

24 Carriage Mews Canterbury CT2 8AL

T: 01227 781335 m:07971821332 e:premierassessors@gmail.com

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

STROMA STRO005087 ~ NHER 003848 ~ BRE HISC AS43

Energy and Sustainability Statement

SITE: 28 Greville Street, London EC1N 8SU

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

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

DATE: October 10 2013

Executive Summary

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

Energy Strategy

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

Introduction

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

National Regulations

Part L Building regulations, 2010

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

Energy Statement

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

'Be Lean' (use less energy)

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

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

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

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

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

Unnecessary ventilation heat loss will be limited by providing building fabric which is air tight. The Air permeability will be set at 5m³/hm² @50 Pascals, but will also comply with Part F of the building regulations All lighting both internal and external, will be low energy

'Be Clean' (supply energy efficiently)

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

'Be Green' (use renewable energy)

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

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

Achievement of Compliance with Part L1A 2010

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

PART L1A 2010 CRITERION 1

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

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

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

This shows a 32.9 percentage improvement over building regulations.

PART L1A 2010 CRITERION 3

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

SUSTAINABILITY STATEMENT

Energy

SAP calculations demonstrate the CO₂ emissions of each flat and the reduction of CO₂ emissions from renewable energy is shown on the CSH report from SAP.

Internal drying space will be provided in the bathroom of each flat, an Energy Display device displaying the current consumption and primary heating fuel data and low energy white goods will be specified as well as low energy internal and external space lighting. Space and services for a home office will be installed.

Water Consumption

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

Materials

All timber will be purchased from companies that supply timber from sustainable sources only.

Materials from local sources will be procured where possible

The BRE Green Guide will be used to calculate the score for this section

Surface Water Run-off & Flood Risk

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

Waste

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

Pollution

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

Health and Well-Being

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

Management

A Home User guide will be supplied to all dwellings for all Operational Issues in the Home and to describe the Site and Surroundings

The Constructor must be a member of the Considerate Constructors scheme or similar. A score reaching 'Best Practice' must be achieved.

Water usage through site activities will be monitored and targets set for reducing the water usage throughout the build

Best practice policies regarding air and water pollution will be operated for site activities.

Water consumption will be monitored during the build and targets set to reduce the use of water.

Police advice on security will also be incorporated into this dwelling.

Ecology

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

6.0 Conclusion

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

END OF REPORT

Attachments:

1 No Energy statement for total development CO2 Emissions

- 3 No SAP calculations
- 3 No CfSH Reports (SAP)

1 No Block Compliance Report

1 CSH pre-assessment

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

Table 1: Carbor	n Dioxide Emissions afte	er each stage of the Energy Hie	erarchy				
	Carbon dioxi	ide emissions					
	(Tonnes CO	(Tonnes CO ₂ per annum)					
	Regulated	Unregulated					
Building Regulations	A	55.58					
2010	53.49						
Part L Compliant							
Development							
After energy demand	В	55.58					
reduction	53.68						
	55.08						
After CHP	C C	55.58					
	53.68						
After renewable energy	D	55.58]				
	34.73						

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

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

Code for Sustainable Homes Report

Assessor and House	Details			
Assessor Name: Property Address:	Andrew Simpson Flat 1 28 Greville Street London EC1N 8SU	Assessor Number:	STRO005087	
Buiding regulation as	sessment			
TER			kg/m²/year 20.05	

DER

12.02 The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10) Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

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

Total Energy Type CO2 Emissions for Codes Levels 6

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

Result:

Credits awarded for Ene 1 = 4.4

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 44.04

Credits awarded for Ene 2 = 4.5

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

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

Credits awarded for Ene 7 = 2

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

The following requirements must also be met:

Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.

· Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.

Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.

