326.59	329.97	321.43	303.25	280.3	258.73	244.32	240.94	249.48	267.66	290.61	312.18	(68)

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

(69)m=	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	72.22	70.08	65.63	59.58	55.65	50.12	45.42	51.44	53.58	59.84	66.91	70.09	(72)

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

(73)m=	553.69	549.28	527.91	494.81	460.95	430.64	412.93	421.22	440.28	473.59	510.59	538.55	(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)

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North	0.9x	0.77	x	1.43	x	14.24	x	0.72	x	0.7	=	7.11	(74)
North	0.9x	0.77	x	1.43	x	23.27	x	0.72	x	0.7	=	11.62	(74)
North	0.9x	0.77	x	1.43	x	39.95	x	0.72	x	0.7	=	19.95	(74)
North	0.9x	0.77	x	1.43	x	67.1	x	0.72	x	0.7	=	33.51	(74)
North	0.9x	0.77	x	1.43	x	87.09	x	0.72	x	0.7	=	43.5	(74)
North	0.9x	0.77	x	1.43	x	100.07	x	0.72	x	0.7	=	49.98	(74)
North	0.9x	0.77	x	1.43	x	92.85	x	0.72	x	0.7	=	46.38	(74)
North	0.9x	0.77	x	1.43	x	74.38	x	0.72	x	0.7	=	37.15	(74)
North	0.9x	0.77	x	1.43	x	51.63	x	0.72	x	0.7	=	25.79	(74)
North	0.9x	0.77	x	1.43	x	30.09	x	0.72	x	0.7	=	15.03	(74)
North	0.9x	0.77	x	1.43	x	16.99	x	0.72	x	0.7	=	8.49	(74)
North	0.9x	0.77	x	1.43	x	11.39	x	0.72	x	0.7	=	5.69	(74)
East	0.9x	0.77	x	8.35	x	26.63	x	0.72	x	0.7	=	77.67	(76)
East	0.9x	0.77	x	8.35	x	43.95	x	0.72	x	0.7	=	128.19	(76)
East	0.9x	0.77	x	8.35	x	71.91	x	0.72	x	0.7	=	209.72	(76)
East	0.9x	0.77	x	8.35	x	108.59	x	0.72	x	0.7	=	316.69	(76)
East	0.9x	0.77	x	8.35	x	128.14	x	0.72	x	0.7	=	373.72	(76)
East	0.9x	0.77	x	8.35	x	141.01	x	0.72	x	0.7	=	411.24	(76)
East	0.9x	0.77	x	8.35	x	133.32	x	0.72	x	0.7	=	388.8	(76)
East	0.9x	0.77	x	8.35	x	115.5	x	0.72	x	0.7	=	336.84	(76)
East	0.9x	0.77	x	8.35	x	89.42	x	0.72	x	0.7	=	260.8	(76)
East	0.9x	0.77	x	8.35	x	56.26	x	0.72	x	0.7	=	164.09	(76)
East	0.9x	0.77	x	8.35	x	31.99	x	0.72	x	0.7	=	93.29	(76)
East	0.9x	0.77	x	8.35	x	21.09	x	0.72	x	0.7	=	61.49	(76)
West	0.9x	0.77	x	3.42	x	26.63	x	0.72	x	0.7	=	31.81	(80)
West	0.9x	0.77	x	3.42	x	43.95	x	0.72	x	0.7	=	52.5	(80)
West	0.9x	0.77	x	3.42	x	71.91	x	0.72	x	0.7	=	85.9	(80)
West	0.9x	0.77	x	3.42	x	108.59	x	0.72	x	0.7	=	129.71	(80)
West	0.9x	0.77	x	3.42	x	128.14	x	0.72	x	0.7	=	153.07	(80)
West	0.9x	0.77	x	3.42	x	141.01	x	0.72	x	0.7	=	168.44	(80)
West	0.9x	0.77	x	3.42	x	133.32	x	0.72	x	0.7	=	159.25	(80)
West	0.9x	0.77	x	3.42	x	115.5	x	0.72	x	0.7	=	137.96	(80)
West	0.9x	0.77	x	3.42	x	89.42	x	0.72	x	0.7	=	106.82	(80)
West	0.9x	0.77	x	3.42	x	56.26	x	0.72	x	0.7	=	67.21	(80)
West	0.9x	0.77	x	3.42	x	31.99	x	0.72	x	0.7	=	38.21	(80)
West	0.9x	0.77	x	3.42	x	21.09	x	0.72	x	0.7	=	25.19	(80)

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

(83)m=	116.6	192.31	315.57	479.91	570.28	629.66	594.43	511.95	393.41	246.32	139.99	92.37	(83)

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

(84)m=	670.29	741.59	843.48	974.72	1031.24	1060.3	1007.36	933.17	833.69	719.91	650.58	630.92	(84)

7a. Mean internal temperature (heating season)

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

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

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

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(86)m=	0.99	0.98	0.95	0.87	0.7	0.49	0.35	0.36	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=	20.05	20.17	20.43	20.74	20.93	20.99	21	21	20.97	20.77	20.38	20.03	(87)

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

(88)m=	19.91	19.92	19.93	19.93	19.93	19.94	19.94	19.94	19.94	19.93	19.93	19.92	(88)

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

(89)m=	0.98	0.97	0.94	0.83	0.63	0.4	0.26	0.25	0.53	0.84	0.96	0.99	(89)

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

(90)m=	19.08	19.21	19.46	19.75	19.89	19.94	19.94	19.94	19.92	19.78	19.42	19.07	(90)

fLA = Living area ÷ (4) = 0.27 (91)

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

(92)m=	19.34	19.47	19.73	20.02	20.17	20.22	20.22	20.23	20.21	20.04	19.68	19.33	(92)

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

(93)m=	19.19	19.32	19.58	19.87	20.02	20.07	20.07	20.08	20.06	19.89	19.53	19.18	(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	0.82	0.64	0.41	0.27	0.27	0.54	0.84	0.96	0.98	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	656.79	718.72	785.39	802.78	655.99	434.8	269.79	250.26	453.79	601.68	623.1	620.44	(95)
Monthly average external temperature from Table 8													
(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	1301.32	1278.02	1154.43	957.71	691.31	438.1	270.09	250.54	465.87	729.61	1026.46	1277.86	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	479.53	375.85	274.57	111.55	26.28	0	0	0	0	95.18	290.41	489.12	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 2142.5 (98)

Space heating requirement in kWh/m²/year 26.88 (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 90.5 (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)													
	479.53	375.85	274.57	111.55	26.28	0	0	0	0	95.18	290.41	489.12	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	529.87	415.3	303.39	123.26	29.04	0	0	0	0	105.17	320.9	540.46	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$= 2367.4 (211)

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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)

	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33

Efficiency of water heater 87.3 (216)

(217)m=	89.66	89.59	89.34	88.73	87.83	87.3	87.3	87.3	87.3	88.58	89.39	89.69	(217)

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

(219)m=	184.15	161.62	168.27	149.18	145.72	128.15	120.38	135.82	136.76	155.1	165.88	178.76	
											Total = Sum(219a)$_{1...12}$ =	1829.78	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2367.4	
Water heating fuel used		1829.78	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		357.03	(232)

10a. Fuel costs - individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)		**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.87	x 0.01 =	91.62	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	18.9	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.87	x 0.01 =	70.81	(247)
Pumps, fans and electric keep-hot	(231)	0	x 0.01 =	14.17	(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)	0	x 0.01 =	67.48	(250)
Additional standing charges (Table 12)				93	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)...(254) =			337.08	(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] =	1.09 (257)
SAP rating (Section 12)		84.82 (258)

12a. CO2 emissions - individual heating systems including micro-CHP

i-Therm Limited
Matt Haskell
[redacted]

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	Energy kWh/year		Emission factor kg CO2/kWh		Emissions kg CO2/year	
Space heating (main system 1)	(211) x		0.216	=	511.36	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	395.23	(264)
Space and water heating	(261) + (262) + (263) + (264) =				906.59	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	185.3	(268)
Total CO2, kg/year		sum of (265)...(271) =			1130.81	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =			14.19	(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	=	2888.23	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.22	=	2232.33	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5120.56	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	230.25	(267)
Electricity for lighting	(232) x		0	=	1096.07	(268)
'Total Primary Energy		sum of (265)...(271) =			6446.88	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =			80.89	(273)

i-Therm Limited
Matt Haskell
[redacted]

TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 4

Address : 4 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.15 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.4 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered			2 (19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor		(21) = (18) x (20) =	0.34 (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

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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

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

0.43	0.43	0.42	0.37	0.37	0.32	0.32	0.31	0.34	0.37	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

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

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

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

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

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

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

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

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

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

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

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

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

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.4)+ 0.04]		=	4.53			(27)
Windows Type 2			8.35	x1/[1/(1.4)+ 0.04]		=	11.07			(27)
Windows Type 3			1.43	x1/[1/(1.4)+ 0.04]		=	1.9			(27)
Floor			39.85	x	0.13	=	5.1805			(28)
Walls	89.3	15.3	74	x	0.18	=	13.32			(29)
Roof	39.85	0	39.85	x	0.13	=	5.18			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

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

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

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 43.28 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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) = 52.29 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.07	38.83	38.6	37.49	37.28	36.32	36.32	36.14	36.69	37.28	37.7	38.14	(38)

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

(39)m=	91.36	91.12	90.89	89.78	89.57	88.61	88.61	88.43	88.98	89.57	89.99	90.43	

Average = Sum(39)$_{1...12}$ /12= 89.78 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.11	1.12	1.12	1.13	1.13	

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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	

Total = Sum(44)$_{1...12}$ = 1110.69 (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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	

Total = Sum(45)$_{1...12}$ = 1456.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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) x (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

TFEE WorkSheet: New dwelling as built

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=	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=	128.34	112.25	115.83	100.98	96.89	83.61	77.48	88.91	89.97	104.85	114.45	124.29	(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=	128.34	112.25	115.83	100.98	96.89	83.61	77.48	88.91	89.97	104.85	114.45	124.29	

Output from water heater (annual)... 1237.84 (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=	32.08	28.06	28.96	25.25	24.22	20.9	19.37	22.23	22.49	26.21	28.61	31.07	(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=	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.22	17.96	14.6	11.06	8.26	6.98	7.54	9.8	13.15	16.7	19.49	20.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	218.81	221.08	215.36	203.18	187.8	173.35	163.7	161.43	167.15	179.33	194.71	209.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	43.12	41.76	38.92	35.06	32.56	29.03	26.03	29.87	31.24	35.23	39.74	41.76	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	342.01	340.65	328.74	309.16	288.48	269.22	257.13	260.96	271.4	291.12	313.79	331.56	(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)

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North	0.9x	0.77	x	1.43	x	10.63	x	0.63	x	0.7	=	4.65	(74)
North	0.9x	0.77	x	1.43	x	20.32	x	0.63	x	0.7	=	8.88	(74)
North	0.9x	0.77	x	1.43	x	34.53	x	0.63	x	0.7	=	15.09	(74)
North	0.9x	0.77	x	1.43	x	55.46	x	0.63	x	0.7	=	24.24	(74)
North	0.9x	0.77	x	1.43	x	74.72	x	0.63	x	0.7	=	32.65	(74)
North	0.9x	0.77	x	1.43	x	79.99	x	0.63	x	0.7	=	34.96	(74)
North	0.9x	0.77	x	1.43	x	74.68	x	0.63	x	0.7	=	32.64	(74)
North	0.9x	0.77	x	1.43	x	59.25	x	0.63	x	0.7	=	25.89	(74)
North	0.9x	0.77	x	1.43	x	41.52	x	0.63	x	0.7	=	18.14	(74)
North	0.9x	0.77	x	1.43	x	24.19	x	0.63	x	0.7	=	10.57	(74)
North	0.9x	0.77	x	1.43	x	13.12	x	0.63	x	0.7	=	5.73	(74)
North	0.9x	0.77	x	1.43	x	8.86	x	0.63	x	0.7	=	3.87	(74)
East	0.9x	0.77	x	8.35	x	19.64	x	0.63	x	0.7	=	50.12	(76)
East	0.9x	0.77	x	8.35	x	38.42	x	0.63	x	0.7	=	98.04	(76)
East	0.9x	0.77	x	8.35	x	63.27	x	0.63	x	0.7	=	161.46	(76)
East	0.9x	0.77	x	8.35	x	92.28	x	0.63	x	0.7	=	235.49	(76)
East	0.9x	0.77	x	8.35	x	113.09	x	0.63	x	0.7	=	288.6	(76)
East	0.9x	0.77	x	8.35	x	115.77	x	0.63	x	0.7	=	295.43	(76)
East	0.9x	0.77	x	8.35	x	110.22	x	0.63	x	0.7	=	281.26	(76)
East	0.9x	0.77	x	8.35	x	94.68	x	0.63	x	0.7	=	241.6	(76)
East	0.9x	0.77	x	8.35	x	73.59	x	0.63	x	0.7	=	187.79	(76)
East	0.9x	0.77	x	8.35	x	45.59	x	0.63	x	0.7	=	116.34	(76)
East	0.9x	0.77	x	8.35	x	24.49	x	0.63	x	0.7	=	62.49	(76)
East	0.9x	0.77	x	8.35	x	16.15	x	0.63	x	0.7	=	41.22	(76)
West	0.9x	0.77	x	3.42	x	19.64	x	0.63	x	0.7	=	20.53	(80)
West	0.9x	0.77	x	3.42	x	38.42	x	0.63	x	0.7	=	40.16	(80)
West	0.9x	0.77	x	3.42	x	63.27	x	0.63	x	0.7	=	66.13	(80)
West	0.9x	0.77	x	3.42	x	92.28	x	0.63	x	0.7	=	96.45	(80)
West	0.9x	0.77	x	3.42	x	113.09	x	0.63	x	0.7	=	118.2	(80)
West	0.9x	0.77	x	3.42	x	115.77	x	0.63	x	0.7	=	121	(80)
West	0.9x	0.77	x	3.42	x	110.22	x	0.63	x	0.7	=	115.2	(80)
West	0.9x	0.77	x	3.42	x	94.68	x	0.63	x	0.7	=	98.95	(80)
West	0.9x	0.77	x	3.42	x	73.59	x	0.63	x	0.7	=	76.92	(80)
West	0.9x	0.77	x	3.42	x	45.59	x	0.63	x	0.7	=	47.65	(80)
West	0.9x	0.77	x	3.42	x	24.49	x	0.63	x	0.7	=	25.6	(80)
West	0.9x	0.77	x	3.42	x	16.15	x	0.63	x	0.7	=	16.88	(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=	75.29	147.08	242.69	356.18	439.45	451.39	429.1	366.45	282.85	174.56	93.82	61.97	(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=	417.3	487.74	571.43	665.33	727.94	720.61	686.23	627.41	554.25	465.68	407.62	393.53	(84)

7a. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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(86)m=	1	1	0.99	0.97	0.89	0.72	0.55	0.62	0.88	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.69	19.84	20.11	20.48	20.78	20.95	20.99	20.98	20.85	20.44	20	19.67	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.96	19.97	19.97	19.98	19.98	19.99	19.99	19.99	19.99	19.98	19.98	19.97	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.95	0.84	0.63	0.43	0.5	0.81	0.98	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.77	18.92	19.19	19.55	19.83	19.97	19.99	19.99	19.9	19.53	19.09	18.75	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.02	19.17	19.44	19.8	20.09	20.23	20.26	20.26	20.16	19.77	19.33	19	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.02	19.17	19.44	19.8	20.09	20.23	20.26	20.26	20.16	19.77	19.33	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	
Utilisation factor for gains, hm:													
(94)m=	1	1	0.99	0.95	0.85	0.66	0.47	0.53	0.83	0.98	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	416.51	485.57	563.71	632.6	618.36	473.31	320.6	334.17	457.45	454.3	406	392.97	(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=	1344.62	1300.24	1176.03	978.8	751.24	498.96	324.2	340.97	538.92	821.63	1100.97	1338.34	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	690.51	547.45	455.57	249.27	98.86	0	0	0	0	273.29	500.38	703.35	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 3518.68 (98)

Space heating requirement in kWh/m²/year 44.15 (99)

9a. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	832.91	655.7	672.06	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.88	0.94	0.91	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	734.44	614.01	611.96	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	934.15	892.09	824.97	0	0	0	0	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m set (104)m to zero if (104)m < 3 × (98)m													
(104)m=	0	0	0	0	0	143.79	206.89	158.47	0	0	0	0	

Total = Sum(104) = 509.16 (104)

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[redacted]

TFEE WorkSheet: New dwelling as built

Cooled fraction — f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104) = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	35.95	51.72	39.62	0	0	0	0

Total = Sum(107) = 127.29 (107)

Space cooling requirement in kWh/m²/year — (107) ÷ (4) = 1.6 (108)

Fabric Energy Efficiency is calculated only if under Special Conditions, see Section 11

Fabric Energy Efficiency — (99) + (108) = 45.75 (109)

Target Fabric Energy Efficiency (TFEE) 52.61 (109)

DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 4

Address : 4 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.15 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.90000009536743 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.35 (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) =	0.29 (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

DFEE WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.37	0.37	0.36	0.32	0.32	0.28	0.28	0.27	0.29	0.32	0.33	0.35

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.2)+ 0.04]		=	3.92			(27)
Windows Type 2			8.35	x1/[1/(1.2)+ 0.04]		=	9.56			(27)
Windows Type 3			1.43	x1/[1/(1.2)+ 0.04]		=	1.64			(27)
Floor			39.85	x	0.12	=	4.782			(28)
Walls	89.3	15.3	74	x	0.27	=	19.98			(29)
Roof	39.85	0	39.85	x	0.11	=	4.38			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 46.36 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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 10.66 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 57.02 (37)

DFEE WorkSheet: New dwelling as built

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	37.49	37.31	37.13	36.31	36.15	35.44	35.44	35.3	35.71	36.15	36.47	36.79	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	94.51	94.33	94.16	93.33	93.18	92.46	92.46	92.33	92.74	93.18	93.49	93.82	
										Average = Sum(39)$_{1...12}$ /12=		93.33	(39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.19	1.18	1.18	1.17	1.17	1.16	1.16	1.16	1.16	1.17	1.17	1.18	
										Average = Sum(40)$_{1...12}$ /12=		1.17	(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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	
											Total = Sum(44)$_{1...12}$ =	1110.69	(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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	
											Total = Sum(45)$_{1...12}$ =	1456.28	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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) x (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

DFEE WorkSheet: New dwelling as built

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=	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=	128.34	112.25	115.83	100.98	96.89	83.61	77.48	88.91	89.97	104.85	114.45	124.29	(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=	128.34	112.25	115.83	100.98	96.89	83.61	77.48	88.91	89.97	104.85	114.45	124.29	

Output from water heater (annual) — 1237.84 — (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=	32.08	28.06	28.96	25.25	24.22	20.9	19.37	22.23	22.49	26.21	28.61	31.07	(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=	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.22	17.96	14.6	11.06	8.26	6.98	7.54	9.8	13.15	16.7	19.49	20.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	218.81	221.08	215.36	203.18	187.8	173.35	163.7	161.43	167.15	179.33	194.71	209.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	43.12	41.76	38.92	35.06	32.56	29.03	26.03	29.87	31.24	35.23	39.74	41.76	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	342.01	340.65	328.74	309.16	288.48	269.22	257.13	260.96	271.4	291.12	313.79	331.56	(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)

DFEE WorkSheet: New dwelling as built

North	0.9x	0.77	x	1.43	x	10.63	x	0.72	x	0.7	=	5.31	(74)
North	0.9x	0.77	x	1.43	x	20.32	x	0.72	x	0.7	=	10.15	(74)
North	0.9x	0.77	x	1.43	x	34.53	x	0.72	x	0.7	=	17.25	(74)
North	0.9x	0.77	x	1.43	x	55.46	x	0.72	x	0.7	=	27.7	(74)
North	0.9x	0.77	x	1.43	x	74.72	x	0.72	x	0.7	=	37.32	(74)
North	0.9x	0.77	x	1.43	x	79.99	x	0.72	x	0.7	=	39.95	(74)
North	0.9x	0.77	x	1.43	x	74.68	x	0.72	x	0.7	=	37.3	(74)
North	0.9x	0.77	x	1.43	x	59.25	x	0.72	x	0.7	=	29.59	(74)
North	0.9x	0.77	x	1.43	x	41.52	x	0.72	x	0.7	=	20.74	(74)
North	0.9x	0.77	x	1.43	x	24.19	x	0.72	x	0.7	=	12.08	(74)
North	0.9x	0.77	x	1.43	x	13.12	x	0.72	x	0.7	=	6.55	(74)
North	0.9x	0.77	x	1.43	x	8.86	x	0.72	x	0.7	=	4.43	(74)
East	0.9x	0.77	x	8.35	x	19.64	x	0.72	x	0.7	=	57.28	(76)
East	0.9x	0.77	x	8.35	x	38.42	x	0.72	x	0.7	=	112.05	(76)
East	0.9x	0.77	x	8.35	x	63.27	x	0.72	x	0.7	=	184.53	(76)
East	0.9x	0.77	x	8.35	x	92.28	x	0.72	x	0.7	=	269.13	(76)
East	0.9x	0.77	x	8.35	x	113.09	x	0.72	x	0.7	=	329.83	(76)
East	0.9x	0.77	x	8.35	x	115.77	x	0.72	x	0.7	=	337.64	(76)
East	0.9x	0.77	x	8.35	x	110.22	x	0.72	x	0.7	=	321.44	(76)
East	0.9x	0.77	x	8.35	x	94.68	x	0.72	x	0.7	=	276.11	(76)
East	0.9x	0.77	x	8.35	x	73.59	x	0.72	x	0.7	=	214.62	(76)
East	0.9x	0.77	x	8.35	x	45.59	x	0.72	x	0.7	=	132.96	(76)
East	0.9x	0.77	x	8.35	x	24.49	x	0.72	x	0.7	=	71.42	(76)
East	0.9x	0.77	x	8.35	x	16.15	x	0.72	x	0.7	=	47.1	(76)
West	0.9x	0.77	x	3.42	x	19.64	x	0.72	x	0.7	=	23.46	(80)
West	0.9x	0.77	x	3.42	x	38.42	x	0.72	x	0.7	=	45.89	(80)
West	0.9x	0.77	x	3.42	x	63.27	x	0.72	x	0.7	=	75.58	(80)
West	0.9x	0.77	x	3.42	x	92.28	x	0.72	x	0.7	=	110.23	(80)
West	0.9x	0.77	x	3.42	x	113.09	x	0.72	x	0.7	=	135.09	(80)
West	0.9x	0.77	x	3.42	x	115.77	x	0.72	x	0.7	=	138.29	(80)
West	0.9x	0.77	x	3.42	x	110.22	x	0.72	x	0.7	=	131.66	(80)
West	0.9x	0.77	x	3.42	x	94.68	x	0.72	x	0.7	=	113.09	(80)
West	0.9x	0.77	x	3.42	x	73.59	x	0.72	x	0.7	=	87.9	(80)
West	0.9x	0.77	x	3.42	x	45.59	x	0.72	x	0.7	=	54.46	(80)
West	0.9x	0.77	x	3.42	x	24.49	x	0.72	x	0.7	=	29.25	(80)
West	0.9x	0.77	x	3.42	x	16.15	x	0.72	x	0.7	=	19.29	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m …(82)m

(83)m=	86.05	168.09	277.36	407.06	502.23	515.87	490.4	418.8	323.26	199.5	107.22	70.82	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	428.06	508.75	606.1	716.21	790.72	785.09	747.53	679.76	594.65	490.61	421.02	402.38	(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

DFEE WorkSheet: New dwelling as built

(86)m=	1	1	0.99	0.96	0.87	0.7	0.53	0.6	0.86	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.65	19.82	20.1	20.48	20.79	20.95	20.99	20.98	20.85	20.43	19.97	19.62	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.93	19.93	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.94	19.94	19.94	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.94	0.82	0.61	0.41	0.48	0.79	0.97	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.7	18.87	19.15	19.53	19.8	19.93	19.95	19.95	19.87	19.48	19.03	18.68	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.96	19.12	19.41	19.78	20.07	20.2	20.23	20.23	20.13	19.74	19.28	18.93	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.96	19.12	19.41	19.78	20.07	20.2	20.23	20.23	20.13	19.74	19.28	18.93	(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	

Utilisation factor for gains, hm:

(94)m=	1	0.99	0.98	0.94	0.83	0.63	0.44	0.51	0.81	0.97	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	427.13	506.04	596.02	673.47	653.47	494.04	332.24	346.77	479.45	476.59	419.08	401.73	(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=	1385.43	1341.61	1215.52	1015.84	779.9	518.21	335.67	353.36	559.34	851.52	1138.69	1382.25	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	712.98	561.5	460.91	246.51	94.06	0	0	0	0	278.95	518.12	729.5	

Total per year (kWh/year) = Sum(98)$_{1,...,12}$ = 3602.52 (98)

Space heating requirement in kWh/m²/year 45.2 (99)

9a. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	869.12	684.2	701.68	0	0	0	0	(100)

Utilisation factor for loss hm

(101)m=	0	0	0	0	0	0.89	0.94	0.91	0	0	0	0	(101)

Useful loss, hmLm (Watts) = (100)m x (101)m

(102)m=	0	0	0	0	0	772.46	643	641.27	0	0	0	0	(102)

Gains (solar gains calculated for applicable weather region, see Table 10)

(103)m=	0	0	0	0	0	1009.52	963.74	886.15	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	170.69	238.63	182.19	0	0	0	0	

Total = Sum(104) = 591.51 (104)

DFEE WorkSheet: New dwelling as built

Cooled fraction — f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104) = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	42.67	59.66	45.55	0	0	0	0

Total = Sum(107) = 147.88 (107)

Space cooling requirement in kWh/m²/year — (107) ÷ (4) = 1.86 (108)

Dwelling Energy Efficiency calculated only if cooling specified and/or Dynamic Overheating Indicator required (see Section 11)

Fabric Energy Efficiency — (99) + (108) = 47.06 (109)

i-Therm Limited
Matt Haskell
[redacted]

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 4

Address : 4 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =	199.25	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.2 (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		3.90000009536743 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.4 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34 (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

DER WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.58	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.58	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.2)+ 0.04]		=	3.92			(27)
Windows Type 2			8.35	x1/[1/(1.2)+ 0.04]		=	9.56			(27)
Windows Type 3			1.43	x1/[1/(1.2)+ 0.04]		=	1.64			(27)
Floor			39.85	x	0.12	=	4.782			(28)
Walls	89.3	15.3	74	x	0.27	=	19.98			(29)
Roof	39.85	0	39.85	x	0.11	=	4.38			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 46.36 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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 10.66 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 57.02 (37)

DER WorkSheet: New dwelling as built

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	38.92	38.69	38.46	37.38	37.18	36.23	36.23	36.06	36.6	37.18	37.58	38.01	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	95.95	95.71	95.48	94.4	94.2	93.26	93.26	93.08	93.62	94.2	94.61	95.04	
										Average = Sum(39)$_{1...12}$ /12=		94.4	(39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.2	1.2	1.2	1.18	1.18	1.17	1.17	1.17	1.17	1.18	1.19	1.19	
										Average = Sum(40)$_{1...12}$ /12=		1.18	(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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	
											Total = Sum(44)$_{1...12}$ =	1110.69	(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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	
											Total = Sum(45)$_{1...12}$ =	1456.28	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	22.65	19.81	20.44	17.82	17.1	14.75	13.67	15.69	15.88	18.5	20.2	21.93	(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) x (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=	14.12	12.74	14.07	13.57	13.99	13.51	13.94	13.97	13.54	14.04	13.63	14.11	(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=	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33	(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=	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33	

Output from water heater (annual) ... 1621.51 (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=	53.73	47.09	48.83	42.89	41.4	36.08	33.79	38.27	38.58	44.52	48.18	52.15	(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=	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.22	17.96	14.6	11.06	8.26	6.98	7.54	9.8	13.15	16.7	19.49	20.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	218.81	221.08	215.36	203.18	187.8	173.35	163.7	161.43	167.15	179.33	194.71	209.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	72.22	70.08	65.63	59.58	55.65	50.12	45.42	51.44	53.58	59.84	66.91	70.09	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	374.11	371.97	358.45	336.67	314.57	293.3	279.51	285.52	296.74	318.73	343.97	362.88	(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)

DER WorkSheet: New dwelling as built

North	0.9x	0.77	x	1.43	x	10.63	x	0.72	x	0.7	=	5.31	(74)
North	0.9x	0.77	x	1.43	x	20.32	x	0.72	x	0.7	=	10.15	(74)
North	0.9x	0.77	x	1.43	x	34.53	x	0.72	x	0.7	=	17.25	(74)
North	0.9x	0.77	x	1.43	x	55.46	x	0.72	x	0.7	=	27.7	(74)
North	0.9x	0.77	x	1.43	x	74.72	x	0.72	x	0.7	=	37.32	(74)
North	0.9x	0.77	x	1.43	x	79.99	x	0.72	x	0.7	=	39.95	(74)
North	0.9x	0.77	x	1.43	x	74.68	x	0.72	x	0.7	=	37.3	(74)
North	0.9x	0.77	x	1.43	x	59.25	x	0.72	x	0.7	=	29.59	(74)
North	0.9x	0.77	x	1.43	x	41.52	x	0.72	x	0.7	=	20.74	(74)
North	0.9x	0.77	x	1.43	x	24.19	x	0.72	x	0.7	=	12.08	(74)
North	0.9x	0.77	x	1.43	x	13.12	x	0.72	x	0.7	=	6.55	(74)
North	0.9x	0.77	x	1.43	x	8.86	x	0.72	x	0.7	=	4.43	(74)
East	0.9x	0.77	x	8.35	x	19.64	x	0.72	x	0.7	=	57.28	(76)
East	0.9x	0.77	x	8.35	x	38.42	x	0.72	x	0.7	=	112.05	(76)
East	0.9x	0.77	x	8.35	x	63.27	x	0.72	x	0.7	=	184.53	(76)
East	0.9x	0.77	x	8.35	x	92.28	x	0.72	x	0.7	=	269.13	(76)
East	0.9x	0.77	x	8.35	x	113.09	x	0.72	x	0.7	=	329.83	(76)
East	0.9x	0.77	x	8.35	x	115.77	x	0.72	x	0.7	=	337.64	(76)
East	0.9x	0.77	x	8.35	x	110.22	x	0.72	x	0.7	=	321.44	(76)
East	0.9x	0.77	x	8.35	x	94.68	x	0.72	x	0.7	=	276.11	(76)
East	0.9x	0.77	x	8.35	x	73.59	x	0.72	x	0.7	=	214.62	(76)
East	0.9x	0.77	x	8.35	x	45.59	x	0.72	x	0.7	=	132.96	(76)
East	0.9x	0.77	x	8.35	x	24.49	x	0.72	x	0.7	=	71.42	(76)
East	0.9x	0.77	x	8.35	x	16.15	x	0.72	x	0.7	=	47.1	(76)
West	0.9x	0.77	x	3.42	x	19.64	x	0.72	x	0.7	=	23.46	(80)
West	0.9x	0.77	x	3.42	x	38.42	x	0.72	x	0.7	=	45.89	(80)
West	0.9x	0.77	x	3.42	x	63.27	x	0.72	x	0.7	=	75.58	(80)
West	0.9x	0.77	x	3.42	x	92.28	x	0.72	x	0.7	=	110.23	(80)
West	0.9x	0.77	x	3.42	x	113.09	x	0.72	x	0.7	=	135.09	(80)
West	0.9x	0.77	x	3.42	x	115.77	x	0.72	x	0.7	=	138.29	(80)
West	0.9x	0.77	x	3.42	x	110.22	x	0.72	x	0.7	=	131.66	(80)
West	0.9x	0.77	x	3.42	x	94.68	x	0.72	x	0.7	=	113.09	(80)
West	0.9x	0.77	x	3.42	x	73.59	x	0.72	x	0.7	=	87.9	(80)
West	0.9x	0.77	x	3.42	x	45.59	x	0.72	x	0.7	=	54.46	(80)
West	0.9x	0.77	x	3.42	x	24.49	x	0.72	x	0.7	=	29.25	(80)
West	0.9x	0.77	x	3.42	x	16.15	x	0.72	x	0.7	=	19.29	(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=	86.05	168.09	277.36	407.06	502.23	515.87	490.4	418.8	323.26	199.5	107.22	70.82	(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=	460.16	540.07	635.8	743.73	816.81	809.18	769.91	704.32	620	518.23	451.19	433.71	(84)

7a. 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	

DER WorkSheet: New dwelling as built

(86)m=	1	1	0.99	0.95	0.86	0.69	0.52	0.59	0.85	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.67	19.83	20.12	20.49	20.8	20.95	20.99	20.98	20.86	20.45	19.99	19.64	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.92	19.92	19.92	19.93	19.93	19.94	19.94	19.95	19.94	19.93	19.93	19.93	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.94	0.81	0.59	0.4	0.46	0.78	0.97	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.7	18.87	19.15	19.53	19.8	19.92	19.94	19.94	19.86	19.49	19.04	18.68	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.96	19.13	19.41	19.79	20.07	20.2	20.22	20.22	20.13	19.75	19.29	18.94	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.81	18.98	19.26	19.64	19.92	20.05	20.07	20.07	19.98	19.6	19.14	18.79	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	1	0.99	0.98	0.93	0.81	0.6	0.42	0.48	0.78	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	458.72	536.23	622.68	692.15	659.97	488.18	321.46	336.91	482.9	499.29	448.27	432.68	(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=	1392.59	1347.41	1218.79	1013.79	774.2	508.3	324.05	341.84	550.69	847.79	1139.3	1386.83	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	694.8	545.11	443.5	231.58	84.99	0	0	0	0	259.29	497.54	709.89	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 3466.71 (98)

Space heating requirement in kWh/m²/year 43.5 (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 90.5 (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)													
	694.8	545.11	443.5	231.58	84.99	0	0	0	0	259.29	497.54	709.89	

(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)

	767.74	602.34	490.06	255.89	93.91	0	0	0	0	286.5	549.77	784.41

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 3830.62 (211)

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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)

	165.1	144.79	150.33	132.37	127.99	111.88	105.09	118.57	119.39	137.39	148.28	160.33

Efficiency of water heater	87.3	(216)

(217)m=	89.87	89.81	89.67	89.31	88.55	87.3	87.3	87.3	87.3	89.37	89.74	89.89	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	183.72	161.22	167.65	148.22	144.54	128.15	120.38	135.82	136.76	153.74	165.22	178.36	
Total = Sum(219a)$_{1...12}$ =												1823.77	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3830.62	
Water heating fuel used		1823.77	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		357.03	(232)

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	=	827.41	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	393.94	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1221.35	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	185.3	(268)
Total CO2, kg/year	sum of (265)...(271) =				1445.57	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				18.14	(273)
EI rating (section 14)					84	(274)

i-Therm Limited
Matt Haskell
[redacted]

TER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 4

Address : 4 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.15 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.4 (18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.43	0.42	0.37	0.37	0.32	0.32	0.31	0.34	0.37	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.4)+ 0.04]		=	4.53			(27)
Windows Type 2			8.35	x1/[1/(1.4)+ 0.04]		=	11.07			(27)
Windows Type 3			1.43	x1/[1/(1.4)+ 0.04]		=	1.9			(27)
Floor			39.85	x	0.13	=	5.1805			(28)
Walls	89.3	15.3	74	x	0.18	=	13.32			(29)
Roof	39.85	0	39.85	x	0.13	=	5.18			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 43.28 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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) = 52.29 (37)

TER WorkSheet: New dwelling as built

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.07	38.83	38.6	37.49	37.28	36.32	36.32	36.14	36.69	37.28	37.7	38.14	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	91.36	91.12	90.89	89.78	89.57	88.61	88.61	88.43	88.98	89.57	89.99	90.43	

Average = Sum(39)$_{1...12}$ /12= 89.78 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.11	1.12	1.12	1.13	1.13	

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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	

Total = Sum(44)$_{1...12}$ = 1110.69 (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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	

Total = Sum(45)$_{1...12}$ = 1456.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.65	19.81	20.44	17.82	17.1	14.75	13.67	15.69	15.88	18.5	20.2	21.93	(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) x (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

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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	45.16	48.11	44.73	44.34	41.08	42.45	44.34	44.73	48.11	48.38	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=	201.94	177.21	184.38	163.53	158.33	139.45	133.6	148.93	150.58	171.46	183.03	197.18	(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=	201.94	177.21	184.38	163.53	158.33	139.45	133.6	148.93	150.58	171.46	183.03	197.18	

Output from water heater (annual) — 2009.63 — (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=	62.94	55.2	57.34	50.68	48.99	42.98	40.92	45.86	46.38	53.04	56.87	61.36	(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=	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.22	17.96	14.6	11.06	8.26	6.98	7.54	9.8	13.15	16.7	19.49	20.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	218.81	221.08	215.36	203.18	187.8	173.35	163.7	161.43	167.15	179.33	194.71	209.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	84.6	82.14	77.06	70.39	65.84	59.69	55	61.64	64.41	71.29	78.98	82.47	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	386.49	384.03	369.89	347.49	324.77	302.88	289.09	295.73	307.57	330.18	356.04	375.26	(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)

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North	0.9x	0.77	x	1.43	x	10.63	x	0.63	x	0.7	=	4.65	(74)
North	0.9x	0.77	x	1.43	x	20.32	x	0.63	x	0.7	=	8.88	(74)
North	0.9x	0.77	x	1.43	x	34.53	x	0.63	x	0.7	=	15.09	(74)
North	0.9x	0.77	x	1.43	x	55.46	x	0.63	x	0.7	=	24.24	(74)
North	0.9x	0.77	x	1.43	x	74.72	x	0.63	x	0.7	=	32.65	(74)
North	0.9x	0.77	x	1.43	x	79.99	x	0.63	x	0.7	=	34.96	(74)
North	0.9x	0.77	x	1.43	x	74.68	x	0.63	x	0.7	=	32.64	(74)
North	0.9x	0.77	x	1.43	x	59.25	x	0.63	x	0.7	=	25.89	(74)
North	0.9x	0.77	x	1.43	x	41.52	x	0.63	x	0.7	=	18.14	(74)
North	0.9x	0.77	x	1.43	x	24.19	x	0.63	x	0.7	=	10.57	(74)
North	0.9x	0.77	x	1.43	x	13.12	x	0.63	x	0.7	=	5.73	(74)
North	0.9x	0.77	x	1.43	x	8.86	x	0.63	x	0.7	=	3.87	(74)
East	0.9x	0.77	x	8.35	x	19.64	x	0.63	x	0.7	=	50.12	(76)
East	0.9x	0.77	x	8.35	x	38.42	x	0.63	x	0.7	=	98.04	(76)
East	0.9x	0.77	x	8.35	x	63.27	x	0.63	x	0.7	=	161.46	(76)
East	0.9x	0.77	x	8.35	x	92.28	x	0.63	x	0.7	=	235.49	(76)
East	0.9x	0.77	x	8.35	x	113.09	x	0.63	x	0.7	=	288.6	(76)
East	0.9x	0.77	x	8.35	x	115.77	x	0.63	x	0.7	=	295.43	(76)
East	0.9x	0.77	x	8.35	x	110.22	x	0.63	x	0.7	=	281.26	(76)
East	0.9x	0.77	x	8.35	x	94.68	x	0.63	x	0.7	=	241.6	(76)
East	0.9x	0.77	x	8.35	x	73.59	x	0.63	x	0.7	=	187.79	(76)
East	0.9x	0.77	x	8.35	x	45.59	x	0.63	x	0.7	=	116.34	(76)
East	0.9x	0.77	x	8.35	x	24.49	x	0.63	x	0.7	=	62.49	(76)
East	0.9x	0.77	x	8.35	x	16.15	x	0.63	x	0.7	=	41.22	(76)
West	0.9x	0.77	x	3.42	x	19.64	x	0.63	x	0.7	=	20.53	(80)
West	0.9x	0.77	x	3.42	x	38.42	x	0.63	x	0.7	=	40.16	(80)
West	0.9x	0.77	x	3.42	x	63.27	x	0.63	x	0.7	=	66.13	(80)
West	0.9x	0.77	x	3.42	x	92.28	x	0.63	x	0.7	=	96.45	(80)
West	0.9x	0.77	x	3.42	x	113.09	x	0.63	x	0.7	=	118.2	(80)
West	0.9x	0.77	x	3.42	x	115.77	x	0.63	x	0.7	=	121	(80)
West	0.9x	0.77	x	3.42	x	110.22	x	0.63	x	0.7	=	115.2	(80)
West	0.9x	0.77	x	3.42	x	94.68	x	0.63	x	0.7	=	98.95	(80)
West	0.9x	0.77	x	3.42	x	73.59	x	0.63	x	0.7	=	76.92	(80)
West	0.9x	0.77	x	3.42	x	45.59	x	0.63	x	0.7	=	47.65	(80)
West	0.9x	0.77	x	3.42	x	24.49	x	0.63	x	0.7	=	25.6	(80)
West	0.9x	0.77	x	3.42	x	16.15	x	0.63	x	0.7	=	16.88	(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=	75.29	147.08	242.69	356.18	439.45	451.39	429.1	366.45	282.85	174.56	93.82	61.97	(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=	461.78	531.12	612.57	703.66	764.22	754.27	718.19	662.17	590.42	504.74	449.86	437.24	(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
Stroma FSAP 2012 Version: 1.0.5.8 (SAP 9.92) http://www.stroma.com												

TER WorkSheet: New dwelling as built

(86)m=	1	1	0.99	0.96	0.87	0.7	0.53	0.59	0.85	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.74	19.89	20.16	20.51	20.8	20.95	20.99	20.98	20.87	20.48	20.05	19.72	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.96	19.97	19.97	19.98	19.98	19.99	19.99	19.99	19.99	19.98	19.98	19.97	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.94	0.82	0.61	0.42	0.47	0.78	0.97	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.29	18.51	18.89	19.41	19.79	19.96	19.99	19.99	19.88	19.37	18.74	18.26	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.68	18.88	19.24	19.7	20.06	20.23	20.26	20.26	20.15	19.67	19.1	18.65	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.68	18.88	19.24	19.7	20.06	20.23	20.26	20.26	20.15	19.67	19.1	18.65	(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=	1	0.99	0.98	0.94	0.83	0.63	0.45	0.51	0.8	0.97	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	460.24	527.36	600.8	660.07	632.78	477.12	321.26	335.57	470.08	487.08	446.83	436.12	(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=	1313.92	1274.02	1157.58	970.05	748.92	498.77	324.21	341	538.16	812.65	1079.71	1307.11	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	635.14	501.75	414.24	223.19	86.41	0	0	0	0	242.22	455.67	648.02	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 3206.64 (98)

Space heating requirement in kWh/m²/year 40.23 (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 93.4 (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)													
	635.14	501.75	414.24	223.19	86.41	0	0	0	0	242.22	455.67	648.02	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	680.02	537.21	443.51	238.96	92.51	0	0	0	0	259.34	487.87	693.81	

Total (kWh/year) =Sum(211)$_{1,5,9,12}$ = 3433.24 (211)

TER WorkSheet: New dwelling as built

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)

	201.94	177.21	184.38	163.53	158.33	139.45	133.6	148.93	150.58	171.46	183.03	197.18

Efficiency of water heater: 80.3 (216)

(217)m=	87.74	87.53	87.03	85.83	83.6	80.3	80.3	80.3	80.3	85.92	87.25	87.82	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	230.17	202.46	211.86	190.52	189.39	173.66	166.38	185.47	187.52	199.56	209.77	224.52	
Total = Sum(219a)$_{1...12}$ =												2371.28	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3433.24	
Water heating fuel used		2371.28	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		357.03	(232)

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	=	741.58	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	512.2	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1253.77	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	185.3	(268)
Total CO2, kg/year	sum of (265)...(271) =				1478	(272)

TER = 18.54 (273)

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SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 02 June 2021

Property Details: Plot 4

Dwelling type:	Semi-detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	6 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	394.51	**(P1)**
Transmission heat loss coefficient:	57	
Summer heat loss coefficient:	451.54	**(P2)**

Overhangs

Orientation:	Ratio:	Z_overhangs:
West (Ext)	0	1
East (Ext)	0	1
North (Ext)	0	1

Solar shading

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
West (Ext)	1	0.9	1	0.9	**(P8)**
East (Ext)	1	0.9	1	0.9	**(P8)**
North (Ext)	1	0.9	1	0.9	**(P8)**

Solar gains

Orientation		Area	Flux	g_	FF	Shading	Gains	
West (Ext)	0.9 x	3.42	124.8	0.72	0.7	0.9	174.24	
East (Ext)	0.9 x	8.35	124.8	0.72	0.7	0.9	425.41	
North (Ext)	0.9 x	1.43	86.66	0.72	0.7	0.9	50.59	
						Total	650.24	**(P3/P4)**

Internal gains

	June	July	August	
Internal gains	427.64	409.93	418.22	
Total summer gains	1119.29	1060.17	980.24	**(P5)**
Summer gain/loss ratio	2.48	2.35	2.17	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	18.13	20	19.92	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

Assessment of likelihood of high internal temperature: Not significant

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Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8
Printed on 10 June 2021 at 13:19:35

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Semi-detached House

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 79.7m²
Site Reference : Langford **Plot Reference:** Plot 5
Address : 5 Langford Close , CLIMPING, BN17 5FG

Client Details

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas
Fuel factor: 1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER)	18.29 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.99 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.4 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	46.8 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (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	3.81 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 478, product index 016635):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi)
Efficiency 89.0 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

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Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.41 kWh/day	
	Permitted by DBSCG: 2.30 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: West	3.42m²
Windows facing: East	8.35m²
Windows facing: South	1.43m²
Ventilation rate:	6.00

10 Key features

Air permeablility	3.8 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Party Walls U-value	0 W/m²K
Floors U-value	0.12 W/m²K

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Thermal Bridge Report

[redacted]

Address: 5 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal Bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.072

External Junctions Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	10.12	E1	[UD]
Sill	0.04	6.17	E3	[A]
Jamb	0.05	19.5	E4	[A]
Ground floor (normal)	0.16	17.86	E5	[A]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	17.86	E6	[A]
Eaves (insulation at ceiling level)	0.06	17.86	E10	[A]
Gable (insulation at ceiling level)	0.24	0	E12	[A]
Corner (normal)	0.09	10	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	0	E17	[A]
Flat roof	0.08	0	E14	[D]
Party wall between dwellings	0.06	10	E18	[A]

Party Junctions Details

Ground floor	0.16	8.96	P1	[D]
Intermediate floor within a dwelling	0	8.96	P2	[D]
Roof (insulation at ceiling level)	0.24	8.96	P4	[D]

i-Therm Limited
Matt Haskell

SAP Input

Property Details: Plot 5

Address:	5 Langford Close , CLIMPING, BN17 5FG
Located in:	England
Region:	South East England
UPRN:	UPRN-502140187952
Date of assessment:	10 June 2021
Date of certificate:	10 June 2021
Assessment type:	New dwelling as built
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:	478

Property description

Dwelling type:	House
Detachment:	Semi-detached
Year Completed:	2021

Floor Location:	**Floor area:**	**Storey height:**
Floor 0	39.85 m²	2.4 m
Floor 1	39.85 m²	2.6 m

Living area:	21.54 m² (fraction 0.27)
Front of dwelling faces:	West

Opening types

Name:	**Source:**	**Type:**	**Glazing:**	**Argon:**	**Frame:**
Entrance	Manufacturer	Solid			PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	**Gap:**	**Frame Factor:**	**g-value:**	**U-value:**	**Area:**	**No. of Openings:**
Entrance	mm	0.7	0	1	2.1	1
Ext	16mm or more	0.7	0.72	1.2	3.42	1
Ext	16mm or more	0.7	0.72	1.2	8.35	1
Ext	16mm or more	0.7	0.72	1.2	1.43	1

Name:	**Type-Name:**	**Location:**	**Orient:**	**Width:**	**Height:**
Entrance	Door (1)	External Wall	West	0	0
Ext	Windows (1)	External Wall	West	0	0
Ext	Windows (1)	External Wall	East	0	0
Ext	Windows (1)	External Wall	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 Wall	89.3	15.3	74	0.27	0	False	N/A
Plane Roof	39.85	0	39.85	0.11	0		N/A
Ground floor	39.85			0.12			N/A
Internal Elements							
Party Elements							
Party	44.8						N/A

SAP Input

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.072

	Length	Psi-value		
	10.12	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	6.17	0.04	E3	Sill
[Approved]	19.5	0.05	E4	Jamb
[Approved]	17.86	0.16	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	17.86	0.07	E6	Intermediate floor within a dwelling
[Approved]	17.86	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	0	0.24	E12	Gable (insulation at ceiling level)
[Approved]	10	0.09	E16	Corner (normal)
[Approved]	0	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof
[Approved]	10	0.06	E18	Party wall between dwellings
	8.96	0.16	P1	Ground floor
	8.96	0	P2	Intermediate floor within a dwelling
	8.96	0.24	P4	Roof (insulation at ceiling level)

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 4
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3.81 (Assessed dwelling is tested)

Main heating system

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 478, product index 016635) Efficiency: Winter 87.3 % Summer: 89.9
Has integral PFGHRD 060025
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
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

[redacted]

SAP Input

Fuel :mains gas
Hot water cylinder
Cylinder volume: 210 litres
Cylinder insulation: Measured loss, 1.41kWh/day
Primary pipework insulation: True
Cylinderstat: True
Cylinder in heated space: True
Flue Gas Heat Recovery System:
Database (rev 478, product index 060025)
Brand name: Ideal
Model: Logic Boost
Model qualifier: 33
Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

i-Therm Limited
Matt Haskell
[redacted]

SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 5

Address : 5 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.2 (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			3.80999994277954 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.39 (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) =	0.33 (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

SAP WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.42	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.2)+ 0.04]		=	3.92			(27)
Windows Type 2			8.35	x1/[1/(1.2)+ 0.04]		=	9.56			(27)
Windows Type 3			1.43	x1/[1/(1.2)+ 0.04]		=	1.64			(27)
Floor			39.85	x	0.12	=	4.782			(28)
Walls	89.3	15.3	74	x	0.27	=	19.98			(29)
Roof	39.85	0	39.85	x	0.11	=	4.38			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 46.36 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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 12.16 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.52 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	38.79	38.56	38.33	37.28	37.08	36.16	36.16	35.99	36.51	37.08	37.48	37.9	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	97.31	97.08	96.86	95.8	95.6	94.68	94.68	94.51	95.04	95.6	96	96.42	

Average = Sum(39)$_{1...12}$ /12= 95.8 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.22	1.22	1.22	1.2	1.2	1.19	1.19	1.19	1.19	1.2	1.2	1.21	

Average = Sum(40)$_{1...12}$ /12= 1.2 (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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	

Total = Sum(44)$_{1...12}$ = 1110.69 (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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	

Total = Sum(45)$_{1...12}$ = 1456.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.65	19.81	20.44	17.82	17.1	14.75	13.67	15.69	15.88	18.5	20.2	21.93	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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) x (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

SAP WorkSheet: New dwelling as built

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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	177.87	156.33	163.15	144.81	140.87	124.38	118.03	131.48	131.86	150.23	160.66	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)
FHRS	7.12	6.51	6.2	4.54	1.53	0	0	0	0	4.85	6.37	7.16	(63) (G2)

Output from water heater

(64)m=	170.74	149.82	156.95	140.27	139.34	124.38	118.03	131.48	131.86	145.39	154.29	165.95	

Output from water heater (annual) — 1728.51 — (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=	56.92	49.98	52.03	46	44.62	39.21	37.03	41.5	41.7	47.74	51.27	55.34	(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=	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	50.54	44.89	36.51	27.64	20.66	17.44	18.85	24.5	32.88	41.75	48.73	51.95	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	326.59	329.97	321.43	303.25	280.3	258.73	244.32	240.94	249.48	267.66	290.61	312.18	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	76.51	74.37	69.93	63.9	59.98	54.46	49.77	55.78	57.91	64.16	71.21	74.38	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	557.98	553.58	532.22	499.13	465.28	434.98	417.28	425.55	444.61	477.91	514.89	542.84	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	8.35	x	19.64	x	0.72	x	0.7	=	57.28	(76)
East	0.9x 0.77	x	8.35	x	38.42	x	0.72	x	0.7	=	112.05	(76)
East	0.9x 0.77	x	8.35	x	63.27	x	0.72	x	0.7	=	184.53	(76)
East	0.9x 0.77	x	8.35	x	92.28	x	0.72	x	0.7	=	269.13	(76)
East	0.9x 0.77	x	8.35	x	113.09	x	0.72	x	0.7	=	329.83	(76)
East	0.9x 0.77	x	8.35	x	115.77	x	0.72	x	0.7	=	337.64	(76)
East	0.9x 0.77	x	8.35	x	110.22	x	0.72	x	0.7	=	321.44	(76)
East	0.9x 0.77	x	8.35	x	94.68	x	0.72	x	0.7	=	276.11	(76)
East	0.9x 0.77	x	8.35	x	73.59	x	0.72	x	0.7	=	214.62	(76)
East	0.9x 0.77	x	8.35	x	45.59	x	0.72	x	0.7	=	132.96	(76)
East	0.9x 0.77	x	8.35	x	24.49	x	0.72	x	0.7	=	71.42	(76)
East	0.9x 0.77	x	8.35	x	16.15	x	0.72	x	0.7	=	47.1	(76)
South	0.9x 0.77	x	1.43	x	46.75	x	0.72	x	0.7	=	23.35	(78)
South	0.9x 0.77	x	1.43	x	76.57	x	0.72	x	0.7	=	38.24	(78)
South	0.9x 0.77	x	1.43	x	97.53	x	0.72	x	0.7	=	48.71	(78)
South	0.9x 0.77	x	1.43	x	110.23	x	0.72	x	0.7	=	55.06	(78)
South	0.9x 0.77	x	1.43	x	114.87	x	0.72	x	0.7	=	57.37	(78)
South	0.9x 0.77	x	1.43	x	110.55	x	0.72	x	0.7	=	55.21	(78)
South	0.9x 0.77	x	1.43	x	108.01	x	0.72	x	0.7	=	53.95	(78)
South	0.9x 0.77	x	1.43	x	104.89	x	0.72	x	0.7	=	52.39	(78)
South	0.9x 0.77	x	1.43	x	101.89	x	0.72	x	0.7	=	50.89	(78)
South	0.9x 0.77	x	1.43	x	82.59	x	0.72	x	0.7	=	41.25	(78)
South	0.9x 0.77	x	1.43	x	55.42	x	0.72	x	0.7	=	27.68	(78)
South	0.9x 0.77	x	1.43	x	40.4	x	0.72	x	0.7	=	20.18	(78)
West	0.9x 0.77	x	3.42	x	19.64	x	0.72	x	0.7	=	23.46	(80)
West	0.9x 0.77	x	3.42	x	38.42	x	0.72	x	0.7	=	45.89	(80)
West	0.9x 0.77	x	3.42	x	63.27	x	0.72	x	0.7	=	75.58	(80)
West	0.9x 0.77	x	3.42	x	92.28	x	0.72	x	0.7	=	110.23	(80)
West	0.9x 0.77	x	3.42	x	113.09	x	0.72	x	0.7	=	135.09	(80)
West	0.9x 0.77	x	3.42	x	115.77	x	0.72	x	0.7	=	138.29	(80)
West	0.9x 0.77	x	3.42	x	110.22	x	0.72	x	0.7	=	131.66	(80)
West	0.9x 0.77	x	3.42	x	94.68	x	0.72	x	0.7	=	113.09	(80)
West	0.9x 0.77	x	3.42	x	73.59	x	0.72	x	0.7	=	87.9	(80)
West	0.9x 0.77	x	3.42	x	45.59	x	0.72	x	0.7	=	54.46	(80)
West	0.9x 0.77	x	3.42	x	24.49	x	0.72	x	0.7	=	29.25	(80)
West	0.9x 0.77	x	3.42	x	16.15	x	0.72	x	0.7	=	19.29	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	104.09	196.19	308.83	434.41	522.29	531.14	507.05	441.6	353.41	228.66	128.35	86.57	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	662.07	749.77	841.04	933.54	987.57	966.12	924.33	867.15	798.02	706.57	643.24	629.42	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) — 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.91	0.78	0.6	0.45	0.49	0.74	0.94	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.87	20.04	20.31	20.63	20.86	20.97	20.99	20.99	20.92	20.61	20.18	19.84	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.9	19.91	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.91	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.88	0.72	0.51	0.34	0.38	0.65	0.91	0.98	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.43	18.67	19.06	19.51	19.8	19.91	19.93	19.93	19.87	19.5	18.89	18.39	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.82	19.04	19.4	19.81	20.09	20.2	20.22	20.22	20.16	19.8	19.24	18.78	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.67	18.89	19.25	19.66	19.94	20.05	20.07	20.07	20.01	19.65	19.09	18.63	(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	0.87	0.72	0.52	0.35	0.4	0.66	0.9	0.97	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	652.25	729.76	793.63	809.93	715.15	504.44	326.84	344.1	527.06	636.83	625.71	621.86	(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=	1398.52	1358.48	1234.62	1031.25	787.39	515.85	328.17	346.42	561.22	864.94	1150.96	1391.62	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	555.22	422.5	328.1	159.35	53.75	0	0	0	0	169.71	378.18	572.7	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2639.51 (98)

Space heating requirement in kWh/m²/year — 33.12 (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 — 89.9 (206)

Efficiency of secondary/supplementary heating system, % — 0 (208)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	555.22	422.5	328.1	159.35	53.75	0	0	0	0	169.71	378.18	572.7		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	617.6	469.97	364.96	177.25	59.79	0	0	0	0	188.78	420.67	637.04		
Total (kWh/year) =Sum(211)$_{1...12}$ =													2936.05	(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)$_{1...12}$ =													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)														
	170.74	149.82	156.95	140.27	139.34	124.38	118.03	131.48	131.86	145.39	154.29	165.95		
Efficiency of water heater													87.3	(216)
(217)m =	89.27	89.2	89.04	88.66	88.01	87.3	87.3	87.3	87.3	88.68	89.13	89.3		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m =	191.26	167.95	176.26	158.21	158.33	142.47	135.2	150.6	151.04	163.94	173.11	185.82		
Total = Sum(219a)$_{1...12}$ =													1954.21	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		2936.05	
Water heating fuel used		1954.21	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		357.03	(232)

12a 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 =	102.17	(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 =	68.01	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(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 =	47.09	(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) =					347.17	(255)

SAP WorkSheet: New dwelling as built

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)		83.69	(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	0.216	=	634.19	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	422.11	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1056.3	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	185.3	(268)
Total CO2, kg/year	sum of (265)...(271) =			1280.52	(272)
CO2 emissions per m²	(272) ÷ (4) =			16.07	(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	=	3581.99	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2384.14	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5966.13	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1096.07	(268)
'Total Primary Energy	sum of (265)...(271) =			7292.45	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			91.5	(273)

[redacted]

EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 5

Address : 5 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.2 (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			3.80999994277954 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.39 (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) =	0.33 (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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.44	0.4	0.38	0.36	0.37	0.34	0.35	0.33	0.35	0.38	0.38	0.41

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.6	0.58	0.57	0.56	0.57	0.56	0.56	0.56	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.6	0.58	0.57	0.56	0.57	0.56	0.56	0.56	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.2)+ 0.04]		=	3.92			(27)
Windows Type 2			8.35	x1/[1/(1.2)+ 0.04]		=	9.56			(27)
Windows Type 3			1.43	x1/[1/(1.2)+ 0.04]		=	1.64			(27)
Floor			39.85	x	0.12	=	4.782			(28)
Walls	89.3	15.3	74	x	0.27	=	19.98			(29)
Roof	39.85	0	39.85	x	0.11	=	4.38			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 46.36 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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 12.16 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.52 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.26	38.11	37.68	37.08	37.28	36.7	36.89	36.51	36.89	37.68	37.68	38.33	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	97.78	96.64	96.21	95.6	95.8	95.22	95.41	95.04	95.41	96.21	96.21	96.86	
										Average = Sum(39)$_{1...12}$ /12=		96.03	(39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.23	1.21	1.21	1.2	1.2	1.19	1.2	1.19	1.2	1.21	1.21	1.22	
											Average = Sum(40)$_{1...12}$ /12=	1.2	(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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	
											Total = Sum(44)$_{1...12}$ =	1110.69	(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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	
											Total = Sum(45)$_{1...12}$ =	1456.28	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)													
(46)m=	22.65	19.81	20.44	17.82	17.1	14.75	13.67	15.69	15.88	18.5	20.2	21.93	(46)

Water storage loss:
Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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) x (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

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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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	177.87	156.33	163.15	144.81	140.87	124.38	118.03	131.48	131.86	150.23	160.66	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)
FHRS	6.74	6.27	5.95	3.05	0.75	0	0	0	0	2.5	6	6.76	(63) (G2)

Output from water heater

(64)m=	171.13	150.06	157.2	141.77	140.13	124.38	118.03	131.48	131.86	147.74	154.67	166.35	

Output from water heater (annual)... 1734.77 (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=	56.92	49.98	52.03	46	44.62	39.21	37.03	41.5	41.7	47.74	51.27	55.34	(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=	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	147.43	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	50.54	44.89	36.51	27.64	20.66	17.44	18.85	24.5	32.88	41.75	48.73	51.95	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	326.59	329.97	321.43	303.25	280.3	258.73	244.32	240.94	249.48	267.66	290.61	312.18	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	76.51	74.37	69.93	63.9	59.98	54.46	49.77	55.78	57.91	64.16	71.21	74.38	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	557.98	553.58	532.22	499.13	465.28	434.98	417.28	425.55	444.61	477.91	514.89	542.84	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	8.35	x	26.63	x	0.72	x	0.7	=	77.67	(76)
East	0.9x 0.77	x	8.35	x	43.95	x	0.72	x	0.7	=	128.19	(76)
East	0.9x 0.77	x	8.35	x	71.91	x	0.72	x	0.7	=	209.72	(76)
East	0.9x 0.77	x	8.35	x	108.59	x	0.72	x	0.7	=	316.69	(76)
East	0.9x 0.77	x	8.35	x	128.14	x	0.72	x	0.7	=	373.72	(76)
East	0.9x 0.77	x	8.35	x	141.01	x	0.72	x	0.7	=	411.24	(76)
East	0.9x 0.77	x	8.35	x	133.32	x	0.72	x	0.7	=	388.8	(76)
East	0.9x 0.77	x	8.35	x	115.5	x	0.72	x	0.7	=	336.84	(76)
East	0.9x 0.77	x	8.35	x	89.42	x	0.72	x	0.7	=	260.8	(76)
East	0.9x 0.77	x	8.35	x	56.26	x	0.72	x	0.7	=	164.09	(76)
East	0.9x 0.77	x	8.35	x	31.99	x	0.72	x	0.7	=	93.29	(76)
East	0.9x 0.77	x	8.35	x	21.09	x	0.72	x	0.7	=	61.49	(76)
South	0.9x 0.77	x	1.43	x	59.74	x	0.72	x	0.7	=	29.84	(78)
South	0.9x 0.77	x	1.43	x	82.27	x	0.72	x	0.7	=	41.09	(78)
South	0.9x 0.77	x	1.43	x	104.17	x	0.72	x	0.7	=	52.03	(78)
South	0.9x 0.77	x	1.43	x	123.04	x	0.72	x	0.7	=	61.45	(78)
South	0.9x 0.77	x	1.43	x	125.05	x	0.72	x	0.7	=	62.46	(78)
South	0.9x 0.77	x	1.43	x	130.26	x	0.72	x	0.7	=	65.06	(78)
South	0.9x 0.77	x	1.43	x	126	x	0.72	x	0.7	=	62.93	(78)
South	0.9x 0.77	x	1.43	x	122	x	0.72	x	0.7	=	60.93	(78)
South	0.9x 0.77	x	1.43	x	116.65	x	0.72	x	0.7	=	58.26	(78)
South	0.9x 0.77	x	1.43	x	95.67	x	0.72	x	0.7	=	47.78	(78)
South	0.9x 0.77	x	1.43	x	68.13	x	0.72	x	0.7	=	34.03	(78)
South	0.9x 0.77	x	1.43	x	49.76	x	0.72	x	0.7	=	24.85	(78)
West	0.9x 0.77	x	3.42	x	26.63	x	0.72	x	0.7	=	31.81	(80)
West	0.9x 0.77	x	3.42	x	43.95	x	0.72	x	0.7	=	52.5	(80)
West	0.9x 0.77	x	3.42	x	71.91	x	0.72	x	0.7	=	85.9	(80)
West	0.9x 0.77	x	3.42	x	108.59	x	0.72	x	0.7	=	129.71	(80)
West	0.9x 0.77	x	3.42	x	128.14	x	0.72	x	0.7	=	153.07	(80)
West	0.9x 0.77	x	3.42	x	141.01	x	0.72	x	0.7	=	168.44	(80)
West	0.9x 0.77	x	3.42	x	133.32	x	0.72	x	0.7	=	159.25	(80)
West	0.9x 0.77	x	3.42	x	115.5	x	0.72	x	0.7	=	137.96	(80)
West	0.9x 0.77	x	3.42	x	89.42	x	0.72	x	0.7	=	106.82	(80)
West	0.9x 0.77	x	3.42	x	56.26	x	0.72	x	0.7	=	67.21	(80)
West	0.9x 0.77	x	3.42	x	31.99	x	0.72	x	0.7	=	38.21	(80)
West	0.9x 0.77	x	3.42	x	21.09	x	0.72	x	0.7	=	25.19	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	139.32	221.78	347.64	507.85	589.24	644.74	610.98	535.74	425.88	279.08	165.53	111.53	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	697.3	775.36	879.86	1006.98	1054.52	1079.72	1028.26	961.29	870.49	756.99	680.42	654.38	(84)

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7. Mean internal temperature (for the whole dwelling) (continuous heating assumed)

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	0.7	0.49	0.35	0.35	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=	20.06	20.18	20.45	20.75	20.93	20.99	21	21	20.97	20.78	20.39	20.04	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.9	19.91	19.91	19.92	19.92	19.92	19.92	19.93	19.92	19.91	19.91	19.91	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.98	0.97	0.93	0.82	0.62	0.4	0.25	0.25	0.52	0.82	0.96	0.98	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.7	18.88	19.25	19.66	19.86	19.92	19.92	19.93	19.91	19.71	19.18	18.68	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.07	19.23	19.58	19.95	20.15	20.21	20.21	20.22	20.19	20	19.51	19.04	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.92	19.08	19.43	19.8	20	20.06	20.06	20.07	20.04	19.85	19.36	18.89	(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	0.41	0.27	0.26	0.53	0.82	0.95	0.98	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	679.93	746	809.57	817.15	663.99	440.14	272.82	253.05	460.35	618.19	645.76	640.95	(95)

Monthly average external temperature from Table 8

(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	1292.45	1274.04	1157.06	965.61	699.28	443.58	273.14	253.33	471.6	735.78	1025.56	1268.28	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	455.71	354.85	258.53	106.89	26.26	0	0	0	0	87.49	273.45	466.73	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 2029.92 (98)

Space heating requirement in kWh/m²/year — 25.47 (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 — 89.9 (206)

Efficiency of secondary/supplementary heating system, % — 0 (208)

EPC Costs WorkSheet: New dwelling as built

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	455.71	354.85	258.53	106.89	26.26	0	0	0	0	87.49	273.45	466.73	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	506.91	394.71	287.58	118.9	29.21	0	0	0	0	97.31	304.18	519.17	(211)
Total (kWh/year) =Sum(211)$_{1...12}$ =													2257.97 (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)$_{1...12}$ =													0 (215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	171.13	150.06	157.2	141.77	140.13	124.38	118.03	131.48	131.86	147.74	154.67	166.35	
Efficiency of water heater													87.3 (216)
(217)m =	89.17	89.11	88.9	88.4	87.7	87.3	87.3	87.3	87.3	88.25	88.94	89.2	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m =	191.9	168.39	176.83	160.37	159.78	142.47	135.2	150.6	151.04	167.41	173.89	186.48	
Total = Sum(219a)$_{1...12}$ =													1964.38 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		2257.97
Water heating fuel used		1964.38
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		357.03 (232)

12a Fuel costs - individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year
Space heating - main system 1	(211) x	3.87 x 0.01 =	87.38 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	18.9 x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.87 x 0.01 =	76.02 (247)
Pumps, fans and electric keep-hot	(231)	0 x 0.01 =	14.17 (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)	0 x 0.01 =	67.48 (250)
Additional standing charges (Table 12)			93 (251)
Appendix Q items: repeat lines (253) and (254) as needed			
Total energy cost (245)...(247) + (250)...(254) =			338.06 (255)

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[redacted]

EPC Costs WorkSheet: New dwelling as built

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)		84.78	(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	=	487.72	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	424.31	(264)
Space and water heating	(261) + (262) + (263) + (264) =				912.03	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	185.3	(268)
Total CO2, kg/year	sum of (265)...(271) =				1136.25	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				14.26	(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	=	2754.73	(261)
Space heating (secondary)	(215)	x	3.07	=	0	(263)
Energy for water heating	(219)	x	1.22	=	2396.54	(264)
Space and water heating	(261) + (262) + (263) + (264) =				5151.27	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	3.07	=	230.25	(267)
Electricity for lighting	(232)	x	0	=	1096.07	(268)
'Total Primary Energy	sum of (265)...(271) =				6477.6	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =				81.27	(273)

TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 5

Address : 5 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		199.25	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.15 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.4 (18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34 (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

TFEE WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.43	0.42	0.37	0.37	0.32	0.32	0.31	0.34	0.37	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.4)+ 0.04]		=	4.53			(27)
Windows Type 2			8.35	x1/[1/(1.4)+ 0.04]		=	11.07			(27)
Windows Type 3			1.43	x1/[1/(1.4)+ 0.04]		=	1.9			(27)
Floor			39.85	x	0.13	=	5.1805			(28)
Walls	89.3	15.3	74	x	0.18	=	13.32			(29)
Roof	39.85	0	39.85	x	0.13	=	5.18			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 43.28 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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) = 52.29 (37)

TFEE WorkSheet: New dwelling as built

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.07	38.83	38.6	37.49	37.28	36.32	36.32	36.14	36.69	37.28	37.7	38.14	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	91.36	91.12	90.89	89.78	89.57	88.61	88.61	88.43	88.98	89.57	89.99	90.43	

Average = Sum(39)$_{1...12}$ /12= 89.78 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.11	1.12	1.12	1.13	1.13	

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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	

Total = Sum(44)$_{1...12}$ = 1110.69 (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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	

Total = Sum(45)$_{1...12}$ = 1456.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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) x (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

TFEE WorkSheet: New dwelling as built

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=	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=	128.34	112.25	115.83	100.98	96.89	83.61	77.48	88.91	89.97	104.85	114.45	124.29	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	128.34	112.25	115.83	100.98	96.89	83.61	77.48	88.91	89.97	104.85	114.45	124.29	

Output from water heater (annual)... 1237.84 (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=	32.08	28.06	28.96	25.25	24.22	20.9	19.37	22.23	22.49	26.21	28.61	31.07	(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=	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.22	17.96	14.6	11.06	8.26	6.98	7.54	9.8	13.15	16.7	19.49	20.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	218.81	221.08	215.36	203.18	187.8	173.35	163.7	161.43	167.15	179.33	194.71	209.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	43.12	41.76	38.92	35.06	32.56	29.03	26.03	29.87	31.24	35.23	39.74	41.76	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	342.01	340.65	328.74	309.16	288.48	269.22	257.13	260.96	271.4	291.12	313.79	331.56	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TFEE WorkSheet: New dwelling as built

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	8.35	x	19.64	x	0.63	x	0.7	=	50.12	(76)
East	0.9x 0.77	x	8.35	x	38.42	x	0.63	x	0.7	=	98.04	(76)
East	0.9x 0.77	x	8.35	x	63.27	x	0.63	x	0.7	=	161.46	(76)
East	0.9x 0.77	x	8.35	x	92.28	x	0.63	x	0.7	=	235.49	(76)
East	0.9x 0.77	x	8.35	x	113.09	x	0.63	x	0.7	=	288.6	(76)
East	0.9x 0.77	x	8.35	x	115.77	x	0.63	x	0.7	=	295.43	(76)
East	0.9x 0.77	x	8.35	x	110.22	x	0.63	x	0.7	=	281.26	(76)
East	0.9x 0.77	x	8.35	x	94.68	x	0.63	x	0.7	=	241.6	(76)
East	0.9x 0.77	x	8.35	x	73.59	x	0.63	x	0.7	=	187.79	(76)
East	0.9x 0.77	x	8.35	x	45.59	x	0.63	x	0.7	=	116.34	(76)
East	0.9x 0.77	x	8.35	x	24.49	x	0.63	x	0.7	=	62.49	(76)
East	0.9x 0.77	x	8.35	x	16.15	x	0.63	x	0.7	=	41.22	(76)
South	0.9x 0.77	x	1.43	x	46.75	x	0.63	x	0.7	=	20.43	(78)
South	0.9x 0.77	x	1.43	x	76.57	x	0.63	x	0.7	=	33.46	(78)
South	0.9x 0.77	x	1.43	x	97.53	x	0.63	x	0.7	=	42.62	(78)
South	0.9x 0.77	x	1.43	x	110.23	x	0.63	x	0.7	=	48.18	(78)
South	0.9x 0.77	x	1.43	x	114.87	x	0.63	x	0.7	=	50.2	(78)
South	0.9x 0.77	x	1.43	x	110.55	x	0.63	x	0.7	=	48.31	(78)
South	0.9x 0.77	x	1.43	x	108.01	x	0.63	x	0.7	=	47.2	(78)
South	0.9x 0.77	x	1.43	x	104.89	x	0.63	x	0.7	=	45.84	(78)
South	0.9x 0.77	x	1.43	x	101.89	x	0.63	x	0.7	=	44.53	(78)
South	0.9x 0.77	x	1.43	x	82.59	x	0.63	x	0.7	=	36.09	(78)
South	0.9x 0.77	x	1.43	x	55.42	x	0.63	x	0.7	=	24.22	(78)
South	0.9x 0.77	x	1.43	x	40.4	x	0.63	x	0.7	=	17.66	(78)
West	0.9x 0.77	x	3.42	x	19.64	x	0.63	x	0.7	=	20.53	(80)
West	0.9x 0.77	x	3.42	x	38.42	x	0.63	x	0.7	=	40.16	(80)
West	0.9x 0.77	x	3.42	x	63.27	x	0.63	x	0.7	=	66.13	(80)
West	0.9x 0.77	x	3.42	x	92.28	x	0.63	x	0.7	=	96.45	(80)
West	0.9x 0.77	x	3.42	x	113.09	x	0.63	x	0.7	=	118.2	(80)
West	0.9x 0.77	x	3.42	x	115.77	x	0.63	x	0.7	=	121	(80)
West	0.9x 0.77	x	3.42	x	110.22	x	0.63	x	0.7	=	115.2	(80)
West	0.9x 0.77	x	3.42	x	94.68	x	0.63	x	0.7	=	98.95	(80)
West	0.9x 0.77	x	3.42	x	73.59	x	0.63	x	0.7	=	76.92	(80)
West	0.9x 0.77	x	3.42	x	45.59	x	0.63	x	0.7	=	47.65	(80)
West	0.9x 0.77	x	3.42	x	24.49	x	0.63	x	0.7	=	25.6	(80)
West	0.9x 0.77	x	3.42	x	16.15	x	0.63	x	0.7	=	16.88	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	91.08	171.66	270.22	380.11	457	464.75	443.67	386.4	309.23	200.08	112.31	75.75	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	433.09	512.32	598.96	689.27	745.49	733.96	700.79	647.35	580.63	491.2	426.1	407.31	(84)

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7. Mean internal temperature (for heating seasons)

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=	1	1	0.99	0.96	0.88	0.71	0.54	0.61	0.86	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.71	19.87	20.14	20.5	20.79	20.95	20.99	20.98	20.86	20.47	20.02	19.69	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.96	19.97	19.97	19.98	19.98	19.99	19.99	19.99	19.99	19.98	19.98	19.97	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.95	0.83	0.62	0.43	0.48	0.79	0.97	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.79	18.95	19.22	19.57	19.84	19.97	19.99	19.99	19.91	19.55	19.11	18.77	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.04	19.2	19.47	19.82	20.1	20.23	20.26	20.26	20.17	19.8	19.36	19.02	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.04	19.2	19.47	19.82	20.1	20.23	20.26	20.26	20.17	19.8	19.36	19.02	(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=	1	0.99	0.98	0.94	0.84	0.65	0.46	0.52	0.81	0.97	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	432.12	509.52	589.22	651.06	626.4	475.11	320.95	335.09	467.69	476.54	424.05	406.64	(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=	1346.3	1302.83	1178.8	980.8	752.09	499.15	324.24	341.07	539.98	824.02	1102.9	1339.8	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	680.15	533.1	438.65	237.42	93.52	0	0	0	0	258.53	488.77	694.27	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3424.42 (98)

Space heating requirement in kWh/m²/year — 42.97 (99)

9a. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	832.91	655.7	672.06	0	0	0	0	(100)

Utilisation factor for loss hm

(101)m=	0	0	0	0	0	0.89	0.94	0.92	0	0	0	0	(101)

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Useful loss, hmLm (Watts) = (100)m x (101)m

(102)m=	0	0	0	0	0	739.15	616.68	617.16	0	0	0	0	(102)

Gains (solar gains calculated for applicable weather region, see Table 10)

(103)m=	0	0	0	0	0	949.76	909.12	848.28	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	151.64	217.57	171.96	0	0	0	0	

Total = Sum(104) = 541.17 (104)

Cooled fraction — f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	

Total = Sum(104) = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	37.91	54.39	42.99	0	0	0	0	

Total = Sum(107) = 135.29 (107)

Space cooling requirement in kWh/m²/year — (107) ÷ (4) = 1.7 (108)

9a. Fabric Energy Efficiency (calculated only under special conditions, see Section 11)

Fabric Energy Efficiency — (99) + (108) = 44.66 (109)

Target Fabric Energy Efficiency (TFEE) 51.36 (109)

i-Therm Limited
Matt Haskell
[redacted]

DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 5

Address : 5 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.15 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			3.80999994277954 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.34 (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) =	0.29 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.2)+ 0.04]		=	3.92			(27)
Windows Type 2			8.35	x1/[1/(1.2)+ 0.04]		=	9.56			(27)
Windows Type 3			1.43	x1/[1/(1.2)+ 0.04]		=	1.64			(27)
Floor			39.85	x	0.12	=	4.782			(28)
Walls	89.3	15.3	74	x	0.27	=	19.98			(29)
Roof	39.85	0	39.85	x	0.11	=	4.38			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 46.36 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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 12.16 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.52 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	37.37	37.19	37.02	36.22	36.07	35.37	35.37	35.24	35.64	36.07	36.37	36.69	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	95.89	95.72	95.55	94.74	94.59	93.89	93.89	93.76	94.16	94.59	94.9	95.21	

Average = Sum(39)$_{1...12}$ /12= 94.74 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.2	1.2	1.2	1.19	1.19	1.18	1.18	1.18	1.18	1.19	1.19	1.19	

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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	

Total = Sum(44)$_{1...12}$ = 1110.69 (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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	

Total = Sum(45)$_{1...12}$ = 1456.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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) x (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=	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=	128.34	112.25	115.83	100.98	96.89	83.61	77.48	88.91	89.97	104.85	114.45	124.29	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	128.34	112.25	115.83	100.98	96.89	83.61	77.48	88.91	89.97	104.85	114.45	124.29	

Output from water heater (annual)... 1237.84 (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=	32.08	28.06	28.96	25.25	24.22	20.9	19.37	22.23	22.49	26.21	28.61	31.07	(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=	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.22	17.96	14.6	11.06	8.26	6.98	7.54	9.8	13.15	16.7	19.49	20.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	218.81	221.08	215.36	203.18	187.8	173.35	163.7	161.43	167.15	179.33	194.71	209.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	43.12	41.76	38.92	35.06	32.56	29.03	26.03	29.87	31.24	35.23	39.74	41.76	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	342.01	340.65	328.74	309.16	288.48	269.22	257.13	260.96	271.4	291.12	313.79	331.56	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	8.35	x	19.64	x	0.72	x	0.7	=	57.28	(76)
East	0.9x 0.77	x	8.35	x	38.42	x	0.72	x	0.7	=	112.05	(76)
East	0.9x 0.77	x	8.35	x	63.27	x	0.72	x	0.7	=	184.53	(76)
East	0.9x 0.77	x	8.35	x	92.28	x	0.72	x	0.7	=	269.13	(76)
East	0.9x 0.77	x	8.35	x	113.09	x	0.72	x	0.7	=	329.83	(76)
East	0.9x 0.77	x	8.35	x	115.77	x	0.72	x	0.7	=	337.64	(76)
East	0.9x 0.77	x	8.35	x	110.22	x	0.72	x	0.7	=	321.44	(76)
East	0.9x 0.77	x	8.35	x	94.68	x	0.72	x	0.7	=	276.11	(76)
East	0.9x 0.77	x	8.35	x	73.59	x	0.72	x	0.7	=	214.62	(76)
East	0.9x 0.77	x	8.35	x	45.59	x	0.72	x	0.7	=	132.96	(76)
East	0.9x 0.77	x	8.35	x	24.49	x	0.72	x	0.7	=	71.42	(76)
East	0.9x 0.77	x	8.35	x	16.15	x	0.72	x	0.7	=	47.1	(76)
South	0.9x 0.77	x	1.43	x	46.75	x	0.72	x	0.7	=	23.35	(78)
South	0.9x 0.77	x	1.43	x	76.57	x	0.72	x	0.7	=	38.24	(78)
South	0.9x 0.77	x	1.43	x	97.53	x	0.72	x	0.7	=	48.71	(78)
South	0.9x 0.77	x	1.43	x	110.23	x	0.72	x	0.7	=	55.06	(78)
South	0.9x 0.77	x	1.43	x	114.87	x	0.72	x	0.7	=	57.37	(78)
South	0.9x 0.77	x	1.43	x	110.55	x	0.72	x	0.7	=	55.21	(78)
South	0.9x 0.77	x	1.43	x	108.01	x	0.72	x	0.7	=	53.95	(78)
South	0.9x 0.77	x	1.43	x	104.89	x	0.72	x	0.7	=	52.39	(78)
South	0.9x 0.77	x	1.43	x	101.89	x	0.72	x	0.7	=	50.89	(78)
South	0.9x 0.77	x	1.43	x	82.59	x	0.72	x	0.7	=	41.25	(78)
South	0.9x 0.77	x	1.43	x	55.42	x	0.72	x	0.7	=	27.68	(78)
South	0.9x 0.77	x	1.43	x	40.4	x	0.72	x	0.7	=	20.18	(78)
West	0.9x 0.77	x	3.42	x	19.64	x	0.72	x	0.7	=	23.46	(80)
West	0.9x 0.77	x	3.42	x	38.42	x	0.72	x	0.7	=	45.89	(80)
West	0.9x 0.77	x	3.42	x	63.27	x	0.72	x	0.7	=	75.58	(80)
West	0.9x 0.77	x	3.42	x	92.28	x	0.72	x	0.7	=	110.23	(80)
West	0.9x 0.77	x	3.42	x	113.09	x	0.72	x	0.7	=	135.09	(80)
West	0.9x 0.77	x	3.42	x	115.77	x	0.72	x	0.7	=	138.29	(80)
West	0.9x 0.77	x	3.42	x	110.22	x	0.72	x	0.7	=	131.66	(80)
West	0.9x 0.77	x	3.42	x	94.68	x	0.72	x	0.7	=	113.09	(80)
West	0.9x 0.77	x	3.42	x	73.59	x	0.72	x	0.7	=	87.9	(80)
West	0.9x 0.77	x	3.42	x	45.59	x	0.72	x	0.7	=	54.46	(80)
West	0.9x 0.77	x	3.42	x	24.49	x	0.72	x	0.7	=	29.25	(80)
West	0.9x 0.77	x	3.42	x	16.15	x	0.72	x	0.7	=	19.29	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	104.09	196.19	308.83	434.41	522.29	531.14	507.05	441.6	353.41	228.66	128.35	86.57	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	446.1	536.84	637.57	743.57	810.77	800.36	764.17	702.55	624.81	519.78	442.15	418.13	(84)

DFEE WorkSheet: New dwelling as built

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=	1	1	0.99	0.95	0.86	0.7	0.53	0.59	0.85	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.65	19.83	20.12	20.49	20.79	20.95	20.99	20.98	20.86	20.44	19.97	19.62	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.92	19.92	19.92	19.93	19.93	19.94	19.94	19.94	19.93	19.93	19.93	19.92	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.94	0.81	0.6	0.41	0.47	0.77	0.97	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.69	18.86	19.16	19.52	19.79	19.91	19.93	19.93	19.86	19.49	19.02	18.66	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.95	19.12	19.42	19.78	20.06	20.19	20.22	20.22	20.13	19.75	19.28	18.92	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.95	19.12	19.42	19.78	20.06	20.19	20.22	20.22	20.13	19.75	19.28	18.92	(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=	1	0.99	0.98	0.93	0.82	0.63	0.44	0.5	0.79	0.97	0.99	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	444.93	533.28	624.87	694.58	664.87	500.54	336.37	351.48	492.86	501.8	439.64	417.32	(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=	1404.73	1361.47	1233.99	1031.08	790.86	525.2	339.87	357.89	567.61	865.06	1155.49	1401.62	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	714.09	556.55	453.18	242.28	93.74	0	0	0	0	270.27	515.41	732.32	

Total per year (kWh/year) = Sum(98)$_{1...12}$ = 3577.84 (98)

Space heating requirement in kWh/m²/year — 44.89 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)

(100)m=	0	0	0	0	0	882.6	694.81	712.6	0	0	0	0	(100)

Utilisation factor for loss hm

(101)m=	0	0	0	0	0	0.89	0.94	0.92	0	0	0	0	(101)

DFEE WorkSheet: New dwelling as built

Useful loss, hmLm (Watts) = (100)m x (101)m

(102)m=	0	0	0	0	0	783.52	652.62	652.79	0	0	0	0	(102)

Gains (solar gains calculated for applicable weather region, see Table 10)

(103)m=	0	0	0	0	0	1027.36	983.2	912.8	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	175.57	245.95	193.45	0	0	0	0	

Total = Sum(104) = 614.97 (104)

Cooled fraction — f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	

Total = Sum(104) = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	43.89	61.49	48.36	0	0	0	0	

Total = Sum(107) = 153.74 (107)

Space cooling requirement in kWh/m²/year — (107) ÷ (4) = 1.93 (108)

9a. Fabric Energy Efficiency (calculated only under special conditions, see Section 11)

Fabric Energy Efficiency — (99) + (108) = 46.82 (109)

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 5

Address : 5 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							4	x 10 =	40	(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) = 40 ÷ (5) =	0.2	(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		3.80999994277954	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.39	(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) =	0.33	(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

DER WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.42	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.2)+ 0.04]		=	3.92			(27)
Windows Type 2			8.35	x1/[1/(1.2)+ 0.04]		=	9.56			(27)
Windows Type 3			1.43	x1/[1/(1.2)+ 0.04]		=	1.64			(27)
Floor			39.85	x	0.12	=	4.782			(28)
Walls	89.3	15.3	74	x	0.27	=	19.98			(29)
Roof	39.85	0	39.85	x	0.11	=	4.38			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 46.36 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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 12.16 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 58.52 (37)

DER WorkSheet: New dwelling as built

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	38.79	38.56	38.33	37.28	37.08	36.16	36.16	35.99	36.51	37.08	37.48	37.9	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	97.31	97.08	96.86	95.8	95.6	94.68	94.68	94.51	95.04	95.6	96	96.42	

Average = Sum(39)$_{1...12}$ /12= 95.8 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.22	1.22	1.22	1.2	1.2	1.19	1.19	1.19	1.19	1.2	1.2	1.21	

Average = Sum(40)$_{1...12}$ /12= 1.2 (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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	

Total = Sum(44)$_{1...12}$ = 1110.69 (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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	

Total = Sum(45)$_{1...12}$ = 1456.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.65	19.81	20.44	17.82	17.1	14.75	13.67	15.69	15.88	18.5	20.2	21.93	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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) x (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

DER WorkSheet: New dwelling as built

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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	177.87	156.33	163.15	144.81	140.87	124.38	118.03	131.48	131.86	150.23	160.66	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)
FHRS	7.54	6.83	6.51	5.76	2.33	0	0	0	0	5.84	6.7	7.56	(63) (G2)

Output from water heater

(64)m=	170.33	149.5	156.63	139.06	138.54	124.38	118.03	131.48	131.86	144.39	153.96	165.54	

Output from water heater (annual)... 1723.7 (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=	56.92	49.98	52.03	46	44.62	39.21	37.03	41.5	41.7	47.74	51.27	55.34	(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=	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.22	17.96	14.6	11.06	8.26	6.98	7.54	9.8	13.15	16.7	19.49	20.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	218.81	221.08	215.36	203.18	187.8	173.35	163.7	161.43	167.15	179.33	194.71	209.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	76.51	74.37	69.93	63.9	59.98	54.46	49.77	55.78	57.91	64.16	71.21	74.38	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	378.4	376.27	362.75	340.99	318.9	297.64	283.86	289.86	301.07	323.05	348.27	367.17	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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DER WorkSheet: New dwelling as built

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	8.35	x	19.64	x	0.72	x	0.7	=	57.28	(76)
East	0.9x 0.77	x	8.35	x	38.42	x	0.72	x	0.7	=	112.05	(76)
East	0.9x 0.77	x	8.35	x	63.27	x	0.72	x	0.7	=	184.53	(76)
East	0.9x 0.77	x	8.35	x	92.28	x	0.72	x	0.7	=	269.13	(76)
East	0.9x 0.77	x	8.35	x	113.09	x	0.72	x	0.7	=	329.83	(76)
East	0.9x 0.77	x	8.35	x	115.77	x	0.72	x	0.7	=	337.64	(76)
East	0.9x 0.77	x	8.35	x	110.22	x	0.72	x	0.7	=	321.44	(76)
East	0.9x 0.77	x	8.35	x	94.68	x	0.72	x	0.7	=	276.11	(76)
East	0.9x 0.77	x	8.35	x	73.59	x	0.72	x	0.7	=	214.62	(76)
East	0.9x 0.77	x	8.35	x	45.59	x	0.72	x	0.7	=	132.96	(76)
East	0.9x 0.77	x	8.35	x	24.49	x	0.72	x	0.7	=	71.42	(76)
East	0.9x 0.77	x	8.35	x	16.15	x	0.72	x	0.7	=	47.1	(76)
South	0.9x 0.77	x	1.43	x	46.75	x	0.72	x	0.7	=	23.35	(78)
South	0.9x 0.77	x	1.43	x	76.57	x	0.72	x	0.7	=	38.24	(78)
South	0.9x 0.77	x	1.43	x	97.53	x	0.72	x	0.7	=	48.71	(78)
South	0.9x 0.77	x	1.43	x	110.23	x	0.72	x	0.7	=	55.06	(78)
South	0.9x 0.77	x	1.43	x	114.87	x	0.72	x	0.7	=	57.37	(78)
South	0.9x 0.77	x	1.43	x	110.55	x	0.72	x	0.7	=	55.21	(78)
South	0.9x 0.77	x	1.43	x	108.01	x	0.72	x	0.7	=	53.95	(78)
South	0.9x 0.77	x	1.43	x	104.89	x	0.72	x	0.7	=	52.39	(78)
South	0.9x 0.77	x	1.43	x	101.89	x	0.72	x	0.7	=	50.89	(78)
South	0.9x 0.77	x	1.43	x	82.59	x	0.72	x	0.7	=	41.25	(78)
South	0.9x 0.77	x	1.43	x	55.42	x	0.72	x	0.7	=	27.68	(78)
South	0.9x 0.77	x	1.43	x	40.4	x	0.72	x	0.7	=	20.18	(78)
West	0.9x 0.77	x	3.42	x	19.64	x	0.72	x	0.7	=	23.46	(80)
West	0.9x 0.77	x	3.42	x	38.42	x	0.72	x	0.7	=	45.89	(80)
West	0.9x 0.77	x	3.42	x	63.27	x	0.72	x	0.7	=	75.58	(80)
West	0.9x 0.77	x	3.42	x	92.28	x	0.72	x	0.7	=	110.23	(80)
West	0.9x 0.77	x	3.42	x	113.09	x	0.72	x	0.7	=	135.09	(80)
West	0.9x 0.77	x	3.42	x	115.77	x	0.72	x	0.7	=	138.29	(80)
West	0.9x 0.77	x	3.42	x	110.22	x	0.72	x	0.7	=	131.66	(80)
West	0.9x 0.77	x	3.42	x	94.68	x	0.72	x	0.7	=	113.09	(80)
West	0.9x 0.77	x	3.42	x	73.59	x	0.72	x	0.7	=	87.9	(80)
West	0.9x 0.77	x	3.42	x	45.59	x	0.72	x	0.7	=	54.46	(80)
West	0.9x 0.77	x	3.42	x	24.49	x	0.72	x	0.7	=	29.25	(80)
West	0.9x 0.77	x	3.42	x	16.15	x	0.72	x	0.7	=	19.29	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	104.09	196.19	308.83	434.41	522.29	531.14	507.05	441.6	353.41	228.66	128.35	86.57	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	482.49	572.45	671.58	775.4	841.19	828.78	790.91	731.46	654.48	551.71	476.62	453.75	(84)

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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=	1	0.99	0.98	0.95	0.85	0.68	0.52	0.57	0.83	0.97	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.67	19.84	20.13	20.5	20.8	20.95	20.99	20.98	20.87	20.47	20	19.64	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.9	19.91	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.91	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.93	0.8	0.59	0.4	0.45	0.75	0.96	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.14	18.39	18.81	19.35	19.73	19.9	19.93	19.92	19.82	19.3	18.62	18.1	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.55	18.78	19.17	19.66	20.02	20.18	20.21	20.21	20.11	19.62	18.99	18.52	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.4	18.63	19.02	19.51	19.87	20.03	20.06	20.06	19.96	19.47	18.84	18.37	(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=	1	0.99	0.97	0.92	0.8	0.6	0.41	0.47	0.76	0.95	0.99	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	480.39	566.77	653.53	713.15	670.44	494.3	325.34	341.28	495.11	525.72	472.34	452.26	(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=	1372.12	1333.29	1212.77	1016.29	780.74	514.38	327.93	345.98	556.5	847.72	1127.48	1365.81	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	663.45	515.1	416.07	218.26	82.07	0	0	0	0	239.57	471.7	679.68	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3285.89 (98)

Space heating requirement in kWh/m²/year — 41.23 (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 — 89.9 (206)

Efficiency of secondary/supplementary heating system, % — 0 (208)

DER WorkSheet: New dwelling as built

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year	
Space heating requirement (calculated above)														
	663.45	515.1	416.07	218.26	82.07	0	0	0	0	239.57	471.7	679.68		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)														(211)
	737.98	572.97	462.82	242.78	91.29	0	0	0	0	266.48	524.69	756.04		
Total (kWh/year) =Sum(211)$_{1...12}$ =													3655.05	(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)$_{1...12}$ =													0	(215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Output from water heater (calculated above)														
	170.33	149.5	156.63	139.06	138.54	124.38	118.03	131.48	131.86	144.39	153.96	165.54		
Efficiency of water heater													87.3	(216)
(217)m =	89.36	89.3	89.17	88.87	88.25	87.3	87.3	87.3	87.3	88.9	89.25	89.38		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m														
(219)m =	190.62	167.41	175.65	156.47	156.99	142.47	135.2	150.6	151.04	162.41	172.51	185.22		
Total = Sum(219a)$_{1...12}$ =													1946.59	(219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3655.05	
Water heating fuel used		1946.59	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		357.03	(232)

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	=	789.49	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	420.46	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1209.96	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	185.3	(268)
Total CO2, kg/year	sum of (265)...(271) =				1434.18	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				17.99	(273)
EI rating (section 14)					85	(274)

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TER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 5

Address : 5 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	39.85	(1a) x	2.4	(2a) =	95.64	(3a)
First floor	39.85	(1b) x	2.6	(2b) =	103.61	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	79.7	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	199.25	(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							3	x 10 =	30	(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) =	30	÷ (5) =	0.15 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.4 (18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.43	0.42	0.37	0.37	0.32	0.32	0.31	0.34	0.37	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors			2.1	x	1	=	2.1			(26)
Windows Type 1			3.42	x1/[1/(1.4)+ 0.04]		=	4.53			(27)
Windows Type 2			8.35	x1/[1/(1.4)+ 0.04]		=	11.07			(27)
Windows Type 3			1.43	x1/[1/(1.4)+ 0.04]		=	1.9			(27)
Floor			39.85	x	0.13	=	5.1805			(28)
Walls	89.3	15.3	74	x	0.18	=	13.32			(29)
Roof	39.85	0	39.85	x	0.13	=	5.18			(30)
Total area of elements, m²			169							(31)
Party wall			44.8	x	0	=	0			(32)

** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2*

*** include the areas on both sides of internal walls and partitions*

Fabric heat loss, W/K = S (A x U) (26)...(30) + (32) = 43.28 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 14110.15 (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) = 52.29 (37)

TER WorkSheet: New dwelling as built

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	39.07	38.83	38.6	37.49	37.28	36.32	36.32	36.14	36.69	37.28	37.7	38.14	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	91.36	91.12	90.89	89.78	89.57	88.61	88.61	88.43	88.98	89.57	89.99	90.43	

Average = Sum(39)$_{1...12}$ /12= 89.78 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.15	1.14	1.14	1.13	1.12	1.11	1.11	1.11	1.12	1.12	1.13	1.13	

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 2.46 (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 92.56 (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=	101.81	98.11	94.41	90.71	87	83.3	83.3	87	90.71	94.41	98.11	101.81	

Total = Sum(44)$_{1...12}$ = 1110.69 (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=	150.99	132.05	136.27	118.8	113.99	98.37	91.15	104.6	105.85	123.35	134.65	146.22	

Total = Sum(45)$_{1...12}$ = 1456.28 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	22.65	19.81	20.44	17.82	17.1	14.75	13.67	15.69	15.88	18.5	20.2	21.93	(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) x (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

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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	45.16	48.11	44.73	44.34	41.08	42.45	44.34	44.73	48.11	48.38	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=	201.94	177.21	184.38	163.53	158.33	139.45	133.6	148.93	150.58	171.46	183.03	197.18	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	201.94	177.21	184.38	163.53	158.33	139.45	133.6	148.93	150.58	171.46	183.03	197.18	

Output from water heater (annual)... 2009.63 (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=	62.94	55.2	57.34	50.68	48.99	42.98	40.92	45.86	46.38	53.04	56.87	61.36	(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=	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	122.86	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	20.22	17.96	14.6	11.06	8.26	6.98	7.54	9.8	13.15	16.7	19.49	20.78	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	218.81	221.08	215.36	203.18	187.8	173.35	163.7	161.43	167.15	179.33	194.71	209.16	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	35.29	(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=	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	-98.29	(71)

Water heating gains (Table 5)

(72)m=	84.6	82.14	77.06	70.39	65.84	59.69	55	61.64	64.41	71.29	78.98	82.47	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	386.49	384.03	369.89	347.49	324.77	302.88	289.09	295.73	307.57	330.18	356.04	375.26	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TER WorkSheet: New dwelling as built

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x 0.77	x	8.35	x	19.64	x	0.63	x	0.7	=	50.12	(76)
East	0.9x 0.77	x	8.35	x	38.42	x	0.63	x	0.7	=	98.04	(76)
East	0.9x 0.77	x	8.35	x	63.27	x	0.63	x	0.7	=	161.46	(76)
East	0.9x 0.77	x	8.35	x	92.28	x	0.63	x	0.7	=	235.49	(76)
East	0.9x 0.77	x	8.35	x	113.09	x	0.63	x	0.7	=	288.6	(76)
East	0.9x 0.77	x	8.35	x	115.77	x	0.63	x	0.7	=	295.43	(76)
East	0.9x 0.77	x	8.35	x	110.22	x	0.63	x	0.7	=	281.26	(76)
East	0.9x 0.77	x	8.35	x	94.68	x	0.63	x	0.7	=	241.6	(76)
East	0.9x 0.77	x	8.35	x	73.59	x	0.63	x	0.7	=	187.79	(76)
East	0.9x 0.77	x	8.35	x	45.59	x	0.63	x	0.7	=	116.34	(76)
East	0.9x 0.77	x	8.35	x	24.49	x	0.63	x	0.7	=	62.49	(76)
East	0.9x 0.77	x	8.35	x	16.15	x	0.63	x	0.7	=	41.22	(76)
South	0.9x 0.77	x	1.43	x	46.75	x	0.63	x	0.7	=	20.43	(78)
South	0.9x 0.77	x	1.43	x	76.57	x	0.63	x	0.7	=	33.46	(78)
South	0.9x 0.77	x	1.43	x	97.53	x	0.63	x	0.7	=	42.62	(78)
South	0.9x 0.77	x	1.43	x	110.23	x	0.63	x	0.7	=	48.18	(78)
South	0.9x 0.77	x	1.43	x	114.87	x	0.63	x	0.7	=	50.2	(78)
South	0.9x 0.77	x	1.43	x	110.55	x	0.63	x	0.7	=	48.31	(78)
South	0.9x 0.77	x	1.43	x	108.01	x	0.63	x	0.7	=	47.2	(78)
South	0.9x 0.77	x	1.43	x	104.89	x	0.63	x	0.7	=	45.84	(78)
South	0.9x 0.77	x	1.43	x	101.89	x	0.63	x	0.7	=	44.53	(78)
South	0.9x 0.77	x	1.43	x	82.59	x	0.63	x	0.7	=	36.09	(78)
South	0.9x 0.77	x	1.43	x	55.42	x	0.63	x	0.7	=	24.22	(78)
South	0.9x 0.77	x	1.43	x	40.4	x	0.63	x	0.7	=	17.66	(78)
West	0.9x 0.77	x	3.42	x	19.64	x	0.63	x	0.7	=	20.53	(80)
West	0.9x 0.77	x	3.42	x	38.42	x	0.63	x	0.7	=	40.16	(80)
West	0.9x 0.77	x	3.42	x	63.27	x	0.63	x	0.7	=	66.13	(80)
West	0.9x 0.77	x	3.42	x	92.28	x	0.63	x	0.7	=	96.45	(80)
West	0.9x 0.77	x	3.42	x	113.09	x	0.63	x	0.7	=	118.2	(80)
West	0.9x 0.77	x	3.42	x	115.77	x	0.63	x	0.7	=	121	(80)
West	0.9x 0.77	x	3.42	x	110.22	x	0.63	x	0.7	=	115.2	(80)
West	0.9x 0.77	x	3.42	x	94.68	x	0.63	x	0.7	=	98.95	(80)
West	0.9x 0.77	x	3.42	x	73.59	x	0.63	x	0.7	=	76.92	(80)
West	0.9x 0.77	x	3.42	x	45.59	x	0.63	x	0.7	=	47.65	(80)
West	0.9x 0.77	x	3.42	x	24.49	x	0.63	x	0.7	=	25.6	(80)
West	0.9x 0.77	x	3.42	x	16.15	x	0.63	x	0.7	=	16.88	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	91.08	171.66	270.22	380.11	457	464.75	443.67	386.4	309.23	200.08	112.31	75.75	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	477.57	555.7	640.11	727.6	781.77	767.62	732.76	682.12	616.8	530.26	468.34	451.02	(84)

[redacted]

TER WorkSheet: New dwelling as built

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=	1	1	0.99	0.95	0.86	0.69	0.52	0.58	0.84	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.76	19.92	20.19	20.54	20.81	20.96	20.99	20.99	20.88	20.51	20.07	19.74	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.96	19.97	19.97	19.98	19.98	19.99	19.99	19.99	19.99	19.98	19.98	19.97	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.94	0.81	0.6	0.41	0.46	0.76	0.96	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.31	18.55	18.94	19.44	19.8	19.96	19.99	19.99	19.89	19.41	18.78	18.28	(90)

fLA = Living area ÷ (4) = 0.27 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.71	18.92	19.28	19.73	20.07	20.23	20.26	20.26	20.16	19.71	19.13	18.68	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.71	18.92	19.28	19.73	20.07	20.23	20.26	20.26	20.16	19.71	19.13	18.68	(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=	1	0.99	0.98	0.93	0.82	0.62	0.44	0.49	0.78	0.96	0.99	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	475.72	550.97	625.61	677.49	640.04	478.66	321.54	336.29	478.9	508.22	464.61	449.7	(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=	1316.16	1277.45	1161.21	972.58	749.92	498.97	324.24	341.09	539.33	815.71	1082.27	1309.07	(97)

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	625.29	488.2	398.49	212.47	81.75	0	0	0	0	228.77	444.71	639.37	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3119.05 (98)

Space heating requirement in kWh/m²/year — 39.13 (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 — 93.4 (206)

Efficiency of secondary/supplementary heating system, % — 0 (208)

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TER WorkSheet: New dwelling as built

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/year
Space heating requirement (calculated above)	625.29	488.2	398.49	212.47	81.75	0	0	0	0	228.77	444.71	639.37	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	669.48	522.69	426.65	227.48	87.53	0	0	0	0	244.94	476.14	684.55	(211)
Total (kWh/year) =Sum(211)$_{1...12}$ =													3339.45 (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)$_{1...12}$ =													0 (215)

Water heating

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Output from water heater (calculated above)	201.94	177.21	184.38	163.53	158.33	139.45	133.6	148.93	150.58	171.46	183.03	197.18	
Efficiency of water heater													80.3 (216)
(217)m=	87.71	87.47	86.94	85.71	83.48	80.3	80.3	80.3	80.3	85.78	87.2	87.8	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	230.25	202.6	212.07	190.79	189.67	173.66	166.38	185.47	187.52	199.89	209.9	224.59	
Total = Sum(219a)$_{1...12}$ =													2372.78 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		3339.45	
Water heating fuel used		2372.78	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75	(231)
Electricity for lighting		357.03	(232)

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	=	721.32	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	512.52	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1233.84	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	185.3	(268)
Total CO2, kg/year	sum of (265)...(271) =				1458.06	(272)

TER = 18.29 (273)

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SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 10 June 2021

Property Details: Plot 5

Dwelling type:	Semi-detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	6 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	394.51	**(P1)**
Transmission heat loss coefficient:	58.5	
Summer heat loss coefficient:	453.04	**(P2)**

Overhangs

Orientation:	**Ratio:**	**Z_overhangs:**
West (Ext)	0	1
East (Ext)	0	1
South (Ext)	0	1

Solar shading

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (Ext)	1	0.9	1	0.9	**(P8)**
East (Ext)	1	0.9	1	0.9	**(P8)**
South (Ext)	1	0.9	1	0.9	**(P8)**

Solar gains

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (Ext)	0.9 x	3.42	124.8	0.72	0.7	0.9	174.24	
East (Ext)	0.9 x	8.35	124.8	0.72	0.7	0.9	425.41	
South (Ext)	0.9 x	1.43	118.4	0.72	0.7	0.9	69.12	
						Total	668.77	**(P3/P4)**

Internal gains

	June	**July**	**August**	
Internal gains	431.98	414.28	422.55	
Total summer gains	1140.61	1083.05	1011.16	**(P5)**
Summer gain/loss ratio	2.52	2.39	2.23	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	18.17	20.04	19.98	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

Assessment of likelihood of high internal temperature: Not significant

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Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8
Printed on 12 August 2021 at 13:58:14

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Detached House

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 139.5m²
Site Reference : Langford **Plot Reference:** Plot 6
Address : 6 Langford Close , CLIMPING, BN17 5FG

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)	16.54 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.20 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	49.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (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	3.76 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 480, product index 016635):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi)
Efficiency 89.0 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

ARUN DISTRICT COUNCIL CM/4/22/DOC

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.41 kWh/day	
	Permitted by DBSCG: 2.30 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: West	7.95m²
Windows facing: North	0.93m²
Windows facing: South	0.93m²
Windows facing: East	11.29m²
Ventilation rate:	8.00

10 Key features

Air permeablility	3.8 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Floors U-value	0.12 W/m²K

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Thermal Bridge Report

Property Details: Plot 6

Address: 6 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.0401

External Junctions Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	17.24	E1	[UD]
Sill	0.04	12.29	E3	[A]
Jamb	0.05	36.6	E4	[A]
Ground floor (normal)	0.076	35.5	E5	[UD]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	33.68	E6	[A]
Eaves (insulation at ceiling level)	0.06	37.5	E10	[A]
Gable (insulation at ceiling level)	0.24	0	E12	[A]
Corner (normal)	0.09	29.8	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	9.8	E17	[A]
Flat roof	0.08	0	E14	[D]
Party wall between dwellings	0.06	0	E18	[A]

Party Junctions Details

Ground floor	0.16	0	P1	[D]
Intermediate floor within a dwelling	0	0	P2	[D]
Roof (insulation at ceiling level)	0.24	0	P4	[D]

i-Therm Limited
Matt Haskell
[redacted]

Code for Sustainable Homes Report
For use with Nov 2010 addendum 2014 England

Assessor and House Details

Assessor Name: Matthew Haskell
Assessor Number: STRO006210
Property Address: 6 Langford Close
CLIMPING
BN17 5FG

Building regulation assessment

	kg/m²/year
TER	16.54
DER	16.2

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO_2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2012 DER Worksheet		16.2	*(ZC1)*
TER		16.54	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		16.2	
% improvement DER/TER	2.1		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	16.2	*(ZC1)*
CO2 emissions from appliances, equation (L14)	13.07	*(ZC2)*
CO2 emissions from cooking, equation (L16)	1.35	*(ZC3)*
Net CO2 emissions	32.1	*(ZC8)*

Result:

Credits awarded for ENE 1 = 0.3

Code Level = 3

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 49.52

Credits awarded for ENE 2 = 5.8

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		32.14	
Standard DER		17.72	
Actual Case CO2 emissions		32.14	
Actual DER		17.72	
Reduction in CO2 emissions	0		

Credits awarded for ENE 7 = 0

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

i-Therm Limited
Matt Haskell
[redacted]

SAP Input

Property Details: Plot 6

Address:	6 Langford Close , CLIMPING, BN17 5FG
Located in:	England
Region:	South East England
UPRN:	UPRN-526156587953
Date of assessment:	12 August 2021
Date of certificate:	12 August 2021
Assessment type:	New dwelling as built
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:	480

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2021

Floor Location:	**Floor area:**	**Storey height:**
Floor 0	70.66 m²	2.4 m
Floor 1	68.84 m²	2.6 m

Living area:	30.6 m² (fraction 0.219)
Front of dwelling faces:	West

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Entrance	Manufacturer	Solid			PVC-U
Utility	Manufacturer	Half glazed			PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Entrance	mm	0.7	0	1	2.1	1
Utility	mm	0.7	0	1	1.95	1
Ext	16mm or more	0.7	0.72	1.2	7.95	1
Ext	16mm or more	0.7	0.72	1.2	0.93	1
Ext	16mm or more	0.7	0.72	1.2	0.93	1
Ext	16mm or more	0.7	0.72	1.2	11.29	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Entrance	Door (1)	External Wall	West	0	0
Utility	Door (2)	External Wall	North	0	0
Ext	Windows (1)	External Wall	West	0	0
Ext	Windows (1)	External Wall	North	0	0
Ext	Windows (1)	External Wall	South	0	0
Ext	Windows (1)	External Wall	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 Wall	172.68	25.15	147.53	0.27	0	False	N/A

SAP Input

Plane Roof	70.66	0	70.66	0.11	0	N/A
Ground floor	70.66			0.12		N/A

Internal Elements
Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0401

	Length	Psi-value		
	17.24	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	12.29	0.04	E3	Sill
[Approved]	36.6	0.05	E4	Jamb
	35.5	0.076	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	33.68	0.07	E6	Intermediate floor within a dwelling
[Approved]	37.5	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	0	0.24	E12	Gable (insulation at ceiling level)
[Approved]	29.8	0.09	E16	Corner (normal)
[Approved]	9.8	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof
[Approved]	0	0.06	E18	Party wall between dwellings
	0	0.16	P1	Ground floor
	0	0	P2	Intermediate floor within a dwelling
	0	0.24	P4	Roof (insulation at ceiling level)

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 5
Number of passive stacks: 0
Number of sides sheltered: 1
Pressure test: 3.76 (Assessed dwelling is tested)

Main heating system

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 480, product index 016635) Efficiency: Winter 87.3 % Summer: 89.9
Has integral PFGHRD 060025
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
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

SAP Input

Water heating

Water heating:	From main heating system Water code: 901 Fuel :mains gas Hot water cylinder Cylinder volume: 210 litres Cylinder insulation: Measured loss, 1.41kWh/day Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Flue Gas Heat Recovery System: Database (rev 480, product index 060025) Brand name: Ideal Model: Logic Boost Model qualifier: 33 Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 6

Address : 6 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66	(1a) x	2.4	(2a) =	169.58	(3a)
First floor	68.84	(1b) x	2.6	(2b) =	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	348.57	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.14 (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		3.75999999046326 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.33 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31 (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

SAP WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.34	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.95	x1/[1/(1.2)+ 0.04]		=	9.1			(27)
Windows Type 2			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			11.29	x1/[1/(1.2)+ 0.04]		=	12.93			(27)
Floor			70.66	x	0.12	=	8.4792			(28)
Walls	172.68	25.15	147.53	x	0.27	=	39.83			(29)
Roof	70.66	0	70.66	x	0.11	=	7.77			(30)
Total area of elements, m²			314							(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) = 84.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). ..(32e) = 17260.34 (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 12.58 (36)

SAP WorkSheet: New dwelling as built

If details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 96.88 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	66.3	65.96	65.63	64.05	63.76	62.39	62.39	62.14	62.92	63.76	64.36	64.98	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	163.18	162.84	162.5	160.93	160.64	159.27	159.27	159.02	159.8	160.64	161.23	161.85	

Average = Sum(39)$_{1...12}$ /12= 160.93 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.17	1.17	1.16	1.15	1.15	1.14	1.14	1.14	1.15	1.15	1.16	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.15 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.32	22.14	22.85	19.92	19.11	16.49	15.28	17.54	17.75	20.68	22.58	24.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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)