All technologies must be accounted for by SAP

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

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

D	D 1 1	EI 1 4
Property	Details:	Flat I

Address:	Flat 1, 28 Greville Street, London, EC1N 8SU
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	10 October 2013
Date of certificate:	10 October 2013
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Dwelling designed to use less than	125 litres per Person per day: True

Property descriptic	n:							
Dwelling type: Detachment: Year Completed:		Flat Mid- 2013	terrace					
Floor Location:		Flo	or area:		Storey height	:		
Floor 0		69.6	3 m²		2.56 m			
Living area:		47.0	4 m ² (fraction 0.67	(6)				
Front of dwelling	faces:	East						
Opening types:								
Name:	Source:		Type:	Glazing:		Argon:	Fram	ne:
d1	Manufacturer		Solid				Wood	
w1	Manufacturer		Windows	low-E, En =	= 0.05, soft coat	Yes		
w2	Manufacturer		Windows	low-E, En =	= 0.05, soft coat	Yes		
w3	Manufacturer		Windows	low-E, En =	= 0.05, soft coat	Yes		
w4	Manufacturer		Windows	low-E, En =	= 0.05, soft coat	Yes		
w5	Manufacturer	•	Windows	low-E, En =	= 0.05, soft coat	Yes		
Name:	Gap:		Frame Facto	or: g-value:	U-value:	Area:	No. c	of Openings
d1	mm		0.7	0	1.4	1.92	1	
w1	16mm o	r more	0.7	0.63	1.4	3.04	1	
w2	16mm o	r more	0.7	0.63	1.4	3.04	1	
w3	16mm o	r more	0.7	0.63	1.4	1.53	1	
w4	16mm o	r more	0.7	0.63	1.4	0.65	1	
w5	16mm o	r more	0.7	0.63	1.4	1.55	1	
Name:	Type-Nam	e:	Location:	Orient:		Width:	Heig	ht:
d1			Stair wall	East		0.915	2.1	
w1			Main wall	South		2.25	1.35	
w2			Main wall	South		2.25	1.35	
w3			Main wall	West		1.13	1.35	
w4			Main wall	West		0.48	1.35	
w5			Main wall	North		1.15	1.35	
Overshading:		Very	Little					
Opaque Elements:		_						
Туре:	Gross area:	Openings	: Net area:	U-value:	Ru value:	Curtair	n wall:	Kappa:
External Elements	38 125	0 01	28 61	0 10	0	Falso		N/A
Stair wall	20.425 24 678	7.01	20.01	0.17	0	Falso		N/A
Roof	9 272	0	9 27	0.16	0			N/A
1001	1.212	0	1.21	0.10	0			

Floor Internal Eleme	69.63 ents			0.11	N/A
Party Element Party wall	40.704				N/A
Thermal bridg	es:				
Thermal bridg	jes:	User-defin	ed (individua	al PSI-values) Y-Value = 0.0746	
	Approved source Approved source Approved source Approved source Approved source Approved source Approved source Approved source Approved source Approved source	Length 8.16 7.26 17.7 24.5 7.62 23.04 10.24 5.12 6.25 1.52	PSI-va 0.5 0.04 0.05 0.07 0.28 0.09 -0.09 0.06 0 0.02	Steel lintel with perforated steel base plate Sill Jamb Intermediate floor between dwellings Flat roof with parapet Corner (normal) Corner (inverted) Party wall between dwellings Intermediate floor between dwellings (in blocks of flats) Roof (insulation at rafter level)	
Ventilation:					
Pressure test: Ventilation: Number of ch Number of op Number of far Number of sid Pressure test: Main heating s	imneys: en flues: ns: les sheltered: system: system:	Yes (As de Natural ve 0 2 3 5 Central he Gas boiler	esigned) ntilation (exi ating system	tract fans) is with radiators or underfloor heating	
		Fuel: main Info Source Manufactu Efficiency: Condensin Fuel Burni Systems w Pump in h	e: Manufacti rer's data 89.8% (SEE g combi with ng Type: Mo rith radiators eat space: Y	ers urer Declaration DBUK2009) n automatic ignition dulation es	
Main heating (Control:				
Main heating	Control:	Time and Control co Boiler inte	temperature de: 2110 rlock: Yes	zone control	
Secondary hea	ating system:				
Secondary he	ating system:	None			
Water heating	:				
Water heating	j:	From mair Water cod Fuel :mair No hot wa Solar pane	n heating sys e: 901 Is gas ter cylinder el: False	tem	
Others:					
Electricity tari In Smoke Con Conservatory:	ff: htrol Area:	standard t Unknown No conser	ariff vatory		