SAP WorkSheet: New dwelling as built

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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.65	171.88	179.2	158.81	154.3	135.96	128.77	143.8	144.33	164.76	176.52	190.32	(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)
FHRS	9.02	8.15	7.58	6.26	3.68	0	0	0	0	6.39	7.88	8.97	(63) (G2)

Output from water heater

(64)m=	186.63	163.74	171.61	152.54	150.62	135.96	128.77	143.8	144.33	158.37	168.64	181.35	

Output from water heater (annual)₁,₁₂ — 1886.35 — (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=	62.84	55.15	57.37	50.66	49.09	43.06	40.6	45.59	45.84	52.57	56.55	61.06	(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=	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	72.64	64.52	52.47	39.72	29.69	25.07	27.09	35.21	47.26	60	70.03	74.66	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	460.96	465.74	453.69	428.03	395.64	365.19	344.85	340.07	352.12	377.78	410.18	440.62	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	84.46	82.07	77.1	70.36	65.98	59.81	54.57	61.28	63.67	70.65	78.54	82.08	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	734.79	729.06	700	654.84	608.04	566.8	543.24	553.3	579.78	625.17	675.48	714.09	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

[redacted]

SAP WorkSheet: New dwelling as built

		Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.93	x	10.63	x	0.72	x	0.7	=	3.45	(74)
North	0.9x	0.77	x	0.93	x	20.32	x	0.72	x	0.7	=	6.6	(74)
North	0.9x	0.77	x	0.93	x	34.53	x	0.72	x	0.7	=	11.22	(74)
North	0.9x	0.77	x	0.93	x	55.46	x	0.72	x	0.7	=	18.02	(74)
North	0.9x	0.77	x	0.93	x	74.72	x	0.72	x	0.7	=	24.27	(74)
North	0.9x	0.77	x	0.93	x	79.99	x	0.72	x	0.7	=	25.98	(74)
North	0.9x	0.77	x	0.93	x	74.68	x	0.72	x	0.7	=	24.26	(74)
North	0.9x	0.77	x	0.93	x	59.25	x	0.72	x	0.7	=	19.24	(74)
North	0.9x	0.77	x	0.93	x	41.52	x	0.72	x	0.7	=	13.49	(74)
North	0.9x	0.77	x	0.93	x	24.19	x	0.72	x	0.7	=	7.86	(74)
North	0.9x	0.77	x	0.93	x	13.12	x	0.72	x	0.7	=	4.26	(74)
North	0.9x	0.77	x	0.93	x	8.86	x	0.72	x	0.7	=	2.88	(74)
East	0.9x	0.77	x	11.29	x	19.64	x	0.72	x	0.7	=	77.45	(76)
East	0.9x	0.77	x	11.29	x	38.42	x	0.72	x	0.7	=	151.5	(76)
East	0.9x	0.77	x	11.29	x	63.27	x	0.72	x	0.7	=	249.5	(76)
East	0.9x	0.77	x	11.29	x	92.28	x	0.72	x	0.7	=	363.89	(76)
East	0.9x	0.77	x	11.29	x	113.09	x	0.72	x	0.7	=	445.96	(76)
East	0.9x	0.77	x	11.29	x	115.77	x	0.72	x	0.7	=	456.52	(76)
East	0.9x	0.77	x	11.29	x	110.22	x	0.72	x	0.7	=	434.62	(76)
East	0.9x	0.77	x	11.29	x	94.68	x	0.72	x	0.7	=	373.33	(76)
East	0.9x	0.77	x	11.29	x	73.59	x	0.72	x	0.7	=	290.18	(76)
East	0.9x	0.77	x	11.29	x	45.59	x	0.72	x	0.7	=	179.77	(76)
East	0.9x	0.77	x	11.29	x	24.49	x	0.72	x	0.7	=	96.57	(76)
East	0.9x	0.77	x	11.29	x	16.15	x	0.72	x	0.7	=	63.69	(76)
South	0.9x	0.77	x	0.93	x	46.75	x	0.72	x	0.7	=	15.19	(78)
South	0.9x	0.77	x	0.93	x	76.57	x	0.72	x	0.7	=	24.87	(78)
South	0.9x	0.77	x	0.93	x	97.53	x	0.72	x	0.7	=	31.68	(78)
South	0.9x	0.77	x	0.93	x	110.23	x	0.72	x	0.7	=	35.81	(78)
South	0.9x	0.77	x	0.93	x	114.87	x	0.72	x	0.7	=	37.31	(78)
South	0.9x	0.77	x	0.93	x	110.55	x	0.72	x	0.7	=	35.91	(78)
South	0.9x	0.77	x	0.93	x	108.01	x	0.72	x	0.7	=	35.08	(78)
South	0.9x	0.77	x	0.93	x	104.89	x	0.72	x	0.7	=	34.07	(78)
South	0.9x	0.77	x	0.93	x	101.89	x	0.72	x	0.7	=	33.09	(78)
South	0.9x	0.77	x	0.93	x	82.59	x	0.72	x	0.7	=	26.83	(78)
South	0.9x	0.77	x	0.93	x	55.42	x	0.72	x	0.7	=	18	(78)
South	0.9x	0.77	x	0.93	x	40.4	x	0.72	x	0.7	=	13.12	(78)
West	0.9x	0.77	x	7.95	x	19.64	x	0.72	x	0.7	=	54.54	(80)
West	0.9x	0.77	x	7.95	x	38.42	x	0.72	x	0.7	=	106.68	(80)
West	0.9x	0.77	x	7.95	x	63.27	x	0.72	x	0.7	=	175.69	(80)

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West	0.9x	0.77	x	7.95	x	92.28	x	0.72	x	0.7	=	256.24	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.72	x	0.7	=	314.03	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.72	x	0.7	=	321.46	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.72	x	0.7	=	306.04	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.72	x	0.7	=	262.89	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.72	x	0.7	=	204.34	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.72	x	0.7	=	126.59	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.72	x	0.7	=	68	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.72	x	0.7	=	44.85	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	150.62	289.66	468.09	673.94	821.56	839.87	800.01	689.54	541.1	341.04	186.83	124.54	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	885.41	1018.72	1168.09	1328.79	1429.6	1406.67	1343.25	1242.83	1120.88	966.22	862.31	838.63	(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=	1	0.99	0.98	0.95	0.85	0.68	0.51	0.57	0.83	0.97	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.76	19.92	20.19	20.54	20.81	20.96	20.99	20.99	20.88	20.51	20.07	19.74	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.94	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.96	19.96	19.96	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.93	0.8	0.59	0.4	0.45	0.75	0.96	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.3	18.53	18.92	19.42	19.78	19.94	19.96	19.96	19.87	19.39	18.76	18.27	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.62	18.84	19.2	19.67	20.01	20.16	20.19	20.19	20.09	19.63	19.04	18.59	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.47	18.69	19.05	19.52	19.86	20.01	20.04	20.04	19.94	19.48	18.89	18.44	(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=	0.99	0.99	0.97	0.92	0.8	0.59	0.41	0.46	0.75	0.95	0.99	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	880.72	1007.62	1135.74	1221.28	1137.37	832.39	544.27	571.84	840.81	917.54	853.24	835.18	(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=	2312.84	2244.94	2039.63	1708.37	1310.34	861.99	547.77	578.34	933.65	1427.26	1901.74	2304.52	(97)

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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1065.5	831.48	672.5	350.7	128.69	0	0	0	0	379.23	754.93	1093.19

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 5276.21 (98)

Space heating requirement in kWh/m²/year 37.82 (99)

2a. 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) x [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 89.9 (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)	1065.5	831.48	672.5	350.7	128.69	0	0	0	0	379.23	754.93	1093.19	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	1185.2	924.89	748.05	390.1	143.15	0	0	0	0	421.83	839.74	1216.01	(211)

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 5868.98 (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)

	186.63	163.74	171.61	152.54	150.62	135.96	128.77	143.8	144.33	158.37	168.64	181.35

Efficiency of water heater 87.3 (216)

(217)m=	89.5	89.46	89.36	89.1	88.48	87.3	87.3	87.3	87.3	89.12	89.41	89.52

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.52	183.03	192.05	171.21	170.23	155.74	147.5	164.72	165.32	177.71	188.6	202.58

Total = Sum(219a)$_{1...12}$ = 2127.21 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		5868.98
Water heating fuel used		2127.21
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		513.12 (232)

12a. Fuel costs – individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year

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Space heating - main system 1	(211)	x	3.48	x 0.01 =	204.24	(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 =	74.03	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(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 =	67.68	(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) =				475.84	(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)		84.89 (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	=	1267.7	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	459.48	(264)
Space and water heating	(261) + (262) + (263) + (264) =					1727.18	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	38.93	(267)
Electricity for lighting	(232)	x		0.519	=	266.31	(268)
Total CO2, kg/year			sum of (265) ..(271) =			2032.41	(272)
CO2 emissions per m²			(272) ÷ (4) =			14.57	(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		1.22	=	7160.15	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2595.19	(264)
Space and water heating	(261) + (262) + (263) + (264) =					9755.34	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	230.25	(267)
Electricity for lighting	(232)	x		0	=	1575.28	(268)
'Total Primary Energy			sum of (265)...(271) =			11560.88	(272)

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Primary energy kWh/m²/year	(272) ÷ (4) =	82.87	(273)

i-Therm Limited
Matt Haskell
[redacted]

EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 6

Address : 6 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66	(1a) x	2.4	(2a) =	169.58	(3a)
First floor	68.84	(1b) x	2.6	(2b) =	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		348.57	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.14 (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		3.75999999046326 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.33 (18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31 (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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.41	0.37	0.35	0.33	0.34	0.31	0.32	0.31	0.32	0.35	0.35	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.57	0.56	0.55	0.56	0.55	0.55	0.55	0.55	0.56	0.56	0.57	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.57	0.56	0.55	0.56	0.55	0.55	0.55	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.95	x1/[1/(1.2)+ 0.04]		=	9.1			(27)
Windows Type 2			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			11.29	x1/[1/(1.2)+ 0.04]		=	12.93			(27)
Floor			70.66	x	0.12	=	8.4792			(28)
Walls	172.68	25.15	147.53	x	0.27	=	39.83			(29)
Roof	70.66	0	70.66	x	0.11	=	7.77			(30)
Total area of elements, m²			314							(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) = 84.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). .(32e) = 17260.34 (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 12.58 (36)

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if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 96.88 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	67	65.3	64.66	63.76	64.05	63.19	63.47	62.92	63.47	64.66	64.66	65.63	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	163.88	162.18	161.54	160.64	160.93	160.07	160.35	159.8	160.35	161.54	161.54	162.5	

Average = Sum(39)$_{1...12}$ /12= 161.28 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.15	1.15	1.16	1.16	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.16 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.32	22.14	22.85	19.92	19.11	16.49	15.28	17.54	17.75	20.68	22.58	24.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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)

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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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.65	171.88	179.2	158.81	154.3	135.96	128.77	143.8	144.33	164.76	176.52	190.32	(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)
FHRS	8.59	7.7	7.1	5.89	1.85	0	0	0	0	5.79	7.18	8.62	(63) (G2)

Output from water heater

(64)m=	187.05	164.18	172.1	152.92	152.45	135.96	128.77	143.8	144.33	158.97	169.34	181.7	

Output from water heater (annual)$_{1,12}$ | 1891.58 | (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=	62.84	55.15	57.37	50.66	49.09	43.06	40.6	45.59	45.84	52.57	56.55	61.06	(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=	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	72.64	64.52	52.47	39.72	29.69	25.07	27.09	35.21	47.26	60	70.03	74.66	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	460.96	465.74	453.69	428.03	395.64	365.19	344.85	340.07	352.12	377.78	410.18	440.62	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	84.46	82.07	77.1	70.36	65.98	59.81	54.57	61.28	63.67	70.65	78.54	82.08	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	734.79	729.06	700	654.84	608.04	566.8	543.24	553.3	579.78	625.17	675.48	714.09	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

[redacted]

EPC Costs WorkSheet: New dwelling as built

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	0.93	x	14.24	x	0.72	x	0.7	=	4.63	(74)
North	0.9x 0.77	x	0.93	x	23.27	x	0.72	x	0.7	=	7.56	(74)
North	0.9x 0.77	x	0.93	x	39.95	x	0.72	x	0.7	=	12.98	(74)
North	0.9x 0.77	x	0.93	x	67.1	x	0.72	x	0.7	=	21.8	(74)
North	0.9x 0.77	x	0.93	x	87.09	x	0.72	x	0.7	=	28.29	(74)
North	0.9x 0.77	x	0.93	x	100.07	x	0.72	x	0.7	=	32.5	(74)
North	0.9x 0.77	x	0.93	x	92.85	x	0.72	x	0.7	=	30.16	(74)
North	0.9x 0.77	x	0.93	x	74.38	x	0.72	x	0.7	=	24.16	(74)
North	0.9x 0.77	x	0.93	x	51.63	x	0.72	x	0.7	=	16.77	(74)
North	0.9x 0.77	x	0.93	x	30.09	x	0.72	x	0.7	=	9.77	(74)
North	0.9x 0.77	x	0.93	x	16.99	x	0.72	x	0.7	=	5.52	(74)
North	0.9x 0.77	x	0.93	x	11.39	x	0.72	x	0.7	=	3.7	(74)
East	0.9x 0.77	x	11.29	x	26.63	x	0.72	x	0.7	=	105.02	(76)
East	0.9x 0.77	x	11.29	x	43.95	x	0.72	x	0.7	=	173.32	(76)
East	0.9x 0.77	x	11.29	x	71.91	x	0.72	x	0.7	=	283.56	(76)
East	0.9x 0.77	x	11.29	x	108.59	x	0.72	x	0.7	=	428.19	(76)
East	0.9x 0.77	x	11.29	x	128.14	x	0.72	x	0.7	=	505.3	(76)
East	0.9x 0.77	x	11.29	x	141.01	x	0.72	x	0.7	=	556.04	(76)
East	0.9x 0.77	x	11.29	x	133.32	x	0.72	x	0.7	=	525.7	(76)
East	0.9x 0.77	x	11.29	x	115.5	x	0.72	x	0.7	=	455.44	(76)
East	0.9x 0.77	x	11.29	x	89.42	x	0.72	x	0.7	=	352.63	(76)
East	0.9x 0.77	x	11.29	x	56.26	x	0.72	x	0.7	=	221.86	(76)
East	0.9x 0.77	x	11.29	x	31.99	x	0.72	x	0.7	=	126.14	(76)
East	0.9x 0.77	x	11.29	x	21.09	x	0.72	x	0.7	=	83.15	(76)
South	0.9x 0.77	x	0.93	x	59.74	x	0.72	x	0.7	=	19.4	(78)
South	0.9x 0.77	x	0.93	x	82.27	x	0.72	x	0.7	=	26.72	(78)
South	0.9x 0.77	x	0.93	x	104.17	x	0.72	x	0.7	=	33.84	(78)
South	0.9x 0.77	x	0.93	x	123.04	x	0.72	x	0.7	=	39.96	(78)
South	0.9x 0.77	x	0.93	x	125.05	x	0.72	x	0.7	=	40.62	(78)
South	0.9x 0.77	x	0.93	x	130.26	x	0.72	x	0.7	=	42.31	(78)
South	0.9x 0.77	x	0.93	x	126	x	0.72	x	0.7	=	40.93	(78)
South	0.9x 0.77	x	0.93	x	122	x	0.72	x	0.7	=	39.63	(78)
South	0.9x 0.77	x	0.93	x	116.65	x	0.72	x	0.7	=	37.89	(78)
South	0.9x 0.77	x	0.93	x	95.67	x	0.72	x	0.7	=	31.08	(78)
South	0.9x 0.77	x	0.93	x	68.13	x	0.72	x	0.7	=	22.13	(78)
South	0.9x 0.77	x	0.93	x	49.76	x	0.72	x	0.7	=	16.16	(78)
West	0.9x 0.77	x	7.95	x	26.63	x	0.72	x	0.7	=	73.95	(80)
West	0.9x 0.77	x	7.95	x	43.95	x	0.72	x	0.7	=	122.05	(80)
West	0.9x 0.77	x	7.95	x	71.91	x	0.72	x	0.7	=	199.67	(80)

EPC Costs WorkSheet: New dwelling as built

West	0.9x	0.77	x	7.95	x	108.59	x	0.72	x	0.7	=	301.52	(80)
West	0.9x	0.77	x	7.95	x	128.14	x	0.72	x	0.7	=	355.81	(80)
West	0.9x	0.77	x	7.95	x	141.01	x	0.72	x	0.7	=	391.54	(80)
West	0.9x	0.77	x	7.95	x	133.32	x	0.72	x	0.7	=	370.18	(80)
West	0.9x	0.77	x	7.95	x	115.5	x	0.72	x	0.7	=	320.7	(80)
West	0.9x	0.77	x	7.95	x	89.42	x	0.72	x	0.7	=	248.31	(80)
West	0.9x	0.77	x	7.95	x	56.26	x	0.72	x	0.7	=	156.23	(80)
West	0.9x	0.77	x	7.95	x	31.99	x	0.72	x	0.7	=	88.82	(80)
West	0.9x	0.77	x	7.95	x	21.09	x	0.72	x	0.7	=	58.55	(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=	203.01	329.65	530.05	791.47	930.02	1022.4	966.97	839.93	655.6	418.94	242.61	161.56	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	937.8	1058.71	1230.04	1446.32	1538.06	1589.2	1510.21	1393.23	1235.38	1044.11	918.09	875.65	(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=	1	0.99	0.97	0.91	0.77	0.55	0.4	0.41	0.71	0.93	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.94	20.06	20.33	20.67	20.9	20.98	21	21	20.95	20.7	20.27	19.93	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.94	19.95	19.95	19.96	19.96	19.96	19.96	19.96	19.96	19.95	19.95	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.97	0.88	0.7	0.45	0.29	0.29	0.61	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=	18.56	18.74	19.13	19.59	19.87	19.95	19.96	19.96	19.93	19.64	19.05	18.54	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.87	19.03	19.39	19.83	20.1	20.18	20.19	20.19	20.15	19.88	19.32	18.85	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.72	18.88	19.24	19.68	19.95	20.03	20.04	20.04	20	19.73	19.17	18.7	(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=	0.99	0.98	0.96	0.87	0.7	0.46	0.3	0.3	0.61	0.89	0.98	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	928.67	1041.27	1178.03	1263.61	1079.34	732.61	454.24	421.17	754.87	929.03	897.77	868.97	(95)

Monthly average external temperature from Table 8

(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	2133.22	2104.67	1912.75	1603.03	1166.18	741.2	455.01	421.88	786.46	1215.77	1691.45	2095.87	(97)

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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=	896.19	714.6	546.63	244.38	64.61	0	0	0	0	213.33	571.45	912.82	
Total per year (kWh/year) = Sum(98)$_{1..5,10..12}$ =													4164.01 (98)
Space heating requirement in kWh/m²/year													29.85 (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) x [1 – (203)] =	1 (204)
Efficiency of main space heating system 1		89.9 (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)	896.19	714.6	546.63	244.38	64.61	0	0	0	0	213.33	571.45	912.82	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	996.87	794.89	608.04	271.84	71.87	0	0	0	0	237.3	635.65	1015.37	
Total (kWh/year) =Sum(211)$_{1..5,10..12}$=													4631.82 (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)	187.05	164.18	172.1	152.92	152.45	135.96	128.77	143.8	144.33	158.97	169.34	181.7	
Efficiency of water heater													87.3 (216)
(217)m=	89.44	89.4	89.26	88.88	88.06	87.3	87.3	87.3	87.3	88.77	89.29	89.46	(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m=	209.14	183.64	192.8	172.05	173.12	155.74	147.5	164.72	165.32	179.08	189.65	203.12	
Total = Sum(219a)$_{1..12}$ =													2135.88 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		4631.82
Water heating fuel used		2135.88
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		513.12 (232)

10a. Fuel costs - individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year

[redacted]

EPC Costs WorkSheet: New dwelling as built

	(211) x	3.74	x 0.01 =	173.23	(240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	19.12	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.74	x 0.01 =	79.88	(247)
Pumps, fans and electric keep-hot	(231)	0	x 0.01 =	14.34	(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)	0	x 0.01 =	98.11	(250)
Additional standing charges (Table 12)				94	(251)
Appendix Q items: repeat lines (253) and (254) as needed					
Total energy cost	(245)...(247) + (250)...(254) =			459.56	(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] =	0.99 (257)
SAP rating (Section 12)		86.25 (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		0.216	=	1000.47	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	461.35	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1461.82	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	266.31	(268)
Total CO2, kg/year	sum of (265) ..(271) =				1767.06	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				12.67	(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	=	5650.82	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.22	=	2605.78	(264)
Space and water heating	(261) + (262) + (263) + (264) =				8256.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	230.25	(267)
Electricity for lighting	(232) x		0	=	1575.28	(268)
'Total Primary Energy	sum of (265)...(271) =				10062.13	(272)

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Primary energy kWh/m²/year	(272) ÷ (4) =	72.13	(273)

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TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 6

Address : 6 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66 (1a)	x	2.4 (2a)	=	169.58	(3a)
First floor	68.84 (1b)	x	2.6 (2b)	=	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		348.57	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.11 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.36 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34 (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

i-Therm Limited
Matt Haskell
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TFEE WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0

(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58

(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58

(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			7.95	x1/[1/(1.4)+ 0.04]		=	10.54			(27)
Windows Type 2			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 3			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 4			11.29	x1/[1/(1.4)+ 0.04]		=	14.97			(27)
Floor			70.66	x	0.13	=	9.185801			(28)
Walls	172.68	25.15	147.53	x	0.18	=	26.56			(29)
Roof	70.66	0	70.66	x	0.13	=	9.19			(30)
Total area of elements, m²			314							(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) = 77.34 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). .(32e) = 17260.34 (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 13.04 (36)

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if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 90.38 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	68.16	67.74	67.34	65.44	65.08	63.42	63.42	63.12	64.06	65.08	65.8	66.55	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	158.53	158.12	157.72	155.81	155.46	153.8	153.8	153.49	154.44	155.46	156.18	156.93	

Average = Sum(39)$_{1...12}$ /12= 155.81 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.14	1.13	1.13	1.12	1.11	1.1	1.1	1.1	1.11	1.11	1.12	1.12	

Average = Sum(40)$_{1...12}$ /12= 1.12 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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)

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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=	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=	143.45	125.46	129.47	112.87	108.3	93.46	86.6	99.38	100.57	117.2	127.93	138.93	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	143.45	125.46	129.47	112.87	108.3	93.46	86.6	99.38	100.57	117.2	127.93	138.93	

Output from water heater (annual)$_{1,12}$ | 1383.63 | (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=	35.86	31.37	32.37	28.22	27.08	23.36	21.65	24.84	25.14	29.3	31.98	34.73	(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=	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.55	25.36	20.62	15.61	11.67	9.85	10.65	13.84	18.57	23.58	27.52	29.34	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.84	312.05	303.97	286.78	265.08	244.68	231.05	227.85	235.92	253.12	274.82	295.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	48.2	46.68	43.5	39.19	36.39	32.45	29.1	33.39	34.92	39.38	44.42	46.68	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	452.33	450.82	434.84	408.32	379.88	353.72	337.54	341.82	356.15	382.82	413.5	437.98	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.93	x	10.63	x	0.63	x	0.7	=	3.02	(74)
North	0.9x	0.77	x	0.93	x	20.32	x	0.63	x	0.7	=	5.78	(74)
North	0.9x	0.77	x	0.93	x	34.53	x	0.63	x	0.7	=	9.81	(74)
North	0.9x	0.77	x	0.93	x	55.46	x	0.63	x	0.7	=	15.76	(74)
North	0.9x	0.77	x	0.93	x	74.72	x	0.63	x	0.7	=	21.24	(74)
North	0.9x	0.77	x	0.93	x	79.99	x	0.63	x	0.7	=	22.73	(74)
North	0.9x	0.77	x	0.93	x	74.68	x	0.63	x	0.7	=	21.22	(74)
North	0.9x	0.77	x	0.93	x	59.25	x	0.63	x	0.7	=	16.84	(74)
North	0.9x	0.77	x	0.93	x	41.52	x	0.63	x	0.7	=	11.8	(74)
North	0.9x	0.77	x	0.93	x	24.19	x	0.63	x	0.7	=	6.88	(74)
North	0.9x	0.77	x	0.93	x	13.12	x	0.63	x	0.7	=	3.73	(74)
North	0.9x	0.77	x	0.93	x	8.86	x	0.63	x	0.7	=	2.52	(74)
East	0.9x	0.77	x	11.29	x	19.64	x	0.63	x	0.7	=	67.77	(76)
East	0.9x	0.77	x	11.29	x	38.42	x	0.63	x	0.7	=	132.57	(76)
East	0.9x	0.77	x	11.29	x	63.27	x	0.63	x	0.7	=	218.32	(76)
East	0.9x	0.77	x	11.29	x	92.28	x	0.63	x	0.7	=	318.4	(76)
East	0.9x	0.77	x	11.29	x	113.09	x	0.63	x	0.7	=	390.21	(76)
East	0.9x	0.77	x	11.29	x	115.77	x	0.63	x	0.7	=	399.45	(76)
East	0.9x	0.77	x	11.29	x	110.22	x	0.63	x	0.7	=	380.29	(76)
East	0.9x	0.77	x	11.29	x	94.68	x	0.63	x	0.7	=	326.67	(76)
East	0.9x	0.77	x	11.29	x	73.59	x	0.63	x	0.7	=	253.91	(76)
East	0.9x	0.77	x	11.29	x	45.59	x	0.63	x	0.7	=	157.3	(76)
East	0.9x	0.77	x	11.29	x	24.49	x	0.63	x	0.7	=	84.5	(76)
East	0.9x	0.77	x	11.29	x	16.15	x	0.63	x	0.7	=	55.73	(76)
South	0.9x	0.77	x	0.93	x	46.75	x	0.63	x	0.7	=	13.29	(78)
South	0.9x	0.77	x	0.93	x	76.57	x	0.63	x	0.7	=	21.76	(78)
South	0.9x	0.77	x	0.93	x	97.53	x	0.63	x	0.7	=	27.72	(78)
South	0.9x	0.77	x	0.93	x	110.23	x	0.63	x	0.7	=	31.33	(78)
South	0.9x	0.77	x	0.93	x	114.87	x	0.63	x	0.7	=	32.65	(78)
South	0.9x	0.77	x	0.93	x	110.55	x	0.63	x	0.7	=	31.42	(78)
South	0.9x	0.77	x	0.93	x	108.01	x	0.63	x	0.7	=	30.7	(78)
South	0.9x	0.77	x	0.93	x	104.89	x	0.63	x	0.7	=	29.81	(78)
South	0.9x	0.77	x	0.93	x	101.89	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	0.93	x	82.59	x	0.63	x	0.7	=	23.47	(78)
South	0.9x	0.77	x	0.93	x	55.42	x	0.63	x	0.7	=	15.75	(78)
South	0.9x	0.77	x	0.93	x	40.4	x	0.63	x	0.7	=	11.48	(78)
West	0.9x	0.77	x	7.95	x	19.64	x	0.63	x	0.7	=	47.72	(80)
West	0.9x	0.77	x	7.95	x	38.42	x	0.63	x	0.7	=	93.35	(80)
West	0.9x	0.77	x	7.95	x	63.27	x	0.63	x	0.7	=	153.73	(80)

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West	0.9x	0.77	x	7.95	x	92.28	x	0.63	x	0.7	=	224.21	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.63	x	0.7	=	274.77	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.63	x	0.7	=	281.28	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.63	x	0.7	=	267.79	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.63	x	0.7	=	230.03	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.63	x	0.7	=	178.79	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.63	x	0.7	=	110.76	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.63	x	0.7	=	59.5	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.63	x	0.7	=	39.24	(80)

Solar gains in watts, calculated for each month (63)m = Sum(74)m ...(82)m

(83)m=	131.79	253.45	409.58	589.7	718.87	734.88	700.01	603.35	473.46	298.41	163.47	108.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	584.13	704.27	844.42	998.02	1098.75	1088.61	1037.54	945.16	829.62	681.23	576.98	546.95	(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=	1	1	1	0.98	0.93	0.79	0.63	0.7	0.92	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.61	19.76	20.02	20.39	20.71	20.92	20.98	20.97	20.8	20.36	19.92	19.59	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.97	19.97	19.98	19.99	19.99	20	20	20	20	19.99	19.98	19.98	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.97	0.9	0.71	0.5	0.57	0.87	0.99	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.69	18.84	19.11	19.48	19.78	19.96	19.99	19.99	19.87	19.46	19.01	18.68	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.89	19.04	19.31	19.68	19.99	20.17	20.21	20.21	20.07	19.66	19.21	18.88	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.89	19.04	19.31	19.68	19.99	20.17	20.21	20.21	20.07	19.66	19.21	18.88	(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:

(94)m=	1	1	0.99	0.97	0.9	0.72	0.53	0.6	0.88	0.99	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	583.72	702.91	838.62	968.97	984.76	788.68	545.06	564.9	729.42	672.79	576.08	546.68	(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=	2313.02	2235.85	2020.06	1678.93	1288.26	856.52	555.27	584.06	922.45	1407.75	1891.6	2303	(97)

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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1286.59	1030.14	879	511.17	225.8	0	0	0	0	546.8	947.18	1306.7

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 6733.37 (98)

Space heating requirement in kWh/m²/year 48.27 (99)

3c. Space Cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)												
(100)m=	0	0	0	0	0	1445.72	1138.12	1166.54	0	0	0	0
Utilisation factor for loss hm												
(101)m=	0	0	0	0	0	0.82	0.9	0.86	0	0	0	0
Useful loss, hmLm (Watts) = (100)m x (101)m												
(102)m=	0	0	0	0	0	1190.31	1020.86	1002.44	0	0	0	0
Gains (solar gains calculated for applicable weather region, see Table 10)												
(103)m=	0	0	0	0	0	1394.96	1332.49	1227	0	0	0	0

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	147.35	231.85	167.07	0	0	0	0

Total = Sum(104)$_{5,6,7,8}$ = 546.27 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104)$_{5,6,7,8}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	36.84	57.96	41.77	0	0	0	0

Total = Sum(107)$_{5,6,7,8}$ = 136.57 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 0.98 (108)

3f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency (99) + (108) = 49.25 (109)

Target Fabric Energy Efficiency (TFEE) 56.63 (109)

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DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 6

Address : 6 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66 (1a)	x	2.4 (2a)	=	169.58	(3a)
First floor	68.84 (1b)	x	2.6 (2b)	=	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =		348.57	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.11 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		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		3.75999999046326 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.3 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.28 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.95	x1/[1/(1.2)+ 0.04]		=	9.1			(27)
Windows Type 2			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			11.29	x1/[1/(1.2)+ 0.04]		=	12.93			(27)
Floor			70.66	x	0.12	=	8.4792			(28)
Walls	172.68	25.15	147.53	x	0.27	=	39.83			(29)
Roof	70.66	0	70.66	x	0.11	=	7.77			(30)
Total area of elements, m²			314							(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) = 84.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). .(32e) = 17260.34 (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 12.58 (36)

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If details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 96.88 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	64.85	64.56	64.28	62.97	62.73	61.58	61.58	61.37	62.02	62.73	63.22	63.74	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	161.72	161.44	161.16	159.85	159.6	158.46	158.46	158.25	158.9	159.6	160.1	160.62	

Average = Sum(39)$_{1...12}$ /12= 159.85 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.16	1.16	1.16	1.15	1.14	1.14	1.14	1.13	1.14	1.14	1.15	1.15	

Average = Sum(40)$_{1...12}$ /12= 1.15 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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)

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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=	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=	143.45	125.46	129.47	112.87	108.3	93.46	86.6	99.38	100.57	117.2	127.93	138.93	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	143.45	125.46	129.47	112.87	108.3	93.46	86.6	99.38	100.57	117.2	127.93	138.93	

Output from water heater (annual)$_{112}$ | 1383.63 | (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=	35.86	31.37	32.37	28.22	27.08	23.36	21.65	24.84	25.14	29.3	31.98	34.73	(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=	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.06	25.81	20.99	15.89	11.88	10.03	10.83	14.08	18.9	24	28.01	29.86	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.84	312.05	303.97	286.78	265.08	244.68	231.05	227.85	235.92	253.12	274.82	295.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	48.2	46.68	43.5	39.19	36.39	32.45	29.1	33.39	34.92	39.38	44.42	46.68	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	452.84	451.27	435.2	408.6	380.09	353.9	337.73	342.06	356.49	383.24	413.99	438.5	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	0.93	x	10.63	x	0.72	x	0.7	=	3.45	(74)
North	0.9x 0.77	x	0.93	x	20.32	x	0.72	x	0.7	=	6.6	(74)
North	0.9x 0.77	x	0.93	x	34.53	x	0.72	x	0.7	=	11.22	(74)
North	0.9x 0.77	x	0.93	x	55.46	x	0.72	x	0.7	=	18.02	(74)
North	0.9x 0.77	x	0.93	x	74.72	x	0.72	x	0.7	=	24.27	(74)
North	0.9x 0.77	x	0.93	x	79.99	x	0.72	x	0.7	=	25.98	(74)
North	0.9x 0.77	x	0.93	x	74.68	x	0.72	x	0.7	=	24.26	(74)
North	0.9x 0.77	x	0.93	x	59.25	x	0.72	x	0.7	=	19.24	(74)
North	0.9x 0.77	x	0.93	x	41.52	x	0.72	x	0.7	=	13.49	(74)
North	0.9x 0.77	x	0.93	x	24.19	x	0.72	x	0.7	=	7.86	(74)
North	0.9x 0.77	x	0.93	x	13.12	x	0.72	x	0.7	=	4.26	(74)
North	0.9x 0.77	x	0.93	x	8.86	x	0.72	x	0.7	=	2.88	(74)
East	0.9x 0.77	x	11.29	x	19.64	x	0.72	x	0.7	=	77.45	(76)
East	0.9x 0.77	x	11.29	x	38.42	x	0.72	x	0.7	=	151.5	(76)
East	0.9x 0.77	x	11.29	x	63.27	x	0.72	x	0.7	=	249.5	(76)
East	0.9x 0.77	x	11.29	x	92.28	x	0.72	x	0.7	=	363.89	(76)
East	0.9x 0.77	x	11.29	x	113.09	x	0.72	x	0.7	=	445.96	(76)
East	0.9x 0.77	x	11.29	x	115.77	x	0.72	x	0.7	=	456.52	(76)
East	0.9x 0.77	x	11.29	x	110.22	x	0.72	x	0.7	=	434.62	(76)
East	0.9x 0.77	x	11.29	x	94.68	x	0.72	x	0.7	=	373.33	(76)
East	0.9x 0.77	x	11.29	x	73.59	x	0.72	x	0.7	=	290.18	(76)
East	0.9x 0.77	x	11.29	x	45.59	x	0.72	x	0.7	=	179.77	(76)
East	0.9x 0.77	x	11.29	x	24.49	x	0.72	x	0.7	=	96.57	(76)
East	0.9x 0.77	x	11.29	x	16.15	x	0.72	x	0.7	=	63.69	(76)
South	0.9x 0.77	x	0.93	x	46.75	x	0.72	x	0.7	=	15.19	(78)
South	0.9x 0.77	x	0.93	x	76.57	x	0.72	x	0.7	=	24.87	(78)
South	0.9x 0.77	x	0.93	x	97.53	x	0.72	x	0.7	=	31.68	(78)
South	0.9x 0.77	x	0.93	x	110.23	x	0.72	x	0.7	=	35.81	(78)
South	0.9x 0.77	x	0.93	x	114.87	x	0.72	x	0.7	=	37.31	(78)
South	0.9x 0.77	x	0.93	x	110.55	x	0.72	x	0.7	=	35.91	(78)
South	0.9x 0.77	x	0.93	x	108.01	x	0.72	x	0.7	=	35.08	(78)
South	0.9x 0.77	x	0.93	x	104.89	x	0.72	x	0.7	=	34.07	(78)
South	0.9x 0.77	x	0.93	x	101.89	x	0.72	x	0.7	=	33.09	(78)
South	0.9x 0.77	x	0.93	x	82.59	x	0.72	x	0.7	=	26.83	(78)
South	0.9x 0.77	x	0.93	x	55.42	x	0.72	x	0.7	=	18	(78)
South	0.9x 0.77	x	0.93	x	40.4	x	0.72	x	0.7	=	13.12	(78)
West	0.9x 0.77	x	7.95	x	19.64	x	0.72	x	0.7	=	54.54	(80)
West	0.9x 0.77	x	7.95	x	38.42	x	0.72	x	0.7	=	106.68	(80)
West	0.9x 0.77	x	7.95	x	63.27	x	0.72	x	0.7	=	175.69	(80)

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West	0.9x	0.77	x	7.95	x	92.28	x	0.72	x	0.7	=	256.24	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.72	x	0.7	=	314.03	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.72	x	0.7	=	321.46	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.72	x	0.7	=	306.04	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.72	x	0.7	=	262.89	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.72	x	0.7	=	204.34	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.72	x	0.7	=	126.59	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.72	x	0.7	=	68	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.72	x	0.7	=	44.85	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	150.62	289.66	468.09	673.94	821.56	839.87	800.01	689.54	541.1	341.04	186.83	124.54	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	603.47	740.93	903.3	1082.55	1201.65	1193.76	1137.74	1031.6	897.58	724.28	600.82	563.04	(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=	1	1	0.99	0.98	0.91	0.76	0.59	0.67	0.91	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.59	19.75	20.03	20.41	20.74	20.93	20.98	20.97	20.81	20.37	19.91	19.56	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.95	19.95	19.96	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.96	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.97	0.87	0.67	0.46	0.54	0.85	0.99	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.66	18.82	19.1	19.48	19.78	19.94	19.97	19.96	19.85	19.44	18.98	18.63	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.86	19.02	19.3	19.68	19.99	20.15	20.19	20.19	20.06	19.64	19.18	18.84	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.86	19.02	19.3	19.68	19.99	20.15	20.19	20.19	20.06	19.64	19.18	18.84	(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=	1	1	0.99	0.96	0.87	0.69	0.49	0.56	0.86	0.98	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	602.96	739.11	895.13	1041.42	1047.94	821.83	560.38	582.58	769.18	712.98	599.67	562.71	(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=	2354.94	2279.86	2063.65	1723.29	1323.23	880.25	568.95	599.06	947.74	1443.19	1934.39	2351.12	(97)

DFEE WorkSheet: New dwelling as built

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=	1303.47	1035.38	869.38	490.95	204.81	0	0	0	0	543.27	961	1330.57

Total per year (kWh/year) = Sum(98)$_{1,\ldots,12}$ = 6738.83 (98)

Space heating requirement in kWh/m²/year 48.31 (99)

3c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)												
(100)m=	0	0	0	0	0	1489.54	1172.62	1202.7	0	0	0	0
Utilisation factor for loss hm												
(101)m=	0	0	0	0	0	0.84	0.91	0.87	0	0	0	0
Useful loss, hmLm (Watts) = (100)m x (101)m												
(102)m=	0	0	0	0	0	1256.04	1067.23	1051.3	0	0	0	0
Gains (solar gains calculated for applicable weather region, see Table 10)												
(103)m=	0	0	0	0	0	1518.11	1449.85	1328.36	0	0	0	0

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(104)m=	0	0	0	0	0	188.69	284.67	206.13	0	0	0	0

Total = Sum(104)$_{5,\ldots,9}$ = 679.49 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104)$_{5,\ldots,9}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(107)m=	0	0	0	0	0	47.17	71.17	51.53	0	0	0	0

Total = Sum(107)$_{5,\ldots,9}$ = 169.87 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 1.22 (108)

3f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency (99) + (108) = 49.52 (109)

i-Therm Limited
Matt Haskell
[redacted]

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 6

Address : 6 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66	(1a) x	2.4	(2a) =	169.58	(3a)
First floor	68.84	(1b) x	2.6	(2b) =	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		348.57	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.14 (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		3.75999999046326 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.33 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31 (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

DER WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.34	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.95	x	1/[1/(1.2)+ 0.04]	=	9.1			(27)
Windows Type 2			0.93	x	1/[1/(1.2)+ 0.04]	=	1.06			(27)
Windows Type 3			0.93	x	1/[1/(1.2)+ 0.04]	=	1.06			(27)
Windows Type 4			11.29	x	1/[1/(1.2)+ 0.04]	=	12.93			(27)
Floor			70.66	x	0.12	=	8.4792			(28)
Walls	172.68	25.15	147.53	x	0.27	=	39.83			(29)
Roof	70.66	0	70.66	x	0.11	=	7.77			(30)
Total area of elements, m²			314							(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) = 84.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). ..(32e) = 17260.34 (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 12.58 (36)

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If details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 96.88 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	66.3	65.96	65.63	64.05	63.76	62.39	62.39	62.14	62.92	63.76	64.36	64.98	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	163.18	162.84	162.5	160.93	160.64	159.27	159.27	159.02	159.8	160.64	161.23	161.85	

Average = Sum(39)$_{1...12}$ /12= 160.93 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.17	1.17	1.16	1.15	1.15	1.14	1.14	1.14	1.15	1.15	1.16	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.15 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.32	22.14	22.85	19.92	19.11	16.49	15.28	17.54	17.75	20.68	22.58	24.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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)

DER WorkSheet: New dwelling as built

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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.65	171.88	179.2	158.81	154.3	135.96	128.77	143.8	144.33	164.76	176.52	190.32	(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)
FHRS	9.03	8.65	8.09	6.6	5.19	0	0	0	0	6.79	8.39	8.99	(63) (G2)

Output from water heater

(64)m=	186.62	163.24	171.11	152.21	149.11	135.96	128.77	143.8	144.33	157.97	168.13	181.34	

Output from water heater (annual)$_{1,12}$ | 1882.57 | (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=	62.84	55.15	57.37	50.66	49.09	43.06	40.6	45.59	45.84	52.57	56.55	61.06	(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=	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.06	25.81	20.99	15.89	11.88	10.03	10.83	14.08	18.9	24	28.01	29.86	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.84	312.05	303.97	286.78	265.08	244.68	231.05	227.85	235.92	253.12	274.82	295.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	84.46	82.07	77.1	70.36	65.98	59.81	54.57	61.28	63.67	70.65	78.54	82.08	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	492.1	489.66	471.8	442.77	412.67	384.26	366.19	372.95	388.24	417.51	451.11	476.9	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

[redacted]

DER WorkSheet: New dwelling as built

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	0.93	x	10.63	x	0.72	x	0.7	=	3.45	(74)
North	0.9x 0.77	x	0.93	x	20.32	x	0.72	x	0.7	=	6.6	(74)
North	0.9x 0.77	x	0.93	x	34.53	x	0.72	x	0.7	=	11.22	(74)
North	0.9x 0.77	x	0.93	x	55.46	x	0.72	x	0.7	=	18.02	(74)
North	0.9x 0.77	x	0.93	x	74.72	x	0.72	x	0.7	=	24.27	(74)
North	0.9x 0.77	x	0.93	x	79.99	x	0.72	x	0.7	=	25.98	(74)
North	0.9x 0.77	x	0.93	x	74.68	x	0.72	x	0.7	=	24.26	(74)
North	0.9x 0.77	x	0.93	x	59.25	x	0.72	x	0.7	=	19.24	(74)
North	0.9x 0.77	x	0.93	x	41.52	x	0.72	x	0.7	=	13.49	(74)
North	0.9x 0.77	x	0.93	x	24.19	x	0.72	x	0.7	=	7.86	(74)
North	0.9x 0.77	x	0.93	x	13.12	x	0.72	x	0.7	=	4.26	(74)
North	0.9x 0.77	x	0.93	x	8.86	x	0.72	x	0.7	=	2.88	(74)
East	0.9x 0.77	x	11.29	x	19.64	x	0.72	x	0.7	=	77.45	(76)
East	0.9x 0.77	x	11.29	x	38.42	x	0.72	x	0.7	=	151.5	(76)
East	0.9x 0.77	x	11.29	x	63.27	x	0.72	x	0.7	=	249.5	(76)
East	0.9x 0.77	x	11.29	x	92.28	x	0.72	x	0.7	=	363.89	(76)
East	0.9x 0.77	x	11.29	x	113.09	x	0.72	x	0.7	=	445.96	(76)
East	0.9x 0.77	x	11.29	x	115.77	x	0.72	x	0.7	=	456.52	(76)
East	0.9x 0.77	x	11.29	x	110.22	x	0.72	x	0.7	=	434.62	(76)
East	0.9x 0.77	x	11.29	x	94.68	x	0.72	x	0.7	=	373.33	(76)
East	0.9x 0.77	x	11.29	x	73.59	x	0.72	x	0.7	=	290.18	(76)
East	0.9x 0.77	x	11.29	x	45.59	x	0.72	x	0.7	=	179.77	(76)
East	0.9x 0.77	x	11.29	x	24.49	x	0.72	x	0.7	=	96.57	(76)
East	0.9x 0.77	x	11.29	x	16.15	x	0.72	x	0.7	=	63.69	(76)
South	0.9x 0.77	x	0.93	x	46.75	x	0.72	x	0.7	=	15.19	(78)
South	0.9x 0.77	x	0.93	x	76.57	x	0.72	x	0.7	=	24.87	(78)
South	0.9x 0.77	x	0.93	x	97.53	x	0.72	x	0.7	=	31.68	(78)
South	0.9x 0.77	x	0.93	x	110.23	x	0.72	x	0.7	=	35.81	(78)
South	0.9x 0.77	x	0.93	x	114.87	x	0.72	x	0.7	=	37.31	(78)
South	0.9x 0.77	x	0.93	x	110.55	x	0.72	x	0.7	=	35.91	(78)
South	0.9x 0.77	x	0.93	x	108.01	x	0.72	x	0.7	=	35.08	(78)
South	0.9x 0.77	x	0.93	x	104.89	x	0.72	x	0.7	=	34.07	(78)
South	0.9x 0.77	x	0.93	x	101.89	x	0.72	x	0.7	=	33.09	(78)
South	0.9x 0.77	x	0.93	x	82.59	x	0.72	x	0.7	=	26.83	(78)
South	0.9x 0.77	x	0.93	x	55.42	x	0.72	x	0.7	=	18	(78)
South	0.9x 0.77	x	0.93	x	40.4	x	0.72	x	0.7	=	13.12	(78)
West	0.9x 0.77	x	7.95	x	19.64	x	0.72	x	0.7	=	54.54	(80)
West	0.9x 0.77	x	7.95	x	38.42	x	0.72	x	0.7	=	106.68	(80)
West	0.9x 0.77	x	7.95	x	63.27	x	0.72	x	0.7	=	175.69	(80)

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West	0.9x	0.77	x	7.95	x	92.28	x	0.72	x	0.7	=	256.24	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.72	x	0.7	=	314.03	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.72	x	0.7	=	321.46	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.72	x	0.7	=	306.04	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.72	x	0.7	=	262.89	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.72	x	0.7	=	204.34	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.72	x	0.7	=	126.59	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.72	x	0.7	=	68	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.72	x	0.7	=	44.85	(80)

Solar gains in watts, calculated for each month (63)m = Sum(74)m ...(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	150.62	289.66	468.09	673.94	821.56	839.87	800.01	689.54	541.1	341.04	186.83	124.54	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	642.72	779.32	939.9	1116.71	1234.24	1224.12	1166.2	1062.49	929.34	758.55	637.94	601.43	(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=	1	1	0.99	0.97	0.9	0.75	0.58	0.65	0.9	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.6	19.76	20.05	20.42	20.74	20.93	20.98	20.97	20.82	20.38	19.92	19.58	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.94	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.96	19.96	19.96	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.96	0.86	0.66	0.45	0.52	0.84	0.98	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.07	18.3	18.72	19.26	19.7	19.92	19.96	19.96	19.81	19.21	18.54	18.03	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.4	18.62	19.01	19.52	19.93	20.14	20.19	20.18	20.03	19.47	18.84	18.37	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.25	18.47	18.86	19.37	19.78	19.99	20.04	20.03	19.88	19.32	18.69	18.22	(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=	1	1	0.99	0.95	0.85	0.66	0.46	0.53	0.83	0.98	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	641.85	776.46	928.32	1064.34	1054.2	810.42	540.81	564.94	773.07	742.14	636	600.85	(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=	2277	2210.13	2008.07	1684.34	1297.87	858.8	547.22	577.27	923.53	1400.58	1869.3	2269.63	(97)

DER WorkSheet: New dwelling as built

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1216.55	963.42	803.34	446.41	181.29	0	0	0	0	489.88	887.98	1241.57	
												Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ =	6230.43 (98)

Space heating requirement in kWh/m²/year 44.66 (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) x [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 89.9 (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)	1216.55	963.42	803.34	446.41	181.29	0	0	0	0	489.88	887.98	1241.57	
(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	1353.23	1071.66	893.59	496.56	201.66	0	0	0	0	544.91	987.74	1381.06	
												Total (kWh/year) =Sum(211)$_{1..5,10..12}$=	6930.4 (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)

	186.62	163.24	171.11	152.21	149.11	135.96	128.77	143.8	144.33	157.97	168.13	181.34

Efficiency of water heater 87.3 (216)

(217)m=	89.55	89.51	89.43	89.22	88.71	87.3	87.3	87.3	87.3	89.25	89.48	89.56

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.4	182.36	191.33	170.59	168.09	155.74	147.5	164.72	165.32	177	187.9	202.48	
												Total = Sum(219a)$_{1..12}$ =	2121.43 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		6930.4
Water heating fuel used		2121.43
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		513.12 (232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year

DER WorkSheet: New dwelling as built

Space heating (main system 1)	(211) x	0.216	=	1496.97	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	458.23	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1955.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	266.31	(268)
Total CO2, kg/year	sum of (265)...(271) =			2260.43	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			16.2	(273)
EI rating (section 14)				84	(274)

TER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 6

Address : 6 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66	(1a) x	2.4	(2a) =	169.58	(3a)
First floor	68.84	(1b) x	2.6	(2b) =	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	348.57	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.11 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.36 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34 (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

TER WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			7.95	x1/[1/(1.4)+ 0.04]		=	10.54			(27)
Windows Type 2			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 3			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 4			11.29	x1/[1/(1.4)+ 0.04]		=	14.97			(27)
Floor			70.66	x	0.13	=	9.185801			(28)
Walls	172.68	25.15	147.53	x	0.18	=	26.56			(29)
Roof	70.66	0	70.66	x	0.13	=	9.19			(30)
Total area of elements, m²			314							(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) = 77.34 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). ..(32e) = 17260.34 (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 13.04 (36)

TER WorkSheet: New dwelling as built

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 90.38 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	68.16	67.74	67.34	65.44	65.08	63.42	63.42	63.12	64.06	65.08	65.8	66.55	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	158.53	158.12	157.72	155.81	155.46	153.8	153.8	153.49	154.44	155.46	156.18	156.93	

Average = Sum(39)$_{1...12}$ /12= 155.81 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.14	1.13	1.13	1.12	1.11	1.1	1.1	1.1	1.11	1.11	1.12	1.12	

Average = Sum(40)$_{1...12}$ /12= 1.12 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.32	22.14	22.85	19.92	19.11	16.49	15.28	17.54	17.75	20.68	22.58	24.52	(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)

TER WorkSheet: New dwelling as built

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 | 0 | (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	46.03	50.96	49.32	49.56	45.92	47.45	49.56	49.32	50.96	49.32	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	219.73	193.63	203.27	182.11	176.98	155.87	149.34	166.47	167.63	188.84	199.82	214.4	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	219.73	193.63	203.27	182.11	176.98	155.87	149.34	166.47	167.63	188.84	199.82	214.4	

Output from water heater (annual)$_{1,12}$ | 2218.09 | (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=	68.86	60.59	63.38	56.48	54.76	48.04	45.74	51.26	51.67	58.59	62.37	67.08	(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=	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.55	25.36	20.62	15.61	11.67	9.85	10.65	13.84	18.57	23.58	27.52	29.34	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.84	312.05	303.97	286.78	265.08	244.68	231.05	227.85	235.92	253.12	274.82	295.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	92.55	90.16	85.19	78.45	73.6	66.72	61.48	68.9	71.76	78.74	86.63	90.17	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	499.68	497.3	479.53	450.58	420.08	390.99	372.92	380.33	396	425.18	458.71	484.47	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

TER WorkSheet: New dwelling as built

Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.93	x	10.63	x	0.63	x	0.7	=	3.02	(74)
North	0.9x	0.77	x	0.93	x	20.32	x	0.63	x	0.7	=	5.78	(74)
North	0.9x	0.77	x	0.93	x	34.53	x	0.63	x	0.7	=	9.81	(74)
North	0.9x	0.77	x	0.93	x	55.46	x	0.63	x	0.7	=	15.76	(74)
North	0.9x	0.77	x	0.93	x	74.72	x	0.63	x	0.7	=	21.24	(74)
North	0.9x	0.77	x	0.93	x	79.99	x	0.63	x	0.7	=	22.73	(74)
North	0.9x	0.77	x	0.93	x	74.68	x	0.63	x	0.7	=	21.22	(74)
North	0.9x	0.77	x	0.93	x	59.25	x	0.63	x	0.7	=	16.84	(74)
North	0.9x	0.77	x	0.93	x	41.52	x	0.63	x	0.7	=	11.8	(74)
North	0.9x	0.77	x	0.93	x	24.19	x	0.63	x	0.7	=	6.88	(74)
North	0.9x	0.77	x	0.93	x	13.12	x	0.63	x	0.7	=	3.73	(74)
North	0.9x	0.77	x	0.93	x	8.86	x	0.63	x	0.7	=	2.52	(74)
East	0.9x	0.77	x	11.29	x	19.64	x	0.63	x	0.7	=	67.77	(76)
East	0.9x	0.77	x	11.29	x	38.42	x	0.63	x	0.7	=	132.57	(76)
East	0.9x	0.77	x	11.29	x	63.27	x	0.63	x	0.7	=	218.32	(76)
East	0.9x	0.77	x	11.29	x	92.28	x	0.63	x	0.7	=	318.4	(76)
East	0.9x	0.77	x	11.29	x	113.09	x	0.63	x	0.7	=	390.21	(76)
East	0.9x	0.77	x	11.29	x	115.77	x	0.63	x	0.7	=	399.45	(76)
East	0.9x	0.77	x	11.29	x	110.22	x	0.63	x	0.7	=	380.29	(76)
East	0.9x	0.77	x	11.29	x	94.68	x	0.63	x	0.7	=	326.67	(76)
East	0.9x	0.77	x	11.29	x	73.59	x	0.63	x	0.7	=	253.91	(76)
East	0.9x	0.77	x	11.29	x	45.59	x	0.63	x	0.7	=	157.3	(76)
East	0.9x	0.77	x	11.29	x	24.49	x	0.63	x	0.7	=	84.5	(76)
East	0.9x	0.77	x	11.29	x	16.15	x	0.63	x	0.7	=	55.73	(76)
South	0.9x	0.77	x	0.93	x	46.75	x	0.63	x	0.7	=	13.29	(78)
South	0.9x	0.77	x	0.93	x	76.57	x	0.63	x	0.7	=	21.76	(78)
South	0.9x	0.77	x	0.93	x	97.53	x	0.63	x	0.7	=	27.72	(78)
South	0.9x	0.77	x	0.93	x	110.23	x	0.63	x	0.7	=	31.33	(78)
South	0.9x	0.77	x	0.93	x	114.87	x	0.63	x	0.7	=	32.65	(78)
South	0.9x	0.77	x	0.93	x	110.55	x	0.63	x	0.7	=	31.42	(78)
South	0.9x	0.77	x	0.93	x	108.01	x	0.63	x	0.7	=	30.7	(78)
South	0.9x	0.77	x	0.93	x	104.89	x	0.63	x	0.7	=	29.81	(78)
South	0.9x	0.77	x	0.93	x	101.89	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	0.93	x	82.59	x	0.63	x	0.7	=	23.47	(78)
South	0.9x	0.77	x	0.93	x	55.42	x	0.63	x	0.7	=	15.75	(78)
South	0.9x	0.77	x	0.93	x	40.4	x	0.63	x	0.7	=	11.48	(78)
West	0.9x	0.77	x	7.95	x	19.64	x	0.63	x	0.7	=	47.72	(80)
West	0.9x	0.77	x	7.95	x	38.42	x	0.63	x	0.7	=	93.35	(80)
West	0.9x	0.77	x	7.95	x	63.27	x	0.63	x	0.7	=	153.73	(80)

TER WorkSheet: New dwelling as built

West	0.9x	0.77	x	7.95	x	92.28	x	0.63	x	0.7	=	224.21	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.63	x	0.7	=	274.77	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.63	x	0.7	=	281.28	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.63	x	0.7	=	267.79	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.63	x	0.7	=	230.03	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.63	x	0.7	=	178.79	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.63	x	0.7	=	110.76	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.63	x	0.7	=	59.5	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.63	x	0.7	=	39.24	(80)