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

Assess Zero Carbon Home:

User Details:	
Assessor Name:Andrew SimpsonStroma Number:STROMSoftware Name:Stroma FSAP 2009Software Version:Version	005087 n: 1.5.0.55
Property Address: Flat 1	
Address : Flat 1, 28 Greville Street, London, EC1N 8SU	
1. Overall dwelling dimensions:	
Area(m^2)Ave Height(m)Ground floor69.63(1a) x2.56(2a) =	178.2528 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 69.63 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = $	178.2528 (5)
2. Ventilation rate:	
Number of chimneys 0 + 0 + 0 = 0 × 40 =	0 (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	0 (6b)
Number of intermittent fans 2 x 10 =	20 (7a)
Number of passive vents 0 x 10 =	0 (7b)
Number of flueless gas fires 0 x 40 =	0 (7c)
Air ch	anges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20 \div (5) = $	0.11 (8)
It a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	(0)
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 $0.25 - [0.2 \times (14) \div (10) = (12) \div (12)$	0 (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)
Air permeability value, q50, expressed in cubic metres per nour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ otherwise $(18) = (16)$	5 (17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.36 (18)
Number of sides on which sheltered	3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.78 (20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.28 (21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m= 5.4 5.1 5.1 4.5 4.1 3.9 3.7 3.7 4.2 4.5 4.8 5.1	
Wind Factor (22a)m = (22)m \div 4	
(22a)m= 1.35 1.27 1.27 1.12 1.02 0.98 0.92 0.92 1.05 1.12 1.2 1.27	

Adjusted in	filtration ra	te (allowi	ng for sl	nelter an	d wind s	speed) = ((21a) x	(22a)m				_		
0.3	8 0.36	0.36	0.32	0.29	0.27	0.26	6	0.26	0.29	0.32	0.34	0.36			
Calculate e	ffective air	<i>change</i> ation:	rate for t	he appli	cable ca	ise								0	(23a)
If exhaust a	ir heat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equatio	n (N	5)), othei	rwise (23t	o) = (23a)				0	(23b)
If balanced	with heat rec	overy: effic	iency in %	allowing	or in-use f	factor (f	from	Table 4h) =	, , ,				0	(23c)
a) If balaı	nced mech	anical ve	entilation	with he	at recov	erv (N	1VH	IR) (24a	a)m = (2	2b)m + (2	23b) x [1 – (23c)	L) ÷ 1001	<u> </u>	
(24a)m= 0	0	0	0	0	0	0		0	0		0	0]		(24a)
b) If bala	nced mech	anical ve	entilation	without	heat red	covery	/ (M	IV) (24b)m = (2	2b)m + (2	23b)		3		
(24b)m= 0	0	0	0	0	0	0		0	0	0	0	0]		(24b)
c) If whol	e house ex	ktract ver	ntilation of	or positiv	e input	ventila	atior	n from c	outside				-		
if (22	b)m < 0.5	× (23b), t	then (24)	c) = (23k	o); other	wise (24c	;) = (22b	o) m + 0	.5 × (23b)		-		
(24c)m= 0	0	0	0	0	0	0		0	0	0	0	0			(24c)
d) If natu	ral ventilati	on or wh	ole hous $m = (22)$	se positiv	ve input arwise (2	ventila 24d)m	atioı – ∩	n from 1	oft 2h)m² y	0 51					
(24d)m= 0.5	7 0.56	0.56	0.55	0.54	0.54	0.53	3	0.53	0.54	0.55	0.56	0.56	1		(24d)
Effective	air change	rate - er	i hter (24a) or (24) or (24	L c) or ((24d	d) in box	(25)				1		
(25)m= 0.5	7 0.56	0.56	0.55	0.54	0.54	0.53	3	0.53	0.54	0.55	0.56	0.56]		(25)
			1		1	1			1	1 1		1	J		
	ses and n			er:	Not Ar				10			k volu	<u></u>		(k
	area	33 ι (m²)	n	95 1 ²	A,r	m²		W/m2	:K	(W/F	<)	kJ/m ² ·	K	kJ/l	K
Doors					1.92		x	1.4	=	2.688					(26)
Windows T	ype 1				3.04		x1/[1/(1.4)+	0.04] =	4.03					(27)
Windows T	ype 2				3.04		x1/[1/(1.4)+	0.04] =	4.03					(27)
Windows T	уре З				1.53		x1/[1/(1.4)+	0.04] =	2.03					(27)
Windows T	ype 4				0.65		x1/[1/(1.4)+	0.04] =	0.86					(27)
Windows T	ype 5				1.55		x1/[1/(1.4)+	0.04] =	2.05					(27)
Floor					69.63	3	x	0.11	=	7.6593					(28)
Walls Type	1 38.	42	9.81		28.67	1	x	0.19	=	5.44					(29)
Walls Type	2 24.	68	1.92	2	22.76	6	x	0.18	=	4.1					(29)
Roof	9.2	27	0		9.27	,	x	0.16	=	1.48					(30)
Total area o	of elements	s, m²			142.00	05									(31)
Party wall					40.7	,	x	0	=	0					(32)
* for windows ** include the a	and roof wind areas on both	lows, use e n sides of ir	effective wi nternal wal	ndow U-va Is and par	alue calcul titions	lated us	sing f	formula 1,	/[(1/U-val	ue)+0.04] a	s given in	n paragrapl	h 3.2		
Fabric heat	loss, W/K	= S (A x	U)				(2	26)(30)) + (32) =				34	1.37	(33)
Heat capac	ity Cm = S	(A x k)							((28).	(30) + (32	?) + (32a).	(32e) =	1502	2.3535	(34)
Thermal ma	ass parame	eter (TMF	- = Cm -	- TFA) ir	n kJ/m²K	ζ.			Indica	ative Value:	Medium		2	:50	(35)
For design ass	sessments wi	here the de	etails of the	construct	ion are no	t knowr	n pre	cisely the	e indicativ	e values of	TMP in T	able 1f			
Thermal bri	dges : S (L	_ x Y) cal	culated	usina Ar	pendix l	K							1().59	(36)
if details of the	ermal bridging	are not kn	nown (36) =	= 0.15 x (3	1)										