Solar gains in watts, calculated for each month (63)m = Sum(74)m ...(82)m

(83)m=	131.79	253.45	409.58	589.7	718.87	734.88	700.01	603.35	473.46	298.41	163.47	108.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	631.47	750.75	889.11	1040.28	1138.95	1125.87	1072.92	983.67	869.46	723.59	622.19	593.44	(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=	1	1	1	0.98	0.92	0.78	0.61	0.68	0.91	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.64	19.79	20.05	20.41	20.73	20.93	20.98	20.97	20.81	20.39	19.95	19.62	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.97	19.97	19.98	19.99	19.99	20	20	20	20	19.99	19.98	19.98	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.97	0.88	0.69	0.48	0.55	0.86	0.99	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.14	18.36	18.75	19.27	19.71	19.95	19.99	19.99	19.83	19.25	18.61	18.11	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.47	18.67	19.03	19.52	19.93	20.16	20.21	20.2	20.05	19.5	18.9	18.44	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.47	18.67	19.03	19.52	19.93	20.16	20.21	20.2	20.05	19.5	18.9	18.44	(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=	1	1	0.99	0.96	0.88	0.71	0.51	0.58	0.86	0.98	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	630.75	748.56	880.7	1002.69	1004.8	795.12	546.32	567.57	747.96	711.14	620.62	592.94	(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=	2246.14	2177.48	1976.66	1655.27	1279.99	855.32	555.19	583.91	918.35	1383.44	1842.99	2235.42	(97)

TER WorkSheet: New dwelling as built

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1201.85	960.24	815.4	469.86	204.74	0	0	0	0	500.19	880.1	1222	

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 6254.38 (98)

Space heating requirement in kWh/m²/year 44.83 (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) x [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.4 (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)	1201.85	960.24	815.4	469.86	204.74	0	0	0	0	500.19	880.1	1222	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	1286.78	1028.09	873.01	503.06	219.21	0	0	0	0	535.54	942.29	1308.35	(211)

Total (kWh/year) =Sum(211)$_{1..5,10..12}$= 6696.34 (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)

	219.73	193.63	203.27	182.11	176.98	155.87	149.34	166.47	167.63	188.84	199.82	214.4	

Efficiency of water heater 80.3 (216)

(217)m=	88.68	88.53	88.19	87.33	85.42	80.3	80.3	80.3	80.3	87.39	88.34	88.73	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	247.79	218.72	230.5	208.52	207.19	194.11	185.97	207.31	208.75	216.1	226.19	241.62	

Total = Sum(219a)$_{1..12}$ = 2592.77 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		6696.34
Water heating fuel used		2592.77
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		504.15 (232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year

TER WorkSheet: New dwelling as built

Space heating (main system 1)	(211) x	0.216	=	1446.41	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	560.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2006.45	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	261.65	(268)
Total CO2, kg/year	sum of (265)...(271) =			2307.03	(272)

TER = 16.54 (273)

i-Therm Limited
Matt Haskell

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SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 12 August 2021

Property Details: Plot 6

Dwelling type:	Detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	8 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	920.22	**(P1)**
Transmission heat loss coefficient:	96.9	
Summer heat loss coefficient:	1017.1	**(P2)**

Overhangs

Orientation:	**Ratio:**	**Z_overhangs:**
West (Ext)	0	1
North (Ext)	0	1
South (Ext)	0	1
East (Ext)	0	1

Solar shading

Orientation:	**Z blinds:**	**Solar access:**	**Overhangs:**	**Z summer:**	
West (Ext)	1	0.9	1	0.9	**(P8)**
North (Ext)	1	0.9	1	0.9	**(P8)**
South (Ext)	1	0.9	1	0.9	**(P8)**
East (Ext)	1	0.9	1	0.9	**(P8)**

Solar gains

Orientation		**Area**	**Flux**	**g_**	**FF**	**Shading**	**Gains**	
West (Ext)	0.9 x	7.95	124.8	0.72	0.7	0.9	405.03	
North (Ext)	0.9 x	0.93	86.66	0.72	0.7	0.9	32.9	
South (Ext)	0.9 x	0.93	118.4	0.72	0.7	0.9	44.95	
East (Ext)	0.9 x	11.29	124.8	0.72	0.7	0.9	575.19	
						Total	1058.08	**(P3/P4)**

Internal gains

	June	**July**	**August**	
Internal gains	563.8	540.24	550.3	
Total summer gains	1687.18	1598.32	1472.72	**(P5)**
Summer gain/loss ratio	1.66	1.57	1.45	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	17.31	19.22	19.2	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Not significant

i-Therm Limited
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Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.8
Printed on 07 September 2021 at 22:42:31

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Detached House

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 139.5m²
Site Reference : Langford **Plot Reference:** Plot 7
Address : 7 Langford Close , CLIMPING, BN17 5FG

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)	16.54 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.20 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	56.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	49.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.11 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (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	3.76 (measured in this dwelling)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 482, product index 016635):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi)
Efficiency 89.0 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

ARUN DISTRICT COUNCIL CM/4/22/DOC

[redacted]

Regulations Compliance Report

5 Controls

Hot water Storage:	Measured cylinder loss: 1.41 kWh/day	
	Permitted by DBSCG: 2.30 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: West	7.95m²
Windows facing: North	0.93m²
Windows facing: South	0.93m²
Windows facing: East	11.29m²
Ventilation rate:	8.00

10 Key features

Air permeablility	3.8 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Floors U-value	0.12 W/m²K

i-Therm Limited
Matt Haskell

[redacted]

Thermal Bridge Report

Property Details: Plot 7

Address: 7 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.0401

External Junctions Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	17.24	E1	[UD]
Sill	0.04	12.29	E3	[A]
Jamb	0.05	36.6	E4	[A]
Ground floor (normal)	0.076	35.5	E5	[UD]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	33.68	E6	[A]
Eaves (insulation at ceiling level)	0.06	37.5	E10	[A]
Gable (insulation at ceiling level)	0.24	0	E12	[A]
Corner (normal)	0.09	29.8	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	9.8	E17	[A]
Flat roof	0.08	0	E14	[D]
Party wall between dwellings	0.06	0	E18	[A]

Party Junctions Details

Ground floor	0.16	0	P1	[D]
Intermediate floor within a dwelling	0	0	P2	[D]
Roof (insulation at ceiling level)	0.24	0	P4	[D]

i-Therm Limited
Matt Haskell
[redacted]

Code for Sustainable Homes Report

For use with Nov 2010 addendum 2014 England

Assessor Name: Matthew Haskell
Assessor Number: STRO006210
Property Address: 7 Langford Close
CLIMPING
BN17 5FG

Building regulation assessment

	kg/m²/year
TER	16.54
DER	16.2

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO_2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2012 DER Worksheet		16.2	*(ZC1)*
TER		16.54	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		16.2	
% improvement DER/TER	2.1		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	16.2	*(ZC1)*
CO2 emissions from appliances, equation (L14)	13.07	*(ZC2)*
CO2 emissions from cooking, equation (L16)	1.35	*(ZC3)*
Net CO2 emissions	32.1	*(ZC8)*

Result:

Credits awarded for ENE 1 = 0.3

Code Level = 3

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 49.52

Credits awarded for ENE 2 = 5.8

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		32.14	
Standard DER		17.72	
Actual Case CO2 emissions		32.14	
Actual DER		17.72	
Reduction in CO2 emissions	0		

Credits awarded for ENE 7 = 0

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

i-Therm Limited
Matt Haskell

SAP Input

[redacted]

Property Details: Plot 7

Address:	7 Langford Close , CLIMPING, BN17 5FG
Located in:	England
Region:	South East England
UPRN:	UPRN-573181116846
Date of assessment:	07 September 2021
Date of certificate:	07 September 2021
Assessment type:	New dwelling as built
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:	482

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2021

Floor Location:	**Floor area:**	**Storey height:**
Floor 0	70.66 m²	2.4 m
Floor 1	68.84 m²	2.6 m

Living area:	30.6 m² (fraction 0.219)
Front of dwelling faces:	West

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Entrance	Manufacturer	Solid			PVC-U
Utility	Manufacturer	Half glazed			PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Entrance	mm	0.7	0	1	2.1	1
Utility	mm	0.7	0	1	1.95	1
Ext	16mm or more	0.7	0.72	1.2	7.95	1
Ext	16mm or more	0.7	0.72	1.2	0.93	1
Ext	16mm or more	0.7	0.72	1.2	0.93	1
Ext	16mm or more	0.7	0.72	1.2	11.29	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Entrance	Door (1)	External Wall	West	0	0
Utility	Door (2)	External Wall	North	0	0
Ext	Windows (1)	External Wall	West	0	0
Ext	Windows (1)	External Wall	North	0	0
Ext	Windows (1)	External Wall	South	0	0
Ext	Windows (1)	External Wall	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 Wall	172.68	25.15	147.53	0.27	0	False	N/A

SAP Input

Plane Roof	70.66	0	70.66	0.11	0	N/A
Ground floor	70.66			0.12		N/A

Internal Elements
Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0401

	Length	Psi-value		
	17.24	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	12.29	0.04	E3	Sill
[Approved]	36.6	0.05	E4	Jamb
	35.5	0.076	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	33.68	0.07	E6	Intermediate floor within a dwelling
[Approved]	37.5	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	0	0.24	E12	Gable (insulation at ceiling level)
[Approved]	29.8	0.09	E16	Corner (normal)
[Approved]	9.8	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof
[Approved]	0	0.06	E18	Party wall between dwellings
	0	0.16	P1	Ground floor
	0	0	P2	Intermediate floor within a dwelling
	0	0.24	P4	Roof (insulation at ceiling level)

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 5
Number of passive stacks: 0
Number of sides sheltered: 1
Pressure test: 3.76 (Assessed dwelling is tested)

Main heating system

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 482, product index 016635) Efficiency: Winter 87.3 % Summer: 89.9
Has integral PFGHRD 060025
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
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

SAP Input

Water heating

Water heating:	From main heating system Water code: 901 Fuel :mains gas Hot water cylinder Cylinder volume: 210 litres Cylinder insulation: Measured loss, 1.41kWh/day Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Flue Gas Heat Recovery System: Database (rev 482, product index 060025) Brand name: Ideal Model: Logic Boost Model qualifier: 33 Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

[redacted]

SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 7

Address : 7 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66	(1a) x	2.4	(2a) =	169.58	(3a)
First floor	68.84	(1b) x	2.6	(2b) =	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	348.57	(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							5	x 10 =	50	(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) = 50 ÷ (5) =	0.14	(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		3.75999999046326	(17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.33	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used			
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92	(20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31	(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

SAP WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.34	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.95	x1/[1/(1.2)+ 0.04]		=	9.1			(27)
Windows Type 2			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			11.29	x1/[1/(1.2)+ 0.04]		=	12.93			(27)
Floor			70.66	x	0.12	=	8.4792			(28)
Walls	172.68	25.15	147.53	x	0.27	=	39.83			(29)
Roof	70.66	0	70.66	x	0.11	=	7.77			(30)
Total area of elements, m²			314							(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) = 84.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). ..(32e) = 17260.34 (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 12.58 (36)

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if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 96.88 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	66.3	65.96	65.63	64.05	63.76	62.39	62.39	62.14	62.92	63.76	64.36	64.98	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	163.18	162.84	162.5	160.93	160.64	159.27	159.27	159.02	159.8	160.64	161.23	161.85	

Average = Sum(39)$_{1...12}$ /12= 160.93 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.17	1.17	1.16	1.15	1.15	1.14	1.14	1.14	1.15	1.15	1.16	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.15 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.32	22.14	22.85	19.92	19.11	16.49	15.28	17.54	17.75	20.68	22.58	24.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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)

SAP WorkSheet: New dwelling as built

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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.65	171.88	179.2	158.81	154.3	135.96	128.77	143.8	144.33	164.76	176.52	190.32	(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)
FHRS	9.02	8.15	7.58	6.26	3.68	0	0	0	0	6.39	7.88	8.97	(63) (G2)

Output from water heater

(64)m=	186.63	163.74	171.61	152.54	150.62	135.96	128.77	143.8	144.33	158.37	168.64	181.35	

Output from water heater (annual)$_{1,12}$ | 1886.35 | (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=	62.84	55.15	57.37	50.66	49.09	43.06	40.6	45.59	45.84	52.57	56.55	61.06	(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=	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	72.64	64.52	52.47	39.72	29.69	25.07	27.09	35.21	47.26	60	70.03	74.66	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	460.96	465.74	453.69	428.03	395.64	365.19	344.85	340.07	352.12	377.78	410.18	440.62	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	84.46	82.07	77.1	70.36	65.98	59.81	54.57	61.28	63.67	70.65	78.54	82.08	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	734.79	729.06	700	654.84	608.04	566.8	543.24	553.3	579.78	625.17	675.48	714.09	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

SAP WorkSheet: New dwelling as built

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	0.93	x	10.63	x	0.72	x	0.7	=	3.45	(74)
North	0.9x 0.77	x	0.93	x	20.32	x	0.72	x	0.7	=	6.6	(74)
North	0.9x 0.77	x	0.93	x	34.53	x	0.72	x	0.7	=	11.22	(74)
North	0.9x 0.77	x	0.93	x	55.46	x	0.72	x	0.7	=	18.02	(74)
North	0.9x 0.77	x	0.93	x	74.72	x	0.72	x	0.7	=	24.27	(74)
North	0.9x 0.77	x	0.93	x	79.99	x	0.72	x	0.7	=	25.98	(74)
North	0.9x 0.77	x	0.93	x	74.68	x	0.72	x	0.7	=	24.26	(74)
North	0.9x 0.77	x	0.93	x	59.25	x	0.72	x	0.7	=	19.24	(74)
North	0.9x 0.77	x	0.93	x	41.52	x	0.72	x	0.7	=	13.49	(74)
North	0.9x 0.77	x	0.93	x	24.19	x	0.72	x	0.7	=	7.86	(74)
North	0.9x 0.77	x	0.93	x	13.12	x	0.72	x	0.7	=	4.26	(74)
North	0.9x 0.77	x	0.93	x	8.86	x	0.72	x	0.7	=	2.88	(74)
East	0.9x 0.77	x	11.29	x	19.64	x	0.72	x	0.7	=	77.45	(76)
East	0.9x 0.77	x	11.29	x	38.42	x	0.72	x	0.7	=	151.5	(76)
East	0.9x 0.77	x	11.29	x	63.27	x	0.72	x	0.7	=	249.5	(76)
East	0.9x 0.77	x	11.29	x	92.28	x	0.72	x	0.7	=	363.89	(76)
East	0.9x 0.77	x	11.29	x	113.09	x	0.72	x	0.7	=	445.96	(76)
East	0.9x 0.77	x	11.29	x	115.77	x	0.72	x	0.7	=	456.52	(76)
East	0.9x 0.77	x	11.29	x	110.22	x	0.72	x	0.7	=	434.62	(76)
East	0.9x 0.77	x	11.29	x	94.68	x	0.72	x	0.7	=	373.33	(76)
East	0.9x 0.77	x	11.29	x	73.59	x	0.72	x	0.7	=	290.18	(76)
East	0.9x 0.77	x	11.29	x	45.59	x	0.72	x	0.7	=	179.77	(76)
East	0.9x 0.77	x	11.29	x	24.49	x	0.72	x	0.7	=	96.57	(76)
East	0.9x 0.77	x	11.29	x	16.15	x	0.72	x	0.7	=	63.69	(76)
South	0.9x 0.77	x	0.93	x	46.75	x	0.72	x	0.7	=	15.19	(78)
South	0.9x 0.77	x	0.93	x	76.57	x	0.72	x	0.7	=	24.87	(78)
South	0.9x 0.77	x	0.93	x	97.53	x	0.72	x	0.7	=	31.68	(78)
South	0.9x 0.77	x	0.93	x	110.23	x	0.72	x	0.7	=	35.81	(78)
South	0.9x 0.77	x	0.93	x	114.87	x	0.72	x	0.7	=	37.31	(78)
South	0.9x 0.77	x	0.93	x	110.55	x	0.72	x	0.7	=	35.91	(78)
South	0.9x 0.77	x	0.93	x	108.01	x	0.72	x	0.7	=	35.08	(78)
South	0.9x 0.77	x	0.93	x	104.89	x	0.72	x	0.7	=	34.07	(78)
South	0.9x 0.77	x	0.93	x	101.89	x	0.72	x	0.7	=	33.09	(78)
South	0.9x 0.77	x	0.93	x	82.59	x	0.72	x	0.7	=	26.83	(78)
South	0.9x 0.77	x	0.93	x	55.42	x	0.72	x	0.7	=	18	(78)
South	0.9x 0.77	x	0.93	x	40.4	x	0.72	x	0.7	=	13.12	(78)
West	0.9x 0.77	x	7.95	x	19.64	x	0.72	x	0.7	=	54.54	(80)
West	0.9x 0.77	x	7.95	x	38.42	x	0.72	x	0.7	=	106.68	(80)
West	0.9x 0.77	x	7.95	x	63.27	x	0.72	x	0.7	=	175.69	(80)

SAP WorkSheet: New dwelling as built

West	0.9x	0.77	x	7.95	x	92.28	x	0.72	x	0.7	=	256.24	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.72	x	0.7	=	314.03	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.72	x	0.7	=	321.46	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.72	x	0.7	=	306.04	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.72	x	0.7	=	262.89	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.72	x	0.7	=	204.34	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.72	x	0.7	=	126.59	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.72	x	0.7	=	68	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.72	x	0.7	=	44.85	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	150.62	289.66	468.09	673.94	821.56	839.87	800.01	689.54	541.1	341.04	186.83	124.54	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	885.41	1018.72	1168.09	1328.79	1429.6	1406.67	1343.25	1242.83	1120.88	966.22	862.31	838.63	(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=	1	0.99	0.98	0.95	0.85	0.68	0.51	0.57	0.83	0.97	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.76	19.92	20.19	20.54	20.81	20.96	20.99	20.99	20.88	20.51	20.07	19.74	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.94	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.96	19.96	19.96	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.93	0.8	0.59	0.4	0.45	0.75	0.96	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.3	18.53	18.92	19.42	19.78	19.94	19.96	19.96	19.87	19.39	18.76	18.27	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.62	18.84	19.2	19.67	20.01	20.16	20.19	20.19	20.09	19.63	19.04	18.59	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.47	18.69	19.05	19.52	19.86	20.01	20.04	20.04	19.94	19.48	18.89	18.44	(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=	0.99	0.99	0.97	0.92	0.8	0.59	0.41	0.46	0.75	0.95	0.99	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	880.72	1007.62	1135.74	1221.28	1137.37	832.39	544.27	571.84	840.81	917.54	853.24	835.18	(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=	2312.84	2244.94	2039.63	1708.37	1310.34	861.99	547.77	578.34	933.65	1427.26	1901.74	2304.52	(97)

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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1065.5	831.48	672.5	350.7	128.69	0	0	0	0	379.23	754.93	1093.19

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 5276.21 (98)

Space heating requirement in kWh/m²/year 37.82 (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) x [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 89.9 (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)	1065.5	831.48	672.5	350.7	128.69	0	0	0	0	379.23	754.93	1093.19	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	1185.2	924.89	748.05	390.1	143.15	0	0	0	0	421.83	839.74	1216.01	(211)

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 5868.98 (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)

	186.63	163.74	171.61	152.54	150.62	135.96	128.77	143.8	144.33	158.37	168.64	181.35

Efficiency of water heater 87.3 (216)

(217)m=	89.5	89.46	89.36	89.1	88.48	87.3	87.3	87.3	87.3	89.12	89.41	89.52

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.52	183.03	192.05	171.21	170.23	155.74	147.5	164.72	165.32	177.71	188.6	202.58

Total = Sum(219a)$_{1...12}$ = 2127.21 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		5868.98
Water heating fuel used		2127.21
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		513.12 (232)

10a. Fuel costs - individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year

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Space heating - main system 1	(211)	x	3.48	x 0.01 =	204.24	(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 =	74.03	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(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 =	67.68	(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) =				475.84	(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)		84.89 (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	=	1267.7	(261)
Space heating (secondary)	(215)	x		0.519	=	0	(263)
Water heating	(219)	x		0.216	=	459.48	(264)
Space and water heating	(261) + (262) + (263) + (264) =					1727.18	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		0.519	=	38.93	(267)
Electricity for lighting	(232)	x		0.519	=	266.31	(268)
Total CO2, kg/year			sum of (265) ..(271) =			2032.41	(272)
CO2 emissions per m²			(272) ÷ (4) =			14.57	(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		1.22	=	7160.15	(261)
Space heating (secondary)	(215)	x		3.07	=	0	(263)
Energy for water heating	(219)	x		1.22	=	2595.19	(264)
Space and water heating	(261) + (262) + (263) + (264) =					9755.34	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x		3.07	=	230.25	(267)
Electricity for lighting	(232)	x		0	=	1575.28	(268)
'Total Primary Energy			sum of (265)...(271) =			11560.88	(272)

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Primary energy kWh/m²/year (272) ÷ (4) = 82.87 (273)

[redacted]

EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 7

Address : 7 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66	(1a) x	2.4	(2a) =	169.58	(3a)
First floor	68.84	(1b) x	2.6	(2b) =	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	348.57	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.14 (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		3.75999999046326 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.33 (18)

Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used

Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31 (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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.41	0.37	0.35	0.33	0.34	0.31	0.32	0.31	0.32	0.35	0.35	0.38

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.57	0.56	0.55	0.56	0.55	0.55	0.55	0.55	0.56	0.56	0.57	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.57	0.56	0.55	0.56	0.55	0.55	0.55	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.95	x1/[1/(1.2)+ 0.04]		=	9.1			(27)
Windows Type 2			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			11.29	x1/[1/(1.2)+ 0.04]		=	12.93			(27)
Floor			70.66	x	0.12	=	8.4792			(28)
Walls	172.68	25.15	147.53	x	0.27	=	39.83			(29)
Roof	70.66	0	70.66	x	0.11	=	7.77			(30)
Total area of elements, m²			314							(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) = 84.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). .(32e) = 17260.34 (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 12.58 (36)

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if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 96.88 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	67	65.3	64.66	63.76	64.05	63.19	63.47	62.92	63.47	64.66	64.66	65.63	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	163.88	162.18	161.54	160.64	160.93	160.07	160.35	159.8	160.35	161.54	161.54	162.5	

Average = Sum(39)$_{1...12}$ /12= 161.28 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.17	1.16	1.16	1.15	1.15	1.15	1.15	1.15	1.15	1.16	1.16	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.16 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.32	22.14	22.85	19.92	19.11	16.49	15.28	17.54	17.75	20.68	22.58	24.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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)

EPC Costs WorkSheet: New dwelling as built

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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.65	171.88	179.2	158.81	154.3	135.96	128.77	143.8	144.33	164.76	176.52	190.32	(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)
FHRS	8.59	7.7	7.1	5.89	1.85	0	0	0	0	5.79	7.18	8.62	(63) (G2)

Output from water heater

(64)m=	187.05	164.18	172.1	152.92	152.45	135.96	128.77	143.8	144.33	158.97	169.34	181.7	

Output from water heater (annual)$_{1,12}$ | 1891.58 | (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=	62.84	55.15	57.37	50.66	49.09	43.06	40.6	45.59	45.84	52.57	56.55	61.06	(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=	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	174.97	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	72.64	64.52	52.47	39.72	29.69	25.07	27.09	35.21	47.26	60	70.03	74.66	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	460.96	465.74	453.69	428.03	395.64	365.19	344.85	340.07	352.12	377.78	410.18	440.62	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	84.46	82.07	77.1	70.36	65.98	59.81	54.57	61.28	63.67	70.65	78.54	82.08	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	734.79	729.06	700	654.84	608.04	566.8	543.24	553.3	579.78	625.17	675.48	714.09	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.93	x	14.24	x	0.72	x	0.7	=	4.63	(74)
North	0.9x	0.77	x	0.93	x	23.27	x	0.72	x	0.7	=	7.56	(74)
North	0.9x	0.77	x	0.93	x	39.95	x	0.72	x	0.7	=	12.98	(74)
North	0.9x	0.77	x	0.93	x	67.1	x	0.72	x	0.7	=	21.8	(74)
North	0.9x	0.77	x	0.93	x	87.09	x	0.72	x	0.7	=	28.29	(74)
North	0.9x	0.77	x	0.93	x	100.07	x	0.72	x	0.7	=	32.5	(74)
North	0.9x	0.77	x	0.93	x	92.85	x	0.72	x	0.7	=	30.16	(74)
North	0.9x	0.77	x	0.93	x	74.38	x	0.72	x	0.7	=	24.16	(74)
North	0.9x	0.77	x	0.93	x	51.63	x	0.72	x	0.7	=	16.77	(74)
North	0.9x	0.77	x	0.93	x	30.09	x	0.72	x	0.7	=	9.77	(74)
North	0.9x	0.77	x	0.93	x	16.99	x	0.72	x	0.7	=	5.52	(74)
North	0.9x	0.77	x	0.93	x	11.39	x	0.72	x	0.7	=	3.7	(74)
East	0.9x	0.77	x	11.29	x	26.63	x	0.72	x	0.7	=	105.02	(76)
East	0.9x	0.77	x	11.29	x	43.95	x	0.72	x	0.7	=	173.32	(76)
East	0.9x	0.77	x	11.29	x	71.91	x	0.72	x	0.7	=	283.56	(76)
East	0.9x	0.77	x	11.29	x	108.59	x	0.72	x	0.7	=	428.19	(76)
East	0.9x	0.77	x	11.29	x	128.14	x	0.72	x	0.7	=	505.3	(76)
East	0.9x	0.77	x	11.29	x	141.01	x	0.72	x	0.7	=	556.04	(76)
East	0.9x	0.77	x	11.29	x	133.32	x	0.72	x	0.7	=	525.7	(76)
East	0.9x	0.77	x	11.29	x	115.5	x	0.72	x	0.7	=	455.44	(76)
East	0.9x	0.77	x	11.29	x	89.42	x	0.72	x	0.7	=	352.63	(76)
East	0.9x	0.77	x	11.29	x	56.26	x	0.72	x	0.7	=	221.86	(76)
East	0.9x	0.77	x	11.29	x	31.99	x	0.72	x	0.7	=	126.14	(76)
East	0.9x	0.77	x	11.29	x	21.09	x	0.72	x	0.7	=	83.15	(76)
South	0.9x	0.77	x	0.93	x	59.74	x	0.72	x	0.7	=	19.4	(78)
South	0.9x	0.77	x	0.93	x	82.27	x	0.72	x	0.7	=	26.72	(78)
South	0.9x	0.77	x	0.93	x	104.17	x	0.72	x	0.7	=	33.84	(78)
South	0.9x	0.77	x	0.93	x	123.04	x	0.72	x	0.7	=	39.96	(78)
South	0.9x	0.77	x	0.93	x	125.05	x	0.72	x	0.7	=	40.62	(78)
South	0.9x	0.77	x	0.93	x	130.26	x	0.72	x	0.7	=	42.31	(78)
South	0.9x	0.77	x	0.93	x	126	x	0.72	x	0.7	=	40.93	(78)
South	0.9x	0.77	x	0.93	x	122	x	0.72	x	0.7	=	39.63	(78)
South	0.9x	0.77	x	0.93	x	116.65	x	0.72	x	0.7	=	37.89	(78)
South	0.9x	0.77	x	0.93	x	95.67	x	0.72	x	0.7	=	31.08	(78)
South	0.9x	0.77	x	0.93	x	68.13	x	0.72	x	0.7	=	22.13	(78)
South	0.9x	0.77	x	0.93	x	49.76	x	0.72	x	0.7	=	16.16	(78)
West	0.9x	0.77	x	7.95	x	26.63	x	0.72	x	0.7	=	73.95	(80)
West	0.9x	0.77	x	7.95	x	43.95	x	0.72	x	0.7	=	122.05	(80)
West	0.9x	0.77	x	7.95	x	71.91	x	0.72	x	0.7	=	199.67	(80)

West	0.9x	0.77	x	7.95	x	108.59	x	0.72	x	0.7	=	301.52	(80)
West	0.9x	0.77	x	7.95	x	128.14	x	0.72	x	0.7	=	355.81	(80)
West	0.9x	0.77	x	7.95	x	141.01	x	0.72	x	0.7	=	391.54	(80)
West	0.9x	0.77	x	7.95	x	133.32	x	0.72	x	0.7	=	370.18	(80)
West	0.9x	0.77	x	7.95	x	115.5	x	0.72	x	0.7	=	320.7	(80)
West	0.9x	0.77	x	7.95	x	89.42	x	0.72	x	0.7	=	248.31	(80)
West	0.9x	0.77	x	7.95	x	56.26	x	0.72	x	0.7	=	156.23	(80)
West	0.9x	0.77	x	7.95	x	31.99	x	0.72	x	0.7	=	88.82	(80)
West	0.9x	0.77	x	7.95	x	21.09	x	0.72	x	0.7	=	58.55	(80)

Solar gains in watts, calculated for each month (63)m = Sum(74)m ...(82)m

(83)m=	203.01	329.65	530.05	791.47	930.02	1022.4	966.97	839.93	655.6	418.94	242.61	161.56	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	937.8	1058.71	1230.04	1446.32	1538.06	1589.2	1510.21	1393.23	1235.38	1044.11	918.09	875.65	(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=	1	0.99	0.97	0.91	0.77	0.55	0.4	0.41	0.71	0.93	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.94	20.06	20.33	20.67	20.9	20.98	21	21	20.95	20.7	20.27	19.93	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.94	19.95	19.95	19.96	19.96	19.96	19.96	19.96	19.96	19.95	19.95	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.97	0.88	0.7	0.45	0.29	0.29	0.61	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=	18.56	18.74	19.13	19.59	19.87	19.95	19.96	19.96	19.93	19.64	19.05	18.54	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.87	19.03	19.39	19.83	20.1	20.18	20.19	20.19	20.15	19.88	19.32	18.85	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.72	18.88	19.24	19.68	19.95	20.03	20.04	20.04	20	19.73	19.17	18.7	(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=	0.99	0.98	0.96	0.87	0.7	0.46	0.3	0.3	0.61	0.89	0.98	0.99	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	928.67	1041.27	1178.03	1263.61	1079.34	732.61	454.24	421.17	754.87	929.03	897.77	868.97	(95)

Monthly average external temperature from Table 8

(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)

Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]

(97)m=	2133.22	2104.67	1912.75	1603.03	1166.18	741.2	455.01	421.88	786.46	1215.77	1691.45	2095.87	(97)

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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	896.19	714.6	546.63	244.38	64.61	0	0	0	0	213.33	571.45	912.82

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 4164.01 (98)

Space heating requirement in kWh/m²/year 29.85 (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) x [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 89.9 (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)	896.19	714.6	546.63	244.38	64.61	0	0	0	0	213.33	571.45	912.82	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	996.87	794.89	608.04	271.84	71.87	0	0	0	0	237.3	635.65	1015.37	(211)

Total (kWh/year) =Sum(211)$_{1..5,10..12}$= 4631.82 (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)

	187.05	164.18	172.1	152.92	152.45	135.96	128.77	143.8	144.33	158.97	169.34	181.7

Efficiency of water heater 87.3 (216)

(217)m=	89.44	89.4	89.26	88.88	88.06	87.3	87.3	87.3	87.3	88.77	89.29	89.46

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	209.14	183.64	192.8	172.05	173.12	155.74	147.5	164.72	165.32	179.08	189.65	203.12

Total = Sum(219a)$_{1..12}$ = 2135.88 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		4631.82
Water heating fuel used		2135.88
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		513.12 (232)

10a. Fuel costs - individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year

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Space heating - main system 1	(211)	x	3.74	x 0.01 =	173.23	(240)
Space heating - main system 2	(213)	x	0	x 0.01 =	0	(241)
Space heating - secondary	(215)	x	19.12	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.74	x 0.01 =	79.88	(247)
Pumps, fans and electric keep-hot	(231)		0	x 0.01 =	14.34	(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)		0	x 0.01 =	98.11	(250)
Additional standing charges (Table 12)					94	(251)
Appendix Q items: repeat lines (253) and (254) as needed						
Total energy cost	(245)...(247) + (250)...(254) =				459.56	(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] =	0.99 (257)
SAP rating (Section 12)		86.25 (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		0.216	=	1000.47	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	461.35	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1461.82	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	266.31	(268)
Total CO2, kg/year	sum of (265) ..(271) =				1767.06	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				12.67	(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	=	5650.82	(261)
Space heating (secondary)	(215) x		3.07	=	0	(263)
Energy for water heating	(219) x		1.22	=	2605.78	(264)
Space and water heating	(261) + (262) + (263) + (264) =				8256.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		3.07	=	230.25	(267)
Electricity for lighting	(232) x		0	=	1575.28	(268)
'Total Primary Energy	sum of (265)...(271) =				10062.13	(272)

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Primary energy kWh/m²/year	(272) ÷ (4) =	72.13	(273)

i-Therm Limited
Matt Haskell
[redacted]

TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 7

Address : 7 Langford Close , CLIMPING, BN17 5FG

1 Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66	(1a) x	2.4	(2a) =	169.58	(3a)
First floor	68.84	(1b) x	2.6	(2b) =	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	348.57	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.11 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.36 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			7.95	x1/[1/(1.4)+ 0.04]		=	10.54			(27)
Windows Type 2			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 3			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 4			11.29	x1/[1/(1.4)+ 0.04]		=	14.97			(27)
Floor			70.66	x	0.13	=	9.185801			(28)
Walls	172.68	25.15	147.53	x	0.18	=	26.56			(29)
Roof	70.66	0	70.66	x	0.13	=	9.19			(30)
Total area of elements, m²			314							(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) = 77.34 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). .(32e) = 17260.34 (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 13.04 (36)

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if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 90.38 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	68.16	67.74	67.34	65.44	65.08	63.42	63.42	63.12	64.06	65.08	65.8	66.55	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	158.53	158.12	157.72	155.81	155.46	153.8	153.8	153.49	154.44	155.46	156.18	156.93	

Average = Sum(39)$_{1...12}$ /12= 155.81 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.14	1.13	1.13	1.12	1.11	1.1	1.1	1.1	1.11	1.11	1.12	1.12	

Average = Sum(40)$_{1...12}$ /12= 1.12 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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)

TFEE WorkSheet: New dwelling as built

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=	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=	143.45	125.46	129.47	112.87	108.3	93.46	86.6	99.38	100.57	117.2	127.93	138.93	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	143.45	125.46	129.47	112.87	108.3	93.46	86.6	99.38	100.57	117.2	127.93	138.93	

Output from water heater (annual)$_{1,12}$ | 1383.63 | (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=	35.86	31.37	32.37	28.22	27.08	23.36	21.65	24.84	25.14	29.3	31.98	34.73	(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=	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.55	25.36	20.62	15.61	11.67	9.85	10.65	13.84	18.57	23.58	27.52	29.34	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.84	312.05	303.97	286.78	265.08	244.68	231.05	227.85	235.92	253.12	274.82	295.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	48.2	46.68	43.5	39.19	36.39	32.45	29.1	33.39	34.92	39.38	44.42	46.68	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	452.33	450.82	434.84	408.32	379.88	353.72	337.54	341.82	356.15	382.82	413.5	437.98	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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TFEE WorkSheet: New dwelling as built

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x 0.77	x	0.93	x	10.63	x	0.63	x	0.7	=	3.02	(74)
North	0.9x 0.77	x	0.93	x	20.32	x	0.63	x	0.7	=	5.78	(74)
North	0.9x 0.77	x	0.93	x	34.53	x	0.63	x	0.7	=	9.81	(74)
North	0.9x 0.77	x	0.93	x	55.46	x	0.63	x	0.7	=	15.76	(74)
North	0.9x 0.77	x	0.93	x	74.72	x	0.63	x	0.7	=	21.24	(74)
North	0.9x 0.77	x	0.93	x	79.99	x	0.63	x	0.7	=	22.73	(74)
North	0.9x 0.77	x	0.93	x	74.68	x	0.63	x	0.7	=	21.22	(74)
North	0.9x 0.77	x	0.93	x	59.25	x	0.63	x	0.7	=	16.84	(74)
North	0.9x 0.77	x	0.93	x	41.52	x	0.63	x	0.7	=	11.8	(74)
North	0.9x 0.77	x	0.93	x	24.19	x	0.63	x	0.7	=	6.88	(74)
North	0.9x 0.77	x	0.93	x	13.12	x	0.63	x	0.7	=	3.73	(74)
North	0.9x 0.77	x	0.93	x	8.86	x	0.63	x	0.7	=	2.52	(74)
East	0.9x 0.77	x	11.29	x	19.64	x	0.63	x	0.7	=	67.77	(76)
East	0.9x 0.77	x	11.29	x	38.42	x	0.63	x	0.7	=	132.57	(76)
East	0.9x 0.77	x	11.29	x	63.27	x	0.63	x	0.7	=	218.32	(76)
East	0.9x 0.77	x	11.29	x	92.28	x	0.63	x	0.7	=	318.4	(76)
East	0.9x 0.77	x	11.29	x	113.09	x	0.63	x	0.7	=	390.21	(76)
East	0.9x 0.77	x	11.29	x	115.77	x	0.63	x	0.7	=	399.45	(76)
East	0.9x 0.77	x	11.29	x	110.22	x	0.63	x	0.7	=	380.29	(76)
East	0.9x 0.77	x	11.29	x	94.68	x	0.63	x	0.7	=	326.67	(76)
East	0.9x 0.77	x	11.29	x	73.59	x	0.63	x	0.7	=	253.91	(76)
East	0.9x 0.77	x	11.29	x	45.59	x	0.63	x	0.7	=	157.3	(76)
East	0.9x 0.77	x	11.29	x	24.49	x	0.63	x	0.7	=	84.5	(76)
East	0.9x 0.77	x	11.29	x	16.15	x	0.63	x	0.7	=	55.73	(76)
South	0.9x 0.77	x	0.93	x	46.75	x	0.63	x	0.7	=	13.29	(78)
South	0.9x 0.77	x	0.93	x	76.57	x	0.63	x	0.7	=	21.76	(78)
South	0.9x 0.77	x	0.93	x	97.53	x	0.63	x	0.7	=	27.72	(78)
South	0.9x 0.77	x	0.93	x	110.23	x	0.63	x	0.7	=	31.33	(78)
South	0.9x 0.77	x	0.93	x	114.87	x	0.63	x	0.7	=	32.65	(78)
South	0.9x 0.77	x	0.93	x	110.55	x	0.63	x	0.7	=	31.42	(78)
South	0.9x 0.77	x	0.93	x	108.01	x	0.63	x	0.7	=	30.7	(78)
South	0.9x 0.77	x	0.93	x	104.89	x	0.63	x	0.7	=	29.81	(78)
South	0.9x 0.77	x	0.93	x	101.89	x	0.63	x	0.7	=	28.96	(78)
South	0.9x 0.77	x	0.93	x	82.59	x	0.63	x	0.7	=	23.47	(78)
South	0.9x 0.77	x	0.93	x	55.42	x	0.63	x	0.7	=	15.75	(78)
South	0.9x 0.77	x	0.93	x	40.4	x	0.63	x	0.7	=	11.48	(78)
West	0.9x 0.77	x	7.95	x	19.64	x	0.63	x	0.7	=	47.72	(80)
West	0.9x 0.77	x	7.95	x	38.42	x	0.63	x	0.7	=	93.35	(80)
West	0.9x 0.77	x	7.95	x	63.27	x	0.63	x	0.7	=	153.73	(80)

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West	0.9x	0.77	x	7.95	x	92.28	x	0.63	x	0.7	=	224.21	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.63	x	0.7	=	274.77	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.63	x	0.7	=	281.28	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.63	x	0.7	=	267.79	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.63	x	0.7	=	230.03	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.63	x	0.7	=	178.79	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.63	x	0.7	=	110.76	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.63	x	0.7	=	59.5	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.63	x	0.7	=	39.24	(80)

Solar gains in watts, calculated for each month (63)m = Sum(74)m ...(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	131.79	253.45	409.58	589.7	718.87	734.88	700.01	603.35	473.46	298.41	163.47	108.97	(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=	584.13	704.27	844.42	998.02	1098.75	1088.61	1037.54	945.16	829.62	681.23	576.98	546.95	(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=	1	1	1	0.98	0.93	0.79	0.63	0.7	0.92	0.99	1	1	(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=	19.61	19.76	20.02	20.39	20.71	20.92	20.98	20.97	20.8	20.36	19.92	19.59	(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=	19.97	19.97	19.98	19.99	19.99	20	20	20	20	19.99	19.98	19.98	(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=	1	1	0.99	0.97	0.9	0.71	0.5	0.57	0.87	0.99	1	1	(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=	18.69	18.84	19.11	19.48	19.78	19.96	19.99	19.99	19.87	19.46	19.01	18.68	(90)

fLA = Living area ÷ (4) = 0.22 (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=	18.89	19.04	19.31	19.68	19.99	20.17	20.21	20.21	20.07	19.66	19.21	18.88	(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=	18.89	19.04	19.31	19.68	19.99	20.17	20.21	20.21	20.07	19.66	19.21	18.88	(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=	1	1	0.99	0.97	0.9	0.72	0.53	0.6	0.88	0.99	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(95)m=	583.72	702.91	838.62	968.97	984.76	788.68	545.06	564.9	729.42	672.79	576.08	546.68	(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=	2313.02	2235.85	2020.06	1678.93	1288.26	856.52	555.27	584.06	922.45	1407.75	1891.6	2303	(97)

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Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1286.59	1030.14	879	511.17	225.8	0	0	0	0	546.8	947.18	1306.7

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 6733.37 (98)

Space heating requirement in kWh/m²/year 48.27 (99)

3c. Space Cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)												
(100)m=	0	0	0	0	0	1445.72	1138.12	1166.54	0	0	0	0
Utilisation factor for loss hm												
(101)m=	0	0	0	0	0	0.82	0.9	0.86	0	0	0	0
Useful loss, hmLm (Watts) = (100)m x (101)m												
(102)m=	0	0	0	0	0	1190.31	1020.86	1002.44	0	0	0	0
Gains (solar gains calculated for applicable weather region, see Table 10)												
(103)m=	0	0	0	0	0	1394.96	1332.49	1227	0	0	0	0

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	147.35	231.85	167.07	0	0	0	0

Total = Sum(104)$_{5,8}$ = 546.27 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104)$_{5,8}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	36.84	57.96	41.77	0	0	0	0

Total = Sum(107)$_{5,8}$ = 136.57 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 0.98 (108)

3f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency (99) + (108) = 49.25 (109)

Target Fabric Energy Efficiency (TFEE) 56.63 (109)

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DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 7

Address : 7 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66 (1a)	x	2.4 (2a)	=	169.58	(3a)
First floor	68.84 (1b)	x	2.6 (2b)	=	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		348.57	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.11 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		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		3.75999999046326 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.3 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.28 (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

DFEE WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.95	x1/[1/(1.2)+ 0.04]		=	9.1			(27)
Windows Type 2			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			11.29	x1/[1/(1.2)+ 0.04]		=	12.93			(27)
Floor			70.66	x	0.12	=	8.4792			(28)
Walls	172.68	25.15	147.53	x	0.27	=	39.83			(29)
Roof	70.66	0	70.66	x	0.11	=	7.77			(30)
Total area of elements, m²			314							(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) = 84.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). .(32e) = 17260.34 (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 12.58 (36)

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if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 96.88 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	64.85	64.56	64.28	62.97	62.73	61.58	61.58	61.37	62.02	62.73	63.22	63.74	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	161.72	161.44	161.16	159.85	159.6	158.46	158.46	158.25	158.9	159.6	160.1	160.62	

Average = Sum(39)$_{1...12}$ /12= 159.85 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.16	1.16	1.16	1.15	1.14	1.14	1.14	1.13	1.14	1.14	1.15	1.15	

Average = Sum(40)$_{1...12}$ /12= 1.15 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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)

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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=	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=	143.45	125.46	129.47	112.87	108.3	93.46	86.6	99.38	100.57	117.2	127.93	138.93	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	143.45	125.46	129.47	112.87	108.3	93.46	86.6	99.38	100.57	117.2	127.93	138.93	

Output from water heater (annual)$_{1,12}$ | 1383.63 | (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=	35.86	31.37	32.37	28.22	27.08	23.36	21.65	24.84	25.14	29.3	31.98	34.73	(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=	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.06	25.81	20.99	15.89	11.88	10.03	10.83	14.08	18.9	24	28.01	29.86	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.84	312.05	303.97	286.78	265.08	244.68	231.05	227.85	235.92	253.12	274.82	295.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	48.2	46.68	43.5	39.19	36.39	32.45	29.1	33.39	34.92	39.38	44.42	46.68	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	452.84	451.27	435.2	408.6	380.09	353.9	337.73	342.06	356.49	383.24	413.99	438.5	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

i-Therm Limited
Matt Haskell
[redacted]

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Orientation:		Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.93	x	10.63	x	0.72	x	0.7	=	3.45	(74)
North	0.9x	0.77	x	0.93	x	20.32	x	0.72	x	0.7	=	6.6	(74)
North	0.9x	0.77	x	0.93	x	34.53	x	0.72	x	0.7	=	11.22	(74)
North	0.9x	0.77	x	0.93	x	55.46	x	0.72	x	0.7	=	18.02	(74)
North	0.9x	0.77	x	0.93	x	74.72	x	0.72	x	0.7	=	24.27	(74)
North	0.9x	0.77	x	0.93	x	79.99	x	0.72	x	0.7	=	25.98	(74)
North	0.9x	0.77	x	0.93	x	74.68	x	0.72	x	0.7	=	24.26	(74)
North	0.9x	0.77	x	0.93	x	59.25	x	0.72	x	0.7	=	19.24	(74)
North	0.9x	0.77	x	0.93	x	41.52	x	0.72	x	0.7	=	13.49	(74)
North	0.9x	0.77	x	0.93	x	24.19	x	0.72	x	0.7	=	7.86	(74)
North	0.9x	0.77	x	0.93	x	13.12	x	0.72	x	0.7	=	4.26	(74)
North	0.9x	0.77	x	0.93	x	8.86	x	0.72	x	0.7	=	2.88	(74)
East	0.9x	0.77	x	11.29	x	19.64	x	0.72	x	0.7	=	77.45	(76)
East	0.9x	0.77	x	11.29	x	38.42	x	0.72	x	0.7	=	151.5	(76)
East	0.9x	0.77	x	11.29	x	63.27	x	0.72	x	0.7	=	249.5	(76)
East	0.9x	0.77	x	11.29	x	92.28	x	0.72	x	0.7	=	363.89	(76)
East	0.9x	0.77	x	11.29	x	113.09	x	0.72	x	0.7	=	445.96	(76)
East	0.9x	0.77	x	11.29	x	115.77	x	0.72	x	0.7	=	456.52	(76)
East	0.9x	0.77	x	11.29	x	110.22	x	0.72	x	0.7	=	434.62	(76)
East	0.9x	0.77	x	11.29	x	94.68	x	0.72	x	0.7	=	373.33	(76)
East	0.9x	0.77	x	11.29	x	73.59	x	0.72	x	0.7	=	290.18	(76)
East	0.9x	0.77	x	11.29	x	45.59	x	0.72	x	0.7	=	179.77	(76)
East	0.9x	0.77	x	11.29	x	24.49	x	0.72	x	0.7	=	96.57	(76)
East	0.9x	0.77	x	11.29	x	16.15	x	0.72	x	0.7	=	63.69	(76)
South	0.9x	0.77	x	0.93	x	46.75	x	0.72	x	0.7	=	15.19	(78)
South	0.9x	0.77	x	0.93	x	76.57	x	0.72	x	0.7	=	24.87	(78)
South	0.9x	0.77	x	0.93	x	97.53	x	0.72	x	0.7	=	31.68	(78)
South	0.9x	0.77	x	0.93	x	110.23	x	0.72	x	0.7	=	35.81	(78)
South	0.9x	0.77	x	0.93	x	114.87	x	0.72	x	0.7	=	37.31	(78)
South	0.9x	0.77	x	0.93	x	110.55	x	0.72	x	0.7	=	35.91	(78)
South	0.9x	0.77	x	0.93	x	108.01	x	0.72	x	0.7	=	35.08	(78)
South	0.9x	0.77	x	0.93	x	104.89	x	0.72	x	0.7	=	34.07	(78)
South	0.9x	0.77	x	0.93	x	101.89	x	0.72	x	0.7	=	33.09	(78)
South	0.9x	0.77	x	0.93	x	82.59	x	0.72	x	0.7	=	26.83	(78)
South	0.9x	0.77	x	0.93	x	55.42	x	0.72	x	0.7	=	18	(78)
South	0.9x	0.77	x	0.93	x	40.4	x	0.72	x	0.7	=	13.12	(78)
West	0.9x	0.77	x	7.95	x	19.64	x	0.72	x	0.7	=	54.54	(80)
West	0.9x	0.77	x	7.95	x	38.42	x	0.72	x	0.7	=	106.68	(80)
West	0.9x	0.77	x	7.95	x	63.27	x	0.72	x	0.7	=	175.69	(80)

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West	0.9x	0.77	x	7.95	x	92.28	x	0.72	x	0.7	=	256.24	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.72	x	0.7	=	314.03	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.72	x	0.7	=	321.46	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.72	x	0.7	=	306.04	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.72	x	0.7	=	262.89	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.72	x	0.7	=	204.34	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.72	x	0.7	=	126.59	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.72	x	0.7	=	68	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.72	x	0.7	=	44.85	(80)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	150.62	289.66	468.09	673.94	821.56	839.87	800.01	689.54	541.1	341.04	186.83	124.54	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	603.47	740.93	903.3	1082.55	1201.65	1193.76	1137.74	1031.6	897.58	724.28	600.82	563.04	(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=	1	1	0.99	0.98	0.91	0.76	0.59	0.67	0.91	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.59	19.75	20.03	20.41	20.74	20.93	20.98	20.97	20.81	20.37	19.91	19.56	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.95	19.95	19.96	19.96	19.96	19.97	19.97	19.97	19.97	19.96	19.96	19.96	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.97	0.87	0.67	0.46	0.54	0.85	0.99	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.66	18.82	19.1	19.48	19.78	19.94	19.97	19.96	19.85	19.44	18.98	18.63	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.86	19.02	19.3	19.68	19.99	20.15	20.19	20.19	20.06	19.64	19.18	18.84	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.86	19.02	19.3	19.68	19.99	20.15	20.19	20.19	20.06	19.64	19.18	18.84	(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=	1	1	0.99	0.96	0.87	0.69	0.49	0.56	0.86	0.98	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	602.96	739.11	895.13	1041.42	1047.94	821.83	560.38	582.58	769.18	712.98	599.67	562.71	(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=	2354.94	2279.86	2063.65	1723.29	1323.23	880.25	568.95	599.06	947.74	1443.19	1934.39	2351.12	(97)

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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=	1303.47	1035.38	869.38	490.95	204.81	0	0	0	0	543.27	961	1330.57

Total per year (kWh/year) = Sum(98)$_{1,...,12}$ = 6738.83 (98)

Space heating requirement in kWh/m²/year 48.31 (99)

3c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1489.54	1172.62	1202.7	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.84	0.91	0.87	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1256.04	1067.23	1051.3	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1518.11	1449.85	1328.36	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m
set (104)m to zero if (104)m < 3 × (98)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(104)m=	0	0	0	0	0	188.69	284.67	206.13	0	0	0	0

Total = Sum(104)$_{5,...,9}$ = 679.49 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0

Total = Sum(104)$_{5,...,9}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(107)m=	0	0	0	0	0	47.17	71.17	51.53	0	0	0	0

Total = Sum(107)$_{5,...,9}$ = 169.87 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 1.22 (108)

3f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency (99) + (108) = 49.52 (109)

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 7

Address : 7 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66 (1a)	x	2.4 (2a)	=	169.58	(3a)
First floor	68.84 (1b)	x	2.6 (2b)	=	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		348.57	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.14 (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		3.75999999046326 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.33 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.31 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.34	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.95	x1/[1/(1.2)+ 0.04]		=	9.1			(27)
Windows Type 2			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			11.29	x1/[1/(1.2)+ 0.04]		=	12.93			(27)
Floor			70.66	x	0.12	=	8.4792			(28)
Walls	172.68	25.15	147.53	x	0.27	=	39.83			(29)
Roof	70.66	0	70.66	x	0.11	=	7.77			(30)
Total area of elements, m²			314							(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) = 84.3 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). ..(32e) = 17260.34 (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 12.58 (36)

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If details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 96.88 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	66.3	65.96	65.63	64.05	63.76	62.39	62.39	62.14	62.92	63.76	64.36	64.98	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	163.18	162.84	162.5	160.93	160.64	159.27	159.27	159.02	159.8	160.64	161.23	161.85	

Average = Sum(39)$_{1...12}$ /12= 160.93 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.17	1.17	1.16	1.15	1.15	1.14	1.14	1.14	1.15	1.15	1.16	1.16	

Average = Sum(40)$_{1...12}$ /12= 1.15 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.32	22.14	22.85	19.92	19.11	16.49	15.28	17.54	17.75	20.68	22.58	24.52	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel 210 (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)

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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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.65	171.88	179.2	158.81	154.3	135.96	128.77	143.8	144.33	164.76	176.52	190.32	(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)
FHRS	9.03	8.65	8.09	6.6	5.19	0	0	0	0	6.79	8.39	8.99	(63) (G2)

Output from water heater

(64)m=	186.62	163.24	171.11	152.21	149.11	135.96	128.77	143.8	144.33	157.97	168.13	181.34	

Output from water heater (annual)$_{1,12}$ | 1882.57 | (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=	62.84	55.15	57.37	50.66	49.09	43.06	40.6	45.59	45.84	52.57	56.55	61.06	(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=	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.06	25.81	20.99	15.89	11.88	10.03	10.83	14.08	18.9	24	28.01	29.86	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.84	312.05	303.97	286.78	265.08	244.68	231.05	227.85	235.92	253.12	274.82	295.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	84.46	82.07	77.1	70.36	65.98	59.81	54.57	61.28	63.67	70.65	78.54	82.08	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	492.1	489.66	471.8	442.77	412.67	384.26	366.19	372.95	388.24	417.51	451.11	476.9	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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Orientation	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	0.93		10.63		0.72		0.7		3.45	(74)
North	0.9x	0.77	0.93		20.32		0.72		0.7		6.6	(74)
North	0.9x	0.77	0.93		34.53		0.72		0.7		11.22	(74)
North	0.9x	0.77	0.93		55.46		0.72		0.7		18.02	(74)
North	0.9x	0.77	0.93		74.72		0.72		0.7		24.27	(74)
North	0.9x	0.77	0.93		79.99		0.72		0.7		25.98	(74)
North	0.9x	0.77	0.93		74.68		0.72		0.7		24.26	(74)
North	0.9x	0.77	0.93		59.25		0.72		0.7		19.24	(74)
North	0.9x	0.77	0.93		41.52		0.72		0.7		13.49	(74)
North	0.9x	0.77	0.93		24.19		0.72		0.7		7.86	(74)
North	0.9x	0.77	0.93		13.12		0.72		0.7		4.26	(74)
North	0.9x	0.77	0.93		8.86		0.72		0.7		2.88	(74)
East	0.9x	0.77	11.29		19.64		0.72		0.7		77.45	(76)
East	0.9x	0.77	11.29		38.42		0.72		0.7		151.5	(76)
East	0.9x	0.77	11.29		63.27		0.72		0.7		249.5	(76)
East	0.9x	0.77	11.29		92.28		0.72		0.7		363.89	(76)
East	0.9x	0.77	11.29		113.09		0.72		0.7		445.96	(76)
East	0.9x	0.77	11.29		115.77		0.72		0.7		456.52	(76)
East	0.9x	0.77	11.29		110.22		0.72		0.7		434.62	(76)
East	0.9x	0.77	11.29		94.68		0.72		0.7		373.33	(76)
East	0.9x	0.77	11.29		73.59		0.72		0.7		290.18	(76)
East	0.9x	0.77	11.29		45.59		0.72		0.7		179.77	(76)
East	0.9x	0.77	11.29		24.49		0.72		0.7		96.57	(76)
East	0.9x	0.77	11.29		16.15		0.72		0.7		63.69	(76)
South	0.9x	0.77	0.93		46.75		0.72		0.7		15.19	(78)
South	0.9x	0.77	0.93		76.57		0.72		0.7		24.87	(78)
South	0.9x	0.77	0.93		97.53		0.72		0.7		31.68	(78)
South	0.9x	0.77	0.93		110.23		0.72		0.7		35.81	(78)
South	0.9x	0.77	0.93		114.87		0.72		0.7		37.31	(78)
South	0.9x	0.77	0.93		110.55		0.72		0.7		35.91	(78)
South	0.9x	0.77	0.93		108.01		0.72		0.7		35.08	(78)
South	0.9x	0.77	0.93		104.89		0.72		0.7		34.07	(78)
South	0.9x	0.77	0.93		101.89		0.72		0.7		33.09	(78)
South	0.9x	0.77	0.93		82.59		0.72		0.7		26.83	(78)
South	0.9x	0.77	0.93		55.42		0.72		0.7		18	(78)
South	0.9x	0.77	0.93		40.4		0.72		0.7		13.12	(78)
West	0.9x	0.77	7.95		19.64		0.72		0.7		54.54	(80)
West	0.9x	0.77	7.95		38.42		0.72		0.7		106.68	(80)
West	0.9x	0.77	7.95		63.27		0.72		0.7		175.69	(80)

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West	0.9x	0.77	x	7.95	x	92.28	x	0.72	x	0.7	=	256.24	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.72	x	0.7	=	314.03	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.72	x	0.7	=	321.46	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.72	x	0.7	=	306.04	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.72	x	0.7	=	262.89	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.72	x	0.7	=	204.34	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.72	x	0.7	=	126.59	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.72	x	0.7	=	68	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.72	x	0.7	=	44.85	(80)

Solar gains in watts, calculated for each month (63)m = Sum(74)m ...(82)m

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(83)m=	150.62	289.66	468.09	673.94	821.56	839.87	800.01	689.54	541.1	341.04	186.83	124.54	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	642.72	779.32	939.9	1116.71	1234.24	1224.12	1166.2	1062.49	929.34	758.55	637.94	601.43	(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=	1	1	0.99	0.97	0.9	0.75	0.58	0.65	0.9	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.6	19.76	20.05	20.42	20.74	20.93	20.98	20.97	20.82	20.38	19.92	19.58	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.94	19.95	19.95	19.96	19.96	19.97	19.97	19.97	19.96	19.96	19.96	19.95	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.96	0.86	0.66	0.45	0.52	0.84	0.98	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.07	18.3	18.72	19.26	19.7	19.92	19.96	19.96	19.81	19.21	18.54	18.03	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.4	18.62	19.01	19.52	19.93	20.14	20.19	20.18	20.03	19.47	18.84	18.37	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.25	18.47	18.86	19.37	19.78	19.99	20.04	20.03	19.88	19.32	18.69	18.22	(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=	1	1	0.99	0.95	0.85	0.66	0.46	0.53	0.83	0.98	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	641.85	776.46	928.32	1064.34	1054.2	810.42	540.81	564.94	773.07	742.14	636	600.85	(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=	2277	2210.13	2008.07	1684.34	1297.87	858.8	547.22	577.27	923.53	1400.58	1869.3	2269.63	(97)

DER WorkSheet: New dwelling as built

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1216.55	963.42	803.34	446.41	181.29	0	0	0	0	489.88	887.98	1241.57	
												Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ =	6230.43 (98)

Space heating requirement in kWh/m²/year 44.66 (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) x [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 89.9 (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)	1216.55	963.42	803.34	446.41	181.29	0	0	0	0	489.88	887.98	1241.57	
(211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)	1353.23	1071.66	893.59	496.56	201.66	0	0	0	0	544.91	987.74	1381.06	
												Total (kWh/year) =Sum(211)$_{1..5,10..12}$=	6930.4 (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)

	186.62	163.24	171.11	152.21	149.11	135.96	128.77	143.8	144.33	157.97	168.13	181.34

Efficiency of water heater 87.3 (216)

(217)m=	89.55	89.51	89.43	89.22	88.71	87.3	87.3	87.3	87.3	89.25	89.48	89.56 (217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.4	182.36	191.33	170.59	168.09	155.74	147.5	164.72	165.32	177	187.9	202.48	
												Total = Sum(219a)$_{1..12}$ =	2121.43 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		6930.4
Water heating fuel used		2121.43
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		513.12 (232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year

DER WorkSheet: New dwelling as built

Space heating (main system 1)	(211) x	0.216	=	1496.97	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	458.23	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1955.2	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	266.31	(268)
Total CO2, kg/year	sum of (265)...(271) =			2260.43	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			16.2	(273)
EI rating (section 14)				84	(274)

i-Therm Limited
Matt Haskell
[redacted]

TER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.8

Property Address: Plot 7

Address : 7 Langford Close , CLIMPING, BN17 5FG

1 Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.66	(1a) x	2.4	(2a) =	169.58	(3a)
First floor	68.84	(1b) x	2.6	(2b) =	178.98	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139.5	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	348.57	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.11 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.36 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.92 (20)
Infiltration rate incorporating shelter factor	(21) = (18) x (20) =	0.34 (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

TER WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			7.95	x1/[1/(1.4)+ 0.04]		=	10.54			(27)
Windows Type 2			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 3			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 4			11.29	x1/[1/(1.4)+ 0.04]		=	14.97			(27)
Floor			70.66	x	0.13	=	9.185801			(28)
Walls	172.68	25.15	147.53	x	0.18	=	26.56			(29)
Roof	70.66	0	70.66	x	0.13	=	9.19			(30)
Total area of elements, m²			314							(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) = 77.34 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a). .(32e) = 17260.34 (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 13.04 (36)

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if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 90.38 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	68.16	67.74	67.34	65.44	65.08	63.42	63.42	63.12	64.06	65.08	65.8	66.55	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	158.53	158.12	157.72	155.81	155.46	153.8	153.8	153.49	154.44	155.46	156.18	156.93	

Average = Sum(39)$_{1...12}$ /12= 155.81 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.14	1.13	1.13	1.12	1.11	1.1	1.1	1.1	1.11	1.11	1.12	1.12	

Average = Sum(40)$_{1...12}$ /12= 1.12 (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 2.92 (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) + 36 103.46 (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=	113.8	109.67	105.53	101.39	97.25	93.11	93.11	97.25	101.39	105.53	109.67	113.8	

Total = Sum(44)$_{1...12}$ = 1241.5 (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=	168.77	147.61	152.32	132.79	127.42	109.95	101.89	116.92	118.31	137.88	150.51	163.44	

Total = Sum(45)$_{1...12}$ = 1627.8 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.32	22.14	22.85	19.92	19.11	16.49	15.28	17.54	17.75	20.68	22.58	24.52	(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)

TER WorkSheet: New dwelling as built

Water storage loss calculated for each month ((56)m = (55) × (41)m

(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	(56)

If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H

(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)

Primary circuit loss (annual) from Table 3 — 0 — (58)

Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	(59)

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m

(61)m=	50.96	46.03	50.96	49.32	49.56	45.92	47.45	49.56	49.32	50.96	49.32	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	219.73	193.63	203.27	182.11	176.98	155.87	149.34	166.47	167.63	188.84	199.82	214.4	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	219.73	193.63	203.27	182.11	176.98	155.87	149.34	166.47	167.63	188.84	199.82	214.4	

Output from water heater (annual)$_{1,12}$ — 2218.09 — (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=	68.86	60.59	63.38	56.48	54.76	48.04	45.74	51.26	51.67	58.59	62.37	67.08	(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=	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	145.81	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	28.55	25.36	20.62	15.61	11.67	9.85	10.65	13.84	18.57	23.58	27.52	29.34	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.84	312.05	303.97	286.78	265.08	244.68	231.05	227.85	235.92	253.12	274.82	295.22	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	-116.65	(71)

Water heating gains (Table 5)

(72)m=	92.55	90.16	85.19	78.45	73.6	66.72	61.48	68.9	71.76	78.74	86.63	90.17	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	499.68	497.3	479.53	450.58	420.08	390.99	372.92	380.33	396	425.18	458.71	484.47	(73)

6. Solar gains:

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

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		Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	0.93	x	10.63	x	0.63	x	0.7	=	3.02	(74)
North	0.9x	0.77	x	0.93	x	20.32	x	0.63	x	0.7	=	5.78	(74)
North	0.9x	0.77	x	0.93	x	34.53	x	0.63	x	0.7	=	9.81	(74)
North	0.9x	0.77	x	0.93	x	55.46	x	0.63	x	0.7	=	15.76	(74)
North	0.9x	0.77	x	0.93	x	74.72	x	0.63	x	0.7	=	21.24	(74)
North	0.9x	0.77	x	0.93	x	79.99	x	0.63	x	0.7	=	22.73	(74)
North	0.9x	0.77	x	0.93	x	74.68	x	0.63	x	0.7	=	21.22	(74)
North	0.9x	0.77	x	0.93	x	59.25	x	0.63	x	0.7	=	16.84	(74)
North	0.9x	0.77	x	0.93	x	41.52	x	0.63	x	0.7	=	11.8	(74)
North	0.9x	0.77	x	0.93	x	24.19	x	0.63	x	0.7	=	6.88	(74)
North	0.9x	0.77	x	0.93	x	13.12	x	0.63	x	0.7	=	3.73	(74)
North	0.9x	0.77	x	0.93	x	8.86	x	0.63	x	0.7	=	2.52	(74)
East	0.9x	0.77	x	11.29	x	19.64	x	0.63	x	0.7	=	67.77	(76)
East	0.9x	0.77	x	11.29	x	38.42	x	0.63	x	0.7	=	132.57	(76)
East	0.9x	0.77	x	11.29	x	63.27	x	0.63	x	0.7	=	218.32	(76)
East	0.9x	0.77	x	11.29	x	92.28	x	0.63	x	0.7	=	318.4	(76)
East	0.9x	0.77	x	11.29	x	113.09	x	0.63	x	0.7	=	390.21	(76)
East	0.9x	0.77	x	11.29	x	115.77	x	0.63	x	0.7	=	399.45	(76)
East	0.9x	0.77	x	11.29	x	110.22	x	0.63	x	0.7	=	380.29	(76)
East	0.9x	0.77	x	11.29	x	94.68	x	0.63	x	0.7	=	326.67	(76)
East	0.9x	0.77	x	11.29	x	73.59	x	0.63	x	0.7	=	253.91	(76)
East	0.9x	0.77	x	11.29	x	45.59	x	0.63	x	0.7	=	157.3	(76)
East	0.9x	0.77	x	11.29	x	24.49	x	0.63	x	0.7	=	84.5	(76)
East	0.9x	0.77	x	11.29	x	16.15	x	0.63	x	0.7	=	55.73	(76)
South	0.9x	0.77	x	0.93	x	46.75	x	0.63	x	0.7	=	13.29	(78)
South	0.9x	0.77	x	0.93	x	76.57	x	0.63	x	0.7	=	21.76	(78)
South	0.9x	0.77	x	0.93	x	97.53	x	0.63	x	0.7	=	27.72	(78)
South	0.9x	0.77	x	0.93	x	110.23	x	0.63	x	0.7	=	31.33	(78)
South	0.9x	0.77	x	0.93	x	114.87	x	0.63	x	0.7	=	32.65	(78)
South	0.9x	0.77	x	0.93	x	110.55	x	0.63	x	0.7	=	31.42	(78)
South	0.9x	0.77	x	0.93	x	108.01	x	0.63	x	0.7	=	30.7	(78)
South	0.9x	0.77	x	0.93	x	104.89	x	0.63	x	0.7	=	29.81	(78)
South	0.9x	0.77	x	0.93	x	101.89	x	0.63	x	0.7	=	28.96	(78)
South	0.9x	0.77	x	0.93	x	82.59	x	0.63	x	0.7	=	23.47	(78)
South	0.9x	0.77	x	0.93	x	55.42	x	0.63	x	0.7	=	15.75	(78)
South	0.9x	0.77	x	0.93	x	40.4	x	0.63	x	0.7	=	11.48	(78)
West	0.9x	0.77	x	7.95	x	19.64	x	0.63	x	0.7	=	47.72	(80)
West	0.9x	0.77	x	7.95	x	38.42	x	0.63	x	0.7	=	93.35	(80)
West	0.9x	0.77	x	7.95	x	63.27	x	0.63	x	0.7	=	153.73	(80)

TER WorkSheet: New dwelling as built

West	0.9x	0.77	x	7.95	x	92.28	x	0.63	x	0.7	=	224.21	(80)
West	0.9x	0.77	x	7.95	x	113.09	x	0.63	x	0.7	=	274.77	(80)
West	0.9x	0.77	x	7.95	x	115.77	x	0.63	x	0.7	=	281.28	(80)
West	0.9x	0.77	x	7.95	x	110.22	x	0.63	x	0.7	=	267.79	(80)
West	0.9x	0.77	x	7.95	x	94.68	x	0.63	x	0.7	=	230.03	(80)
West	0.9x	0.77	x	7.95	x	73.59	x	0.63	x	0.7	=	178.79	(80)
West	0.9x	0.77	x	7.95	x	45.59	x	0.63	x	0.7	=	110.76	(80)
West	0.9x	0.77	x	7.95	x	24.49	x	0.63	x	0.7	=	59.5	(80)
West	0.9x	0.77	x	7.95	x	16.15	x	0.63	x	0.7	=	39.24	(80)

Solar gains in watts, calculated for each month (63)m = Sum(74)m ...(82)m

(83)m=	131.79	253.45	409.58	589.7	718.87	734.88	700.01	603.35	473.46	298.41	163.47	108.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	631.47	750.75	889.11	1040.28	1138.95	1125.87	1072.92	983.67	869.46	723.59	622.19	593.44	(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=	1	1	1	0.98	0.92	0.78	0.61	0.68	0.91	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.64	19.79	20.05	20.41	20.73	20.93	20.98	20.97	20.81	20.39	19.95	19.62	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.97	19.97	19.98	19.99	19.99	20	20	20	20	19.99	19.98	19.98	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.97	0.88	0.69	0.48	0.55	0.86	0.99	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.14	18.36	18.75	19.27	19.71	19.95	19.99	19.99	19.83	19.25	18.61	18.11	(90)

fLA = Living area ÷ (4) = 0.22 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.47	18.67	19.03	19.52	19.93	20.16	20.21	20.2	20.05	19.5	18.9	18.44	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.47	18.67	19.03	19.52	19.93	20.16	20.21	20.2	20.05	19.5	18.9	18.44	(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=	1	1	0.99	0.96	0.88	0.71	0.51	0.58	0.86	0.98	1	1	(94)

Useful gains, hmGm , W = (94)m x (84)m

(95)m=	630.75	748.56	880.7	1002.69	1004.8	795.12	546.32	567.57	747.96	711.14	620.62	592.94	(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=	2246.14	2177.48	1976.66	1655.27	1279.99	855.32	555.19	583.91	918.35	1383.44	1842.99	2235.42	(97)

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TER WorkSheet: New dwelling as built

Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m

(98)m=	1201.85	960.24	815.4	469.86	204.74	0	0	0	0	500.19	880.1	1222

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 6254.38 (98)

Space heating requirement in kWh/m²/year 44.83 (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) x [1 – (203)] = 1 (204)

Efficiency of main space heating system 1 93.4 (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)	1201.85	960.24	815.4	469.86	204.74	0	0	0	0	500.19	880.1	1222	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	1286.78	1028.09	873.01	503.06	219.21	0	0	0	0	535.54	942.29	1308.35	(211)

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 6696.34 (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)

	219.73	193.63	203.27	182.11	176.98	155.87	149.34	166.47	167.63	188.84	199.82	214.4

Efficiency of water heater 80.3 (216)

(217)m=	88.68	88.53	88.19	87.33	85.42	80.3	80.3	80.3	80.3	87.39	88.34	88.73

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	247.79	218.72	230.5	208.52	207.19	194.11	185.97	207.31	208.75	216.1	226.19	241.62

Total = Sum(219a)$_{1...12}$ = 2592.77 (219)

Annual totals	**kWh/year**	**kWh/year**
Space heating fuel used, main system 1		6696.34
Water heating fuel used		2592.77
Electricity for pumps, fans and electric keep-hot		
central heating pump:	30	(230c)
boiler with a fan-assisted flue	45	(230e)
Total electricity for the above, kWh/year sum of (230a)...(230g) =		75 (231)
Electricity for lighting		504.15 (232)

12a. CO2 emissions – Individual heating systems including micro-CHP

	Energy kWh/year	**Emission factor** kg CO2/kWh	**Emissions** kg CO2/year

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TER WorkSheet: New dwelling as built

Space heating (main system 1)	(211) x	0.216	=	1446.41	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	560.04	(264)
Space and water heating	(261) + (262) + (263) + (264) =			2006.45	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	261.65	(268)
Total CO2, kg/year	sum of (265)...(271) =			2307.03	(272)

TER = 16.54 (273)

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SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 07 September 2021

Property Details: Plot 7

Dwelling type:	Detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	West
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	8 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	920.22	**(P1)**
Transmission heat loss coefficient:	96.9	
Summer heat loss coefficient:	1017.1	**(P2)**

Overhangs

Orientation:	Ratio:	Z_overhangs:
West (Ext)	0	1
North (Ext)	0	1
South (Ext)	0	1
East (Ext)	0	1

Solar shading

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
West (Ext)	1	0.9	1	0.9	**(P8)**
North (Ext)	1	0.9	1	0.9	**(P8)**
South (Ext)	1	0.9	1	0.9	**(P8)**
East (Ext)	1	0.9	1	0.9	**(P8)**

Solar gains

Orientation		Area	Flux	g_	FF	Shading	Gains	
West (Ext)	0.9 x	7.95	124.8	0.72	0.7	0.9	405.03	
North (Ext)	0.9 x	0.93	86.66	0.72	0.7	0.9	32.9	
South (Ext)	0.9 x	0.93	118.4	0.72	0.7	0.9	44.95	
East (Ext)	0.9 x	11.29	124.8	0.72	0.7	0.9	575.19	
						Total	1058.08	**(P3/P4)**

Internal gains

	June	July	August	
Internal gains	563.8	540.24	550.3	
Total summer gains	1687.18	1598.32	1472.72	**(P5)**
Summer gain/loss ratio	1.66	1.57	1.45	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	
Thermal mass temperature increment	0.25	0.25	0.25	
Threshold temperature	17.31	19.22	19.2	**(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**	

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Not significant

i-Therm Limited
Matt Haskell
[redacted]

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.15
Printed on 02 November 2021 at 18:06:46

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Detached House

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 135m²
Site Reference : Langford **Plot Reference:** Plot 8
Address : 8 Langford Close , CLIMPING, BN17 5FG

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)	16.51 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.03 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.8 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	48.5 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.28 (max. 0.30)	0.30 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.18 (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	3.87	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 485, product index 016635):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi)
Efficiency 89.0 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

ARUN DISTRICT COUNCIL CM/4/22/DOC

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	No cylinder thermostat	
	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	7.23m²
Windows facing: South	12.18m²
Windows facing: East	0.93m²
Windows facing: West	1.63m²
Roof windows facing: West	0.94m²
Ventilation rate:	8.00

10 Key features

Thermal bridging	0.039 W/m²K
Air permeablility	3.9 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Floors U-value	0.12 W/m²K

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[redacted]

Thermal Bridge Report

Property Details: Plot 8

Address: 8 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal Bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.0391

Extended Junctional Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	15.67	E1	[UD]
Sill	0.04	7.95	E3	[A]
Jamb	0.05	33.9	E4	[A]
Ground floor (normal)	0.076	39.4	E5	[UD]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	32.18	E6	[A]
Eaves (insulation at ceiling level)	0.06	29.74	E10	[A]
Gable (insulation at ceiling level)	0.24	1.82	E12	[A]
Corner (normal)	0.09	30	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	10	E17	[A]
Flat roof	0.08	6.36	E14	[D]
Gable (insulation at rafter level)	0.04	5.9	E13	[A]

i-Therm Limited
Matt Haskell
[redacted]

Code for Sustainable Homes Report
For use with Nov 2010 addendum 2014 England

Assessor and House Details

Assessor Name: Matthew Haskell
Assessor Number: STRO006210
Property Address: 8 Langford Close
CLIMPING
BN17 5FG

Building regulation assessment

	kg/m²/year
TER	16.51
DER	16.03

ENE 1 Assessment - Dwelling Emission Rate

Total Energy Type CO_2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2012 DER Worksheet		16.03	*(ZC1)*
TER		16.51	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		16.03	
% improvement DER/TER	2.9		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	16.03	*(ZC1)*
CO2 emissions from appliances, equation (L14)	13.28	*(ZC2)*
CO2 emissions from cooking, equation (L16)	1.4	*(ZC3)*
Net CO2 emissions	32.2	*(ZC8)*

Result:

Credits awarded for ENE 1 = 0.4

Code Level = 3

ENE 2 - Fabric energy Efficiency

Fabric energy Efficiency: 48.47

Credits awarded for ENE 2 = 6.2

ENE 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		32.24	
Standard DER		17.56	
Actual Case CO2 emissions		32.24	
Actual DER		17.56	
Reduction in CO2 emissions	0		

Credits awarded for ENE 7 = 0

Technologies eligible to contribute to achieving the requirements of this issue must produce energy from renewable sources and meet all other ancillary requirements as defined by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

The following requirements must also be met:

- Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.
- Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.
- Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.
- All technologies must be accounted for by SAP.

CHP schemes fuelled by mains gas are eligible to contribute to performance against this issue. Where these schemes are above 50kWe they must be certified under the CHPQA.

It is the responsibly of the Accredited OCDEA and Code Assessor to ensure all technologies use in the calculation are appropriate before awarding credits.

[redacted]

SAP Input

Property Details: Plot 8

Address:	8 Langford Close , CLIMPING, BN17 5FG
Located in:	England
Region:	South East England
UPRN:	UPRN-503137387955
Date of assessment:	02 November 2021
Date of certificate:	02 November 2021
Assessment type:	New dwelling as built
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:	485

Property description:

Dwelling type:	House
Detachment:	Detached
Year Completed:	2021

Floor Location:	**Floor area:**	**Storey height:**
Floor 0	85.22 m²	2.4 m
Floor 1	49.78 m²	2.6 m

Living area:	37.17 m² (fraction 0.275)
Front of dwelling faces:	North

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Entrance	Manufacturer	Solid			PVC-U
Ext	Manufacturer	Half glazed	low-E, En = 0.05, soft coat	Yes	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	Manufacturer	Roof Windows	low-E, En = 0.05, soft coat	Yes	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Entrance	mm	0.7	0	1	2.1	1
Ext	16mm or more mm	0.7	0	1	1.95	1
Ext	16mm or more	0.7	0.72	1.2	7.23	1
Ext	16mm or more	0.7	0.72	1.2	12.18	1
Ext	16mm or more	0.7	0.72	1.2	0.93	1
Ext	16mm or more	0.7	0.72	1.2	1.63	1
Ext	16mm or more	0.7	0.63	1.4	0.94	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Entrance		External Wall	North	0	0
Ext		External Wall	East	0	0
Ext		External Wall	North	0	0
Ext		External Wall	South	0	0
Ext		External Wall	East	0	0
Ext		External Wall	West	0	0
Ext		Plane Roof	West	0.001	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:

SAP Input

External Elements

External Wall	120.32	26.02	94.3	0.27	0	False	N/A
Stud wall to 1st floor	32.26	0	32.26	0.3	0	False	N/A
Dormer Cheeks	7.6	0	7.6	0.3	0	False	N/A
Plane Roof	71.11	0.94	70.17	0.11	0		N/A
Skilling	15.24	0	15.24	0.14	0		N/A
Flat	2.39	0	2.39	0.14	0		N/A
Ground floor	85.22			0.12			N/A

Internal Elements

Party Elements

Thermal Bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0391

	Length	Psi-value		
	15.67	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	7.95	0.04	E3	Sill
[Approved]	33.9	0.05	E4	Jamb
	39.4	0.076	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	32.18	0.07	E6	Intermediate floor within a dwelling
[Approved]	29.74	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	1.82	0.24	E12	Gable (insulation at ceiling level)
[Approved]	30	0.09	E16	Corner (normal)
[Approved]	10	-0.09	E17	Corner (inverted internal area greater than external area)
	6.36	0.08	E14	Flat roof
[Approved]	5.9	0.04	E13	Gable (insulation at rafter level)

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 5
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3.87 (Assessed dwelling is tested)

Main Heating System

Main heating system: Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 485, product index 016635) Efficiency: Winter 87.3 % Summer: 89.9
Has integral PFGHRD 060025
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
Boiler interlock: Yes
Delayed start

Main Heating Control

Main heating Control: Time and temperature zone control by suitable arrangement of plumbing and electrical services

SAP Input

[redacted]

Control code: 2110

Secondary heating system:	None

Water heating

Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Flue Gas Heat Recovery System: Database (rev 485, product index 060025) Brand name: Ideal Model: Logic Boost Model qualifier: 33 Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.15

Property Address: Plot 8

Address : 8 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.22	(1a) x	2.4	(2a) =	204.53	(3a)
First floor	49.78	(1b) x	2.6	(2b) =	129.43	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	135	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		333.96	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.15 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.86999988555908 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.34 (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) =	0.29 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.23	x1/[1/(1.2)+ 0.04]		=	8.28			(27)
Windows Type 2			12.18	x1/[1/(1.2)+ 0.04]		=	13.95			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			1.63	x1/[1/(1.2)+ 0.04]		=	1.87			(27)
Rooflights			0.94	x1/[1/(1.4) + 0.04]		=	1.316			(27b)
Floor			85.22	x	0.12	=	10.2264			(28)
Walls Type1	120.32	26.02	94.3	x	0.27	=	25.46			(29)
Walls Type2	32.26	0	32.26	x	0.3	=	9.68			(29)
Walls Type3	7.6	0	7.6	x	0.3	=	2.28			(29)
Roof Type1	71.11	0.94	70.17	x	0.11	=	7.72			(30)
Roof Type2	15.24	0	15.24	x	0.14	=	2.13			(30)
Roof Type3	2.39	0	2.39	x	0.14	=	0.33			(30)
Total area of elements, m²			334.14							(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) = 88.29 (33)

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((28)...(30) + (32) + (32a)...(32e) = 16539.88 (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 — 13.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss — (33) + (36) = — 101.36 (37)

Ventilation heat loss calculated monthly — (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	62.73	62.43	62.14	60.78	60.52	59.34	59.34	59.12	59.79	60.52	61.04	61.58	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

(39)m=	164.09	163.79	163.5	162.14	161.88	160.7	160.7	160.48	161.15	161.88	162.4	162.94	

Average = Sum(39)$_{1...12}$ /12= 162.14 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	1.22	1.21	1.21	1.2	1.2	1.19	1.19	1.19	1.19	1.2	1.2	1.21	

Average = Sum(40)$_{1...12}$ /12= 1.2 (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 — 2.91 (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 — 103.24 (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=	113.56	109.43	105.3	101.17	97.04	92.91	92.91	97.04	101.17	105.3	109.43	113.56	

Total = Sum(44)$_{1...12}$ = 1238.86 (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=	168.41	147.29	151.99	132.51	127.15	109.72	101.67	116.67	118.06	137.59	150.19	163.1	

Total = Sum(45)$_{1...12}$ = 1624.35 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.26	22.09	22.8	19.88	19.07	16.46	15.25	17.5	17.71	20.64	22.53	24.46	(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:

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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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.29	171.57	178.87	158.52	154.03	135.73	128.55	143.55	144.07	164.47	176.2	189.98	(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)
FHRS	9.01	7.92	7.39	6.22	3.88	0	0	0	0	6.22	7.7	8.97	(63) (G2)

Output from water heater

(64)m=	186.28	163.65	171.48	152.3	150.15	135.73	128.55	143.55	144.07	158.25	168.51	181.01	

Output from water heater (annual)$_{112}$ 1883.53 (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=	62.72	55.04	57.26	50.56	49	42.98	40.53	45.51	45.76	52.47	56.44	60.95	(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=	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	68.8	61.11	49.7	37.62	28.12	23.74	25.66	33.35	44.76	56.83	66.33	70.71	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	453.21	457.91	446.06	420.83	388.98	359.05	339.06	334.35	346.2	371.43	403.28	433.21	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	(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=	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	(71)

Water heating gains (Table 5)

(72)m=	84.3	81.91	76.96	70.23	65.86	59.7	54.47	61.17	63.55	70.52	78.39	81.92	(72)

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Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	722.79	717.42	689.2	645.17	599.45	558.98	535.67	545.36	571	615.27	664.49	702.33

(73)

5. 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	7.23		10.63		0.72		0.7		26.85	(74)
North	0.9x	0.77	7.23		20.32		0.72		0.7		51.32	(74)
North	0.9x	0.77	7.23		34.53		0.72		0.7		87.2	(74)
North	0.9x	0.77	7.23		55.46		0.72		0.7		140.06	(74)
North	0.9x	0.77	7.23		74.72		0.72		0.7		188.67	(74)
North	0.9x	0.77	7.23		79.99		0.72		0.7		201.98	(74)
North	0.9x	0.77	7.23		74.68		0.72		0.7		188.58	(74)
North	0.9x	0.77	7.23		59.25		0.72		0.7		149.61	(74)
North	0.9x	0.77	7.23		41.52		0.72		0.7		104.84	(74)
North	0.9x	0.77	7.23		24.19		0.72		0.7		61.08	(74)
North	0.9x	0.77	7.23		13.12		0.72		0.7		33.13	(74)
North	0.9x	0.77	7.23		8.86		0.72		0.7		22.39	(74)
East	0.9x	0.77	0.93		19.64		0.72		0.7		6.38	(76)
East	0.9x	0.77	0.93		38.42		0.72		0.7		12.48	(76)
East	0.9x	0.77	0.93		63.27		0.72		0.7		20.55	(76)
East	0.9x	0.77	0.93		92.28		0.72		0.7		29.97	(76)
East	0.9x	0.77	0.93		113.09		0.72		0.7		36.74	(76)
East	0.9x	0.77	0.93		115.77		0.72		0.7		37.6	(76)
East	0.9x	0.77	0.93		110.22		0.72		0.7		35.8	(76)
East	0.9x	0.77	0.93		94.68		0.72		0.7		30.75	(76)
East	0.9x	0.77	0.93		73.59		0.72		0.7		23.9	(76)
East	0.9x	0.77	0.93		45.59		0.72		0.7		14.81	(76)
East	0.9x	0.77	0.93		24.49		0.72		0.7		7.95	(76)
East	0.9x	0.77	0.93		16.15		0.72		0.7		5.25	(76)
South	0.9x	0.77	12.18		46.75		0.72		0.7		198.89	(78)
South	0.9x	0.77	12.18		76.57		0.72		0.7		325.73	(78)
South	0.9x	0.77	12.18		97.53		0.72		0.7		414.92	(78)
South	0.9x	0.77	12.18		110.23		0.72		0.7		468.95	(78)
South	0.9x	0.77	12.18		114.87		0.72		0.7		488.68	(78)
South	0.9x	0.77	12.18		110.55		0.72		0.7		470.29	(78)
South	0.9x	0.77	12.18		108.01		0.72		0.7		459.5	(78)
South	0.9x	0.77	12.18		104.89		0.72		0.7		446.24	(78)
South	0.9x	0.77	12.18		101.89		0.72		0.7		433.44	(78)
South	0.9x	0.77	12.18		82.59		0.72		0.7		351.33	(78)

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South	0.9x	0.77	x	12.18	x	55.42	x	0.72	x	0.7	=	235.75	(78)
South	0.9x	0.77	x	12.18	x	40.4	x	0.72	x	0.7	=	171.86	(78)
West	0.9x	0.77	x	1.63	x	19.64	x	0.72	x	0.7	=	11.18	(80)
West	0.9x	0.77	x	1.63	x	38.42	x	0.72	x	0.7	=	21.87	(80)
West	0.9x	0.77	x	1.63	x	63.27	x	0.72	x	0.7	=	36.02	(80)
West	0.9x	0.77	x	1.63	x	92.28	x	0.72	x	0.7	=	52.54	(80)
West	0.9x	0.77	x	1.63	x	113.09	x	0.72	x	0.7	=	64.39	(80)
West	0.9x	0.77	x	1.63	x	115.77	x	0.72	x	0.7	=	65.91	(80)
West	0.9x	0.77	x	1.63	x	110.22	x	0.72	x	0.7	=	62.75	(80)
West	0.9x	0.77	x	1.63	x	94.68	x	0.72	x	0.7	=	53.9	(80)
West	0.9x	0.77	x	1.63	x	73.59	x	0.72	x	0.7	=	41.9	(80)
West	0.9x	0.77	x	1.63	x	45.59	x	0.72	x	0.7	=	25.95	(80)
West	0.9x	0.77	x	1.63	x	24.49	x	0.72	x	0.7	=	13.94	(80)
West	0.9x	0.77	x	1.63	x	16.15	x	0.72	x	0.7	=	9.2	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	252.98	430.75	591.67	741.39	841.19	840.7	808.13	732.25	643	476.43	302.91	216.59	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	975.77	1148.17	1280.87	1386.56	1440.64	1399.68	1343.8	1277.61	1214	1091.7	967.4	918.93	(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=	1	0.99	0.98	0.94	0.85	0.68	0.52	0.56	0.79	0.95	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.78	19.97	20.23	20.54	20.8	20.95	20.99	20.98	20.9	20.56	20.1	19.75	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.91	19.91	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.91	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.99	0.97	0.92	0.79	0.59	0.4	0.44	0.71	0.93	0.99	1	(89)

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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.31	18.57	18.95	19.4	19.73	19.9	19.92	19.92	19.85	19.43	18.78	18.25	(90)

fLA = Living area ÷ (4) = 0.28 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.71	18.96	19.3	19.71	20.03	20.19	20.22	20.22	20.14	19.74	19.15	18.67	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.56	18.81	19.15	19.56	19.88	20.04	20.07	20.07	19.99	19.59	19	18.52	(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=	0.99	0.98	0.96	0.91	0.79	0.6	0.41	0.45	0.71	0.92	0.98	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	967.24	1126.76	1229.38	1256.85	1141.74	838.6	552.79	581	867.16	1008.82	950.21	912.74	(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=	2340.31	2277.93	2068.66	1728.82	1323.86	873.53	557.22	588.2	948.43	1454.79	1931.75	2332.52	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1021.56	773.59	624.42	339.82	135.5	0	0	0	0	331.81	706.71	1056.31	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 4989.72 (98)

Space heating requirement in kWh/m²/year 36.96 (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 89.9 (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)													
	1021.56	773.59	624.42	339.82	135.5	0	0	0	0	331.81	706.71	1056.31	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1136.33	860.5	694.58	378	150.72	0	0	0	0	369.08	786.1	1174.99	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 5550.3 (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)

	186.28	163.65	171.48	152.3	150.15	135.73	128.55	143.55	144.07	158.25	168.51	181.01	

Efficiency of water heater 87.3 (216)

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(217)m=	89.49	89.43	89.33	89.08	88.51	87.3	87.3	87.3	87.3	89.04	89.39	89.51	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.16	182.98	191.97	170.97	169.64	155.48	147.25	164.43	165.03	177.73	188.51	202.22	

Total = Sum(219a)$_{1...12}$ = 2124.37 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		5550.3	
Water heating fuel used		2124.37	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		486.01	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		8235.68	(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 = 193.15	(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 cost (other fuel)	(219)	3.48	x 0.01 = 73.93	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 = 9.89	(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 = 64.11	(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) =		461.08	(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)	84.99	(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 =	1198.87	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	458.86	(264)

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Space and water heating	(261) + (262) + (263) + (264) =			1657.73	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	252.24	(268)
Total CO2, kg/year	sum of (265) ..(271) =			1948.89	(272)
CO2 emissions per m²	(272) ÷ (4) =			14.44	(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	1.22	=	6771.37	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2591.73	(264)
Space and water heating	(261) + (262) + (263) + (264) =			9363.09	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1492.07	(268)
'Total Primary Energy	sum of (265)...(271) =			11085.41	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			82.11	(273)

i-Therm Limited
Matt Haskell
[redacted]

EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.15

Property Address: Plot 8

Address : 8 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.22	(1a) x	2.4	(2a) =	204.53	(3a)
First floor	49.78	(1b) x	2.6	(2b) =	129.43	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	135	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		333.96	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.15 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.86999988555908 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.34 (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) =	0.29 (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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.39	0.35	0.34	0.31	0.32	0.3	0.31	0.29	0.31	0.34	0.34	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.55	0.54	0.55	0.56	0.56	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.55	0.54	0.55	0.56	0.56	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.23	x1/[1/(1.2)+ 0.04]		=	8.28			(27)
Windows Type 2			12.18	x1/[1/(1.2)+ 0.04]		=	13.95			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			1.63	x1/[1/(1.2)+ 0.04]		=	1.87			(27)
Rooflights			0.94	x1/[1/(1.4) + 0.04]		=	1.316			(27b)
Floor			85.22	x	0.12	=	10.2264			(28)
Walls Type1	120.32	26.02	94.3	x	0.27	=	25.46			(29)
Walls Type2	32.26	0	32.26	x	0.3	=	9.68			(29)
Walls Type3	7.6	0	7.6	x	0.3	=	2.28			(29)
Roof Type1	71.11	0.94	70.17	x	0.11	=	7.72			(30)
Roof Type2	15.24	0	15.24	x	0.14	=	2.13			(30)
Roof Type3	2.39	0	2.39	x	0.14	=	0.33			(30)
Total area of elements, m²			334.14							(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) = 88.29 (33)

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Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 16539.88 (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 13.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 101.36 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	63.34	61.86	61.31	60.52	60.78	60.03	60.27	59.79	60.27	61.31	61.31	62.14	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	164.7	163.22	162.67	161.88	162.14	161.39	161.63	161.15	161.63	162.67	162.67	163.5	

Average = Sum(39)$_{1...12}$ /12= 162.44 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.22	1.21	1.2	1.2	1.2	1.2	1.2	1.19	1.2	1.2	1.2	1.21	

Average = Sum(40)$_{1...12}$ /12= 1.2 (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 2.91 (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) + 36 103.24 (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=	113.56	109.43	105.3	101.17	97.04	92.91	92.91	97.04	101.17	105.3	109.43	113.56	

Total = Sum(44)$_{1...12}$ = 1238.86 (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=	168.41	147.29	151.99	132.51	127.15	109.72	101.67	116.67	118.06	137.59	150.19	163.1	

Total = Sum(45)$_{1...12}$ = 1624.35 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.26	22.09	22.8	19.88	19.07	16.46	15.25	17.5	17.71	20.64	22.53	24.46	(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:

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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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.29	171.57	178.87	158.52	154.03	135.73	128.55	143.55	144.07	164.47	176.2	189.98	(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)
FHRS	8.36	7.49	6.94	5.87	2.04	0	0	0	0	5.09	6.97	8.43	(63) (G2)

Output from water heater

(64)m=	186.93	164.08	171.93	152.65	151.99	135.73	128.55	143.55	144.07	159.38	169.23	181.55	

Output from water heater (annual)₁₁₂ 1889.64 (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=	62.72	55.04	57.26	50.56	49	42.98	40.53	45.51	45.76	52.47	56.44	60.95	(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=	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	174.41	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	68.8	61.11	49.7	37.62	28.12	23.74	25.66	33.35	44.76	56.83	66.33	70.71	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	453.21	457.91	446.06	420.83	388.98	359.05	339.06	334.35	346.2	371.43	403.28	433.21	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	55.35	(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=	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	(71)

Water heating gains (Table 5)

(72)m=	84.3	81.91	76.96	70.23	65.86	59.7	54.47	61.17	63.55	70.52	78.39	81.92	(72)

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Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	722.79	717.42	689.2	645.17	599.45	558.98	535.67	545.36	571	615.27	664.49	702.33

(73)

5. 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	7.23		14.24		0.72		0.7		35.97	(74)
North	0.9x	0.77	7.23		23.27		0.72		0.7		58.76	(74)
North	0.9x	0.77	7.23		39.95		0.72		0.7		100.89	(74)
North	0.9x	0.77	7.23		67.1		0.72		0.7		169.45	(74)
North	0.9x	0.77	7.23		87.09		0.72		0.7		219.93	(74)
North	0.9x	0.77	7.23		100.07		0.72		0.7		252.7	(74)
North	0.9x	0.77	7.23		92.85		0.72		0.7		234.48	(74)
North	0.9x	0.77	7.23		74.38		0.72		0.7		187.83	(74)
North	0.9x	0.77	7.23		51.63		0.72		0.7		130.38	(74)
North	0.9x	0.77	7.23		30.09		0.72		0.7		75.97	(74)
North	0.9x	0.77	7.23		16.99		0.72		0.7		42.9	(74)
North	0.9x	0.77	7.23		11.39		0.72		0.7		28.77	(74)
East	0.9x	0.77	0.93		26.63		0.72		0.7		8.65	(76)
East	0.9x	0.77	0.93		43.95		0.72		0.7		14.28	(76)
East	0.9x	0.77	0.93		71.91		0.72		0.7		23.36	(76)
East	0.9x	0.77	0.93		108.59		0.72		0.7		35.27	(76)
East	0.9x	0.77	0.93		128.14		0.72		0.7		41.62	(76)
East	0.9x	0.77	0.93		141.01		0.72		0.7		45.8	(76)
East	0.9x	0.77	0.93		133.32		0.72		0.7		43.3	(76)
East	0.9x	0.77	0.93		115.5		0.72		0.7		37.52	(76)
East	0.9x	0.77	0.93		89.42		0.72		0.7		29.05	(76)
East	0.9x	0.77	0.93		56.26		0.72		0.7		18.28	(76)
East	0.9x	0.77	0.93		31.99		0.72		0.7		10.39	(76)
East	0.9x	0.77	0.93		21.09		0.72		0.7		6.85	(76)
South	0.9x	0.77	12.18		59.74		0.72		0.7		254.12	(78)
South	0.9x	0.77	12.18		82.27		0.72		0.7		349.99	(78)
South	0.9x	0.77	12.18		104.17		0.72		0.7		443.14	(78)
South	0.9x	0.77	12.18		123.04		0.72		0.7		523.41	(78)
South	0.9x	0.77	12.18		125.05		0.72		0.7		531.96	(78)
South	0.9x	0.77	12.18		130.26		0.72		0.7		554.14	(78)
South	0.9x	0.77	12.18		126		0.72		0.7		536.02	(78)
South	0.9x	0.77	12.18		122		0.72		0.7		518.99	(78)
South	0.9x	0.77	12.18		116.65		0.72		0.7		496.26	(78)
South	0.9x	0.77	12.18		95.67		0.72		0.7		406.99	(78)

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South	0.9x	0.77	x	12.18	x	68.13	x	0.72	x	0.7	=	289.82	(78)
South	0.9x	0.77	x	12.18	x	49.76	x	0.72	x	0.7	=	211.67	(78)
West	0.9x	0.77	x	1.63	x	26.63	x	0.72	x	0.7	=	15.16	(80)
West	0.9x	0.77	x	1.63	x	43.95	x	0.72	x	0.7	=	25.02	(80)
West	0.9x	0.77	x	1.63	x	71.91	x	0.72	x	0.7	=	40.94	(80)
West	0.9x	0.77	x	1.63	x	108.59	x	0.72	x	0.7	=	61.82	(80)
West	0.9x	0.77	x	1.63	x	128.14	x	0.72	x	0.7	=	72.95	(80)
West	0.9x	0.77	x	1.63	x	141.01	x	0.72	x	0.7	=	80.28	(80)
West	0.9x	0.77	x	1.63	x	133.32	x	0.72	x	0.7	=	75.9	(80)
West	0.9x	0.77	x	1.63	x	115.5	x	0.72	x	0.7	=	65.75	(80)
West	0.9x	0.77	x	1.63	x	89.42	x	0.72	x	0.7	=	50.91	(80)
West	0.9x	0.77	x	1.63	x	56.26	x	0.72	x	0.7	=	32.03	(80)
West	0.9x	0.77	x	1.63	x	31.99	x	0.72	x	0.7	=	18.21	(80)
West	0.9x	0.77	x	1.63	x	21.09	x	0.72	x	0.7	=	12	(80)
Rooflights	0.9x	1	x	0.94	x	35.42	x	0.63	x	0.7	=	13.22	(82)
Rooflights	0.9x	1	x	0.94	x	59.83	x	0.63	x	0.7	=	22.32	(82)
Rooflights	0.9x	1	x	0.94	x	101.31	x	0.63	x	0.7	=	37.8	(82)
Rooflights	0.9x	1	x	0.94	x	158.55	x	0.63	x	0.7	=	59.15	(82)
Rooflights	0.9x	1	x	0.94	x	191.82	x	0.63	x	0.7	=	71.57	(82)
Rooflights	0.9x	1	x	0.94	x	213.31	x	0.63	x	0.7	=	79.58	(82)
Rooflights	0.9x	1	x	0.94	x	200.77	x	0.63	x	0.7	=	74.9	(82)
Rooflights	0.9x	1	x	0.94	x	170.54	x	0.63	x	0.7	=	63.63	(82)
Rooflights	0.9x	1	x	0.94	x	127.85	x	0.63	x	0.7	=	47.7	(82)
Rooflights	0.9x	1	x	0.94	x	77.56	x	0.63	x	0.7	=	28.94	(82)
Rooflights	0.9x	1	x	0.94	x	42.83	x	0.63	x	0.7	=	15.98	(82)
Rooflights	0.9x	1	x	0.94	x	27.87	x	0.63	x	0.7	=	10.4	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	327.12	470.37	646.12	849.1	938.03	1012.5	964.6	873.71	754.29	562.21	377.31	269.69	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	1049.92	1187.79	1335.32	1494.27	1537.48	1571.48	1500.27	1419.07	1325.3	1177.48	1041.8	972.02	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)

Utilisation factor for gains for living area, h1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(86)m=	0.99	0.98	0.96	0.9	0.77	0.56	0.41	0.41	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=	19.98	20.11	20.36	20.67	20.89	20.98	21	21	20.96	20.74	20.32	19.95	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.9	19.91	19.92	19.92	19.92	19.92	19.92	19.93	19.92	19.92	19.92	19.91	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.95	0.87	0.7	0.46	0.29	0.29	0.57	0.85	0.97	0.99	(89)

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Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.59	18.78	19.14	19.56	19.83	19.91	19.92	19.92	19.9	19.66	19.1	18.56	(90)

fLA = Living area ÷ (4) = 0.28 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.98	19.15	19.48	19.87	20.12	20.21	20.22	20.22	20.19	19.96	19.43	18.94	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.83	19	19.33	19.72	19.97	20.06	20.07	20.07	20.04	19.81	19.28	18.79	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	0.98	0.97	0.94	0.86	0.7	0.47	0.31	0.3	0.58	0.85	0.96	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	1032.74	1155.83	1258.51	1287.1	1082.53	740.82	462.42	429.34	769.84	999.63	1003.64	959.74	(95)
Monthly average external temperature from Table 8													
(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	2161.94	2137.42	1940.47	1621.33	1178.38	751.75	463.48	430.23	798.21	1238.12	1721.63	2124.15	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	840.13	659.63	507.38	240.64	71.31	0	0	0	0	177.44	516.95	866.32	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 3879.81 (98)

Space heating requirement in kWh/m²/year 28.74 (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 89.9 (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)													
	840.13	659.63	507.38	240.64	71.31	0	0	0	0	177.44	516.95	866.32	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	934.51	733.74	564.38	267.68	79.33	0	0	0	0	197.37	575.03	963.65	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 4315.69 (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)

	186.93	164.08	171.93	152.65	151.99	135.73	128.55	143.55	144.07	159.38	169.23	181.55	

Efficiency of water heater 87.3 (216)

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(217)m=	89.42	89.37	89.23	88.87	88.11	87.3	87.3	87.3	87.3	88.65	89.24	89.44	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	209.05	183.6	192.69	171.76	172.49	155.48	147.25	164.43	165.03	179.78	189.63	202.98	

Total = Sum(219a)$_{1...12}$ = 2134.18 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		4315.69	
Water heating fuel used		2134.18	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		486.01	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		7010.89	(338)

12a. Fuel costs - individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.74 x 0.01 =	161.41	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	19.12 x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.74 x 0.01 =	79.82	(247)
Pumps, fans and electric keep-hot	(231)	0 x 0.01 =	14.34	(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)	0 x 0.01 =	92.93	(250)
Additional standing charges (Table 12)			94	(251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =		442.49	(255)

13a. 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)		86.38 (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 =	932.19	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	460.98	(264)

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Space and water heating	(261) + (262) + (263) + (264) =			1393.17	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	252.24	(268)
Total CO2, kg/year	sum of (265) ..(271) =			1684.34	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			12.48	(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	=	5265.15	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2603.7	(264)
Space and water heating	(261) + (262) + (263) + (264) =			7868.85	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1492.07	(268)
'Total Primary Energy	sum of (265)...(271) =			9591.16	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			71.05	(273)

i-Therm Limited
Matt Haskell
[redacted]

TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.15

Property Address: Plot 8

Address : 8 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.22	(1a) x	2.4	(2a) =	204.53	(3a)
First floor	49.78	(1b) x	2.6	(2b) =	129.43	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	135	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		333.96	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.12 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.37 (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) =	0.31 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			7.23	x1/[1/(1.4)+ 0.04]		=	9.59			(27)
Windows Type 2			12.18	x1/[1/(1.4)+ 0.04]		=	16.15			(27)
Windows Type 3			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 4			1.63	x1/[1/(1.4)+ 0.04]		=	2.16			(27)
Rooflights			0.94	x1/[1/(1.7) + 0.04]		=	1.598			(27b)
Floor			85.22	x	0.13	=	11.0786			(28)
Walls Type1	120.32	26.02	94.3	x	0.18	=	16.97			(29)
Walls Type2	32.26	0	32.26	x	0.18	=	5.81			(29)
Walls Type3	7.6	0	7.6	x	0.18	=	1.37			(29)
Roof Type1	71.11	0.94	70.17	x	0.13	=	9.12			(30)
Roof Type2	15.24	0	15.24	x	0.13	=	1.98			(30)
Roof Type3	2.39	0	2.39	x	0.13	=	0.31			(30)
Total area of elements, m²			334.14							(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) = 81.7 (33)

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Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 16539.88 (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 13.85 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 95.56 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	63.95	63.61	63.27	61.69	61.39	60.02	60.02	59.76	60.55	61.39	61.99	62.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	159.51	159.17	158.83	157.25	156.95	155.57	155.57	155.32	156.11	156.95	157.55	158.18	

Average = Sum(39)$_{1...12}$ /12= 157.25 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.18	1.18	1.18	1.16	1.16	1.15	1.15	1.15	1.16	1.16	1.17	1.17	

Average = Sum(40)$_{1...12}$ /12= 1.16 (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 2.91 (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) + 36 103.24 (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=	113.56	109.43	105.3	101.17	97.04	92.91	92.91	97.04	101.17	105.3	109.43	113.56	

Total = Sum(44)$_{1...12}$ = 1238.86 (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=	168.41	147.29	151.99	132.51	127.15	109.72	101.67	116.67	118.06	137.59	150.19	163.1	

Total = Sum(45)$_{1...12}$ = 1624.35 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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:

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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=	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=	143.15	125.2	129.19	112.63	108.08	93.26	86.42	99.17	100.35	116.95	127.66	138.63	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	143.15	125.2	129.19	112.63	108.08	93.26	86.42	99.17	100.35	116.95	127.66	138.63	

Output from water heater (annual)₁..₁₂ — 1380.69 — (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=	35.79	31.3	32.3	28.16	27.02	23.32	21.6	24.79	25.09	29.24	31.92	34.66	(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=	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	27.52	24.44	19.88	15.05	11.25	9.5	10.26	13.34	17.9	22.73	26.53	28.29	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	303.65	306.8	298.86	281.96	260.62	240.56	227.17	224.02	231.96	248.86	270.2	290.25	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	(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=	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	(71)

Water heating gains (Table 5)

(72)m=	48.1	46.58	43.41	39.11	36.32	32.38	29.04	33.32	34.84	39.3	44.33	46.58	(72)

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Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	445.88	444.43	428.76	402.72	374.79	349.05	333.07	337.28	351.31	377.49	407.66	431.73	(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	7.23		10.63		0.63		0.7		23.5	(74)
North	0.9x	0.77	7.23		20.32		0.63		0.7		44.9	(74)
North	0.9x	0.77	7.23		34.53		0.63		0.7		76.3	(74)
North	0.9x	0.77	7.23		55.46		0.63		0.7		122.55	(74)
North	0.9x	0.77	7.23		74.72		0.63		0.7		165.09	(74)
North	0.9x	0.77	7.23		79.99		0.63		0.7		176.73	(74)
North	0.9x	0.77	7.23		74.68		0.63		0.7		165	(74)
North	0.9x	0.77	7.23		59.25		0.63		0.7		130.91	(74)
North	0.9x	0.77	7.23		41.52		0.63		0.7		91.73	(74)
North	0.9x	0.77	7.23		24.19		0.63		0.7		53.45	(74)
North	0.9x	0.77	7.23		13.12		0.63		0.7		28.98	(74)
North	0.9x	0.77	7.23		8.86		0.63		0.7		19.59	(74)
East	0.9x	0.77	0.93		19.64		0.63		0.7		5.58	(76)
East	0.9x	0.77	0.93		38.42		0.63		0.7		10.92	(76)
East	0.9x	0.77	0.93		63.27		0.63		0.7		17.98	(76)
East	0.9x	0.77	0.93		92.28		0.63		0.7		26.23	(76)
East	0.9x	0.77	0.93		113.09		0.63		0.7		32.14	(76)
East	0.9x	0.77	0.93		115.77		0.63		0.7		32.9	(76)
East	0.9x	0.77	0.93		110.22		0.63		0.7		31.33	(76)
East	0.9x	0.77	0.93		94.68		0.63		0.7		26.91	(76)
East	0.9x	0.77	0.93		73.59		0.63		0.7		20.92	(76)
East	0.9x	0.77	0.93		45.59		0.63		0.7		12.96	(76)
East	0.9x	0.77	0.93		24.49		0.63		0.7		6.96	(76)
East	0.9x	0.77	0.93		16.15		0.63		0.7		4.59	(76)
South	0.9x	0.77	12.18		46.75		0.63		0.7		174.03	(78)
South	0.9x	0.77	12.18		76.57		0.63		0.7		285.01	(78)
South	0.9x	0.77	12.18		97.53		0.63		0.7		363.06	(78)
South	0.9x	0.77	12.18		110.23		0.63		0.7		410.33	(78)
South	0.9x	0.77	12.18		114.87		0.63		0.7		427.59	(78)
South	0.9x	0.77	12.18		110.55		0.63		0.7		411.5	(78)
South	0.9x	0.77	12.18		108.01		0.63		0.7		402.06	(78)
South	0.9x	0.77	12.18		104.89		0.63		0.7		390.46	(78)
South	0.9x	0.77	12.18		101.89		0.63		0.7		379.26	(78)
South	0.9x	0.77	12.18		82.59		0.63		0.7		307.41	(78)

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South	0.9x	0.77	x	12.18	x	55.42	x	0.63	x	0.7	=	206.28	(78)
South	0.9x	0.77	x	12.18	x	40.4	x	0.63	x	0.7	=	150.38	(78)
West	0.9x	0.77	x	1.63	x	19.64	x	0.63	x	0.7	=	9.78	(80)
West	0.9x	0.77	x	1.63	x	38.42	x	0.63	x	0.7	=	19.14	(80)
West	0.9x	0.77	x	1.63	x	63.27	x	0.63	x	0.7	=	31.52	(80)
West	0.9x	0.77	x	1.63	x	92.28	x	0.63	x	0.7	=	45.97	(80)
West	0.9x	0.77	x	1.63	x	113.09	x	0.63	x	0.7	=	56.34	(80)
West	0.9x	0.77	x	1.63	x	115.77	x	0.63	x	0.7	=	57.67	(80)
West	0.9x	0.77	x	1.63	x	110.22	x	0.63	x	0.7	=	54.91	(80)
West	0.9x	0.77	x	1.63	x	94.68	x	0.63	x	0.7	=	47.16	(80)
West	0.9x	0.77	x	1.63	x	73.59	x	0.63	x	0.7	=	36.66	(80)
West	0.9x	0.77	x	1.63	x	45.59	x	0.63	x	0.7	=	22.71	(80)
West	0.9x	0.77	x	1.63	x	24.49	x	0.63	x	0.7	=	12.2	(80)
West	0.9x	0.77	x	1.63	x	16.15	x	0.63	x	0.7	=	8.05	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

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=	222.56	379.33	521.83	654.95	743.88	743.73	714.8	647.19	567.49	419.78	266.57	190.51	(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=	668.44	823.75	950.59	1057.67	1118.67	1092.78	1047.88	984.47	918.79	797.28	674.23	622.23	(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=	1	1	0.99	0.98	0.92	0.79	0.62	0.68	0.89	0.99	1	1	(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=	19.62	19.8	20.06	20.4	20.7	20.91	20.98	20.97	20.82	20.41	19.95	19.59	(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=	19.93	19.94	19.94	19.95	19.95	19.96	19.96	19.96	19.96	19.95	19.95	19.94	(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=	1	1	0.99	0.97	0.89	0.7	0.49	0.55	0.83	0.98	1	1	(89)

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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=	18.67	18.85	19.11	19.45	19.74	19.91	19.95	19.95	19.85	19.47	19.01	18.65	(90)

fLA = Living area ÷ (4) = 0.28 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.93	19.11	19.37	19.71	20.01	20.19	20.24	20.23	20.12	19.73	19.27	18.91	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.93	19.11	19.37	19.71	20.01	20.19	20.24	20.23	20.12	19.73	19.27	18.91	(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=	1	1	0.99	0.96	0.89	0.73	0.53	0.58	0.84	0.98	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	667.42	820.13	938.85	1017.61	995.14	793.93	553.45	575.25	774.13	777.64	671.79	621.57	(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=	2334.05	2261.66	2044.62	1700.04	1303.54	869.42	565.54	594.95	939.42	1433.17	1917.01	2326.35	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1239.97	968.71	822.69	491.34	229.45	0	0	0	0	487.71	896.56	1268.36	

Total per year (kWh/year) = Sum(98)$_{1,...,12}$ = 6404.8 (98)

Space heating requirement in kWh/m²/year 47.44 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1462.4	1151.25	1180.43	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.81	0.89	0.86	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1185.99	1022.69	1015.92	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1387	1332.34	1262.23	0	0	0	0	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m set (104)m to zero if (104)m < 3 × (98)m													
(104)m=	0	0	0	0	0	144.72	230.37	183.26	0	0	0	0	