Total fa	abric he	at loss							(33) +	(36) =			44.96	(37)
Ventila	tion hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	33.64	33.18	33.18	32.34	31.85	31.61	31.39	31.39	31.97	32.34	32.75	33.18		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	78.6	78.14	78.14	77.31	76.81	76.58	76.36	76.36	76.93	77.31	77.71	78.14		
							-	-	1	Average =	Sum(39)1.	12 /12=	77.37	(39)
Heat Ic	oss para	meter (F	HLP), W/	m²K					(40)m	= (39)m ÷	(4)	4.40		
(40)m=	1.13	1.12	1.12	1.11	1.1	1.1	1.1	1.1	1.1	1.11 Average –	1.12 Sum(40)	1.12	1 1 1	
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	-verage =	Sum(40)1.	12 / 12=	1.11	(+0)
	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. Wa	ter heat	ting enei	rgy requi	irement:								kWh/ye	ear:	
A			N I											(
if TF	ied occu A > 13.9	ipancy, i 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.() 013 x (1	ΓFA -13.	<u>2.2</u> 9)	371		(42)
if TF	A £ 13.9	9, N = 1			(- (//]			- /			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36	o torgot o	87.3	3313		(43)
not more	e that 125	litres per j	person per	r day (all w	ater use, l	hot and co	ld)	lo acilieve	a water us	se largel o	I			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	000			200		
(44)m=	96.06	92.57	89.08	85.58	82.09	78.6	78.6	82.09	85.58	89.08	92.57	96.06		
			I	I	I	I	I	I	-	Total = Su	m(44) ₁₁₂ =	=	1047.9759	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x L	OTm / 3600) kWh/mon	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	142.8	124.9	128.88	112.36	107.81	93.03	86.21	98.93	100.11	116.67	127.35	138.3		_
If instan	topoquo u	otor hooti	na ot point	of upp (pr	hot wata	r otorogo)	ontor 0 in	hovon (16	t_{0}	Total = Su	m(45) ₁₁₂ =	-	1377.3491	(45)
n mstan						slorage),								(40)
(46)m= Water	21.42 storage	18.73 loss:	19.33	16.85	16.17	13.96	12.93	14.84	15.02	17.5	19.1	20.74		(46)
a) If m	anufactu	urer's de	clared lo	oss facto	or is knov	vn (kWh	/day):					0		(47)
Tempe	erature f	actor fro	m Table	2b		·	• /					0		(48)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(47) x (48)) =			0		(49)
If man	ufacture	r's decla	ared cylir	nder loss	s factor is	s not kno	own:							
Cylind	er volum	ne (litres) includir	ng any s	olar stor	age with	iin same	;				0		(50)
If con	nmunity he wise if no	eating and	l no tank in t water (th	i dwelling, is includes	enter 110 instantan	litres in bo)X (50) hi hoilers)	ontor '0' in	box (50)					
	tor ctor		factor fr	om Tabl		b/litro/dc			box (00)			•		(54)
Volum	e factor	from To	hle 22			1/11110/02	iy)					0		(51)
Tempe	e lactor	actor fro	m Table	2b								0		(52)
Energy	/ lost fro	m water	storage	_~ k\//h/v/	ar			((50) x (51) x (52) x ((53) =		0		(54)
Enter ((49) or (54) in (5	5)	,, y	501) X (02) X ((00) -		0		(55)
Water	storage	loss cal	culated I	for each	month			((56)m = (55) × (41)r	m	L			
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	l d solar sto	rage, (57)	<u>I</u> m = (56)m	x [(50) – (I H11)] ÷ (5	1 0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)