Total = Sum(104)$_{5,...,9}$ = 558.35 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	

Total = Sum(104)$_{5,...,9}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	36.18	57.59	45.81	0	0	0	0	

Total = Sum(107)$_{5,...,9}$ = 139.59 (107)

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Space cooling requirement in kWh/m²/year	(107) ÷ (4) =	1.03	(108)
9a. Fabric Energy Efficiency (calculated only under special conditions, see section 11)			
Fabric Energy Efficiency	(99) + (108) =	48.48	(109)
Target Fabric Energy Efficiency (TFEE)		55.75	(109)

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DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.15

Property Address: Plot: 8

Address : 8 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.22	(1a) x	2.4	(2a) =	204.53	(3a)
First floor	49.78	(1b) x	2.6	(2b) =	129.43	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	135	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	333.96	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.12 (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		3.86999988555908 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.31 (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) =	0.27 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.23	x	1/[1/(1.2)+ 0.04]	=	8.28			(27)
Windows Type 2			12.18	x	1/[1/(1.2)+ 0.04]	=	13.95			(27)
Windows Type 3			0.93	x	1/[1/(1.2)+ 0.04]	=	1.06			(27)
Windows Type 4			1.63	x	1/[1/(1.2)+ 0.04]	=	1.87			(27)
Rooflights			0.94	x	1/[1/(1.4) + 0.04]	=	1.316			(27b)
Floor			85.22	x	0.12	=	10.2264			(28)
Walls Type1	120.32	26.02	94.3	x	0.27	=	25.46			(29)
Walls Type2	32.26	0	32.26	x	0.3	=	9.68			(29)
Walls Type3	7.6	0	7.6	x	0.3	=	2.28			(29)
Roof Type1	71.11	0.94	70.17	x	0.11	=	7.72			(30)
Roof Type2	15.24	0	15.24	x	0.14	=	2.13			(30)
Roof Type3	2.39	0	2.39	x	0.14	=	0.33			(30)
Total area of elements, m²			334.14							(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) = 88.29 (33)

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Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 16539.88 (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 13.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 101.36 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	61.45	61.21	60.97	59.83	59.62	58.63	58.63	58.45	59.01	59.62	60.05	60.5	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	162.82	162.57	162.33	161.19	160.98	159.99	159.99	159.81	160.37	160.98	161.41	161.86	

Average = Sum(39)$_{1...12}$ /12= 161.19 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.21	1.2	1.2	1.19	1.19	1.19	1.19	1.18	1.19	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 2.91 (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) + 36 103.24 (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=	113.56	109.43	105.3	101.17	97.04	92.91	92.91	97.04	101.17	105.3	109.43	113.56	

Total = Sum(44)$_{1...12}$ = 1238.86 (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=	168.41	147.29	151.99	132.51	127.15	109.72	101.67	116.67	118.06	137.59	150.19	163.1	

Total = Sum(45)$_{1...12}$ = 1624.35 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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:

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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=	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=	143.15	125.2	129.19	112.63	108.08	93.26	86.42	99.17	100.35	116.95	127.66	138.63	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	143.15	125.2	129.19	112.63	108.08	93.26	86.42	99.17	100.35	116.95	127.66	138.63	

Output from water heater (annual)₁..₁₂ — 1380.69 — (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=	35.79	31.3	32.3	28.16	27.02	23.32	21.6	24.79	25.09	29.24	31.92	34.66	(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=	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	27.52	24.44	19.88	15.05	11.25	9.5	10.26	13.34	17.9	22.73	26.53	28.29	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	303.65	306.8	298.86	281.96	260.62	240.56	227.17	224.02	231.96	248.86	270.2	290.25	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	(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=	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	(71)

Water heating gains (Table 5)

(72)m=	48.1	46.58	43.41	39.11	36.32	32.38	29.04	33.32	34.84	39.3	44.33	46.58	(72)

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Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	445.88	444.43	428.76	402.72	374.79	349.05	333.07	337.28	351.31	377.49	407.66	431.73

(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	7.23		10.63		0.72		0.7	=	26.85	(74)
North	0.9x	0.77	7.23		20.32		0.72		0.7	=	51.32	(74)
North	0.9x	0.77	7.23		34.53		0.72		0.7	=	87.2	(74)
North	0.9x	0.77	7.23		55.46		0.72		0.7	=	140.06	(74)
North	0.9x	0.77	7.23		74.72		0.72		0.7	=	188.67	(74)
North	0.9x	0.77	7.23		79.99		0.72		0.7	=	201.98	(74)
North	0.9x	0.77	7.23		74.68		0.72		0.7	=	188.58	(74)
North	0.9x	0.77	7.23		59.25		0.72		0.7	=	149.61	(74)
North	0.9x	0.77	7.23		41.52		0.72		0.7	=	104.84	(74)
North	0.9x	0.77	7.23		24.19		0.72		0.7	=	61.08	(74)
North	0.9x	0.77	7.23		13.12		0.72		0.7	=	33.13	(74)
North	0.9x	0.77	7.23		8.86		0.72		0.7	=	22.39	(74)
East	0.9x	0.77	0.93		19.64		0.72		0.7	=	6.38	(76)
East	0.9x	0.77	0.93		38.42		0.72		0.7	=	12.48	(76)
East	0.9x	0.77	0.93		63.27		0.72		0.7	=	20.55	(76)
East	0.9x	0.77	0.93		92.28		0.72		0.7	=	29.97	(76)
East	0.9x	0.77	0.93		113.09		0.72		0.7	=	36.74	(76)
East	0.9x	0.77	0.93		115.77		0.72		0.7	=	37.6	(76)
East	0.9x	0.77	0.93		110.22		0.72		0.7	=	35.8	(76)
East	0.9x	0.77	0.93		94.68		0.72		0.7	=	30.75	(76)
East	0.9x	0.77	0.93		73.59		0.72		0.7	=	23.9	(76)
East	0.9x	0.77	0.93		45.59		0.72		0.7	=	14.81	(76)
East	0.9x	0.77	0.93		24.49		0.72		0.7	=	7.95	(76)
East	0.9x	0.77	0.93		16.15		0.72		0.7	=	5.25	(76)
South	0.9x	0.77	12.18		46.75		0.72		0.7	=	198.89	(78)
South	0.9x	0.77	12.18		76.57		0.72		0.7	=	325.73	(78)
South	0.9x	0.77	12.18		97.53		0.72		0.7	=	414.92	(78)
South	0.9x	0.77	12.18		110.23		0.72		0.7	=	468.95	(78)
South	0.9x	0.77	12.18		114.87		0.72		0.7	=	488.68	(78)
South	0.9x	0.77	12.18		110.55		0.72		0.7	=	470.29	(78)
South	0.9x	0.77	12.18		108.01		0.72		0.7	=	459.5	(78)
South	0.9x	0.77	12.18		104.89		0.72		0.7	=	446.24	(78)
South	0.9x	0.77	12.18		101.89		0.72		0.7	=	433.44	(78)
South	0.9x	0.77	12.18		82.59		0.72		0.7	=	351.33	(78)

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South	0.9x	0.77	x	12.18	x	55.42	x	0.72	x	0.7	=	235.75	(78)
South	0.9x	0.77	x	12.18	x	40.4	x	0.72	x	0.7	=	171.86	(78)
West	0.9x	0.77	x	1.63	x	19.64	x	0.72	x	0.7	=	11.18	(80)
West	0.9x	0.77	x	1.63	x	38.42	x	0.72	x	0.7	=	21.87	(80)
West	0.9x	0.77	x	1.63	x	63.27	x	0.72	x	0.7	=	36.02	(80)
West	0.9x	0.77	x	1.63	x	92.28	x	0.72	x	0.7	=	52.54	(80)
West	0.9x	0.77	x	1.63	x	113.09	x	0.72	x	0.7	=	64.39	(80)
West	0.9x	0.77	x	1.63	x	115.77	x	0.72	x	0.7	=	65.91	(80)
West	0.9x	0.77	x	1.63	x	110.22	x	0.72	x	0.7	=	62.75	(80)
West	0.9x	0.77	x	1.63	x	94.68	x	0.72	x	0.7	=	53.9	(80)
West	0.9x	0.77	x	1.63	x	73.59	x	0.72	x	0.7	=	41.9	(80)
West	0.9x	0.77	x	1.63	x	45.59	x	0.72	x	0.7	=	25.95	(80)
West	0.9x	0.77	x	1.63	x	24.49	x	0.72	x	0.7	=	13.94	(80)
West	0.9x	0.77	x	1.63	x	16.15	x	0.72	x	0.7	=	9.2	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	252.98	430.75	591.67	741.39	841.19	840.7	808.13	732.25	643	476.43	302.91	216.59	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	698.85	875.18	1020.42	1144.11	1215.98	1189.75	1141.2	1069.54	994.3	853.92	710.57	648.32	(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=	1	1	0.99	0.97	0.9	0.76	0.59	0.65	0.87	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.61	19.8	20.07	20.42	20.73	20.92	20.98	20.97	20.83	20.42	19.94	19.57	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.92	19.92	19.92	19.92	19.93	19.93	19.93	19.93	19.93	19.93	19.92	19.92	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.96	0.86	0.67	0.46	0.52	0.8	0.97	1	1	(89)

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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=	18.64	18.84	19.11	19.45	19.74	19.89	19.93	19.92	19.84	19.46	18.98	18.61	(90)

fLA = Living area ÷ (4) = 0.28 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.91	19.1	19.38	19.72	20.01	20.18	20.22	20.21	20.11	19.73	19.25	18.88	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.91	19.1	19.38	19.72	20.01	20.18	20.22	20.21	20.11	19.73	19.25	18.88	(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:													
(94)m=	1	0.99	0.98	0.95	0.87	0.69	0.5	0.55	0.82	0.97	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	697.53	870.21	1004.05	1089.12	1054.23	825.66	568.38	592.19	812.65	827.56	707.34	647.46	(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=	2378.76	2308.51	2090.13	1743.82	1337.54	892.17	578.76	609.35	963.96	1469.22	1960.71	2375.58	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1250.83	966.53	808.04	471.39	210.78	0	0	0	0	477.39	902.42	1285.72	

Total per year (kWh/year) = Sum(98)$_{1,...,12}$ = 6373.11 (98)

Space heating requirement in kWh/m²/year 47.21 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1503.9	1183.93	1214.53	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.83	0.9	0.87	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1247.8	1066.75	1062.19	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1500.34	1441.42	1361.65	0	0	0	0	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m set (104)m to zero if (104)m < 3 × (98)m													
(104)m=	0	0	0	0	0	181.83	278.76	222.8	0	0	0	0	

Total = Sum(104)$_{5,...,9}$ = 683.39 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	

Total = Sum(104)$_{5,...,9}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	45.46	69.69	55.7	0	0	0	0	

Total = Sum(107)$_{5,...,9}$ = 170.85 (107)

DFEE WorkSheet: New dwelling as built

Space cooling requirement in kWh/m²/year	(107) ÷ (4) =	1.27	(108)
9b. Fabric Energy Efficiency (calculated only under special conditions, see section 11)			
Fabric Energy Efficiency	(99) + (108) =	48.47	(109)

[redacted]

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.15

Property Address: Plot 8

Address : 8 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.22	(1a) x	2.4	(2a) =	204.53	(3a)
First floor	49.78	(1b) x	2.6	(2b) =	129.43	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	135	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		333.96	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.15 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		3.86999988555908 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.34 (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) =	0.29 (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

DER WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			7.23	x1/[1/(1.2)+ 0.04]		=	8.28			(27)
Windows Type 2			12.18	x1/[1/(1.2)+ 0.04]		=	13.95			(27)
Windows Type 3			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Windows Type 4			1.63	x1/[1/(1.2)+ 0.04]		=	1.87			(27)
Rooflights			0.94	x1/[1/(1.4) + 0.04]		=	1.316			(27b)
Floor			85.22	x	0.12	=	10.2264			(28)
Walls Type1	120.32	26.02	94.3	x	0.27	=	25.46			(29)
Walls Type2	32.26	0	32.26	x	0.3	=	9.68			(29)
Walls Type3	7.6	0	7.6	x	0.3	=	2.28			(29)
Roof Type1	71.11	0.94	70.17	x	0.11	=	7.72			(30)
Roof Type2	15.24	0	15.24	x	0.14	=	2.13			(30)
Roof Type3	2.39	0	2.39	x	0.14	=	0.33			(30)
Total area of elements, m²			334.14							(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) = 88.29 (33)

DER WorkSheet: New dwelling as built

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 16539.88 (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 13.08 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 101.36 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	62.73	62.43	62.14	60.78	60.52	59.34	59.34	59.12	59.79	60.52	61.04	61.58	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	164.09	163.79	163.5	162.14	161.88	160.7	160.7	160.48	161.15	161.88	162.4	162.94	

Average = Sum(39)$_{1...12}$ /12= 162.14 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.22	1.21	1.21	1.2	1.2	1.19	1.19	1.19	1.19	1.2	1.2	1.21	

Average = Sum(40)$_{1...12}$ /12= 1.2 (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 2.91 (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) + 36 103.24 (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=	113.56	109.43	105.3	101.17	97.04	92.91	92.91	97.04	101.17	105.3	109.43	113.56	

Total = Sum(44)$_{1...12}$ = 1238.86 (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=	168.41	147.29	151.99	132.51	127.15	109.72	101.67	116.67	118.06	137.59	150.19	163.1	

Total = Sum(45)$_{1...12}$ = 1624.35 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.26	22.09	22.8	19.88	19.07	16.46	15.25	17.5	17.71	20.64	22.53	24.46	(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:

[redacted]

DER WorkSheet: New dwelling as built

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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.29	171.57	178.87	158.52	154.03	135.73	128.55	143.55	144.07	164.47	176.2	189.98	(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)
FHRS	9.03	8.4	7.87	6.54	5.35	0	0	0	0	6.57	8.18	8.98	(63) (G2)

Output from water heater

(64)m=	186.26	163.17	171.01	151.99	148.68	135.73	128.55	143.55	144.07	157.9	168.02	181	

Output from water heater (annual)$_{(12)}$	1879.93	(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=	62.72	55.04	57.26	50.56	49	42.98	40.53	45.51	45.76	52.47	56.44	60.95	(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=	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	27.52	24.44	19.88	15.05	11.25	9.5	10.26	13.34	17.9	22.73	26.53	28.29	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	303.65	306.8	298.86	281.96	260.62	240.56	227.17	224.02	231.96	248.86	270.2	290.25	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	(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=	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	(71)

Water heating gains (Table 5)

(72)m=	84.3	81.91	76.96	70.23	65.86	59.7	54.47	61.17	63.55	70.52	78.39	81.92	(72)

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Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	485.07	482.76	465.3	436.84	407.33	379.37	361.5	368.13	383.02	411.72	444.73	470.06	(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)	
North	0.9x	0.77	7.23		10.63		0.72		0.7	=	26.85	(74)
North	0.9x	0.77	7.23		20.32		0.72		0.7	=	51.32	(74)
North	0.9x	0.77	7.23		34.53		0.72		0.7	=	87.2	(74)
North	0.9x	0.77	7.23		55.46		0.72		0.7	=	140.06	(74)
North	0.9x	0.77	7.23		74.72		0.72		0.7	=	188.67	(74)
North	0.9x	0.77	7.23		79.99		0.72		0.7	=	201.98	(74)
North	0.9x	0.77	7.23		74.68		0.72		0.7	=	188.58	(74)
North	0.9x	0.77	7.23		59.25		0.72		0.7	=	149.61	(74)
North	0.9x	0.77	7.23		41.52		0.72		0.7	=	104.84	(74)
North	0.9x	0.77	7.23		24.19		0.72		0.7	=	61.08	(74)
North	0.9x	0.77	7.23		13.12		0.72		0.7	=	33.13	(74)
North	0.9x	0.77	7.23		8.86		0.72		0.7	=	22.39	(74)
East	0.9x	0.77	0.93		19.64		0.72		0.7	=	6.38	(76)
East	0.9x	0.77	0.93		38.42		0.72		0.7	=	12.48	(76)
East	0.9x	0.77	0.93		63.27		0.72		0.7	=	20.55	(76)
East	0.9x	0.77	0.93		92.28		0.72		0.7	=	29.97	(76)
East	0.9x	0.77	0.93		113.09		0.72		0.7	=	36.74	(76)
East	0.9x	0.77	0.93		115.77		0.72		0.7	=	37.6	(76)
East	0.9x	0.77	0.93		110.22		0.72		0.7	=	35.8	(76)
East	0.9x	0.77	0.93		94.68		0.72		0.7	=	30.75	(76)
East	0.9x	0.77	0.93		73.59		0.72		0.7	=	23.9	(76)
East	0.9x	0.77	0.93		45.59		0.72		0.7	=	14.81	(76)
East	0.9x	0.77	0.93		24.49		0.72		0.7	=	7.95	(76)
East	0.9x	0.77	0.93		16.15		0.72		0.7	=	5.25	(76)
South	0.9x	0.77	12.18		46.75		0.72		0.7	=	198.89	(78)
South	0.9x	0.77	12.18		76.57		0.72		0.7	=	325.73	(78)
South	0.9x	0.77	12.18		97.53		0.72		0.7	=	414.92	(78)
South	0.9x	0.77	12.18		110.23		0.72		0.7	=	468.95	(78)
South	0.9x	0.77	12.18		114.87		0.72		0.7	=	488.68	(78)
South	0.9x	0.77	12.18		110.55		0.72		0.7	=	470.29	(78)
South	0.9x	0.77	12.18		108.01		0.72		0.7	=	459.5	(78)
South	0.9x	0.77	12.18		104.89		0.72		0.7	=	446.24	(78)
South	0.9x	0.77	12.18		101.89		0.72		0.7	=	433.44	(78)
South	0.9x	0.77	12.18		82.59		0.72		0.7	=	351.33	(78)

[redacted]

DER WorkSheet: New dwelling as built

South	0.9x	0.77	x	12.18	x	55.42	x	0.72	x	0.7	=	235.75	(78)
South	0.9x	0.77	x	12.18	x	40.4	x	0.72	x	0.7	=	171.86	(78)
West	0.9x	0.77	x	1.63	x	19.64	x	0.72	x	0.7	=	11.18	(80)
West	0.9x	0.77	x	1.63	x	38.42	x	0.72	x	0.7	=	21.87	(80)
West	0.9x	0.77	x	1.63	x	63.27	x	0.72	x	0.7	=	36.02	(80)
West	0.9x	0.77	x	1.63	x	92.28	x	0.72	x	0.7	=	52.54	(80)
West	0.9x	0.77	x	1.63	x	113.09	x	0.72	x	0.7	=	64.39	(80)
West	0.9x	0.77	x	1.63	x	115.77	x	0.72	x	0.7	=	65.91	(80)
West	0.9x	0.77	x	1.63	x	110.22	x	0.72	x	0.7	=	62.75	(80)
West	0.9x	0.77	x	1.63	x	94.68	x	0.72	x	0.7	=	53.9	(80)
West	0.9x	0.77	x	1.63	x	73.59	x	0.72	x	0.7	=	41.9	(80)
West	0.9x	0.77	x	1.63	x	45.59	x	0.72	x	0.7	=	25.95	(80)
West	0.9x	0.77	x	1.63	x	24.49	x	0.72	x	0.7	=	13.94	(80)
West	0.9x	0.77	x	1.63	x	16.15	x	0.72	x	0.7	=	9.2	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	252.98	430.75	591.67	741.39	841.19	840.7	808.13	732.25	643	476.43	302.91	216.59	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	738.05	913.51	1056.97	1178.22	1248.52	1220.07	1169.63	1100.39	1026.01	888.15	747.64	686.66	(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=	1	1	0.99	0.96	0.9	0.75	0.58	0.64	0.86	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.62	19.81	20.09	20.43	20.73	20.92	20.98	20.97	20.84	20.44	19.96	19.59	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.91	19.91	19.91	19.92	19.92	19.93	19.93	19.93	19.93	19.92	19.92	19.91	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.95	0.85	0.66	0.45	0.5	0.79	0.97	1	1	(89)

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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=	18.07	18.35	18.75	19.25	19.65	19.88	19.92	19.92	19.8	19.26	18.57	18.02	(90)

fLA = Living area ÷ (4) = 0.28 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.5	18.75	19.12	19.57	19.95	20.16	20.21	20.21	20.08	19.59	18.95	18.45	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.35	18.6	18.97	19.42	19.8	20.01	20.06	20.06	19.93	19.44	18.8	18.3	(93)

8. Space heating requirement

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains, hm:													
(94)m=	1	0.99	0.98	0.94	0.85	0.67	0.47	0.52	0.79	0.96	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	735.95	906.33	1035.07	1109.99	1060.15	814.7	548.75	574.16	812.34	852.8	742.69	685.26	(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=	2305.12	2244.16	2038.59	1706.09	1311.52	870.03	556.57	587.14	940.25	1430.67	1900.2	2298.15	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1167.46	899.02	746.62	429.19	187.02	0	0	0	0	429.93	833.41	1200	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 5892.66 (98)

Space heating requirement in kWh/m²/year 43.65 (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 89.9 (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)													
	1167.46	899.02	746.62	429.19	187.02	0	0	0	0	429.93	833.41	1200	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1298.62	1000.02	830.51	477.41	208.04	0	0	0	0	478.23	927.04	1334.81	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 6554.69 (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)

	186.26	163.17	171.01	151.99	148.68	135.73	128.55	143.55	144.07	157.9	168.02	181	

Efficiency of water heater 87.3 (216)

DER WorkSheet: New dwelling as built

(217)m=	89.53	89.49	89.4	89.21	88.73	87.3	87.3	87.3	87.3	89.19	89.45	89.55	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.04	182.34	191.28	170.38	167.56	155.48	147.25	164.43	165.03	177.04	187.83	202.12	

Total = Sum(219a)$_{1...12}$ = 2118.78 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		6554.69	
Water heating fuel used		2118.78	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		486.01	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		9234.48	(338)

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	=	1415.81	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	457.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1873.47	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	252.24	(268)
Total CO2, kg/year	sum of (265)...(271) =				2164.64	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				16.03	(273)
EI rating (section 14)					84	(274)

i-Therm Limited
Matt Haskell
[redacted]

TER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.15

Property Address: Plot 8

Address : 8 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	85.22	(1a) x	2.4	(2a) =	204.53	(3a)
First floor	49.78	(1b) x	2.6	(2b) =	129.43	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	135	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	333.96	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.12 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.37 (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) =	0.31 (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

TER WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			7.23	x1/[1/(1.4)+ 0.04]		=	9.59			(27)
Windows Type 2			12.18	x1/[1/(1.4)+ 0.04]		=	16.15			(27)
Windows Type 3			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Windows Type 4			1.63	x1/[1/(1.4)+ 0.04]		=	2.16			(27)
Rooflights			0.94	x1/[1/(1.7) + 0.04]		=	1.598			(27b)
Floor			85.22	x	0.13	=	11.0786			(28)
Walls Type1	120.32	26.02	94.3	x	0.18	=	16.97			(29)
Walls Type2	32.26	0	32.26	x	0.18	=	5.81			(29)
Walls Type3	7.6	0	7.6	x	0.18	=	1.37			(29)
Roof Type1	71.11	0.94	70.17	x	0.13	=	9.12			(30)
Roof Type2	15.24	0	15.24	x	0.13	=	1.98			(30)
Roof Type3	2.39	0	2.39	x	0.13	=	0.31			(30)
Total area of elements, m²			334.14							(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) = 81.7 (33)

TER WorkSheet: New dwelling as built

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 16539.88 (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 13.85 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 95.56 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	63.95	63.61	63.27	61.69	61.39	60.02	60.02	59.76	60.55	61.39	61.99	62.62	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	159.51	159.17	158.83	157.25	156.95	155.57	155.57	155.32	156.11	156.95	157.55	158.18	

Average = Sum(39)$_{1...12}$ /12= 157.25 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.18	1.18	1.18	1.16	1.16	1.15	1.15	1.15	1.16	1.16	1.17	1.17	

Average = Sum(40)$_{1...12}$ /12= 1.16 (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 2.91 (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) + 36 103.24 (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=	113.56	109.43	105.3	101.17	97.04	92.91	92.91	97.04	101.17	105.3	109.43	113.56	

Total = Sum(44)$_{1...12}$ = 1238.86 (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=	168.41	147.29	151.99	132.51	127.15	109.72	101.67	116.67	118.06	137.59	150.19	163.1	

Total = Sum(45)$_{1...12}$ = 1624.35 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.26	22.09	22.8	19.88	19.07	16.46	15.25	17.5	17.71	20.64	22.53	24.46	(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:

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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	50.96	49.32	49.45	45.82	47.35	49.45	49.32	50.96	49.32	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	219.37	193.32	202.95	181.83	176.6	155.54	149.02	166.12	167.38	188.55	199.5	214.06	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	219.37	193.32	202.95	181.83	176.6	155.54	149.02	166.12	167.38	188.55	199.5	214.06	

Output from water heater (annual)$_{1,12}$	2214.23	(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=	68.74	60.48	63.28	56.39	54.64	47.94	45.64	51.16	51.58	58.49	62.27	66.97	(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 Tables 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	145.34	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	27.52	24.44	19.88	15.05	11.25	9.5	10.26	13.34	17.9	22.73	26.53	28.29	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	303.65	306.8	298.86	281.96	260.62	240.56	227.17	224.02	231.96	248.86	270.2	290.25	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	37.53	(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=	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	-116.28	(71)

Water heating gains (Table 5)

(72)m=	92.39	90	85.05	78.32	73.44	66.58	61.35	68.76	71.64	78.61	86.48	90.01	(72)

TER WorkSheet: New dwelling as built

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	493.16	490.85	473.39	444.93	414.91	386.24	368.38	375.72	391.11	419.81	452.82	478.15	(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	7.23		10.63		0.63		0.7	=	23.5	(74)
North	0.9x	0.77	7.23		20.32		0.63		0.7	=	44.9	(74)
North	0.9x	0.77	7.23		34.53		0.63		0.7	=	76.3	(74)
North	0.9x	0.77	7.23		55.46		0.63		0.7	=	122.55	(74)
North	0.9x	0.77	7.23		74.72		0.63		0.7	=	165.09	(74)
North	0.9x	0.77	7.23		79.99		0.63		0.7	=	176.73	(74)
North	0.9x	0.77	7.23		74.68		0.63		0.7	=	165	(74)
North	0.9x	0.77	7.23		59.25		0.63		0.7	=	130.91	(74)
North	0.9x	0.77	7.23		41.52		0.63		0.7	=	91.73	(74)
North	0.9x	0.77	7.23		24.19		0.63		0.7	=	53.45	(74)
North	0.9x	0.77	7.23		13.12		0.63		0.7	=	28.98	(74)
North	0.9x	0.77	7.23		8.86		0.63		0.7	=	19.59	(74)
East	0.9x	0.77	0.93		19.64		0.63		0.7	=	5.58	(76)
East	0.9x	0.77	0.93		38.42		0.63		0.7	=	10.92	(76)
East	0.9x	0.77	0.93		63.27		0.63		0.7	=	17.98	(76)
East	0.9x	0.77	0.93		92.28		0.63		0.7	=	26.23	(76)
East	0.9x	0.77	0.93		113.09		0.63		0.7	=	32.14	(76)
East	0.9x	0.77	0.93		115.77		0.63		0.7	=	32.9	(76)
East	0.9x	0.77	0.93		110.22		0.63		0.7	=	31.33	(76)
East	0.9x	0.77	0.93		94.68		0.63		0.7	=	26.91	(76)
East	0.9x	0.77	0.93		73.59		0.63		0.7	=	20.92	(76)
East	0.9x	0.77	0.93		45.59		0.63		0.7	=	12.96	(76)
East	0.9x	0.77	0.93		24.49		0.63		0.7	=	6.96	(76)
East	0.9x	0.77	0.93		16.15		0.63		0.7	=	4.59	(76)
South	0.9x	0.77	12.18		46.75		0.63		0.7	=	174.03	(78)
South	0.9x	0.77	12.18		76.57		0.63		0.7	=	285.01	(78)
South	0.9x	0.77	12.18		97.53		0.63		0.7	=	363.06	(78)
South	0.9x	0.77	12.18		110.23		0.63		0.7	=	410.33	(78)
South	0.9x	0.77	12.18		114.87		0.63		0.7	=	427.59	(78)
South	0.9x	0.77	12.18		110.55		0.63		0.7	=	411.5	(78)
South	0.9x	0.77	12.18		108.01		0.63		0.7	=	402.06	(78)
South	0.9x	0.77	12.18		104.89		0.63		0.7	=	390.46	(78)
South	0.9x	0.77	12.18		101.89		0.63		0.7	=	379.26	(78)
South	0.9x	0.77	12.18		82.59		0.63		0.7	=	307.41	(78)

TER WorkSheet: New dwelling as built

			x	12.18	x	55.42	x	0.63	x	0.7	=	206.28	(78)
South	0.9x	0.77	x	12.18	x	40.4	x	0.63	x	0.7	=	150.38	(78)
West	0.9x	0.77	x	1.63	x	19.64	x	0.63	x	0.7	=	9.78	(80)
West	0.9x	0.77	x	1.63	x	38.42	x	0.63	x	0.7	=	19.14	(80)
West	0.9x	0.77	x	1.63	x	63.27	x	0.63	x	0.7	=	31.52	(80)
West	0.9x	0.77	x	1.63	x	92.28	x	0.63	x	0.7	=	45.97	(80)
West	0.9x	0.77	x	1.63	x	113.09	x	0.63	x	0.7	=	56.34	(80)
West	0.9x	0.77	x	1.63	x	115.77	x	0.63	x	0.7	=	57.67	(80)
West	0.9x	0.77	x	1.63	x	110.22	x	0.63	x	0.7	=	54.91	(80)
West	0.9x	0.77	x	1.63	x	94.68	x	0.63	x	0.7	=	47.16	(80)
West	0.9x	0.77	x	1.63	x	73.59	x	0.63	x	0.7	=	36.66	(80)
West	0.9x	0.77	x	1.63	x	45.59	x	0.63	x	0.7	=	22.71	(80)
West	0.9x	0.77	x	1.63	x	24.49	x	0.63	x	0.7	=	12.2	(80)
West	0.9x	0.77	x	1.63	x	16.15	x	0.63	x	0.7	=	8.05	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	222.56	379.33	521.83	654.95	743.88	743.73	714.8	647.19	567.49	419.78	266.57	190.51	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	715.73	870.18	995.23	1099.88	1158.79	1129.97	1083.18	1022.91	958.6	839.59	719.38	668.66	(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=	1	1	0.99	0.97	0.91	0.78	0.61	0.66	0.88	0.98	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.65	19.83	20.09	20.42	20.72	20.92	20.98	20.97	20.84	20.44	19.98	19.62	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.93	19.94	19.94	19.95	19.95	19.96	19.96	19.96	19.96	19.95	19.95	19.94	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.96	0.88	0.69	0.48	0.53	0.81	0.97	1	1	(89)

TER WorkSheet: New dwelling as built

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.13	18.39	18.77	19.26	19.66	19.9	19.95	19.95	19.82	19.29	18.62	18.09	(90)

fLA = Living area ÷ (4) = 0.28 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.55	18.78	19.13	19.58	19.96	20.18	20.23	20.23	20.1	19.61	18.99	18.51	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.55	18.78	19.13	19.58	19.96	20.18	20.23	20.23	20.1	19.61	18.99	18.51	(93)

3. 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=	1	0.99	0.98	0.95	0.88	0.71	0.51	0.56	0.82	0.97	0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	714.06	864.81	979.22	1049.58	1014.76	800.8	554.9	577.85	789.42	812.96	715.55	667.54	(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=	2273.13	2210.04	2006.61	1678.84	1295.76	868.23	565.47	594.84	936.38	1413.38	1873.77	2264.17	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1159.95	903.99	764.38	453.06	209.07	0	0	0	0	446.71	833.91	1187.89	

Total per year (kWh/year) = Sum(98)$_{1...5,9...12}$ = 5958.97 (98)

Space heating requirement in kWh/m²/year 44.14 (99)

3a. 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 93.4 (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)													
	1159.95	903.99	764.38	453.06	209.07	0	0	0	0	446.71	833.91	1187.89	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1241.92	967.87	818.4	485.08	223.84	0	0	0	0	478.28	892.84	1271.84	

Total (kWh/year) =Sum(211)$_{1...5,10...12}$= 6380.06 (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)

	219.37	193.32	202.95	181.83	176.6	155.54	149.02	166.12	167.38	188.55	199.5	214.06

Efficiency of water heater 80.3 (216)

TER WorkSheet: New dwelling as built

(217)m=	88.63	88.44	88.08	87.26	85.48	80.3	80.3	80.3	80.3	87.15	88.26	88.7

(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	247.52	218.59	230.43	208.38	206.61	193.7	185.58	206.88	208.44	216.36	226.05	241.33

Total = Sum(219a)$_{1...12}$ = 2589.85 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		6380.06	
Water heating fuel used		2589.85	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		486.01	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		9530.92	(338)

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	=	1378.09	(261)
Space heating (secondary)	(215)	x	0.519	=	0	(263)
Water heating	(219)	x	0.216	=	559.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1937.5	(265)
Electricity for pumps, fans and electric keep-hot	(231)	x	0.519	=	38.93	(267)
Electricity for lighting	(232)	x	0.519	=	252.24	(268)
Total CO2, kg/year	sum of (265)...(271) =				2228.67	(272)

TER = 16.51 (273)

i-Therm Limited
Matt Haskell
[redacted]

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 02 November 2021

Property Details: Plot 6

Dwelling type:	Detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	North
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	8 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	881.64	**(P1)**
Transmission heat loss coefficient:	101.4	
Summer heat loss coefficient:	983	**(P2)**

Overhangs

Orientation:	Ratio:	Z_overhangs:
North (Ext)	0	1
South (Ext)	0	1
East (Ext)	0	1
West (Ext)	0	1
West (Ext)	0	1

Solar shading

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North (Ext)	1	0.9	1	0.9	**(P8)**
South (Ext)	1	0.9	1	0.9	**(P8)**
East (Ext)	1	0.9	1	0.9	**(P8)**
West (Ext)	1	0.9	1	0.9	**(P8)**
West (Ext)	0.85	1	1	0.85	**(P8)**

Solar gains

Orientation		Area	Flux	g_	FF	Shading	Gains	
North (Ext)	0.9 x	7.23	86.66	0.72	0.7	0.9	255.78	
South (Ext)	0.9 x	12.18	118.4	0.72	0.7	0.9	588.72	
East (Ext)	0.9 x	0.93	124.8	0.72	0.7	0.9	47.38	
West (Ext)	0.9 x	1.63	124.8	0.72	0.7	0.9	83.04	
	1 x	0.94	187.8	0.63	0.7	0.85	59.56	
						Total	1034.48	**(P3/P4)**

Internal gains

	June	July	August	
Internal gains	555.98	532.67	542.36	
Total summer gains	1645.84	1567.15	1484.9	**(P5)**
Summer gain/loss ratio	1.67	1.59	1.51	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	

SAP 2012 Overheating Assessment

Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	17.32	19.24	19.26 **(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**

Assessment of likelihood of high internal temperature: Not significant

i-Therm Limited
Matt Haskell
[redacted]

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.14
Printed on 01 October 2021 at 13:59:46

Project Information

Assessed By: Matthew Haskell (STRO006210) **Building Type:** Detached House

Dwelling Details

NEW DWELLING AS BUILT Total Floor Area: 139m²
Site Reference : Langford **Plot Reference:** Plot 9
Address : 9 Langford Close , CLIMPING, BN17 5FG

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)	15.72 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	15.40 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	51.6 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	45.4 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.27 (max. 0.30)	0.27 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.17 (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	3.83	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 482, product index 016635):
Boiler systems with radiators or underfloor heating - mains gas
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi)
Efficiency 89.0 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

ARUN DISTRICT COUNCIL CM/4/22/DOC

Regulations Compliance Report

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 1.41 kWh/day	
	Permitted by DBSCG: 2.30 kWh/day	OK
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls	TTZC by plumbing and electrical services	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: North	5.79m²
Windows facing: South	9.78m²
Windows facing: East	0.69m²
Windows facing: West	0.93m²
Roof windows facing: West	0.94m²
Ventilation rate:	8.00

10 Key features

Air permeablility	3.8 m³/m²h
Doors U-value	1 W/m²K
Roofs U-value	0.11 W/m²K
Floors U-value	0.12 W/m²K

i-Therm Limited
Matt Haskell

Thermal Bridge Report

[redacted]

Property Details: Plot 9

Address: 9 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England

Thermal Bridges

Thermal bridges: User-defined = UD
Default = D
Approved = A
User-defined (individual PSI-values) Y-Value = 0.0446

Extended Junctions Details

Junction Type	PSI-Value	Length	Reference	Type
Steel lintel with perforated steel base plate	0.067	14.07	E1	[UD]
Sill	0.04	9.25	E3	[A]
Jamb	0.05	32.1	E4	[A]
Ground floor (normal)	0.076	36.8	E5	[A]
Exposed floor (normal)	0	0	E20	[UD]
Intermediate floor within a dwelling	0.07	34.94	E6	[A]
Eaves (insulation at ceiling level)	0.06	3.82	E10	[A]
Gable (insulation at ceiling level)	0.24	8.1	E12	[A]
Corner (normal)	0.09	24.8	E16	[A]
Corner (inverted internal area greater than external area)	-0.09	0	E17	[A]
Flat roof	0.08	0	E14	[D]
Gable (insulation at rafter level)	0.04	5.9	E13	[A]
Eaves (insulation at rafter level)	0.04	7.2	E11	[A]

SAP Input

Property Address: [redacted]

Address: 9 Langford Close , CLIMPING, BN17 5FG
Located in: England
Region: South East England
UPRN: UPRN-545108687956
Date of assessment: 01 October 2021
Date of certificate: 01 October 2021
Assessment type: New dwelling as built
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: 482

Property description

Dwelling type: House
Detachment: Detached
Year Completed: 2021

Floor Location:	Floor area:	Storey height:
Floor 0	70.41 m²	2.4 m
Floor 1	68.59 m²	2.6 m

Living area: 35.36 m² (fraction 0.254)
Front of dwelling faces: North

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
Entrance	Manufacturer	Solid			PVC-U
Ext	Manufacturer	Half glazed	low-E, En = 0.05, soft coat	Yes	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	SAP 2012	Windows	low-E, En = 0.05, soft coat	No	PVC-U
Ext	Manufacturer	Roof Windows	low-E, En = 0.05, soft coat	Yes	PVC-U

Name:	Gap:	Frame Factor:	g-value:	U-value:	Area:	No. of Openings:
Entrance	mm	0.7	0	1	2.1	1
Ext	16mm or more mm	0.7	0	1	1.95	1
Ext	16mm or more	0.7	0.72	1.2	5.79	1
Ext	16mm or more	0.7	0.72	1.2	9.78	1
Ext	16mm or more	0.7	0.72	1.2	0.69	1
Ext	16mm or more	0.7	0.72	1.2	0.93	1
Ext	16mm or more	0.7	0.63	1.4	0.94	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
Entrance		External Wall	North	0	0
Ext		External Wall	East	0	0
Ext		External Wall	North	0	0
Ext		External Wall	South	0	0
Ext		External Wall	East	0	0
Ext		External Wall	West	0	0
Ext		Plane Roof	West	0.001	0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:

SAP Input

External Elements							
External Wall	142.58	21.24	121.34	0.27	0	False	N/A
Plane Roof	43.53	0.94	42.59	0.11	0		N/A
Skilling	37.08	0	37.08	0.14	0		N/A
Ground floor	70.41			0.12			N/A

Internal Elements

Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0446

	Length	Psi-value		
	14.07	0.067	E1	Steel lintel with perforated steel base plate
[Approved]	9.25	0.04	E3	Sill
[Approved]	32.1	0.05	E4	Jamb
[Approved]	36.8	0.076	E5	Ground floor (normal)
	0	0	E20	Exposed floor (normal)
[Approved]	34.94	0.07	E6	Intermediate floor within a dwelling
[Approved]	3.82	0.06	E10	Eaves (insulation at ceiling level)
[Approved]	8.1	0.24	E12	Gable (insulation at ceiling level)
[Approved]	24.8	0.09	E16	Corner (normal)
[Approved]	0	-0.09	E17	Corner (inverted internal area greater than external area)
	0	0.08	E14	Flat roof
[Approved]	5.9	0.04	E13	Gable (insulation at rafter level)
[Approved]	7.2	0.04	E11	Eaves (insulation at rafter level)

Ventilation

Pressure test: Yes (As built)
Ventilation: Natural ventilation (extract fans)
Number of chimneys: 0
Number of open flues: 0
Number of fans: 5
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3.83 (Assessed dwelling is tested)

Main heating system

Main heating system:
Boiler systems with radiators or underfloor heating
Gas boilers and oil boilers
Fuel: mains gas
Info Source: Boiler Database
Database: (rev 482, product index 016635) Efficiency: Winter 87.3 % Summer: 89.9
Has integral PFGHRD 060025
Brand name: Ideal
Model: Logic Code Combi
Model qualifier: 33
(Combi boiler)
Systems with radiators
Central heating pump : 2013 or later
Design flow temperature: Unknown
Room-sealed
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

SAP Input

Water heating

Water heating:	From main heating system Water code: 901 Fuel :mains gas Hot water cylinder Cylinder volume: 210 litres Cylinder insulation: Measured loss, 1.41kWh/day Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Flue Gas Heat Recovery System: Database (rev 482, product index 060025) Brand name: Ideal Model: Logic Boost Model qualifier: 33 Solar panel: False

Others

Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Rural
EPC language:	English
Wind turbine:	No
Photovoltaics:	None
Assess Zero Carbon Home:	No

[redacted]

SAP WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.14

Property Address: Plot 9

Address : 9 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.41	(1a) x	2.4	(2a) =	168.98	(3a)
First floor	68.59	(1b) x	2.6	(2b) =	178.33	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =	347.32	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.14 (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		3.82999992370605 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.34 (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) =	0.29 (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

SAP WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			5.79	x1/[1/(1.2)+ 0.04]		=	6.63			(27)
Windows Type 2			9.78	x1/[1/(1.2)+ 0.04]		=	11.2			(27)
Windows Type 3			0.69	x1/[1/(1.2)+ 0.04]		=	0.79			(27)
Windows Type 4			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Rooflights			0.94	x1/[1/(1.4) + 0.04]		=	1.316			(27b)
Floor			70.41	x	0.12	=	8.449201			(28)
Walls	142.58	21.24	121.34	x	0.27	=	32.76			(29)
Roof Type1	43.53	0.94	42.59	x	0.11	=	4.68			(30)
Roof Type2	37.08	0	37.08	x	0.14	=	5.19			(30)
Total area of elements, m²			293.6							(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) = 76.07 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15742.53 (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 — 13.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss — (33) + (36) = — 89.16 (37)

Ventilation heat loss calculated monthly — (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	64.88	64.59	64.3	62.95	62.69	61.51	61.51	61.29	61.97	62.69	63.2	63.74	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

(39)m=	154.04	153.74	153.46	152.1	151.85	150.67	150.67	150.45	151.12	151.85	152.36	152.9	

Average = Sum(39)$_{1..12}$ /12= 152.1 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	1.11	1.11	1.1	1.09	1.09	1.08	1.08	1.08	1.09	1.09	1.1	1.1	

Average = Sum(40)$_{1..12}$ /12= 1.09 (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 — 2.92 (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 — 103.43 (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=	113.78	109.64	105.5	101.37	97.23	93.09	93.09	97.23	101.37	105.5	109.64	113.78	

Total = Sum(44)$_{1..12}$ = 1241.22 (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=	168.73	147.57	152.28	132.76	127.39	109.93	101.86	116.89	118.29	137.85	150.48	163.41	

Total = Sum(45)$_{1..12}$ = 1627.44 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.31	22.14	22.84	19.91	19.11	16.49	15.28	17.53	17.74	20.68	22.57	24.51	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 210 (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)

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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) x (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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.61	171.85	179.16	158.78	154.27	135.94	128.74	143.77	144.3	164.73	176.49	190.29	(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)
FHRS	8.85	7.79	7.33	6.22	3.99	0	0	0	0	6.18	7.54	8.93	(63) (G2)

Output from water heater

(64)m=	186.76	164.06	171.83	152.55	150.28	135.94	128.74	143.77	144.3	158.56	168.94	181.36	

Output from water heater (annual) ... 1887.1 (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=	62.82	55.14	57.35	50.65	49.08	43.05	40.59	45.59	45.83	52.56	56.54	61.05	(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=	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	73.06	64.89	52.77	39.95	29.87	25.21	27.24	35.41	47.53	60.35	70.44	75.09	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	460.11	464.88	452.85	427.24	394.9	364.52	344.21	339.44	351.47	377.09	409.42	439.81	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	(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=	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	(71)

Water heating gains (Table 5)

(72)m=	84.44	82.05	77.09	70.34	65.96	59.8	54.56	61.27	63.66	70.64	78.52	82.06	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	734.32	728.53	699.42	654.24	607.44	566.24	542.73	552.84	579.37	624.79	675.09	713.67	(73)

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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	5.79		10.63		0.72		0.7	=	21.5	(74)
North	0.9x	0.77	5.79		20.32		0.72		0.7	=	41.09	(74)
North	0.9x	0.77	5.79		34.53		0.72		0.7	=	69.83	(74)
North	0.9x	0.77	5.79		55.46		0.72		0.7	=	112.16	(74)
North	0.9x	0.77	5.79		74.72		0.72		0.7	=	151.1	(74)
North	0.9x	0.77	5.79		79.99		0.72		0.7	=	161.75	(74)
North	0.9x	0.77	5.79		74.68		0.72		0.7	=	151.02	(74)
North	0.9x	0.77	5.79		59.25		0.72		0.7	=	119.81	(74)
North	0.9x	0.77	5.79		41.52		0.72		0.7	=	83.96	(74)
North	0.9x	0.77	5.79		24.19		0.72		0.7	=	48.92	(74)
North	0.9x	0.77	5.79		13.12		0.72		0.7	=	26.53	(74)
North	0.9x	0.77	5.79		8.86		0.72		0.7	=	17.93	(74)
East	0.9x	0.77	0.69		19.64		0.72		0.7	=	4.73	(76)
East	0.9x	0.77	0.69		38.42		0.72		0.7	=	9.26	(76)
East	0.9x	0.77	0.69		63.27		0.72		0.7	=	15.25	(76)
East	0.9x	0.77	0.69		92.28		0.72		0.7	=	22.24	(76)
East	0.9x	0.77	0.69		113.09		0.72		0.7	=	27.26	(76)
East	0.9x	0.77	0.69		115.77		0.72		0.7	=	27.9	(76)
East	0.9x	0.77	0.69		110.22		0.72		0.7	=	26.56	(76)
East	0.9x	0.77	0.69		94.68		0.72		0.7	=	22.82	(76)
East	0.9x	0.77	0.69		73.59		0.72		0.7	=	17.73	(76)
East	0.9x	0.77	0.69		45.59		0.72		0.7	=	10.99	(76)
East	0.9x	0.77	0.69		24.49		0.72		0.7	=	5.9	(76)
East	0.9x	0.77	0.69		16.15		0.72		0.7	=	3.89	(76)
South	0.9x	0.77	9.78		46.75		0.72		0.7	=	159.7	(78)
South	0.9x	0.77	9.78		76.57		0.72		0.7	=	261.55	(78)
South	0.9x	0.77	9.78		97.53		0.72		0.7	=	333.16	(78)
South	0.9x	0.77	9.78		110.23		0.72		0.7	=	376.55	(78)
South	0.9x	0.77	9.78		114.87		0.72		0.7	=	392.39	(78)
South	0.9x	0.77	9.78		110.55		0.72		0.7	=	377.62	(78)
South	0.9x	0.77	9.78		108.01		0.72		0.7	=	368.96	(78)
South	0.9x	0.77	9.78		104.89		0.72		0.7	=	358.31	(78)
South	0.9x	0.77	9.78		101.89		0.72		0.7	=	348.03	(78)
South	0.9x	0.77	9.78		82.59		0.72		0.7	=	282.1	(78)
South	0.9x	0.77	9.78		55.42		0.72		0.7	=	189.3	(78)
South	0.9x	0.77	9.78		40.4		0.72		0.7	=	138	(78)

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West	0.9x	0.77	x	0.93	x	19.64	x	0.72	x	0.7	=	6.38	(80)
West	0.9x	0.77	x	0.93	x	38.42	x	0.72	x	0.7	=	12.48	(80)
West	0.9x	0.77	x	0.93	x	63.27	x	0.72	x	0.7	=	20.55	(80)
West	0.9x	0.77	x	0.93	x	92.28	x	0.72	x	0.7	=	29.97	(80)
West	0.9x	0.77	x	0.93	x	113.09	x	0.72	x	0.7	=	36.74	(80)
West	0.9x	0.77	x	0.93	x	115.77	x	0.72	x	0.7	=	37.6	(80)
West	0.9x	0.77	x	0.93	x	110.22	x	0.72	x	0.7	=	35.8	(80)
West	0.9x	0.77	x	0.93	x	94.68	x	0.72	x	0.7	=	30.75	(80)
West	0.9x	0.77	x	0.93	x	73.59	x	0.72	x	0.7	=	23.9	(80)
West	0.9x	0.77	x	0.93	x	45.59	x	0.72	x	0.7	=	14.81	(80)
West	0.9x	0.77	x	0.93	x	24.49	x	0.72	x	0.7	=	7.95	(80)
West	0.9x	0.77	x	0.93	x	16.15	x	0.72	x	0.7	=	5.25	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	201.99	343.73	471.77	590.79	670.19	669.79	643.85	583.44	512.55	380.07	241.82	172.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	936.31	1072.27	1171.19	1245.03	1277.63	1236.03	1186.57	1136.28	1091.92	1004.86	916.91	886.64	(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=	1	0.99	0.98	0.95	0.88	0.72	0.55	0.59	0.82	0.96	0.99	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.88	20.04	20.27	20.55	20.8	20.95	20.99	20.99	20.9	20.58	20.18	19.85	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.99	20	20	20.01	20.01	20.01	20.01	20.02	20.01	20.01	20	20	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	0.99	0.98	0.94	0.83	0.63	0.43	0.47	0.75	0.95	0.99	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

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(90)m=	18.51	18.74	19.07	19.48	19.81	19.98	20.01	20.01	19.93	19.53	18.95	18.47	(90)

fLA = Living area ÷ (4) = 0.25 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.86	19.07	19.38	19.76	20.06	20.23	20.26	20.26	20.18	19.8	19.26	18.82	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.71	18.92	19.23	19.61	19.91	20.08	20.11	20.11	20.03	19.65	19.11	18.67	(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	0.99	0.97	0.93	0.83	0.64	0.44	0.49	0.75	0.94	0.99	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	930.08	1057.66	1136.8	1156.41	1059.67	789.81	524.64	551.11	815.88	943.74	904.36	882.09	(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=	2219.94	2155.52	1952.95	1628.39	1247.21	825.24	528.8	557.84	895.89	1373.93	1829.72	2212.7	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	959.66	737.77	607.21	339.83	139.53	0	0	0	0	320.06	666.26	989.97	

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 4760.29 (98)

Space heating requirement in kWh/m²/year 34.25 (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 89.9 (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)													
	959.66	737.77	607.21	339.83	139.53	0	0	0	0	320.06	666.26	989.97	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1067.47	820.65	675.43	378.01	155.2	0	0	0	0	356.02	741.11	1101.19	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 5295.09 (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)

	186.76	164.06	171.83	152.55	150.28	135.94	128.74	143.77	144.3	158.56	168.94	181.36	

Efficiency of water heater 87.3 (216)

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(217)m=	89.47	89.42	89.31	89.08	88.53	87.3	87.3	87.3	87.3	89.02	89.36	89.49	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.75	183.48	192.39	171.26	169.74	155.72	147.47	164.69	165.29	178.11	189.06	202.66

Total = Sum(219a)$_{1...12}$ = 2128.62 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		5295.09	
Water heating fuel used		2128.62	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		516.12	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		8014.84	(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 =	184.27	(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 cost (other fuel)	(219)	3.48 x 0.01 =	74.08	(247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	9.89	(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 =	68.08	(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) =		456.31	(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] =	1.04 (257)
SAP rating (Section 12)		85.47 (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 =	1143.74	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	459.78	(264)

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Space and water heating	(261) + (262) + (263) + (264) =			1603.52	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	267.87	(268)
Total CO2, kg/year	sum of (265) ..(271) =			1910.31	(272)
CO2 emissions per m²	(272) ÷ (4) =			13.74	(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	=	6460.01	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2596.92	(264)
Space and water heating	(261) + (262) + (263) + (264) =			9056.93	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1584.5	(268)
'Total Primary Energy	sum of (265)...(271) =			10871.68	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			78.21	(273)

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EPC Costs WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.14

Property Address: Plot 9

Address : 9 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.41	(1a) x	2.4	(2a) =	168.98	(3a)
First floor	68.59	(1b) x	2.6	(2b) =	178.33	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		347.32	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.14 (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		3.82999992370605 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.34 (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) =	0.29 (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=	5.3	4.8	4.6	4.3	4.4	4.1	4.2	4	4.2	4.6	4.6	4.9

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Wind Factor (22a)m = (22)m ÷ 4

(22a)m=	1.32	1.2	1.15	1.08	1.1	1.02	1.05	1	1.05	1.15	1.15	1.23

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.38	0.34	0.33	0.31	0.31	0.29	0.3	0.29	0.3	0.33	0.33	0.35

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.56	0.55	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.55	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			5.79	x1/[1/(1.2)+ 0.04]		=	6.63			(27)
Windows Type 2			9.78	x1/[1/(1.2)+ 0.04]		=	11.2			(27)
Windows Type 3			0.69	x1/[1/(1.2)+ 0.04]		=	0.79			(27)
Windows Type 4			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Rooflights			0.94	x1/[1/(1.4) + 0.04]		=	1.316			(27b)
Floor			70.41	x	0.12	=	8.449201			(28)
Walls	142.58	21.24	121.34	x	0.27	=	32.76			(29)
Roof Type1	43.53	0.94	42.59	x	0.11	=	4.68			(30)
Roof Type2	37.08	0	37.08	x	0.14	=	5.19			(30)
Total area of elements, m²			293.6							(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) = 76.07 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15742.53 (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

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can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 13.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss — (33) + (36) = — 89.16 (37)

Ventilation heat loss calculated monthly — (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	65.49	64.02	63.47	62.69	62.95	62.2	62.44	61.97	62.44	63.47	63.47	64.3	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

(39)m=	154.64	153.17	152.63	151.85	152.1	151.36	151.6	151.12	151.6	152.63	152.63	153.46	

Average = Sum(39)$_{1..12}$ /12= 152.4 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.09	1.09	1.1	1.1	1.1	

Average = Sum(40)$_{1..12}$ /12= 1.1 (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 (DER/TER)

Assumed occupancy, N — 2.92 (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 — 103.43 (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=	113.78	109.64	105.5	101.37	97.23	93.09	93.09	97.23	101.37	105.5	109.64	113.78	

Total = Sum(44)$_{1..12}$ = 1241.22 (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=	168.73	147.57	152.28	132.76	127.39	109.93	101.86	116.89	118.29	137.85	150.48	163.41	

Total = Sum(45)$_{1..12}$ = 1627.44 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.31	22.14	22.84	19.91	19.11	16.49	15.28	17.53	17.74	20.68	22.57	24.51	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 210 (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)

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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) x (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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88	(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=	195.61	171.85	179.16	158.78	154.27	135.94	128.74	143.77	144.3	164.73	176.49	190.29	(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)
FHRS	8.18	7.39	6.9	5.89	2.13	0	0	0	0	4.96	6.87	8.22	(63) (G2)

Output from water heater

(64)m=	187.44	164.46	172.26	152.89	152.14	135.94	128.74	143.77	144.3	159.77	169.62	182.06	

Output from water heater (annual) 1893.39 (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=	62.82	55.14	57.35	50.65	49.08	43.05	40.59	45.59	45.83	52.56	56.54	61.05	(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=	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	174.91	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	73.06	64.89	52.77	39.95	29.87	25.21	27.24	35.41	47.53	60.35	70.44	75.09	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	460.11	464.88	452.85	427.24	394.9	364.52	344.21	339.44	351.47	377.09	409.42	439.81	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	55.41	(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=	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	(71)

Water heating gains (Table 5)

(72)m=	84.44	82.05	77.09	70.34	65.96	59.8	54.56	61.27	63.66	70.64	78.52	82.06	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	734.32	728.53	699.42	654.24	607.44	566.24	542.73	552.84	579.37	624.79	675.09	713.67	(73)