Primary circuit loss calculated for each month (6)m = (68) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostal) (some) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)				
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostal; (59) 0	Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m									
(59)m 0 <td>(mod</td> <td>dified by</td> <td>factor fr</td> <td>om Tab</td> <td>le H5 if t</td> <td>here is s</td> <td>solar wat</td> <td>er heati</td> <td>ng and a</td> <td>cylinde</td> <td>r thermo</td> <td>stat)</td> <td>-</td> <td></td> <td></td>	(mod	dified by	factor fr	om Tab	le H5 if t	here is s	solar wat	er heati	ng and a	cylinde	r thermo	stat)	-						
Combi loss calculated for each month (61)m = (60) + 365 x (41)m (61)m = 48.95 42.61 45.39 42.21 41.83 88.76 40.05 41.83 42.21 45.39 45.65 48.95 (61) Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 191.76 167.5 174.27 154.57 149.65 131.8 126.26 140.76 142.32 162.06 173 187.25 (62) Safor DHV input calculated wing Appendix G or Appendix H (negative quantity) (ertre 'i no solar contribution to water heating (additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m = 0 0 0 0 0 0 0 0 0 0	(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)				
(61)m: 48.95 42.61 45.39 42.21 41.83 38.76 40.05 41.83 42.21 45.39 45.65 48.95 (61) Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62) 173 187.26 (62) Solar DHW input calculated using Appendix G or Appendix G or Appendix G is an integritive quantity (lenter 0' in o solar contribution to water heating) (63) 0	Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m										
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)m + (46)m + (67)m + (59)m + (61)m$ (62)m = 191.76 167.5 174.27 154.57 149.85 131.8 126.26 140.76 142.32 162.06 173 187.25 (62) Solar DW 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	(61)m=	48.95	42.61	45.39	42.21	41.83	38.76	40.05	41.83	42.21	45.39	45.65	48.95		(61)				
(62)m= 191.76 167.5 174.27 154.57 149.65 131.8 126.26 140.76 142.32 162.06 173 187.25 (62) Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63) (63)m= 0	Total h	eat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m					
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) (63)m= 0	(62)m=	191.76	167.5	174.27	154.57	149.65	131.8	126.26	140.76	142.32	162.06	173	187.25		(62)				
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m 0 <td>Solar DH</td> <td>HW input</td> <td>calculated</td> <td>using App</td> <td>endix G or</td> <td>· Appendix</td> <td>H (negati</td> <td>ve quantity</td> <td>y) (enter '0</td> <td>' if no sola</td> <td>r contribut</td> <td>ion to wate</td> <td>er heating)</td> <td></td> <td></td>	Solar DH	HW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix C	G)									
Output from water heater (64)m= 191.7.6 167.5 174.27 154.7.7 149.7.6 149.7.6 174.27 154.7.7 149.7.6 149.7.6 177.4 157.7 149.7.7 149.7.7 149.7.7 149.7.7 149.7.7 149.7.7 149.7.7 149.7.7 149.7.7 149.7.7 149.7.7 149.7.7 140.62 38.68 43.3.5 45.8.7 65.7.2 52.18 54.2 47.9.1 46.31 40.62 38.68 43.3.5 43.8.8 149.1.4 1901.1935 (65) Include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5 167.1 142.32 134.23 134.23 134.23 134.23 134.23 134.23 134.23 134.23 <th <="" colspan="4" td=""><td>(63)m=</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td><td>(63)</td></th>	<td>(63)m=</td> <td>0</td> <td></td> <td>(63)</td>				(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
(64)me 191.76 167.5 174.27 154.57 149.65 131.8 126.26 140.76 142.32 162.06 173 187.25 Output from water heater (annual)	Output	from w	ater hea	ter	-					-	-	-	-						
Output from water heating, kWh/month 0.25 ⁻⁷ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (64) (65)m= 59.72 52.18 54.2 47.91 46.31 40.62 38.68 43.35 43.84 50.14 53.76 58.22 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5	(64)m=	191.76	167.5	174.27	154.57	149.65	131.8	126.26	140.76	142.32	162.06	173	187.25						
Heat gains from water heating, kWh/month 0.25 $' [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$ (66)m= 59.72 52.18 54.2 47.91 46.31 40.62 38.68 43.35 43.84 50.14 53.76 58.22 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a) : Metabolic gains (Table 5), Watts (66)m= 134.23 134									Outp	out from wa	ater heate	r (annual)₁	12	1901.1935	(64)				
(65)m= 59.72 52.18 54.2 47.91 46.31 40.62 38.68 43.35 43.84 50.14 53.76 58.22 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Wetabolic gains (Table 5), Wats Image: State	Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]					
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 Idam Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 134.23 <td>(65)m=</td> <td>59.72</td> <td>52.18</td> <td>54.2</td> <td>47.91</td> <td>46.31</td> <td>40.62</td> <td>38.68</td> <td>43.35</td> <td>43.84</td> <td>50.14</td> <td>53.76</td> <td>58.22</td> <td></td> <td>(65)</td>	(65)m=	59.72	52.18	54.2	47.91	46.31	40.62	38.68	43.35	43.84	50.14	53.76	58.22		(65)				
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 134.23	inclu	ide (57)	m in calc	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	5. Int	ernal ga	ains (see	Table 5	5 and 5a):													
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Metabo	olic gain	s (Table	5) Wat	ts														
(66)me 134.23	motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m = 45.17 40.12 32.62 24.7 18.46 15.59 16.84 21.89 29.38 37.31 43.55 46.42 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m = 293.18 296.22 288.56 272.24 251.63 232.27 219.33 216.29 223.96 240.28 260.88 280.25 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m = 50.66 50.66 50.66 50.66 50.66 50.66 50.66 50.66 50.66 50.66 50.66 50.66 50.66 (69) Pumps and fans gains (Table 5a) (70)m = 10 10 10 10 10 10 10 10 10 10 10 (70) Losses e.g. evaporation (negative values) (Table 5) (71)m = -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 (71) Water heating gains (Table 5) (72)m = 80.27 77.65 72.85 66.54 62.24 56.42 51.99 58.27 60.89 67.39 74.66 78.26 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m = 524.02 519.39 499.44 468.88 437.74 409.68 393.57 401.85 419.63 450.38 484.49 510.32 (73)	(66)m=	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23	134.23		(66)				
$ \begin{array}{c} (67)m = & \hline 45.17 & 40.12 & 32.62 & 24.7 & 18.46 & 15.59 & 16.84 & 21.89 & 29.38 & 37.31 & 43.55 & 46.42 \\ \hline \mbox{Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5} \\ (68)m = & 293.18 & 296.22 & 288.56 & 272.24 & 251.63 & 232.27 & 219.33 & 216.29 & 223.96 & 240.28 & 260.88 & 280.25 \\ \hline \mbox{Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5} \\ (69)m = & & 50.66 $	Lightin	g gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see ⁻	Table 5									