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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	5.79	x	14.24	x	0.72	x	0.7	=	28.81	(74)
North	0.9x 0.77	x	5.79	x	23.27	x	0.72	x	0.7	=	47.06	(74)
North	0.9x 0.77	x	5.79	x	39.95	x	0.72	x	0.7	=	80.79	(74)
North	0.9x 0.77	x	5.79	x	67.1	x	0.72	x	0.7	=	135.7	(74)
North	0.9x 0.77	x	5.79	x	87.09	x	0.72	x	0.7	=	176.12	(74)
North	0.9x 0.77	x	5.79	x	100.07	x	0.72	x	0.7	=	202.37	(74)
North	0.9x 0.77	x	5.79	x	92.85	x	0.72	x	0.7	=	187.78	(74)
North	0.9x 0.77	x	5.79	x	74.38	x	0.72	x	0.7	=	150.42	(74)
North	0.9x 0.77	x	5.79	x	51.63	x	0.72	x	0.7	=	104.41	(74)
North	0.9x 0.77	x	5.79	x	30.09	x	0.72	x	0.7	=	60.84	(74)
North	0.9x 0.77	x	5.79	x	16.99	x	0.72	x	0.7	=	34.36	(74)
North	0.9x 0.77	x	5.79	x	11.39	x	0.72	x	0.7	=	23.04	(74)
East	0.9x 0.77	x	0.69	x	26.63	x	0.72	x	0.7	=	6.42	(76)
East	0.9x 0.77	x	0.69	x	43.95	x	0.72	x	0.7	=	10.59	(76)
East	0.9x 0.77	x	0.69	x	71.91	x	0.72	x	0.7	=	17.33	(76)
East	0.9x 0.77	x	0.69	x	108.59	x	0.72	x	0.7	=	26.17	(76)
East	0.9x 0.77	x	0.69	x	128.14	x	0.72	x	0.7	=	30.88	(76)
East	0.9x 0.77	x	0.69	x	141.01	x	0.72	x	0.7	=	33.98	(76)
East	0.9x 0.77	x	0.69	x	133.32	x	0.72	x	0.7	=	32.13	(76)
East	0.9x 0.77	x	0.69	x	115.5	x	0.72	x	0.7	=	27.83	(76)
East	0.9x 0.77	x	0.69	x	89.42	x	0.72	x	0.7	=	21.55	(76)
East	0.9x 0.77	x	0.69	x	56.26	x	0.72	x	0.7	=	13.56	(76)
East	0.9x 0.77	x	0.69	x	31.99	x	0.72	x	0.7	=	7.71	(76)
East	0.9x 0.77	x	0.69	x	21.09	x	0.72	x	0.7	=	5.08	(76)
South	0.9x 0.77	x	9.78	x	59.74	x	0.72	x	0.7	=	204.05	(78)
South	0.9x 0.77	x	9.78	x	82.27	x	0.72	x	0.7	=	281.03	(78)
South	0.9x 0.77	x	9.78	x	104.17	x	0.72	x	0.7	=	355.82	(78)
South	0.9x 0.77	x	9.78	x	123.04	x	0.72	x	0.7	=	420.28	(78)
South	0.9x 0.77	x	9.78	x	125.05	x	0.72	x	0.7	=	427.14	(78)
South	0.9x 0.77	x	9.78	x	130.26	x	0.72	x	0.7	=	444.95	(78)
South	0.9x 0.77	x	9.78	x	126	x	0.72	x	0.7	=	430.4	(78)
South	0.9x 0.77	x	9.78	x	122	x	0.72	x	0.7	=	416.72	(78)
South	0.9x 0.77	x	9.78	x	116.65	x	0.72	x	0.7	=	398.47	(78)
South	0.9x 0.77	x	9.78	x	95.67	x	0.72	x	0.7	=	326.8	(78)
South	0.9x 0.77	x	9.78	x	68.13	x	0.72	x	0.7	=	232.72	(78)
South	0.9x 0.77	x	9.78	x	49.76	x	0.72	x	0.7	=	169.96	(78)

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West	0.9x	0.77	x	0.93	x	26.63	x	0.72	x	0.7	=	8.65	(80)
West	0.9x	0.77	x	0.93	x	43.95	x	0.72	x	0.7	=	14.28	(80)
West	0.9x	0.77	x	0.93	x	71.91	x	0.72	x	0.7	=	23.36	(80)
West	0.9x	0.77	x	0.93	x	108.59	x	0.72	x	0.7	=	35.27	(80)
West	0.9x	0.77	x	0.93	x	128.14	x	0.72	x	0.7	=	41.62	(80)
West	0.9x	0.77	x	0.93	x	141.01	x	0.72	x	0.7	=	45.8	(80)
West	0.9x	0.77	x	0.93	x	133.32	x	0.72	x	0.7	=	43.3	(80)
West	0.9x	0.77	x	0.93	x	115.5	x	0.72	x	0.7	=	37.52	(80)
West	0.9x	0.77	x	0.93	x	89.42	x	0.72	x	0.7	=	29.05	(80)
West	0.9x	0.77	x	0.93	x	56.26	x	0.72	x	0.7	=	18.28	(80)
West	0.9x	0.77	x	0.93	x	31.99	x	0.72	x	0.7	=	10.39	(80)
West	0.9x	0.77	x	0.93	x	21.09	x	0.72	x	0.7	=	6.85	(80)
Rooflights	0.9x	1	x	0.94	x	35.42	x	0.63	x	0.7	=	13.22	(82)
Rooflights	0.9x	1	x	0.94	x	59.83	x	0.63	x	0.7	=	22.32	(82)
Rooflights	0.9x	1	x	0.94	x	101.31	x	0.63	x	0.7	=	37.8	(82)
Rooflights	0.9x	1	x	0.94	x	158.55	x	0.63	x	0.7	=	59.15	(82)
Rooflights	0.9x	1	x	0.94	x	191.82	x	0.63	x	0.7	=	71.57	(82)
Rooflights	0.9x	1	x	0.94	x	213.31	x	0.63	x	0.7	=	79.58	(82)
Rooflights	0.9x	1	x	0.94	x	200.77	x	0.63	x	0.7	=	74.9	(82)
Rooflights	0.9x	1	x	0.94	x	170.54	x	0.63	x	0.7	=	63.63	(82)
Rooflights	0.9x	1	x	0.94	x	127.85	x	0.63	x	0.7	=	47.7	(82)
Rooflights	0.9x	1	x	0.94	x	77.56	x	0.63	x	0.7	=	28.94	(82)
Rooflights	0.9x	1	x	0.94	x	42.83	x	0.63	x	0.7	=	15.98	(82)
Rooflights	0.9x	1	x	0.94	x	27.87	x	0.63	x	0.7	=	10.4	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	261.14	375.27	515.1	676.57	747.34	806.68	768.51	696.12	601.18	448.41	301.15	215.33	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	995.46	1103.81	1214.52	1330.81	1354.78	1372.92	1311.23	1248.95	1180.55	1073.2	976.24	929	(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	0.99	0.97	0.93	0.81	0.6	0.44	0.43	0.71	0.92	0.98	0.99	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	20.06	20.17	20.39	20.67	20.89	20.98	21	21	20.96	20.76	20.37	20.04	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.99	20	20	20.01	20.01	20.01	20.01	20.01	20.01	20	20	20	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	0.99	0.98	0.96	0.9	0.75	0.5	0.32	0.32	0.61	0.88	0.98	0.99	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

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(90)m=	18.77	18.93	19.25	19.64	19.91	20	20.01	20.01	19.98	19.76	19.23	18.74	(90)

fLA = Living area ÷ (4) = 0.25 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.1	19.24	19.54	19.9	20.16	20.25	20.26	20.26	20.23	20.01	19.52	19.07	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.95	19.09	19.39	19.75	20.01	20.1	20.11	20.11	20.08	19.86	19.37	18.92	(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=	0.99	0.98	0.96	0.89	0.75	0.51	0.34	0.33	0.62	0.87	0.97	0.99	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	982.99	1081.73	1162.32	1186.12	1011.24	700.3	440.09	409.01	727.26	936.67	948	919.92	(95)
Monthly average external temperature from Table 8													
(96)m=	5.7	5.9	7.4	9.7	12.7	15.4	17.2	17.4	15.1	12.2	8.7	5.8	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]													
(97)m=	2049.04	2020.91	1830.13	1526.22	1111.1	711.33	441.06	409.79	755.08	1169.1	1628.92	2013.92	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	793.15	631.13	496.85	244.87	74.3	0	0	0	0	172.93	490.27	813.94	

Total per year (kWh/year) = Sum(98)$_{1,5,9,...12}$ = 3717.43 (98)

Space heating requirement in kWh/m²/year 26.74 (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 89.9 (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)													
	793.15	631.13	496.85	244.87	74.3	0	0	0	0	172.93	490.27	813.94	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	882.25	702.04	552.67	272.38	82.65	0	0	0	0	192.35	545.35	905.38	

Total (kWh/year) =Sum(211)$_{1,5,10,...12}$= 4135.07 (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)													
	187.44	164.46	172.26	152.89	152.14	135.94	128.74	143.77	144.3	159.77	169.62	182.06	

Efficiency of water heater 87.3 (216)

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(217)m=	89.39	89.35	89.22	88.88	88.14	87.3	87.3	87.3	87.3	88.63	89.22	89.41	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	209.68	184.07	193.08	172.01	172.62	155.72	147.47	164.69	165.29	180.26	190.12	203.62	

Total = Sum(219a)$_{1...12}$ = 2138.63 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		4135.07	
Water heating fuel used		2138.63	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		516.12	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		6864.82	(338)

12a. Fuel costs - individual heating systems

	Fuel kWh/year	**Fuel Price** (Table 12)	**Fuel Cost** £/year	
Space heating - main system 1	(211) x	3.74 x 0.01 =	154.65	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	19.12 x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.74 x 0.01 =	79.98	(247)
Pumps, fans and electric keep-hot	(231)	0 x 0.01 =	14.34	(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)	0 x 0.01 =	98.68	(250)
Additional standing charges (Table 12)			94	(251)
Appendix Q items: repeat lines (253) and (254) as needed				
Total energy cost	(245)...(247) + (250)...(254) =		441.66	(255)

13a. 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)		86.74 (258)

14a. 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 =	893.18	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.216 =	461.94	(264)

EPC Costs WorkSheet: New dwelling as built

Space and water heating	(261) + (262) + (263) + (264) =			1355.12	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	267.87	(268)
Total CO2, kg/year	sum of (265) ..(271) =			1661.91	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =			11.96	(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	=	5044.79	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2609.13	(264)
Space and water heating	(261) + (262) + (263) + (264) =			7653.92	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1584.5	(268)
'Total Primary Energy	sum of (265)...(271) =			9468.66	(272)
Primary energy kWh/m²/year	(272) ÷ (4) =			68.12	(273)

i-Therm Limited
Matt Haskell
[redacted]

TFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.14

Property Address: Plot 9

Address : 9 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.41	(1a) x	2.4	(2a) =	168.98	(3a)
First floor	68.59	(1b) x	2.6	(2b) =	178.33	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		347.32	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.12 (8)

If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)

Number of storeys in the dwelling (ns)		0 (9)
Additional infiltration	[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0 (12)
If no draught lobby, enter 0.05, else enter 0		0 (13)
Percentage of windows and doors draught stripped		0 (14)
Window infiltration	0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate	(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.37 (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) =	0.31 (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

[redacted]

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.4	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			5.79	x1/[1/(1.4)+ 0.04]		=	7.68			(27)
Windows Type 2			9.78	x1/[1/(1.4)+ 0.04]		=	12.97			(27)
Windows Type 3			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 4			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Rooflights			0.94	x1/[1/(1.7) + 0.04]		=	1.598			(27b)
Floor			70.41	x	0.13	=	9.1533			(28)
Walls	142.58	21.24	121.34	x	0.18	=	21.84			(29)
Roof Type1	43.53	0.94	42.59	x	0.13	=	5.54			(30)
Roof Type2	37.08	0	37.08	x	0.13	=	4.82			(30)
Total area of elements, m²			293.6							(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) = 70.08 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15742.53 (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

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can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 12.37 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss — (33) + (36) = — 82.44 (37)

Ventilation heat loss calculated monthly — (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	66.28	65.93	65.59	63.99	63.69	62.29	62.29	62.03	62.83	63.69	64.3	64.93	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

(39)m=	148.73	148.38	148.04	146.43	146.13	144.73	144.73	144.48	145.27	146.13	146.74	147.37	

Average = Sum(39)$_{1..12}$ /12= 146.43 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	1.07	1.07	1.07	1.05	1.05	1.04	1.04	1.04	1.05	1.05	1.06	1.06	

Average = Sum(40)$_{1..12}$ /12= 1.05 (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 — 2.92 (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 — 103.43 (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=	113.78	109.64	105.5	101.37	97.23	93.09	93.09	97.23	101.37	105.5	109.64	113.78	

Total = Sum(44)$_{1..12}$ = 1241.22 (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=	168.73	147.57	152.28	132.76	127.39	109.93	101.86	116.89	118.29	137.85	150.48	163.41	

Total = Sum(45)$_{1..12}$ = 1627.44 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(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)

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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) x (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=	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=	143.42	125.44	129.44	112.85	108.28	93.44	86.58	99.36	100.54	117.17	127.9	138.9	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	143.42	125.44	129.44	112.85	108.28	93.44	86.58	99.36	100.54	117.17	127.9	138.9	

Output from water heater (annual) 1383.32 (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=	35.86	31.36	32.36	28.21	27.07	23.36	21.65	24.84	25.14	29.29	31.98	34.72	(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=	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.22	25.96	21.11	15.98	11.95	10.09	10.9	14.17	19.01	24.14	28.18	30.04	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.27	311.47	303.41	286.25	264.59	244.23	230.62	227.43	235.49	252.65	274.31	294.67	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	(71)

Water heating gains (Table 5)

(72)m=	48.19	46.67	43.49	39.18	36.38	32.44	29.09	33.39	34.91	39.37	44.41	46.67	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	452.42	450.82	434.74	408.14	379.64	353.48	337.34	341.7	356.14	382.89	413.63	438.11	(73)

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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	5.79		10.63		0.63		0.7	=	18.82	(74)
North	0.9x	0.77	5.79		20.32		0.63		0.7	=	35.96	(74)
North	0.9x	0.77	5.79		34.53		0.63		0.7	=	61.1	(74)
North	0.9x	0.77	5.79		55.46		0.63		0.7	=	98.14	(74)
North	0.9x	0.77	5.79		74.72		0.63		0.7	=	132.21	(74)
North	0.9x	0.77	5.79		79.99		0.63		0.7	=	141.53	(74)
North	0.9x	0.77	5.79		74.68		0.63		0.7	=	132.14	(74)
North	0.9x	0.77	5.79		59.25		0.63		0.7	=	104.84	(74)
North	0.9x	0.77	5.79		41.52		0.63		0.7	=	73.46	(74)
North	0.9x	0.77	5.79		24.19		0.63		0.7	=	42.8	(74)
North	0.9x	0.77	5.79		13.12		0.63		0.7	=	23.21	(74)
North	0.9x	0.77	5.79		8.86		0.63		0.7	=	15.69	(74)
East	0.9x	0.77	0.69		19.64		0.63		0.7	=	4.14	(76)
East	0.9x	0.77	0.69		38.42		0.63		0.7	=	8.1	(76)
East	0.9x	0.77	0.69		63.27		0.63		0.7	=	13.34	(76)
East	0.9x	0.77	0.69		92.28		0.63		0.7	=	19.46	(76)
East	0.9x	0.77	0.69		113.09		0.63		0.7	=	23.85	(76)
East	0.9x	0.77	0.69		115.77		0.63		0.7	=	24.41	(76)
East	0.9x	0.77	0.69		110.22		0.63		0.7	=	23.24	(76)
East	0.9x	0.77	0.69		94.68		0.63		0.7	=	19.96	(76)
East	0.9x	0.77	0.69		73.59		0.63		0.7	=	15.52	(76)
East	0.9x	0.77	0.69		45.59		0.63		0.7	=	9.61	(76)
East	0.9x	0.77	0.69		24.49		0.63		0.7	=	5.16	(76)
East	0.9x	0.77	0.69		16.15		0.63		0.7	=	3.41	(76)
South	0.9x	0.77	9.78		46.75		0.63		0.7	=	139.74	(78)
South	0.9x	0.77	9.78		76.57		0.63		0.7	=	228.85	(78)
South	0.9x	0.77	9.78		97.53		0.63		0.7	=	291.52	(78)
South	0.9x	0.77	9.78		110.23		0.63		0.7	=	329.48	(78)
South	0.9x	0.77	9.78		114.87		0.63		0.7	=	343.34	(78)
South	0.9x	0.77	9.78		110.55		0.63		0.7	=	330.42	(78)
South	0.9x	0.77	9.78		108.01		0.63		0.7	=	322.84	(78)
South	0.9x	0.77	9.78		104.89		0.63		0.7	=	313.52	(78)
South	0.9x	0.77	9.78		101.89		0.63		0.7	=	304.53	(78)
South	0.9x	0.77	9.78		82.59		0.63		0.7	=	246.84	(78)
South	0.9x	0.77	9.78		55.42		0.63		0.7	=	165.64	(78)
South	0.9x	0.77	9.78		40.4		0.63		0.7	=	120.75	(78)

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West	0.9x	0.77	x	0.93	x	19.64	x	0.63	x	0.7	=	5.58	(80)
West	0.9x	0.77	x	0.93	x	38.42	x	0.63	x	0.7	=	10.92	(80)
West	0.9x	0.77	x	0.93	x	63.27	x	0.63	x	0.7	=	17.98	(80)
West	0.9x	0.77	x	0.93	x	92.28	x	0.63	x	0.7	=	26.23	(80)
West	0.9x	0.77	x	0.93	x	113.09	x	0.63	x	0.7	=	32.14	(80)
West	0.9x	0.77	x	0.93	x	115.77	x	0.63	x	0.7	=	32.9	(80)
West	0.9x	0.77	x	0.93	x	110.22	x	0.63	x	0.7	=	31.33	(80)
West	0.9x	0.77	x	0.93	x	94.68	x	0.63	x	0.7	=	26.91	(80)
West	0.9x	0.77	x	0.93	x	73.59	x	0.63	x	0.7	=	20.92	(80)
West	0.9x	0.77	x	0.93	x	45.59	x	0.63	x	0.7	=	12.96	(80)
West	0.9x	0.77	x	0.93	x	24.49	x	0.63	x	0.7	=	6.96	(80)
West	0.9x	0.77	x	0.93	x	16.15	x	0.63	x	0.7	=	4.59	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	177.95	303.19	416.92	523.17	594.25	594.19	571.05	516.98	453.35	335.47	213.11	152.33	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	630.37	754.01	851.66	931.32	973.9	947.67	908.4	858.69	809.48	718.35	626.74	590.44	(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=	1	1	1	0.98	0.95	0.84	0.67	0.72	0.92	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.73	19.88	20.11	20.41	20.7	20.91	20.98	20.97	20.82	20.44	20.03	19.7	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.03	20.03	20.03	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.04	20.03	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.98	0.92	0.76	0.54	0.6	0.87	0.99	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.85	19	19.24	19.54	19.82	20	20.04	20.04	19.94	19.58	19.16	18.84	(90)

fLA = Living area ÷ (4) = 0.25 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.08	19.23	19.46	19.76	20.04	20.23	20.28	20.28	20.16	19.8	19.38	19.06	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.08	19.23	19.46	19.76	20.04	20.23	20.28	20.28	20.16	19.8	19.38	19.06	(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=	1	1	0.99	0.98	0.92	0.77	0.57	0.63	0.88	0.98	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	629.79	752.08	845.46	909.11	897.6	734.31	520.33	539.84	710.5	706.83	625.35	590.06	(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=	2197.65	2125.71	1918.26	1590.97	1219.25	815.04	532.78	560.05	880.59	1344.25	1802.32	2189.54	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1166.49	923.08	798.16	490.94	239.31	0	0	0	0	474.24	847.42	1190.01	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 6129.65 (98)

Space heating requirement in kWh/m²/year 44.1 (99)

9a. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1360.5	1071.03	1098.01	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.8	0.88	0.85	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1081.82	942.58	935.93	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1219.43	1171.34	1117.48	0	0	0	0	(103)

Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m

set (104)m to zero if (104)m < 3 × (98)m

(104)m=	0	0	0	0	0	99.07	170.2	135.07	0	0	0	0	

Total = Sum(104)$_{5,6,7,8}$ = 404.35 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	

Total = Sum(104)$_{5,6,7,8}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	24.77	42.55	33.77	0	0	0	0	

Total = Sum(107)$_{5,6,7,8}$ = 101.09 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 0.73 (108)

i-Therm Limited
Matt Haskell
[redacted]

TFEE WorkSheet: New dwelling as built

9a. Fabric Energy Efficiency (calculated only under special conditions - see section 1.8)			
Fabric Energy Efficiency	(99) + (108) =	44.83	(109)
Target Fabric Energy Efficiency (TFEE)		51.55	(109)

i-Therm Limited
Matt Haskell
[redacted]

DFEE WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.14

Property Address: Plot 9

Address : 9 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.41 (1a)	x	2.4 (2a)	=	168.98	(3a)
First floor	68.59 (1b)	x	2.6 (2b)	=	178.33	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139 (4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =		347.32	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.12 (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		3.82999992370605 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.31 (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) =	0.26 (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

DFEE WorkSheet: New dwelling as built

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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.33	0.33	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			5.79	x1/[1/(1.2)+ 0.04]		=	6.63			(27)
Windows Type 2			9.78	x1/[1/(1.2)+ 0.04]		=	11.2			(27)
Windows Type 3			0.69	x1/[1/(1.2)+ 0.04]		=	0.79			(27)
Windows Type 4			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Rooflights			0.94	x1/[1/(1.4) + 0.04]		=	1.316			(27b)
Floor			70.41	x	0.12	=	8.449201			(28)
Walls	142.58	21.24	121.34	x	0.27	=	32.76			(29)
Roof Type1	43.53	0.94	42.59	x	0.11	=	4.68			(30)
Roof Type2	37.08	0	37.08	x	0.14	=	5.19			(30)
Total area of elements, m²			293.6							(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) = 76.07 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15742.53 (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

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can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 13.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 89.16 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	63.64	63.39	63.15	62.02	61.81	60.82	60.82	60.64	61.2	61.81	62.24	62.68	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	152.79	152.55	152.31	151.18	150.96	149.98	149.98	149.8	150.36	150.96	151.39	151.84	

Average = Sum(39)$_{1..12}$ /12= 151.17 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.1	1.1	1.1	1.09	1.09	1.08	1.08	1.08	1.08	1.09	1.09	1.09	

Average = Sum(40)$_{1..12}$ /12= 1.09 (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 — 2.92 (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 — 103.43 (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=	113.78	109.64	105.5	101.37	97.23	93.09	93.09	97.23	101.37	105.5	109.64	113.78	

Total = Sum(44)$_{1..12}$ = 1241.22 (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=	168.73	147.57	152.28	132.76	127.39	109.93	101.86	116.89	118.29	137.85	150.48	163.41	

Total = Sum(45)$_{1..12}$ = 1627.44 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	0	0	0	0	0	0	0	0	0	0	0	0	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 210 (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)

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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=	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=	143.42	125.44	129.44	112.85	108.28	93.44	86.58	99.36	100.54	117.17	127.9	138.9	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	143.42	125.44	129.44	112.85	108.28	93.44	86.58	99.36	100.54	117.17	127.9	138.9	

Output from water heater (annual)	1383.32	(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=	35.86	31.36	32.36	28.21	27.07	23.36	21.65	24.84	25.14	29.29	31.98	34.72	(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=	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.22	25.96	21.11	15.98	11.95	10.09	10.9	14.17	19.01	24.14	28.18	30.04	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.27	311.47	303.41	286.25	264.59	244.23	230.62	227.43	235.49	252.65	274.31	294.67	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	(71)

Water heating gains (Table 5)

(72)m=	48.19	46.67	43.49	39.18	36.38	32.44	29.09	33.39	34.91	39.37	44.41	46.67	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	452.42	450.82	434.74	408.14	379.64	353.48	337.34	341.7	356.14	382.89	413.63	438.11	(73)

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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	5.79		10.63		0.72		0.7	=	21.5	(74)
North	0.9x	0.77	5.79		20.32		0.72		0.7	=	41.09	(74)
North	0.9x	0.77	5.79		34.53		0.72		0.7	=	69.83	(74)
North	0.9x	0.77	5.79		55.46		0.72		0.7	=	112.16	(74)
North	0.9x	0.77	5.79		74.72		0.72		0.7	=	151.1	(74)
North	0.9x	0.77	5.79		79.99		0.72		0.7	=	161.75	(74)
North	0.9x	0.77	5.79		74.68		0.72		0.7	=	151.02	(74)
North	0.9x	0.77	5.79		59.25		0.72		0.7	=	119.81	(74)
North	0.9x	0.77	5.79		41.52		0.72		0.7	=	83.96	(74)
North	0.9x	0.77	5.79		24.19		0.72		0.7	=	48.92	(74)
North	0.9x	0.77	5.79		13.12		0.72		0.7	=	26.53	(74)
North	0.9x	0.77	5.79		8.86		0.72		0.7	=	17.93	(74)
East	0.9x	0.77	0.69		19.64		0.72		0.7	=	4.73	(76)
East	0.9x	0.77	0.69		38.42		0.72		0.7	=	9.26	(76)
East	0.9x	0.77	0.69		63.27		0.72		0.7	=	15.25	(76)
East	0.9x	0.77	0.69		92.28		0.72		0.7	=	22.24	(76)
East	0.9x	0.77	0.69		113.09		0.72		0.7	=	27.26	(76)
East	0.9x	0.77	0.69		115.77		0.72		0.7	=	27.9	(76)
East	0.9x	0.77	0.69		110.22		0.72		0.7	=	26.56	(76)
East	0.9x	0.77	0.69		94.68		0.72		0.7	=	22.82	(76)
East	0.9x	0.77	0.69		73.59		0.72		0.7	=	17.73	(76)
East	0.9x	0.77	0.69		45.59		0.72		0.7	=	10.99	(76)
East	0.9x	0.77	0.69		24.49		0.72		0.7	=	5.9	(76)
East	0.9x	0.77	0.69		16.15		0.72		0.7	=	3.89	(76)
South	0.9x	0.77	9.78		46.75		0.72		0.7	=	159.7	(78)
South	0.9x	0.77	9.78		76.57		0.72		0.7	=	261.55	(78)
South	0.9x	0.77	9.78		97.53		0.72		0.7	=	333.16	(78)
South	0.9x	0.77	9.78		110.23		0.72		0.7	=	376.55	(78)
South	0.9x	0.77	9.78		114.87		0.72		0.7	=	392.39	(78)
South	0.9x	0.77	9.78		110.55		0.72		0.7	=	377.62	(78)
South	0.9x	0.77	9.78		108.01		0.72		0.7	=	368.96	(78)
South	0.9x	0.77	9.78		104.89		0.72		0.7	=	358.31	(78)
South	0.9x	0.77	9.78		101.89		0.72		0.7	=	348.03	(78)
South	0.9x	0.77	9.78		82.59		0.72		0.7	=	282.1	(78)
South	0.9x	0.77	9.78		55.42		0.72		0.7	=	189.3	(78)
South	0.9x	0.77	9.78		40.4		0.72		0.7	=	138	(78)

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West	0.9x	0.77	x	0.93	x	19.64	x	0.72	x	0.7	=	6.38	(80)
West	0.9x	0.77	x	0.93	x	38.42	x	0.72	x	0.7	=	12.48	(80)
West	0.9x	0.77	x	0.93	x	63.27	x	0.72	x	0.7	=	20.55	(80)
West	0.9x	0.77	x	0.93	x	92.28	x	0.72	x	0.7	=	29.97	(80)
West	0.9x	0.77	x	0.93	x	113.09	x	0.72	x	0.7	=	36.74	(80)
West	0.9x	0.77	x	0.93	x	115.77	x	0.72	x	0.7	=	37.6	(80)
West	0.9x	0.77	x	0.93	x	110.22	x	0.72	x	0.7	=	35.8	(80)
West	0.9x	0.77	x	0.93	x	94.68	x	0.72	x	0.7	=	30.75	(80)
West	0.9x	0.77	x	0.93	x	73.59	x	0.72	x	0.7	=	23.9	(80)
West	0.9x	0.77	x	0.93	x	45.59	x	0.72	x	0.7	=	14.81	(80)
West	0.9x	0.77	x	0.93	x	24.49	x	0.72	x	0.7	=	7.95	(80)
West	0.9x	0.77	x	0.93	x	16.15	x	0.72	x	0.7	=	5.25	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	201.99	343.73	471.77	590.79	670.19	669.79	643.85	583.44	512.55	380.07	241.82	172.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	654.41	794.56	906.51	998.93	1049.83	1023.28	981.19	925.15	868.69	762.96	655.45	611.07	(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=	1	1	0.99	0.98	0.93	0.81	0.64	0.7	0.91	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.71	19.87	20.11	20.42	20.71	20.91	20.98	20.97	20.83	20.44	20.01	19.68	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20	20	20	20.01	20.01	20.02	20.02	20.02	20.02	20.01	20.01	20.01	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.97	0.91	0.73	0.51	0.57	0.85	0.98	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

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(90)m=	18.81	18.97	19.21	19.53	19.8	19.97	20.01	20.01	19.91	19.55	19.12	18.79	(90)

fLA = Living area ÷ (4) = 0.25 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	19.04	19.2	19.44	19.75	20.03	20.21	20.26	20.25	20.15	19.78	19.35	19.01	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.04	19.2	19.44	19.75	20.03	20.21	20.26	20.25	20.15	19.78	19.35	19.01	(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=	1	1	0.99	0.97	0.91	0.75	0.55	0.6	0.86	0.98	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	653.67	791.95	897.99	968.81	950.98	766.63	537.26	558.48	746.38	747.76	653.64	610.59	(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=	2252	2181.31	1971.13	1640.85	1258.23	841.77	548.73	577.31	909	1385.73	1854.12	2248.99	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1189.16	933.65	798.42	483.87	228.6	0	0	0	0	474.65	864.35	1218.97	

Total per year (kWh/year) = Sum(98)$_{1,5,9,12}$ = 6191.67 (98)

Space heating requirement in kWh/m²/year 44.54 (99)

9a. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)													
(100)m=	0	0	0	0	0	1409.79	1109.84	1138.44	0	0	0	0	(100)
Utilisation factor for loss hm													
(101)m=	0	0	0	0	0	0.81	0.89	0.86	0	0	0	0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m													
(102)m=	0	0	0	0	0	1138.9	985.86	980.07	0	0	0	0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)													
(103)m=	0	0	0	0	0	1307.8	1256.43	1195.16	0	0	0	0	(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m													
set (104)m to zero if (104)m < 3 × (98)m													
(104)m=	0	0	0	0	0	121.61	201.3	160.03	0	0	0	0	

Total = Sum(104)$_{5,6,7,8}$ = 482.94 (104)

Cooled fraction f C = cooled area ÷ (4) = 1 (105)

Intermittency factor (Table 10b)

(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0	

Total = Sum(104)$_{5,6,7,8}$ = 0 (106)

Space cooling requirement for month = (104)m × (105) × (106)m

(107)m=	0	0	0	0	0	30.4	50.33	40.01	0	0	0	0	

Total = Sum(107)$_{5,6,7,8}$ = 120.73 (107)

Space cooling requirement in kWh/m²/year (107) ÷ (4) = 0.87 (108)

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9d Fabric Energy Efficiency (calculated only under special conditions, see section 11)

Fabric Energy Efficiency	(99) + (108) =	45.41	(109)

i-Therm Limited
Matt Haskell
[redacted]

DER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.14

Property Address: Plot 9

Address : 9 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.41	(1a) x	2.4	(2a) =	168.98	(3a)
First floor	68.59	(1b) x	2.6	(2b) =	178.33	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139	(4)				
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =		347.32	(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							5	x 10 =	50	(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) =	50	÷ (5) =	0.14 (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		3.82999992370605 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)		0.34 (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) =	0.29 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.36	0.36	0.35	0.31	0.31	0.27	0.27	0.26	0.29	0.31	0.32	0.34

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56	(25)

3. Heat losses and heat loss parameter

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1	=	1.95			(26)
Windows Type 1			5.79	x1/[1/(1.2)+ 0.04]		=	6.63			(27)
Windows Type 2			9.78	x1/[1/(1.2)+ 0.04]		=	11.2			(27)
Windows Type 3			0.69	x1/[1/(1.2)+ 0.04]		=	0.79			(27)
Windows Type 4			0.93	x1/[1/(1.2)+ 0.04]		=	1.06			(27)
Rooflights			0.94	x1/[1/(1.4) + 0.04]		=	1.316			(27b)
Floor			70.41	x	0.12	=	8.449201			(28)
Walls	142.58	21.24	121.34	x	0.27	=	32.76			(29)
Roof Type1	43.53	0.94	42.59	x	0.11	=	4.68			(30)
Roof Type2	37.08	0	37.08	x	0.14	=	5.19			(30)
Total area of elements, m²			293.6							(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) = 76.07 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15742.53 (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

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can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 13.09 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss — (33) + (36) = — 89.16 (37)

Ventilation heat loss calculated monthly — (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	64.88	64.59	64.3	62.95	62.69	61.51	61.51	61.29	61.97	62.69	63.2	63.74	(38)

Heat transfer coefficient, W/K — (39)m = (37) + (38)m

(39)m=	154.04	153.74	153.46	152.1	151.85	150.67	150.67	150.45	151.12	151.85	152.36	152.9	

Average = Sum(39)$_{1..12}$ /12= 152.1 (39)

Heat loss parameter (HLP), W/m²K — (40)m = (39)m ÷ (4)

(40)m=	1.11	1.11	1.1	1.09	1.09	1.08	1.08	1.08	1.09	1.09	1.1	1.1	

Average = Sum(40)$_{1..12}$ /12= 1.09 (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 — 2.92 (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 — 103.43 (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=	113.78	109.64	105.5	101.37	97.23	93.09	93.09	97.23	101.37	105.5	109.64	113.78	

Total = Sum(44)$_{1..12}$ = 1241.22 (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=	168.73	147.57	152.28	132.76	127.39	109.93	101.86	116.89	118.29	137.85	150.48	163.41	

Total = Sum(45)$_{1..12}$ = 1627.44 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.31	22.14	22.84	19.91	19.11	16.49	15.28	17.53	17.74	20.68	22.57	24.51	(46)

Water storage loss:

Storage volume (litres) including any solar or WWHRS storage within same vessel — 210 (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)

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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) x (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=	26.88	24.28	26.88	26.01	26.88	26.01	26.88	26.88	26.01	26.88	26.01	26.88 (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=	195.61	171.85	179.16	158.78	154.27	135.94	128.74	143.77	144.3	164.73	176.49	190.29 (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)
FHRS	9.02	8.29	7.84	6.58	5.73	0	0	0	0	6.56	8.05	8.98 (63) (G2)

Output from water heater

(64)m=	186.59	163.56	171.33	152.2	148.54	135.94	128.74	143.77	144.3	158.17	168.44	181.31

Output from water heater (annual) ... 1882.89 (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=	62.82	55.14	57.35	50.65	49.08	43.05	40.59	45.59	45.83	52.56	56.54	61.05 (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=	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.22	25.96	21.11	15.98	11.95	10.09	10.9	14.17	19.01	24.14	28.18	30.04 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.27	311.47	303.41	286.25	264.59	244.23	230.62	227.43	235.49	252.65	274.31	294.67 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58 (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=	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61 (71)

Water heating gains (Table 5)

(72)m=	84.44	82.05	77.09	70.34	65.96	59.8	54.56	61.27	63.66	70.64	78.52	82.06 (72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	491.66	489.21	471.34	442.3	412.22	383.84	365.81	372.59	387.88	417.16	450.74	476.5 (73)

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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	5.79		10.63		0.72		0.7	=	21.5	(74)
North	0.9x	0.77	5.79		20.32		0.72		0.7	=	41.09	(74)
North	0.9x	0.77	5.79		34.53		0.72		0.7	=	69.83	(74)
North	0.9x	0.77	5.79		55.46		0.72		0.7	=	112.16	(74)
North	0.9x	0.77	5.79		74.72		0.72		0.7	=	151.1	(74)
North	0.9x	0.77	5.79		79.99		0.72		0.7	=	161.75	(74)
North	0.9x	0.77	5.79		74.68		0.72		0.7	=	151.02	(74)
North	0.9x	0.77	5.79		59.25		0.72		0.7	=	119.81	(74)
North	0.9x	0.77	5.79		41.52		0.72		0.7	=	83.96	(74)
North	0.9x	0.77	5.79		24.19		0.72		0.7	=	48.92	(74)
North	0.9x	0.77	5.79		13.12		0.72		0.7	=	26.53	(74)
North	0.9x	0.77	5.79		8.86		0.72		0.7	=	17.93	(74)
East	0.9x	0.77	0.69		19.64		0.72		0.7	=	4.73	(76)
East	0.9x	0.77	0.69		38.42		0.72		0.7	=	9.26	(76)
East	0.9x	0.77	0.69		63.27		0.72		0.7	=	15.25	(76)
East	0.9x	0.77	0.69		92.28		0.72		0.7	=	22.24	(76)
East	0.9x	0.77	0.69		113.09		0.72		0.7	=	27.26	(76)
East	0.9x	0.77	0.69		115.77		0.72		0.7	=	27.9	(76)
East	0.9x	0.77	0.69		110.22		0.72		0.7	=	26.56	(76)
East	0.9x	0.77	0.69		94.68		0.72		0.7	=	22.82	(76)
East	0.9x	0.77	0.69		73.59		0.72		0.7	=	17.73	(76)
East	0.9x	0.77	0.69		45.59		0.72		0.7	=	10.99	(76)
East	0.9x	0.77	0.69		24.49		0.72		0.7	=	5.9	(76)
East	0.9x	0.77	0.69		16.15		0.72		0.7	=	3.89	(76)
South	0.9x	0.77	9.78		46.75		0.72		0.7	=	159.7	(78)
South	0.9x	0.77	9.78		76.57		0.72		0.7	=	261.55	(78)
South	0.9x	0.77	9.78		97.53		0.72		0.7	=	333.16	(78)
South	0.9x	0.77	9.78		110.23		0.72		0.7	=	376.55	(78)
South	0.9x	0.77	9.78		114.87		0.72		0.7	=	392.39	(78)
South	0.9x	0.77	9.78		110.55		0.72		0.7	=	377.62	(78)
South	0.9x	0.77	9.78		108.01		0.72		0.7	=	368.96	(78)
South	0.9x	0.77	9.78		104.89		0.72		0.7	=	358.31	(78)
South	0.9x	0.77	9.78		101.89		0.72		0.7	=	348.03	(78)
South	0.9x	0.77	9.78		82.59		0.72		0.7	=	282.1	(78)
South	0.9x	0.77	9.78		55.42		0.72		0.7	=	189.3	(78)
South	0.9x	0.77	9.78		40.4		0.72		0.7	=	138	(78)

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West	0.9x	0.77	x	0.93	x	19.64	x	0.72	x	0.7	=	6.38	(80)
West	0.9x	0.77	x	0.93	x	38.42	x	0.72	x	0.7	=	12.48	(80)
West	0.9x	0.77	x	0.93	x	63.27	x	0.72	x	0.7	=	20.55	(80)
West	0.9x	0.77	x	0.93	x	92.28	x	0.72	x	0.7	=	29.97	(80)
West	0.9x	0.77	x	0.93	x	113.09	x	0.72	x	0.7	=	36.74	(80)
West	0.9x	0.77	x	0.93	x	115.77	x	0.72	x	0.7	=	37.6	(80)
West	0.9x	0.77	x	0.93	x	110.22	x	0.72	x	0.7	=	35.8	(80)
West	0.9x	0.77	x	0.93	x	94.68	x	0.72	x	0.7	=	30.75	(80)
West	0.9x	0.77	x	0.93	x	73.59	x	0.72	x	0.7	=	23.9	(80)
West	0.9x	0.77	x	0.93	x	45.59	x	0.72	x	0.7	=	14.81	(80)
West	0.9x	0.77	x	0.93	x	24.49	x	0.72	x	0.7	=	7.95	(80)
West	0.9x	0.77	x	0.93	x	16.15	x	0.72	x	0.7	=	5.25	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	201.99	343.73	471.77	590.79	670.19	669.79	643.85	583.44	512.55	380.07	241.82	172.97	(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	693.65	832.94	943.1	1033.09	1082.41	1053.63	1009.65	956.03	900.43	797.22	692.56	649.46	(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=	1	1	0.99	0.98	0.93	0.8	0.63	0.68	0.89	0.99	1	1	(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.72	19.88	20.12	20.43	20.72	20.92	20.98	20.97	20.84	20.46	20.03	19.69	(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	19.99	20	20	20.01	20.01	20.01	20.01	20.02	20.01	20.01	20	20	(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.97	0.9	0.72	0.5	0.56	0.84	0.98	1	1	(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

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(90)m=	18.27	18.51	18.86	19.32	19.72	19.95	20.01	20	19.87	19.36	18.73	18.24	(90)

fLA = Living area ÷ (4) = 0.25 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.64	18.86	19.18	19.6	19.97	20.2	20.25	20.25	20.12	19.64	19.06	18.61	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.49	18.71	19.03	19.45	19.82	20.05	20.1	20.1	19.97	19.49	18.91	18.46	(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=	1	1	0.99	0.96	0.89	0.72	0.51	0.57	0.83	0.97	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	692.41	828.97	931.09	993.82	962.37	759.48	519.63	542.75	750.67	775.72	689.64	648.63	(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=	2186.15	2122.85	1923.31	1604.88	1233.29	821.03	528.05	556.61	886.68	1349.69	1799.28	2179.74	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1111.34	869.49	738.21	439.96	201.56	0	0	0	0	427.04	798.94	1139.15	

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 5725.68 (98)

Space heating requirement in kWh/m²/year 41.19 (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 89.9 (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)													
	1111.34	869.49	738.21	439.96	201.56	0	0	0	0	427.04	798.94	1139.15	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1236.19	967.17	821.15	489.39	224.2	0	0	0	0	475.02	888.69	1267.13	

Total (kWh/year) =Sum(211)$_{1..5,10..12}$= 6368.94 (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)

	186.59	163.56	171.33	152.2	148.54	135.94	128.74	143.77	144.3	158.17	168.44	181.31

Efficiency of water heater 87.3 (216)

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(217)m=	89.52	89.48	89.4	89.22	88.78	87.3	87.3	87.3	87.3	89.18	89.44	89.53	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	208.44	182.8	191.64	170.59	167.32	155.72	147.47	164.69	165.29	177.35	188.33	202.5	

Total = Sum(219a)$_{1...12}$ = 2122.15 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		6368.94	
Water heating fuel used		2122.15	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		516.12	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		9082.21	(338)

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	=	1375.69	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	458.38	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1834.08	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	267.87	(268)
Total CO2, kg/year	sum of (265)...(271) =				2140.87	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =				15.4	(273)
EI rating (section 14)					84	(274)

i-Therm Limited
Matt Haskell
[redacted]

TER WorkSheet: New dwelling as built

User Details

Assessor Name:	Matthew Haskell	**Stroma Number:**	STRO006210
Software Name:	Stroma FSAP 2012	**Software Version:**	Version: 1.0.5.14

Property Address: Plot 9

Address : 9 Langford Close , CLIMPING, BN17 5FG

1. Overall dwelling dimensions

	Area(m²)		Av. Height(m)		Volume(m³)	
Ground floor	70.41	(1a) x	2.4	(2a) =	168.98	(3a)
First floor	68.59	(1b) x	2.6	(2b) =	178.33	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+.....(1n)	139	(4)				
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)+.....(3n) =	347.32	(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							4	x 10 =	40	(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) =	40	÷ (5) =	0.12 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)			
Number of storeys in the dwelling (ns)			0 (9)
Additional infiltration		[(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35			
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0 (12)
If no draught lobby, enter 0.05, else enter 0			0 (13)
Percentage of windows and doors draught stripped			0 (14)
Window infiltration		0.25 - [0.2 x (14) ÷ 100] =	0 (15)
Infiltration rate		(8) + (10) + (11) + (12) + (13) + (15) =	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area			5 (17)
If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)			0.37 (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) =	0.31 (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

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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

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m

0.4	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36

Calculate effective air change rate for the applicable case

If mechanical ventilation: 0 (23a)

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) 0 (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c)

a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (23c) ÷ 100]

(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24a)

b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)

(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24b)

c) If whole house extract ventilation or positive input ventilation from outside
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)

(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)

d) If natural ventilation or whole house positive input ventilation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]

(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(24d)

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	(25)

3. Heat losses and heat loss parameter:

ELEMENT	Gross area (m²)	Openings m²	Net Area A ,m²		U-value W/m2K		A X U (W/K)	k-value kJ/m²·K	A X k kJ/K	
Doors Type 1			2.1	x	1	=	2.1			(26)
Doors Type 2			1.95	x	1.2	=	2.34			(26)
Windows Type 1			5.79	x1/[1/(1.4)+ 0.04]		=	7.68			(27)
Windows Type 2			9.78	x1/[1/(1.4)+ 0.04]		=	12.97			(27)
Windows Type 3			0.69	x1/[1/(1.4)+ 0.04]		=	0.91			(27)
Windows Type 4			0.93	x1/[1/(1.4)+ 0.04]		=	1.23			(27)
Rooflights			0.94	x1/[1/(1.7) + 0.04]		=	1.598			(27b)
Floor			70.41	x	0.13	=	9.1533			(28)
Walls	142.58	21.24	121.34	x	0.18	=	21.84			(29)
Roof Type1	43.53	0.94	42.59	x	0.13	=	5.54			(30)
Roof Type2	37.08	0	37.08	x	0.13	=	4.82			(30)
Total area of elements, m²			293.6							(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) = 70.08 (33)

Heat capacity Cm = S(A x k) ((28)...(30) + (32) + (32a)...(32e) = 15742.53 (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

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can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K — 12.37 (36)

if details of thermal bridging are not known (36) = 0.05 x (31)

Total fabric heat loss (33) + (36) = 82.44 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m=	66.28	65.93	65.59	63.99	63.69	62.29	62.29	62.03	62.83	63.69	64.3	64.93	(38)

Heat transfer coefficient, W/K (39)m = (37) + (38)m

(39)m=	148.73	148.38	148.04	146.43	146.13	144.73	144.73	144.48	145.27	146.13	146.74	147.37	

Average = Sum(39)$_{1..12}$ /12= 146.43 (39)

Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4)

(40)m=	1.07	1.07	1.07	1.05	1.05	1.04	1.04	1.04	1.05	1.05	1.06	1.06	

Average = Sum(40)$_{1..12}$ /12= 1.05 (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 — 2.92 (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 — 103.43 (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=	113.78	109.64	105.5	101.37	97.23	93.09	93.09	97.23	101.37	105.5	109.64	113.78	

Total = Sum(44)$_{1..12}$ = 1241.22 (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=	168.73	147.57	152.28	132.76	127.39	109.93	101.86	116.89	118.29	137.85	150.48	163.41	

Total = Sum(45)$_{1..12}$ = 1627.44 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

(46)m=	25.31	22.14	22.84	19.91	19.11	16.49	15.28	17.53	17.74	20.68	22.57	24.51	(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)

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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	50.96	49.32	49.55	45.91	47.44	49.55	49.32	50.96	49.32	50.96	(61)

Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

(62)m=	219.69	193.6	203.24	182.08	176.94	155.84	149.3	166.44	167.6	188.81	199.79	214.37	(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)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0	(63) (G2)

Output from water heater

(64)m=	219.69	193.6	203.24	182.08	176.94	155.84	149.3	166.44	167.6	188.81	199.79	214.37	

Output from water heater (annual) ... 2217.68 (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=	68.84	60.57	63.37	56.47	54.74	48.03	45.73	51.25	51.66	58.58	62.36	67.07	(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=	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	145.76	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

(67)m=	29.22	25.96	21.11	15.98	11.95	10.09	10.9	14.17	19.01	24.14	28.18	30.04	(67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

(68)m=	308.27	311.47	303.41	286.25	264.59	244.23	230.62	227.43	235.49	252.65	274.31	294.67	(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

(69)m=	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	37.58	(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=	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	-116.61	(71)

Water heating gains (Table 5)

(72)m=	92.53	90.14	85.18	78.43	73.58	66.71	61.46	68.89	71.75	78.73	86.61	90.15	(72)

Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

(73)m=	499.75	497.3	479.43	450.39	419.84	390.74	372.71	380.21	395.97	425.25	458.83	484.59	(73)

TER WorkSheet: New dwelling as built

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	5.79		10.63		0.63		0.7	=	18.82	(74)
North	0.9x	0.77	5.79		20.32		0.63		0.7	=	35.96	(74)
North	0.9x	0.77	5.79		34.53		0.63		0.7	=	61.1	(74)
North	0.9x	0.77	5.79		55.46		0.63		0.7	=	98.14	(74)
North	0.9x	0.77	5.79		74.72		0.63		0.7	=	132.21	(74)
North	0.9x	0.77	5.79		79.99		0.63		0.7	=	141.53	(74)
North	0.9x	0.77	5.79		74.68		0.63		0.7	=	132.14	(74)
North	0.9x	0.77	5.79		59.25		0.63		0.7	=	104.84	(74)
North	0.9x	0.77	5.79		41.52		0.63		0.7	=	73.46	(74)
North	0.9x	0.77	5.79		24.19		0.63		0.7	=	42.8	(74)
North	0.9x	0.77	5.79		13.12		0.63		0.7	=	23.21	(74)
North	0.9x	0.77	5.79		8.86		0.63		0.7	=	15.69	(74)
East	0.9x	0.77	0.69		19.64		0.63		0.7	=	4.14	(76)
East	0.9x	0.77	0.69		38.42		0.63		0.7	=	8.1	(76)
East	0.9x	0.77	0.69		63.27		0.63		0.7	=	13.34	(76)
East	0.9x	0.77	0.69		92.28		0.63		0.7	=	19.46	(76)
East	0.9x	0.77	0.69		113.09		0.63		0.7	=	23.85	(76)
East	0.9x	0.77	0.69		115.77		0.63		0.7	=	24.41	(76)
East	0.9x	0.77	0.69		110.22		0.63		0.7	=	23.24	(76)
East	0.9x	0.77	0.69		94.68		0.63		0.7	=	19.96	(76)
East	0.9x	0.77	0.69		73.59		0.63		0.7	=	15.52	(76)
East	0.9x	0.77	0.69		45.59		0.63		0.7	=	9.61	(76)
East	0.9x	0.77	0.69		24.49		0.63		0.7	=	5.16	(76)
East	0.9x	0.77	0.69		16.15		0.63		0.7	=	3.41	(76)
South	0.9x	0.77	9.78		46.75		0.63		0.7	=	139.74	(78)
South	0.9x	0.77	9.78		76.57		0.63		0.7	=	228.85	(78)
South	0.9x	0.77	9.78		97.53		0.63		0.7	=	291.52	(78)
South	0.9x	0.77	9.78		110.23		0.63		0.7	=	329.48	(78)
South	0.9x	0.77	9.78		114.87		0.63		0.7	=	343.34	(78)
South	0.9x	0.77	9.78		110.55		0.63		0.7	=	330.42	(78)
South	0.9x	0.77	9.78		108.01		0.63		0.7	=	322.84	(78)
South	0.9x	0.77	9.78		104.89		0.63		0.7	=	313.52	(78)
South	0.9x	0.77	9.78		101.89		0.63		0.7	=	304.53	(78)
South	0.9x	0.77	9.78		82.59		0.63		0.7	=	246.84	(78)
South	0.9x	0.77	9.78		55.42		0.63		0.7	=	165.64	(78)
South	0.9x	0.77	9.78		40.4		0.63		0.7	=	120.75	(78)

TER WorkSheet: New dwelling as built

West	0.9x	0.77	x	0.93	x	19.64	x	0.63	x	0.7	=	5.58	(80)
West	0.9x	0.77	x	0.93	x	38.42	x	0.63	x	0.7	=	10.92	(80)
West	0.9x	0.77	x	0.93	x	63.27	x	0.63	x	0.7	=	17.98	(80)
West	0.9x	0.77	x	0.93	x	92.28	x	0.63	x	0.7	=	26.23	(80)
West	0.9x	0.77	x	0.93	x	113.09	x	0.63	x	0.7	=	32.14	(80)
West	0.9x	0.77	x	0.93	x	115.77	x	0.63	x	0.7	=	32.9	(80)
West	0.9x	0.77	x	0.93	x	110.22	x	0.63	x	0.7	=	31.33	(80)
West	0.9x	0.77	x	0.93	x	94.68	x	0.63	x	0.7	=	26.91	(80)
West	0.9x	0.77	x	0.93	x	73.59	x	0.63	x	0.7	=	20.92	(80)
West	0.9x	0.77	x	0.93	x	45.59	x	0.63	x	0.7	=	12.96	(80)
West	0.9x	0.77	x	0.93	x	24.49	x	0.63	x	0.7	=	6.96	(80)
West	0.9x	0.77	x	0.93	x	16.15	x	0.63	x	0.7	=	4.59	(80)
Rooflights	0.9x	1	x	0.94	x	25.93	x	0.63	x	0.7	=	9.67	(82)
Rooflights	0.9x	1	x	0.94	x	51.88	x	0.63	x	0.7	=	19.35	(82)
Rooflights	0.9x	1	x	0.94	x	88.38	x	0.63	x	0.7	=	32.97	(82)
Rooflights	0.9x	1	x	0.94	x	133.65	x	0.63	x	0.7	=	49.86	(82)
Rooflights	0.9x	1	x	0.94	x	168.1	x	0.63	x	0.7	=	62.72	(82)
Rooflights	0.9x	1	x	0.94	x	174	x	0.63	x	0.7	=	64.92	(82)
Rooflights	0.9x	1	x	0.94	x	164.87	x	0.63	x	0.7	=	61.51	(82)
Rooflights	0.9x	1	x	0.94	x	138.72	x	0.63	x	0.7	=	51.75	(82)
Rooflights	0.9x	1	x	0.94	x	104.33	x	0.63	x	0.7	=	38.92	(82)
Rooflights	0.9x	1	x	0.94	x	62.32	x	0.63	x	0.7	=	23.25	(82)
Rooflights	0.9x	1	x	0.94	x	32.54	x	0.63	x	0.7	=	12.14	(82)
Rooflights	0.9x	1	x	0.94	x	21.19	x	0.63	x	0.7	=	7.91	(82)

Solar gains in watts, calculated for each month (83)m = Sum(74)m ...(82)m

(83)m=	177.95	303.19	416.92	523.17	594.25	594.19	571.05	516.98	453.35	335.47	213.11	152.33

(83)

Total gains – internal and solar (84)m = (73)m + (83)m , watts

(84)m=	677.7	800.48	896.35	973.57	1014.09	984.93	943.77	897.19	849.32	760.71	671.94	636.92

(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=	1	1	0.99	0.98	0.94	0.82	0.65	0.7	0.91	0.99	1	1

(86)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)

(87)m=	19.76	19.91	20.14	20.44	20.72	20.92	20.98	20.97	20.84	20.47	20.06	19.74

(87)

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

(88)m=	20.03	20.03	20.03	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.04	20.03

(88)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

(89)m=	1	1	0.99	0.97	0.91	0.74	0.52	0.57	0.85	0.98	1	1

(89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

TER WorkSheet: New dwelling as built

(90)m=	18.36	18.57	18.91	19.35	19.74	19.99	20.04	20.04	19.9	19.4	18.8	18.33	(90)

fLA = Living area ÷ (4) = 0.25 (91)

Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2

(92)m=	18.71	18.91	19.22	19.63	19.99	20.22	20.28	20.28	20.14	19.67	19.12	18.69	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.71	18.91	19.22	19.63	19.99	20.22	20.28	20.28	20.14	19.67	19.12	18.69	(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=	1	1	0.99	0.97	0.91	0.75	0.55	0.61	0.86	0.98	1	1	(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m=	676.7	797.46	887.4	944.16	921.16	743.22	522.16	543.08	728.73	744.14	669.63	636.24	(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=	2143.75	2079.38	1883.46	1570.92	1211.6	813.91	532.73	559.98	877.73	1326.12	1763.91	2134.72	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m=	1091.48	861.45	741.06	451.26	216.09	0	0	0	0	432.99	787.88	1114.86	

Total per year (kWh/year) = Sum(98)$_{1..5,9..12}$ = 5697.09 (98)

Space heating requirement in kWh/m²/year 40.99 (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 93.4 (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)													
	1091.48	861.45	741.06	451.26	216.09	0	0	0	0	432.99	787.88	1114.86	
(211)m = {[(98)m x (204)] } x 100 ÷ (206)													(211)
	1168.61	922.32	793.43	483.15	231.36	0	0	0	0	463.59	843.56	1193.64	

Total (kWh/year) =Sum(211)$_{1..5,10...12}$= 6099.66 (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)

	219.69	193.6	203.24	182.08	176.94	155.84	149.3	166.44	167.6	188.81	199.79	214.37

Efficiency of water heater 80.3 (216)

TER WorkSheet: New dwelling as built

(217)m=	88.53	88.36	88.02	87.25	85.56	80.3	80.3	80.3	80.3	87.07	88.16	88.6	(217)

Fuel for water heating, kWh/month
(219)m = (64)m x 100 ÷ (217)m

(219)m=	248.14	219.1	230.91	208.7	206.81	194.07	185.93	207.27	208.72	216.84	226.63	241.94	

Total = Sum(219a)$_{1...12}$ = 2595.05 (219)

Annual totals	**kWh/year**	**kWh/year**	
Space heating fuel used, main system 1		6099.66	
Water heating fuel used		2595.05	
Electricity for pumps, fans and electric keep-hot			
central heating pump:	30		(230c)
boiler with a fan-assisted flue	45		(230e)
Total electricity for the above, kWh/year	sum of (230a)...(230g) =	75	(231)
Electricity for lighting		516.12	(232)
Total delivered energy for all uses (211)...(221) + (231) + (232)...(237b) =		9285.83	(338)

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	=	1317.53	(261)
Space heating (secondary)	(215) x		0.519	=	0	(263)
Water heating	(219) x		0.216	=	560.53	(264)
Space and water heating	(261) + (262) + (263) + (264) =				1878.06	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	267.87	(268)
Total CO2, kg/year	sum of (265)...(271) =				2184.85	(272)

TER = 15.72 (273)

i-Therm Limited
Matt Haskell
[redacted]

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 01 October 2021

Property Details: [redacted]

Dwelling type:	Detached House
Located in:	England
Region:	South East England
Cross ventilation possible:	Yes
Number of storeys:	2
Front of dwelling faces:	North
Overshading:	Average or unknown
Overhangs:	None
Thermal mass parameter:	Indicative Value Medium
Night ventilation:	True
Blinds, curtains, shutters:	
Ventilation rate during hot weather (ach):	8 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient:	916.92	**(P1)**
Transmission heat loss coefficient:	89.2	
Summer heat loss coefficient:	1006.08	**(P2)**

Overhangs

Orientation:	Ratio:	Z_overhangs:
North (Ext)	0	1
South (Ext)	0	1
East (Ext)	0	1
West (Ext)	0	1
West (Ext)	0	1

Solar shading

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North (Ext)	1	0.9	1	0.9	**(P8)**
South (Ext)	1	0.9	1	0.9	**(P8)**
East (Ext)	1	0.9	1	0.9	**(P8)**
West (Ext)	1	0.9	1	0.9	**(P8)**
West (Ext)	0.85	1	1	0.85	**(P8)**

Solar gains

Orientation		Area	Flux	g_	FF	Shading	Gains	
North (Ext)	0.9 x	5.79	86.66	0.72	0.7	0.9	204.84	
South (Ext)	0.9 x	9.78	118.4	0.72	0.7	0.9	472.72	
East (Ext)	0.9 x	0.69	124.8	0.72	0.7	0.9	35.15	
West (Ext)	0.9 x	0.93	124.8	0.72	0.7	0.9	47.38	
	1 x	0.94	187.8	0.63	0.7	0.85	59.56	
						Total	819.65	**(P3/P4)**

Internal gains

	June	July	August	
Internal gains	563.24	539.73	549.84	
Total summer gains	1426.7	1359.37	1296.93	**(P5)**
Summer gain/loss ratio	1.42	1.35	1.29	**(P6)**
Mean summer external temperature (South East England)	15.4	17.4	17.5	

SAP 2012 Overheating Assessment

Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	17.07	19	19.04 **(P7)**
Likelihood of high internal temperature	**Not significant**	**Not significant**	**Not significant**

Assessment of likelihood of high internal temperature: Not significant

Energy performance certificate (EPC)

1 Langford Close
CLIMPING
BN17 5FG

Energy rating

B

Valid until	Certificate number
1 June 2031	8459-6035-8130-2263-0226

Property type

Detached bungalow

Total floor area

116 square metres

Rules on letting this property

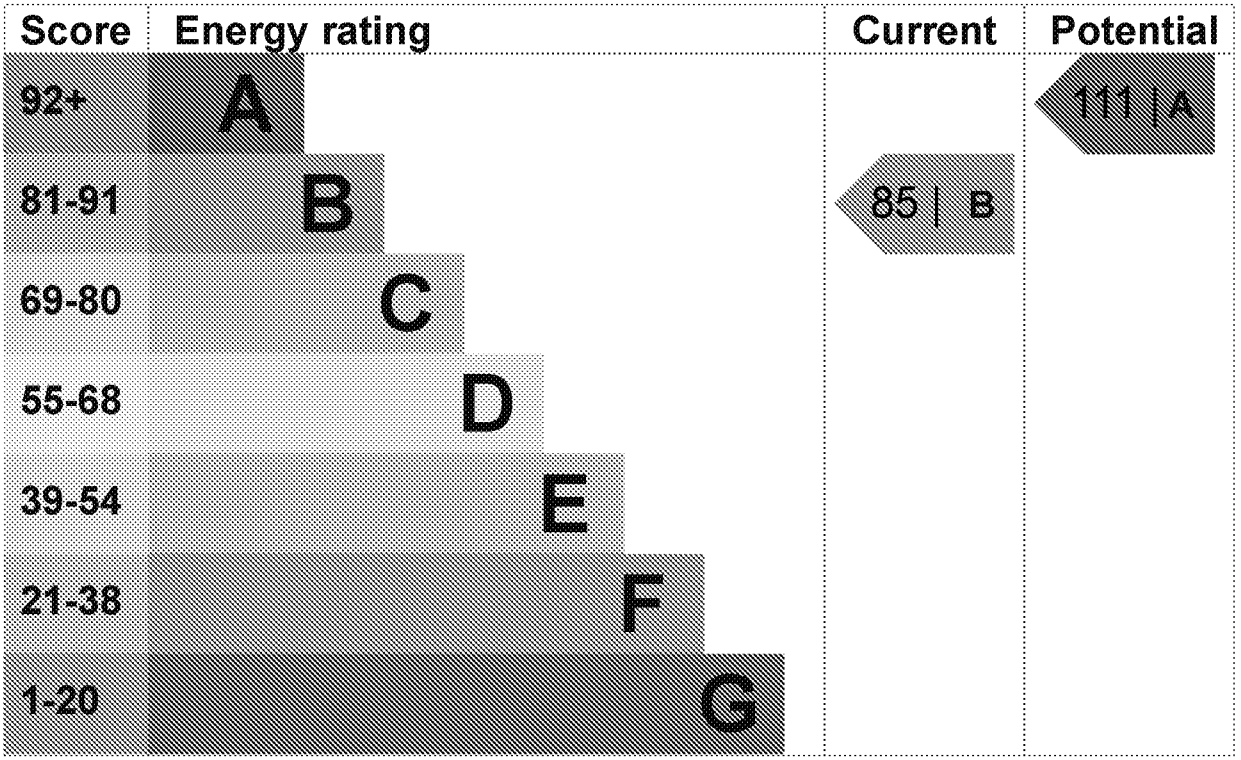
Properties can be rented if they have an energy rating from A to E.