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5(68)m=293.18296.22288.56272.24251.63232.27219.33216.29223.96240.28260.88280.25(68)Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5(69)m= 50.66 50.66 50.66 50.66 50.66 50.66 50.66 50.66 50.66 (69)Pumps and fans gains (Table 5a)(70)m=10101010101010(70)Losses e.g. evaporation (negative values) (Table 5)(71)m= -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 (71)Water heating gains (Table 5)(72)m= 80.27 77.65 72.85 66.54 62.24 51.99 58.27 60.89 67.39 74.66 78.26 (72)Total internal gains =(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m(73)m 524.02 519.39 499.44 468.88 437.74 409.68 393.57 401.85 419.63 450.38 484.49 510.32 (73)	(67)m=	45.17	40.12	32.62	24.7	18.46	15.59	16.84	21.89	29.38	37.31	43.55	46.42		(67)				
$\begin{array}{c} (68)m= & 293.18 & 296.22 & 288.56 & 272.24 & 251.63 & 232.27 & 219.33 & 216.29 & 223.96 & 240.28 & 260.88 & 280.25 \\ \hline (68)m= & 50.66 &$	Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5								
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 50.66 $50.$	(68)m=	293.18	296.22	288.56	272.24	251.63	232.27	219.33	216.29	223.96	240.28	260.88	280.25		(68)				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Cookin	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also se	e Table	5	1							
Pumps and fans gains (Table 5a) $(70)m=$ 10 </td <td>(69)m=</td> <td>50.66</td> <td></td> <td>(69)</td>	(69)m=	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66	50.66		(69)				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Pumps	and fai	ns gains	(Table {	5a)														
Losses e.g. evaporation (negative values) (Table 5) (71)m = -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 -89.48 (71) Water heating gains (Table 5) $(72)m = 80.27 77.65 72.85 66.54 62.24 56.42 51.99 58.27 60.89 67.39 74.66 78.26$ (72) Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m(73)m = 524.02 519.39 499.44 468.88 437.74 409.68 393.57 401.85 419.63 450.38 484.49 510.32$ (73)	(70)m=	10	10	10	, 10	10	10	10	10	10	10	10	10		(70)				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Losses	se.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)												
Water heating gains (Table 5) (72)m= 80.27 77.65 72.85 66.54 62.24 56.42 51.99 58.27 60.89 67.39 74.66 78.26 (72) Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 524.02 519.39 499.44 468.88 437.74 409.68 393.57 401.85 419.63 450.38 484.49 510.32 (73)	(71)m=	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48	-89.48		(71)				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Water	heating	dains (T	able 5)	I	ļ	ļ	ļ		ļ	ļ	I		1					
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$ (73)m= 524.02 519.39 499.44 468.88 437.74 409.68 393.57 401.85 419.63 450.38 484.49 510.32 (73)	(72)m=	80.27	77.65	72.85	66.54	62.24	56.42	51.99	58.27	60.89	67.39	74.66	78.26		(72)				
(73)m = 524.02 519.39 499.44 468.88 437.74 409.68 393.57 401.85 419.63 450.38 484.49 510.32	Total i	nternal	gains =				(66)	l m + (67)m	1 + (68)m +	L ⊦ (69)m + ((70)m + (7	1)m + (72)	m	1					
	(73)m=	524.02	519.39	499.44	468.88	437.74	409.68	393.57	401.85	419.63	450.38	484.49	510.32		(73)				
6. Solar gains:	6. So	lar gains	S:																
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	Solar g	ains are o	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	e applicat	le orientat	ion.						
Orientation: Access Factor Area Flux g_ FF Gains	Orienta	ation: A	Access F	actor	Area		Flu	x		g_		FF		Gains					