If the property is rated F or G, it cannot be let, unless an exemption has been registered. You can read guidance for landlords on the regulations and exemptions (https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy efficiency rating for this property

This property's current energy rating is B. It has the potential to be A.

See how to improve this property's energy performance.



The graph shows this property's current and potential energy efficiency.

Properties are given a rating from A (most efficient) to G (least efficient).

Properties are also given a score. The higher the number the lower your fuel bills are likely to be.

For properties in England and Wales:

- the average energy rating is D
- the average energy score is 60

Breakdown of property's energy performance

This section shows the energy performance for features of this property. The assessment does not consider the condition of a feature and how well it is working.

Each feature is assessed as one of the following:

- very good (most efficient)
- good
- average
- poor
- very poor (least efficient)

When the description says "assumed", it means that the feature could not be inspected and an assumption has been made based on the property's age and type.

Feature	Description	Rating
Walls	Average thermal transmittance 0.27 W/m²K	Very good
Roof	Average thermal transmittance 0.11 W/m²K	Very good
Floor	Average thermal transmittance 0.12 W/m²K	Very good

Feature	Description	Rating
Windows	High performance glazing	Very good
Main heating	Boiler and radiators, mains gas	Good
Main heating control	Time and temperature zone control	Very good
Hot water	From main system	Good
Lighting	Low energy lighting in all fixed outlets	Very good
Air tightness	Air permeability 4.0 m³/h.m² (as tested)	Good
Secondary heating	None	N/A

Primary energy use

The primary energy use for this property per year is 75 kilowatt hours per square metre (kWh/m2).

▶ What is primary energy use?

Environmental impact of this property

One of the biggest contributors to climate change is carbon dioxide (CO2). The energy used for heating, lighting and power in our homes produces over a quarter of the UK's CO2 emissions.

An average household produces

6 tonnes of CO2

This property produces

1.5 tonnes of CO2

This property's potential production

-1.7 tonnes of CO2

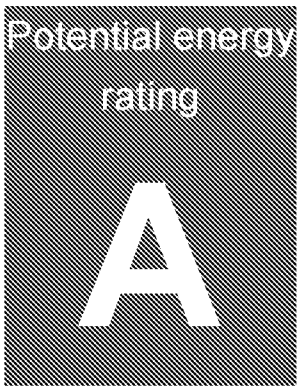
By making the recommended changes, you could reduce this property's CO2 emissions by 3.2 tonnes per year. This will help to protect the environment.

Environmental impact ratings are based on assumptions about average occupancy and energy use. They may not reflect how energy is consumed by the people living at the property.

How to improve this property's energy performance

Making any of the recommended changes will improve this property's energy efficiency.

If you make all of the recommended changes, this will improve the property's energy rating and score from B (85) to A (111).



▶ What is an energy rating?

Recommendation 1: Solar water heating

Solar water heating

Typical installation cost

[redacted]

Typical yearly saving

[redacted]

Potential rating after carrying out recommendation 1

86 | B

Recommendation 2: Solar photovoltaic panels, 2.5 kWp

Solar photovoltaic panels

Typical installation cost

£3,500 - £5,500

Typical yearly saving

£388

Potential rating after carrying out recommendations 1 and 2

94 | A

Recommendation 3: Wind turbine

Wind turbine

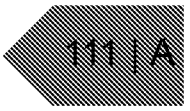
Typical installation cost

[redacted]

Typical yearly saving

[redacted]

Potential rating after carrying out recommendations 1 to 3



Paying for energy improvements

Find energy grants and ways to save energy in your home. (https://www.gov.uk/improve-energy-efficiency)

Estimated energy use and potential savings

Estimated yearly energy cost for this property

Potential saving

The estimated cost shows how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

The estimated saving is based on making all of the recommendations in how to improve this property's energy performance.

For advice on how to reduce your energy bills visit Simple Energy Advice (https://www.simpleenergyadvice.org.uk/).

Heating use in this property

Heating a property usually makes up the majority of energy costs.

Estimated energy used to heat this property

Space heating

2764 kWh per year

Water heating

2321 kWh per year

Potential energy savings by installing insulation

The assessor did not find any opportunities to save energy by installing insulation in this property.

You might be able to receive Renewable Heat Incentive payments (https://www.gov.uk/domestic-renewable-heat-incentive). This will help to reduce carbon emissions by replacing your existing heating system with one that generates renewable heat. The estimated energy required for space and water heating will form the basis of the payments.

Contacting the assessor and accreditation scheme

This EPC was created by a qualified energy assessor.

If you are unhappy about your property's energy assessment or certificate, you can complain to the assessor directly.

If you are still unhappy after contacting the assessor, you should contact the assessor's accreditation scheme.

Accreditation schemes are appointed by the government to ensure that assessors are qualified to carry out EPC assessments.

Assessor contact details

Assessor's name
Matthew Haskell

Telephone
[redacted]

Email
[redacted]

Accreditation scheme contact details

Accreditation scheme
Stroma Certification Ltd

Assessor ID
STRO006210

Telephone
0330 124 9660

Email
certification@stroma.com

Assessment details

Assessor's declaration
No related party

Date of assessment
27 May 2021

Date of certificate
2 June 2021

Type of assessment

▶ SAP

Other certificates for this property

If you are aware of previous certificates for this property and they are not listed here, please contact us at mhclg.digital-services@communities.gov.uk or call our helpdesk on 020 3829 0748.

There are no related certificates for this property.

Energy performance certificate (EPC)

2 Langford Close
CLIMPING
BN17 5FG

Energy rating

B

Valid until	Certificate number
1 June 2031	0585-3923-7150-2229-3481

Property type

Semi-detached house

Total floor area

93 square metres

Rules on letting this property

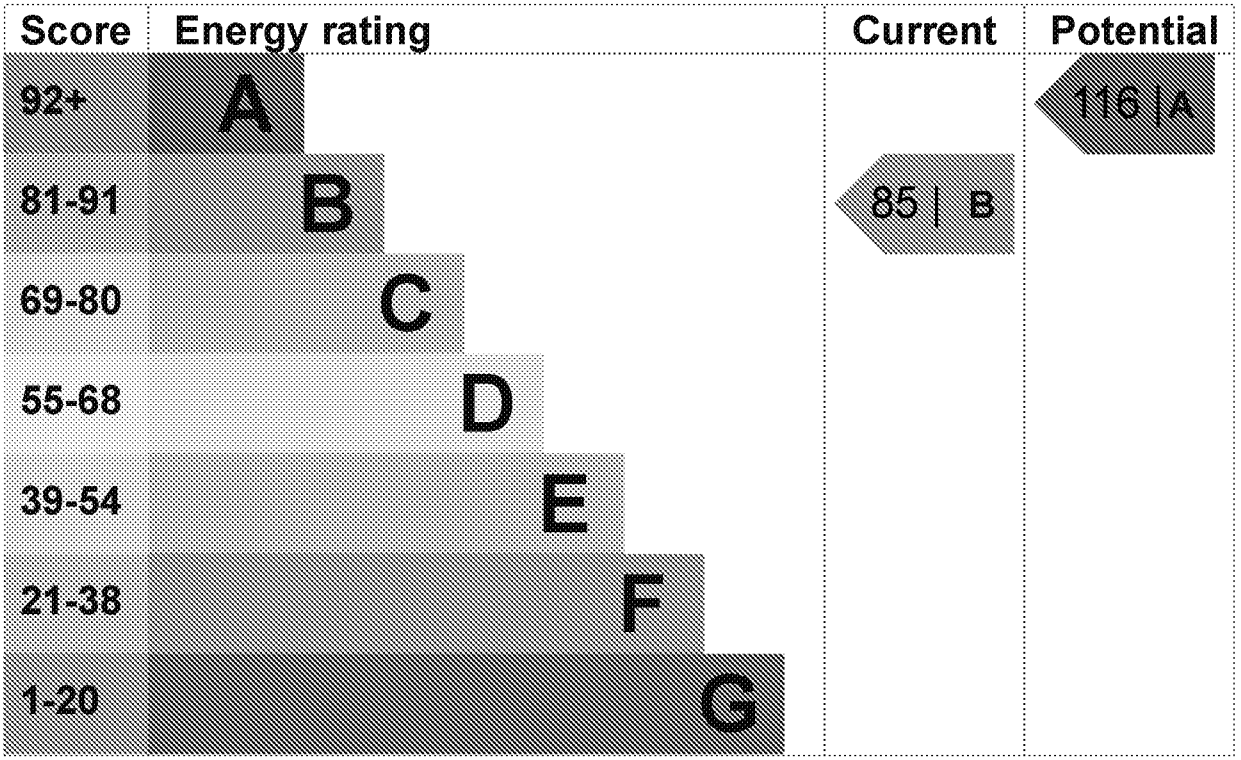
Properties can be rented if they have an energy rating from A to E.

If the property is rated F or G, it cannot be let, unless an exemption has been registered. You can read guidance for landlords on the regulations and exemptions (https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy efficiency rating for this property

This property's current energy rating is B. It has the potential to be A.

See how to improve this property's energy performance.



The graph shows this property's current and potential energy efficiency.

Properties are given a rating from A (most efficient) to G (least efficient).

Properties are also given a score. The higher the number the lower your fuel bills are likely to be.

For properties in England and Wales:

- the average energy rating is D
- the average energy score is 60

Breakdown of property's energy performance

This section shows the energy performance for features of this property. The assessment does not consider the condition of a feature and how well it is working.

Each feature is assessed as one of the following:

- very good (most efficient)
- good
- average
- poor
- very poor (least efficient)

When the description says "assumed", it means that the feature could not be inspected and an assumption has been made based on the property's age and type.

Feature	Description	Rating
Walls	Average thermal transmittance 0.27 W/m²K	Very good
Roof	Average thermal transmittance 0.11 W/m²K	Very good
Floor	Average thermal transmittance 0.12 W/m²K	Very good

Feature	Description	Rating
Windows	High performance glazing	Very good
Main heating	Boiler and radiators, mains gas	Good
Main heating control	Programmer, room thermostat and TRVs	Good
Hot water	From main system	Good
Lighting	Low energy lighting in all fixed outlets	Very good
Air tightness	Air permeability 3.8 m³/h.m² (as tested)	Good
Secondary heating	None	N/A

Primary energy use

The primary energy use for this property per year is 72 kilowatt hours per square metre (kWh/m2).

▶ What is primary energy use?

Environmental impact of this property

One of the biggest contributors to climate change is carbon dioxide (CO2). The energy used for heating, lighting and power in our homes produces over a quarter of the UK's CO2 emissions.

An average household produces

6 tonnes of CO2

This property produces

1.2 tonnes of CO2

This property's potential production

-1.9 tonnes of CO2

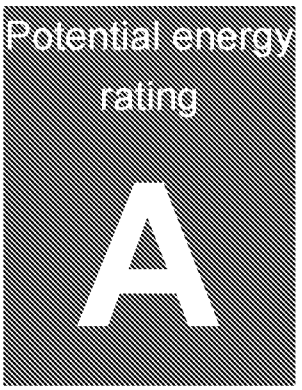
By making the recommended changes, you could reduce this property's CO2 emissions by 3.1 tonnes per year. This will help to protect the environment.

Environmental impact ratings are based on assumptions about average occupancy and energy use. They may not reflect how energy is consumed by the people living at the property.

How to improve this property's energy performance

Making any of the recommended changes will improve this property's energy efficiency.

If you make all of the recommended changes, this will improve the property's energy rating and score from B (85) to A (116).



▶ What is an energy rating?

Recommendation 1: Solar water heating

Solar water heating

Typical installation cost

[redacted]

Typical yearly saving

Potential rating after carrying out recommendation 1

86 | B

Recommendation 2: Solar photovoltaic panels, 2.5 kWp

Solar photovoltaic panels

Typical installation cost

£3,500 - £5,500

Typical yearly saving

£388

Potential rating after carrying out recommendations 1 and 2

96 | A

Recommendation 3: Wind turbine

Wind turbine

Typical installation cost

[redacted]

Typical yearly saving

Potential rating after carrying out recommendations 1 to 3



Paying for energy improvements

Find energy grants and ways to save energy in your home. (https://www.gov.uk/improve-energy-efficiency)

Estimated energy use and potential savings

Estimated yearly energy cost for this property

[redacted]

Potential saving

The estimated cost shows how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

The estimated saving is based on making all of the recommendations in how to improve this property's energy performance.

For advice on how to reduce your energy bills visit Simple Energy Advice (https://www.simpleenergyadvice.org.uk/).

Heating use in this property

Heating a property usually makes up the majority of energy costs.

Estimated energy used to heat this property

Space heating

2135 kWh per year

Water heating

1700 kWh per year

Potential energy savings by installing insulation

The assessor did not find any opportunities to save energy by installing insulation in this property.

You might be able to receive Renewable Heat Incentive payments (https://www.gov.uk/domestic-renewable-heat-incentive). This will help to reduce carbon emissions by replacing your existing heating system with one that generates renewable heat. The estimated energy required for space and water heating will form the basis of the payments.

Contacting the assessor and accreditation scheme

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Matthew Haskell

Telephone
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Email
[redacted]

Accreditation scheme contact details

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Stroma Certification Ltd

Assessor ID
STRO006210

Telephone
0330 124 9660

Email
certification@stroma.com

Assessment details

Assessor's declaration
No related party

Date of assessment
27 May 2021

Date of certificate
2 June 2021

Type of assessment

▶ SAP

Other certificates for this property

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There are no related certificates for this property.

Energy performance certificate (EPC)

3 Langford Close
CLIMPING
BN17 5FG

Energy rating

B

Valid until	Certificate number
1 June 2031	0581-3973-7154-2229-9575

Property type

Semi-detached house

Total floor area

93 square metres

Rules on letting this property

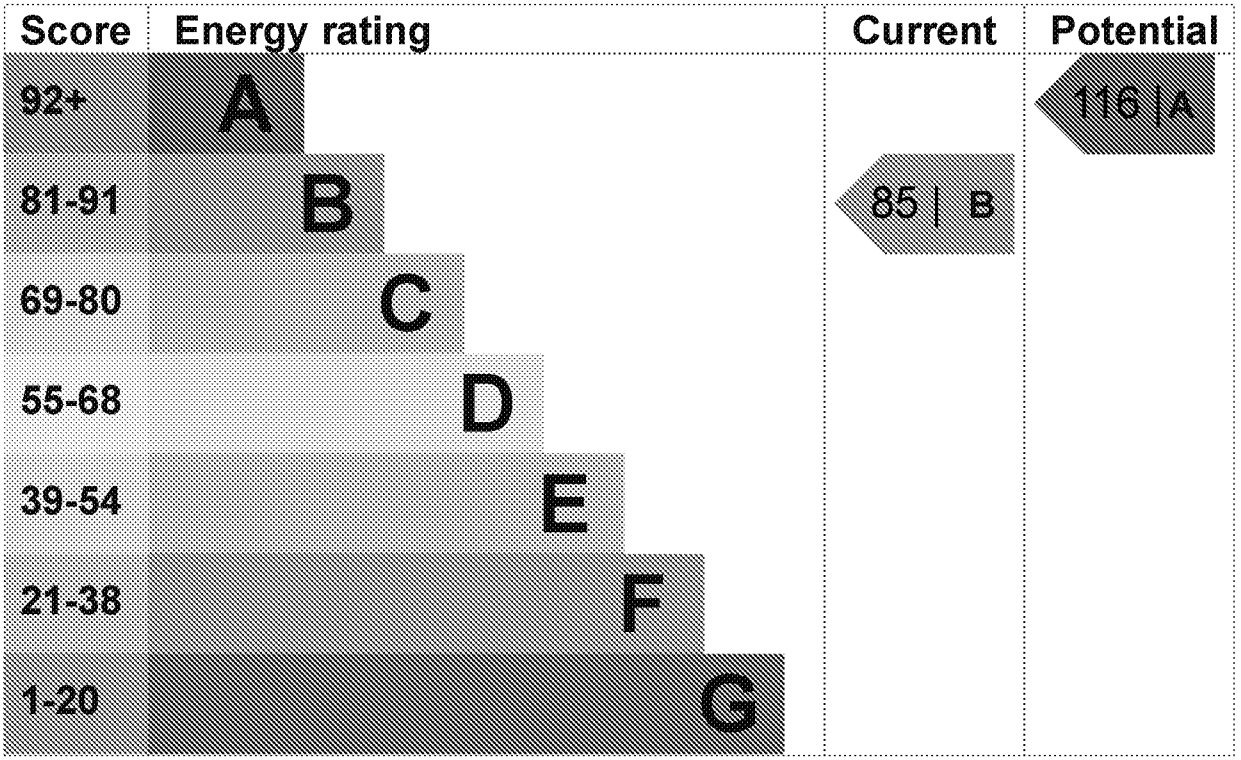
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Energy efficiency rating for this property

This property's current energy rating is B. It has the potential to be A.

See how to improve this property's energy performance.



The graph shows this property's current and potential energy efficiency.

Properties are given a rating from A (most efficient) to G (least efficient).

Properties are also given a score. The higher the number the lower your fuel bills are likely to be.

For properties in England and Wales:

- the average energy rating is D
- the average energy score is 60

Breakdown of property's energy performance

This section shows the energy performance for features of this property. The assessment does not consider the condition of a feature and how well it is working.

Each feature is assessed as one of the following:

- very good (most efficient)
- good
- average
- poor
- very poor (least efficient)

When the description says "assumed", it means that the feature could not be inspected and an assumption has been made based on the property's age and type.

Feature	Description	Rating
Walls	Average thermal transmittance 0.27 W/m²K	Very good
Roof	Average thermal transmittance 0.11 W/m²K	Very good
Floor	Average thermal transmittance 0.12 W/m²K	Very good

Feature	Description	Rating
Windows	High performance glazing	Very good
Main heating	Boiler and radiators, mains gas	Good
Main heating control	Programmer, room thermostat and TRVs	Good
Hot water	From main system	Good
Lighting	Low energy lighting in all fixed outlets	Very good
Air tightness	Air permeability 4.0 m³/h.m² (as tested)	Good
Secondary heating	None	N/A

Primary energy use

The primary energy use for this property per year is 72 kilowatt hours per square metre (kWh/m2).

▶ What is primary energy use?

Environmental impact of this property

One of the biggest contributors to climate change is carbon dioxide (CO2). The energy used for heating, lighting and power in our homes produces over a quarter of the UK's CO2 emissions.

An average household produces

6 tonnes of CO2

This property produces

1.2 tonnes of CO2

This property's potential production

-1.9 tonnes of CO2

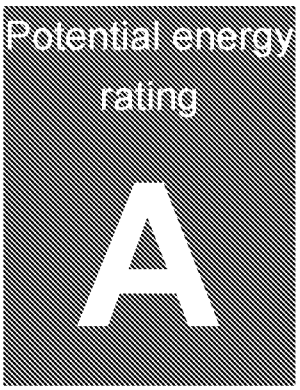
By making the recommended changes, you could reduce this property's CO2 emissions by 3.1 tonnes per year. This will help to protect the environment.

Environmental impact ratings are based on assumptions about average occupancy and energy use. They may not reflect how energy is consumed by the people living at the property.

How to improve this property's energy performance

Making any of the recommended changes will improve this property's energy efficiency.

If you make all of the recommended changes, this will improve the property's energy rating and score from B (85) to A (116).



▶ What is an energy rating?

Recommendation 1: Solar water heating

Solar water heating

Typical installation cost

[redacted]

Typical yearly saving

[redacted]

Potential rating after carrying out recommendation 1

86 | B

Recommendation 2: Solar photovoltaic panels, 2.5 kWp

Solar photovoltaic panels

Typical installation cost

[redacted]

Typical yearly saving

[redacted]

Potential rating after carrying out recommendations 1 and 2

96 | A

Recommendation 3: Wind turbine

Wind turbine

Typical installation cost

[redacted]

Typical yearly saving

[redacted]

Potential rating after carrying out recommendations 1 to 3



Paying for energy improvements

Find energy grants and ways to save energy in your home. (https://www.gov.uk/improve-energy-efficiency)

Estimated energy use and potential savings

Estimated yearly energy cost for this property

[redacted]

Potential saving

The estimated cost shows how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

The estimated saving is based on making all of the recommendations in how to improve this property's energy performance.

For advice on how to reduce your energy bills visit Simple Energy Advice (https://www.simpleenergyadvice.org.uk/).

Heating use in this property

Heating a property usually makes up the majority of energy costs.

Estimated energy used to heat this property

Space heating

2145 kWh per year

Water heating

1700 kWh per year

Potential energy savings by installing insulation

The assessor did not find any opportunities to save energy by installing insulation in this property.

You might be able to receive Renewable Heat Incentive payments (https://www.gov.uk/domestic-renewable-heat-incentive). This will help to reduce carbon emissions by replacing your existing heating system with one that generates renewable heat. The estimated energy required for space and water heating will form the basis of the payments.

Contacting the assessor and accreditation scheme

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Assessor's name
Matthew Haskell

Telephone
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Email
[redacted]

Accreditation scheme contact details

Accreditation scheme
Stroma Certification Ltd

Assessor ID
STRO006210

Telephone
0330 124 9660

Email
certification@stroma.com

Assessment details

Assessor's declaration
No related party

Date of assessment
27 May 2021

Date of certificate
2 June 2021

Type of assessment

▶ SAP

Other certificates for this property

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There are no related certificates for this property.

Energy performance certificate (EPC)

4 Langford Close
CLIMPING
BN17 5FG

Energy rating

B

Valid until

1 June 2031

Certificate number

9359-7635-8140-8663-6222

Property type

Semi-detached house

Total floor area

80 square metres

Rules on letting this property

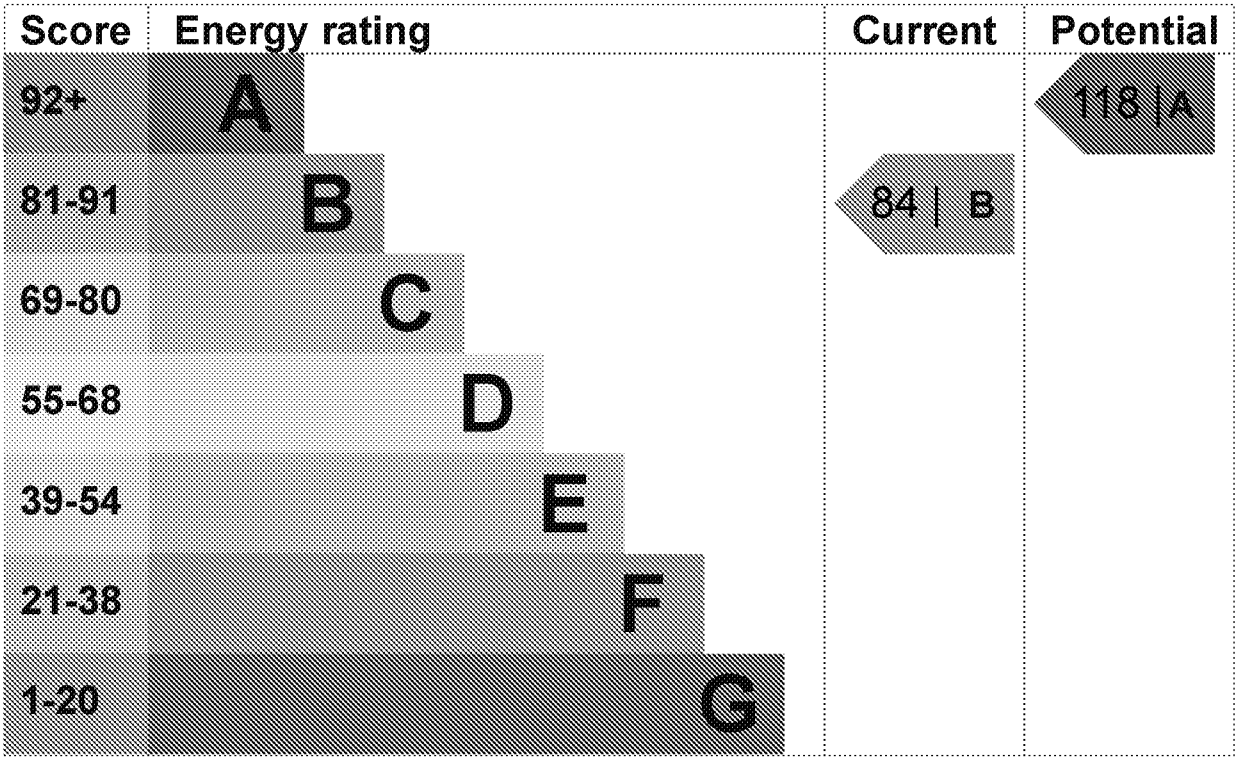
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Energy efficiency rating for this property

This property's current energy rating is B. It has the potential to be A.

See how to improve this property's energy performance.



The graph shows this property's current and potential energy efficiency.

Properties are given a rating from A (most efficient) to G (least efficient).

Properties are also given a score. The higher the number the lower your fuel bills are likely to be.

For properties in England and Wales:

- the average energy rating is D
- the average energy score is 60

Breakdown of property's energy performance

This section shows the energy performance for features of this property. The assessment does not consider the condition of a feature and how well it is working.

Each feature is assessed as one of the following:

- very good (most efficient)
- good
- average
- poor
- very poor (least efficient)

When the description says "assumed", it means that the feature could not be inspected and an assumption has been made based on the property's age and type.

Feature	Description	Rating
Walls	Average thermal transmittance 0.27 W/m²K	Very good
Roof	Average thermal transmittance 0.11 W/m²K	Very good
Floor	Average thermal transmittance 0.12 W/m²K	Very good

Feature	Description	Rating
Windows	High performance glazing	Very good
Main heating	Boiler and radiators, mains gas	Good
Main heating control	Programmer, room thermostat and TRVs	Good
Hot water	From main system	Good
Lighting	Low energy lighting in all fixed outlets	Very good
Air tightness	Air permeability 3.9 m³/h.m² (as tested)	Good
Secondary heating	None	N/A

Primary energy use

The primary energy use for this property per year is 81 kilowatt hours per square metre (kWh/m2).

▶ What is primary energy use?

Environmental impact of this property

One of the biggest contributors to climate change is carbon dioxide (CO2). The energy used for heating, lighting and power in our homes produces over a quarter of the UK's CO2 emissions.

An average household produces

6 tonnes of CO2

This property produces

1.1 tonnes of CO2

This property's potential production

-2.0 tonnes of CO2

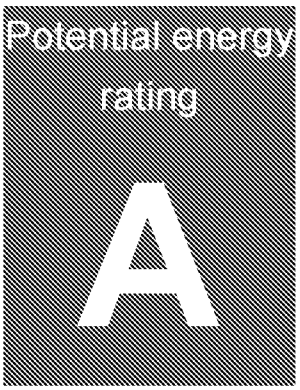
By making the recommended changes, you could reduce this property's CO2 emissions by 3.1 tonnes per year. This will help to protect the environment.

Environmental impact ratings are based on assumptions about average occupancy and energy use. They may not reflect how energy is consumed by the people living at the property.

How to improve this property's energy performance

Making any of the recommended changes will improve this property's energy efficiency.

If you make all of the recommended changes, this will improve the property's energy rating and score from B (84) to A (118).



▶ What is an energy rating?

Recommendation 1: Solar water heating

Solar water heating

Typical installation cost

[redacted]

Typical yearly saving

[redacted]

Potential rating after carrying out recommendation 1

85 | B

Recommendation 2: Solar photovoltaic panels, 2.5 kWp

Solar photovoltaic panels

Typical installation cost

[redacted]

Typical yearly saving

[redacted]

Potential rating after carrying out recommendations 1 and 2

96 | A

Recommendation 3: Wind turbine

Wind turbine

Typical installation cost

[redacted]

Typical yearly saving

[redacted]

Potential rating after carrying out recommendations 1 to 3



Paying for energy improvements

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Estimated energy use and potential savings

Estimated yearly energy cost for this property

[redacted]

Potential saving

The estimated cost shows how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

The estimated saving is based on making all of the recommendations in how to improve this property's energy performance.

For advice on how to reduce your energy bills visit Simple Energy Advice (https://www.simpleenergyadvice.org.uk/).

Heating use in this property

Heating a property usually makes up the majority of energy costs.

Estimated energy used to heat this property

Space heating

2142 kWh per year

Water heating

1622 kWh per year

Potential energy savings by installing insulation

The assessor did not find any opportunities to save energy by installing insulation in this property.

You might be able to receive Renewable Heat Incentive payments (https://www.gov.uk/domestic-renewable-heat-incentive). This will help to reduce carbon emissions by replacing your existing heating system with one that generates renewable heat. The estimated energy required for space and water heating will form the basis of the payments.

Contacting the assessor and accreditation scheme

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Assessment details

Assessor's declaration
No related party

Date of assessment
27 May 2021

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2 June 2021

Type of assessment

▶ SAP

Other certificates for this property

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There are no related certificates for this property.

Energy performance certificate (EPC)

5 Langford Close
CLIMPING
BN17 5FG

Energy rating

B

Valid until

9 June 2031

Certificate number

9659-7036-8120-0170-4292

Property type

Semi-detached house

Total floor area

80 square metres

Rules on letting this property

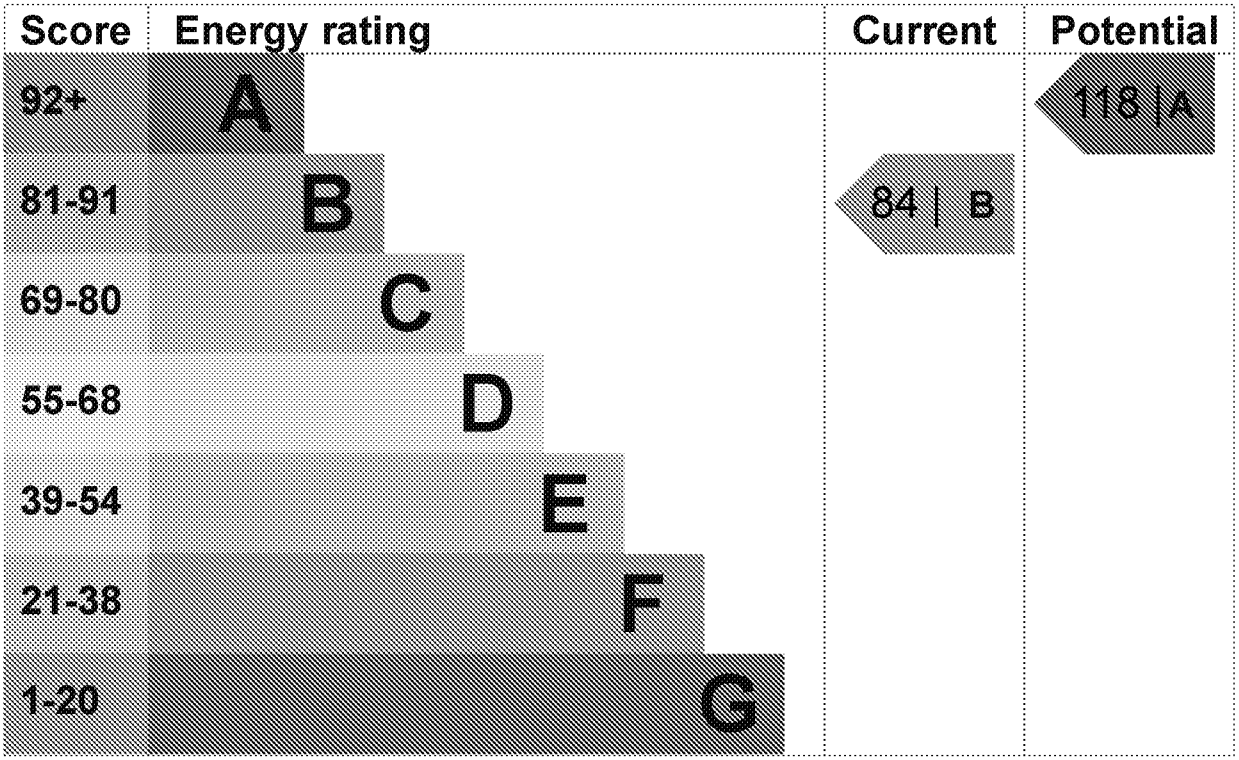
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Energy efficiency rating for this property

This property's current energy rating is B. It has the potential to be A.

See how to improve this property's energy performance.



The graph shows this property's current and potential energy efficiency.

Properties are given a rating from A (most efficient) to G (least efficient).

Properties are also given a score. The higher the number the lower your fuel bills are likely to be.

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Roof	Average thermal transmittance 0.11 W/m²K	Very good
Floor	Average thermal transmittance 0.12 W/m²K	Very good

Feature	Description	Rating
Windows	High performance glazing	Very good
Main heating	Boiler and radiators, mains gas	Good
Main heating control	Time and temperature zone control	Very good
Hot water	From main system, flue gas heat recovery	Very good
Lighting	Low energy lighting in all fixed outlets	Very good
Air tightness	Air permeability 3.8 m³/h.m² (as tested)	Good
Secondary heating	None	N/A

Primary energy use

The primary energy use for this property per year is 81 kilowatt hours per square metre (kWh/m2).

▶ What is primary energy use?

Environmental impact of this property

One of the biggest contributors to climate change is carbon dioxide (CO2). The energy used for heating, lighting and power in our homes produces over a quarter of the UK's CO2 emissions.

An average household produces

6 tonnes of CO2

This property produces

1.1 tonnes of CO2

This property's potential production

-2.0 tonnes of CO2

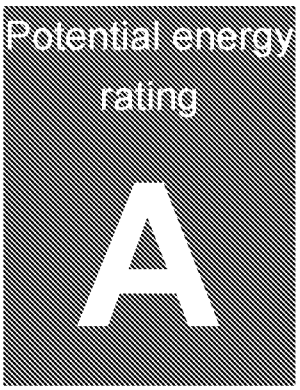
By making the recommended changes, you could reduce this property's CO2 emissions by 3.1 tonnes per year. This will help to protect the environment.

Environmental impact ratings are based on assumptions about average occupancy and energy use. They may not reflect how energy is consumed by the people living at the property.

How to improve this property's energy performance

Making any of the recommended changes will improve this property's energy efficiency.

If you make all of the recommended changes, this will improve the property's energy rating and score from B (84) to A (118).



▶ What is an energy rating?

Recommendation 1: Solar water heating

Solar water heating

Typical installation cost

[redacted]

Typical yearly saving

Potential rating after carrying out recommendation 1

85 | B

Recommendation 2: Solar photovoltaic panels, 2.5 kWp

Solar photovoltaic panels

Typical installation cost

[redacted]

Typical yearly saving

Potential rating after carrying out recommendations 1 and 2

96 | A

Recommendation 3: Wind turbine

Wind turbine

Typical installation cost

[redacted]

Typical yearly saving

Potential rating after carrying out recommendations 1 to 3



Paying for energy improvements

Find energy grants and ways to save energy in your home. (https://www.gov.uk/improve-energy-efficiency)

Estimated energy use and potential savings

Estimated yearly energy cost for this property

[redacted]

Potential saving

The estimated cost shows how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

The estimated saving is based on making all of the recommendations in how to improve this property's energy performance.

For advice on how to reduce your energy bills visit Simple Energy Advice (https://www.simpleenergyadvice.org.uk/).

Heating use in this property

Heating a property usually makes up the majority of energy costs.

Estimated energy used to heat this property

Space heating

2030 kWh per year

Water heating

1773 kWh per year

Potential energy savings by installing insulation

The assessor did not find any opportunities to save energy by installing insulation in this property.

You might be able to receive Renewable Heat Incentive payments (https://www.gov.uk/domestic-renewable-heat-incentive). This will help to reduce carbon emissions by replacing your existing heating system with one that generates renewable heat. The estimated energy required for space and water heating will form the basis of the payments.

Contacting the assessor and accreditation scheme

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Accreditation schemes are appointed by the government to ensure that assessors are qualified to carry out EPC assessments.

Assessor contact details

Assessor's name
Matthew Haskell

Telephone
[redacted]

Email
[redacted]

Accreditation scheme contact details

Accreditation scheme
Stroma Certification Ltd

Assessor ID
STRO006210

Telephone
0330 124 9660

Email
certification@stroma.com

Assessment details

Assessor's declaration
No related party

Date of assessment
10 June 2021

Date of certificate
10 June 2021

Type of assessment

▶ SAP

Other certificates for this property

If you are aware of previous certificates for this property and they are not listed here, please contact us at mhclg.digital-services@communities.gov.uk or call our helpdesk on 020 3829 0748.

There are no related certificates for this property.

Energy performance certificate (EPC)

9 Langford Close CLIMPING BN17 5FG	Energy rating **B**	Valid until: **11 August 2031** Certificate number: **9659-7638-8160-2572-5292**

Property type	Detached house
Total floor area	140 square metres

Rules on letting this property

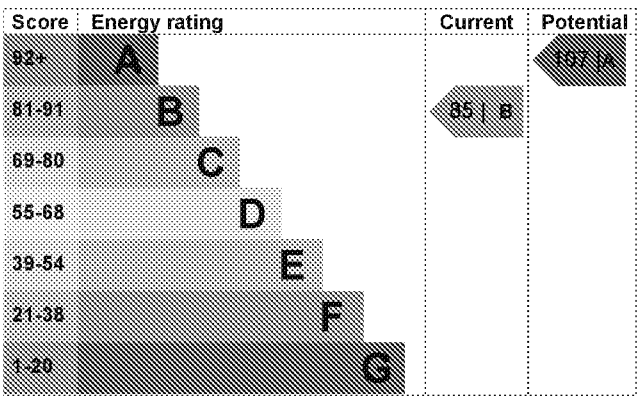
Properties can be rented if they have an energy rating from A to E.

If the property is rated F or G, it cannot be let, unless an exemption has been registered. You can read guidance for landlords on the regulations and exemptions (https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy efficiency rating for this property

This property's current energy rating is B. It has the potential to be A.

See how to improve this property's energy performance.



The graph shows this property's current and potential energy efficiency.

Properties are given a rating from A (most efficient) to G (least efficient).

Properties are also given a score. The higher the number the lower your fuel bills are likely to be.

For properties in England and Wales:

the average energy rating is D
the average energy score is 60

Breakdown of property's energy performance

This section shows the energy performance for features of this property. The assessment does not consider the condition of a feature and how well it is working.

Each feature is assessed as one of the following:

- very good (most efficient)
- good
- average
- poor
- very poor (least efficient)

When the description says "assumed", it means that the feature could not be inspected and an assumption has been made based on the property's age and type.

Feature	Description	Rating
Walls	Average thermal transmittance 0.27 W/m²K	Very good
Roof	Average thermal transmittance 0.11 W/m²K	Very good
Floor	Average thermal transmittance 0.12 W/m²K	Very good
Windows	High performance glazing	Very good
Main heating	Boiler and radiators, mains gas	Good
Main heating control	Time and temperature zone control	Very good
Hot water	From main system, flue gas heat recovery	Very good
Lighting	Low energy lighting in all fixed outlets	Very good
Air tightness	Air permeability 3.8 m³/h.m² (as tested)	Good
Secondary heating	None	N/A

Primary energy use

The primary energy use for this property per year is 72 kilowatt hours per square metre (kWh/m2).

Environmental impact of this property

One of the biggest contributors to climate change is carbon dioxide (CO2). The energy used for heating, lighting and power in our homes produces over a quarter of the UK's CO2 emissions.

An average household produces	6 tonnes of CO2
This property produces	1.8 tonnes of CO2
This property's potential production	-1.2 tonnes of CO2

By making the recommended changes, you could reduce this property's CO2 emissions by 3.0 tonnes per year. This will help to protect the environment.

Environmental impact ratings are based on assumptions about average occupancy and energy use. They may not reflect how energy is consumed by the people living at the property.

How to improve this property's energy performance

Making any of the recommended changes will improve this property's energy efficiency.

If you make all of the recommended changes, this will improve the property's energy rating and score from B (85) to A (107).

Recommendation	Typical installation cost	Typical yearly saving
1. Solar photovoltaic panels	[redacted]	
2. Wind turbine		

Paying for energy improvements

Find energy grants and ways to save energy in your home. (https://www.gov.uk/improve-energy-efficiency)

Estimated energy use and potential savings

Estimated yearly energy cost for this property	[redacted]
Potential saving	

The estimated cost shows how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

The estimated saving is based on making all of the recommendations in how to improve this property's energy performance.

For advice on how to reduce your energy bills visit Simple Energy Advice (https://www.simpleenergyadvice.org.uk/).

Heating use in this property

Heating a property usually makes up the majority of energy costs.

Estimated energy used to heat this property

Space heating	4164 kWh per year
Water heating	1944 kWh per year

Potential energy savings by installing insulation

The assessor did not find any opportunities to save energy by installing insulation in this property.

You might be able to receive Renewable Heat Incentive payments (https://www.gov.uk/domestic-renewable-heat-incentive). This will help to reduce carbon emissions by replacing your existing heating system with one that generates renewable heat. The estimated energy required for space and water heating will form the basis of the payments.

Contacting the assessor and accreditation scheme

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Assessor contact details

Assessor's name	Matthew Haskell
Telephone	[redacted]
Email	

Accreditation scheme contact details

Accreditation scheme	Stroma Certification Ltd
Assessor ID	STRO006210
Telephone	[redacted]
Email	

Assessment details

Assessor's declaration	No related party
Date of assessment	12 August 2021
Date of certificate	12 August 2021
Type of assessment	SAP

Energy performance certificate (EPC)

4 Langford Close CLIMPING BN17 5FG	Energy rating **B**	Valid until: 1 November 2031 Certificate number: 5439-5839-9739-1782-3206

Property type	Detached house
Total floor area	135 square metres

Rules on letting this property

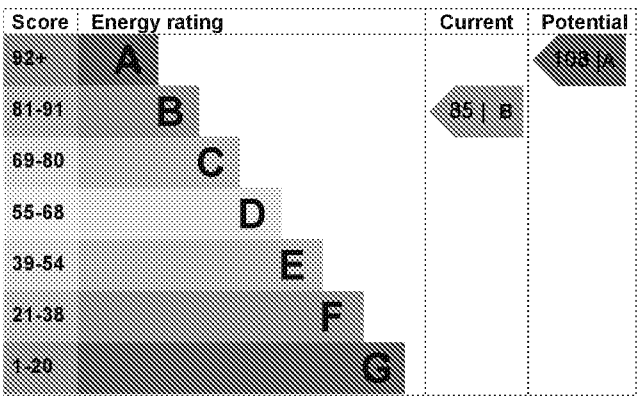
Properties can be rented if they have an energy rating from A to E.

If the property is rated F or G, it cannot be let, unless an exemption has been registered. You can read guidance for landlords on the regulations and exemptions (https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy efficiency rating for this property

This property's current energy rating is B. It has the potential to be A.

See how to improve this property's energy performance.



The graph shows this property's current and potential energy efficiency.

Properties are given a rating from A (most efficient) to G (least efficient).

Properties are also given a score. The higher the number the lower your fuel bills are likely to be.

For properties in England and Wales:

the average energy rating is D
the average energy score is 60

Breakdown of property's energy performance

This section shows the energy performance for features of this property. The assessment does not consider the condition of a feature and how well it is working.

Each feature is assessed as one of the following:

- very good (most efficient)
- good
- average
- poor
- very poor (least efficient)

When the description says "assumed", it means that the feature could not be inspected and an assumption has been made based on the property's age and type.

Feature	Description	Rating
Walls	Average thermal transmittance 0.28 W/m²K	Very good
Roof	Average thermal transmittance 0.12 W/m²K	Very good
Floor	Average thermal transmittance 0.12 W/m²K	Very good
Windows	High performance glazing	Very good
Main heating	Boiler and radiators, mains gas	Good
Main heating control	Time and temperature zone control	Very good
Hot water	From main system, flue gas heat recovery	Very good
Lighting	Low energy lighting in all fixed outlets	Very good
Air tightness	Air permeability 3.9 m³/h.m² (as tested)	Good
Secondary heating	None	N/A

Primary energy use

The primary energy use for this property per year is 71 kilowatt hours per square metre (kWh/m2).

Environmental impact of this property

One of the biggest contributors to climate change is carbon dioxide (CO2). The energy used for heating, lighting and power in our homes produces over a quarter of the UK's CO2 emissions.

An average household produces	6 tonnes of CO2
This property produces	1.7 tonnes of CO2
This property's potential production	-1.2 tonnes of CO2

By making the recommended changes, you could reduce this property's CO2 emissions by 2.9 tonnes per year. This will help to protect the environment.

Environmental impact ratings are based on assumptions about average occupancy and energy use. They may not reflect how energy is consumed by the people living at the property.

How to improve this property's energy performance

Making any of the recommended changes will improve this property's energy efficiency.

If you make all of the recommended changes, this will improve the property's energy rating and score from B (85) to A (108).

Recommendation	Typical installation cost	Typical yearly saving
1. Solar photovoltaic panels	[redacted]	
2. Wind turbine		

Paying for energy improvements

Find energy grants and ways to save energy in your home. (https://www.gov.uk/improve-energy-efficiency)

Estimated energy use and potential savings

Estimated yearly energy cost for this property	[redacted]
Potential saving	

The estimated cost shows how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

The estimated saving is based on making all of the recommendations in how to improve this property's energy performance.

For advice on how to reduce your energy bills visit Simple Energy Advice (https://www.simpleenergyadvice.org.uk/).

Heating use in this property

Heating a property usually makes up the majority of energy costs.

Estimated energy used to heat this property

Space heating	3880 kWh per year
Water heating	1941 kWh per year

Potential energy savings by installing insulation

The assessor did not find any opportunities to save energy by installing insulation in this property.

You might be able to receive Renewable Heat Incentive payments (https://www.gov.uk/domestic-renewable-heat-incentive). This will help to reduce carbon emissions by replacing your existing heating system with one that generates renewable heat. The estimated energy required for space and water heating will form the basis of the payments.

Contacting the assessor and accreditation scheme

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If you are unhappy about your property's energy assessment or certificate, you can complain to the assessor directly.

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Assessor contact details

Assessor's name	Matthew Haskell
Telephone	[redacted]
Email	

Accreditation scheme contact details

Accreditation scheme	Stroma Certification Ltd
Assessor ID	STRO006210
Telephone	[redacted]
Email	

Assessment details

Assessor's declaration	No related party
Date of assessment	2 November 2021
Date of certificate	2 November 2021
Type of assessment	SAP

Energy performance certificate (EPC)

9 Langford Close CLIMPING BN17 5FG	Energy rating **B**	Valid until: 30 September 2031 Certificate number: 9591-3679-5800-2809-5671

Property type	Detached house
Total floor area	139 square metres

Rules on letting this property

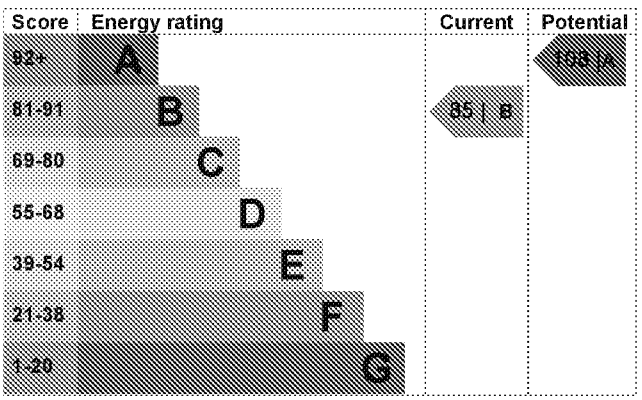
Properties can be rented if they have an energy rating from A to E.

If the property is rated F or G, it cannot be let, unless an exemption has been registered. You can read guidance for landlords on the regulations and exemptions (https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy efficiency rating for this property

This property's current energy rating is B. It has the potential to be A.

See how to improve this property's energy performance.



The graph shows this property's current and potential energy efficiency.

Properties are given a rating from A (most efficient) to G (least efficient).

Properties are also given a score. The higher the number the lower your fuel bills are likely to be.

For properties in England and Wales:

the average energy rating is D
the average energy score is 60

Breakdown of property's energy performance

This section shows the energy performance for features of this property. The assessment does not consider the condition of a feature and how well it is working.

Each feature is assessed as one of the following:

- very good (most efficient)
- good
- average
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Feature	Description	Rating
Walls	Average thermal transmittance 0.27 W/m²K	Very good
Roof	Average thermal transmittance 0.12 W/m²K	Very good
Floor	Average thermal transmittance 0.12 W/m²K	Very good
Windows	High performance glazing	Very good
Main heating	Boiler and radiators, mains gas	Good
Main heating control	Time and temperature zone control	Very good
Hot water	From main system, flue gas heat recovery	Very good
Lighting	Low energy lighting in all fixed outlets	Very good
Air tightness	Air permeability 3.8 m³/h.m² (as tested)	Good
Secondary heating	None	N/A

Primary energy use

The primary energy use for this property per year is 68 kilowatt hours per square metre (kWh/m2).

Environmental impact of this property

One of the biggest contributors to climate change is carbon dioxide (CO2). The energy used for heating, lighting and power in our homes produces over a quarter of the UK's CO2 emissions.

An average household produces	6 tonnes of CO2
This property produces	1.7 tonnes of CO2
This property's potential production	-1.3 tonnes of CO2

By making the recommended changes, you could reduce this property's CO2 emissions by 3.0 tonnes per year. This will help to protect the environment.

Environmental impact ratings are based on assumptions about average occupancy and energy use. They may not reflect how energy is consumed by the people living at the property.

How to improve this property's energy performance

Making any of the recommended changes will improve this property's energy efficiency.

If you make all of the recommended changes, this will improve the property's energy rating and score from B (85) to A (108).

Recommendation	Typical installation cost	Typical yearly saving
1. Solar photovoltaic panels	[redacted]	
2. Wind turbine		

Paying for energy improvements

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Estimated energy use and potential savings

Estimated yearly energy cost for this property	[redacted]
Potential saving	

The estimated cost shows how much the average household would spend in this property for heating, lighting and hot water. It is not based on how energy is used by the people living at the property.

The estimated saving is based on making all of the recommendations in how to improve this property's energy performance.

For advice on how to reduce your energy bills visit Simple Energy Advice (https://www.simpleenergyadvice.org.uk/).

Heating use in this property

Heating a property usually makes up the majority of energy costs.

Estimated energy used to heat this property

Space heating	3717 kWh per year
Water heating	1944 kWh per year

Potential energy savings by installing insulation

The assessor did not find any opportunities to save energy by installing insulation in this property.

You might be able to receive Renewable Heat Incentive payments (https://www.gov.uk/domestic-renewable-heat-incentive). This will help to reduce carbon emissions by replacing your existing heating system with one that generates renewable heat. The estimated energy required for space and water heating will form the basis of the payments.

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Telephone	[redacted]
Email	

Accreditation scheme contact details

Accreditation scheme	Stroma Certification Ltd
Assessor ID	STRO006210
Telephone	[redacted]
Email	

Assessment details

Assessor's declaration	No related party
Date of assessment	1 October 2021
Date of certificate	1 October 2021
Type of assessment	SAP