	Т	able 6d		m²		Table 6a		Table 6b		Table 6c		(W)	
North	0.9x	1	x	1.55	x	10.73	x	0.63	×	0.7	=	6.6	(74)
North	0.9x	1	x	1.55	x	20.36	x	0.63	×	0.7	=	12.52	(74)

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

West	0.9x	1	x	0	.65	x	9	1.41	x	0.63	x		0.7	=	23.58	(80)
West	0.9x	1	×	1	.53	x	1	11.22	x	0.63	x		0.7	_ =	67.54	(80)
West	0.9x	1	x	0	.65	x	1.	11.22	x	0.63	x		0.7	=	28.69	(80)
West	0.9x	1	×	1	.53	x	1'	16.05	x	0.63	x		0.7	=	70.47	(80)
West	0.9x	1	×	0	.65	x	1	16.05	x	0.63	x		0.7	=	29.94	(80)
West	0.9x	1	×	1	.53	x	1.	12.64	x	0.63	x		0.7	=	68.4	(80)
West	0.9x	1	×	0	.65	x	1.	12.64	x	0.63	x		0.7	=	29.06	(80)
West	0.9x	1	×	1	.53	x	9	8.03	x	0.63	x		0.7	=	59.53	(80)
West	0.9x	1	×	0	.65	x	9	8.03	x	0.63	x		0.7	_ =	25.29	(80)
West	0.9x	1	×	1	.53	x	7	73.6	x	0.63	x		0.7	=	44.7	(80)
West	0.9x	1	×	0	.65	x		73.6	x	0.63	x		0.7	_ =	18.99	(80)
West	0.9x	1	x	1	.53	x	4	6.91	x	0.63	x		0.7	=	28.49	(80)
West	0.9x	1	×	0	.65	x	4	6.91	x	0.63	x		0.7	_ =	12.1	(80)
West	0.9x	1	x	1	.53	x	2	4.71	x	0.63	x		0.7	=	15	(80)
West	0.9x	1	×	0	.65	x	2	4.71	x	0.63	x		0.7	=	6.37	(80)
West	0.9x	1	×	1	.53	x	1	6.39	x	0.63	x		0.7	=	9.95	(80)
West	0.9x	1	x	0	.65	x	1	6.39	x	0.63	x		0.7	=	4.23	(80)
Solar	gains in	watts, ca	alculate	d for ea	ch mont	h			(83)m	n = Sum(74)n	n(82)r	۱			L	
(83)m=	137.99	232.11	301.19	366.36	404.45	5 4	14.93	404.68	373	.38 330.25	261.	58 164	1.81	118.36		(83)
Total g	gains – i	nternal a	and sola	r (84)m	= (73)m	<u>ו + (</u>	83)m	, watts							l	
(84)m=	662.01	751.5	800.63	835.24	842.19	8	24.61	798.24	775	.24 749.88	712.	649	9.31	628.69		(84)
7. Me	ean inter	nal temp	perature	(heatin	g seasc	on)										
Tem	perature	during h	neating	periods	in the liv	ving	area f	rom Tab	ole 9,	, Th1 (°C)					21	(85)
Utilis	ation fac	tor for g	ains for	living a	rea, h1,	m (s	ee Ta	ble 9a)		- 1	_				I	
	Jan	Feb	Mar	Apr	May	4	Jun	Jul	A	ug Sep	00	t N	lov	Dec		(2.2)
(86)m=	0.98	0.97	0.94	0.89	0.76		0.58	0.39	0.4	4 0.65	0.88	3 0.	97	0.99		(86)
Mear	n interna	l temper	ature in	living a	rea T1 (follo	ow ste	ps 3 to 7	' in T	able 9c)	-1				l.	
(87)m=	20.13	20.29	20.52	20.71	20.9	2	20.98	21	2'	1 20.97	20.7	8 20	.38	20.13		(87)
Tem	perature	during h	neating	periods	in rest c	of dv	velling	from Ta		T = 0						
(88)m=	19.98	19.98	10.00		-				ble s	9, Th2 (°C)		_				
Utilis			19.90	19.99	20		20	20.01	20.	9, Th2 (°C) 01 20	19.9	9 19	.99	19.98		(88)
	ation fac	tor for g	ains for	rest of o	20 dwelling	, h2	20 ,m (se	20.01 ee Table	20.0 9a)	9, Th2 (°C) 01 20	19.9	9 19	.99	19.98		(88)
(89)m=	ation fac	tor for g	ains for	19.99 rest of 0 0.86	20 dwelling 0.7	, h2	20 ,m (se 0.49	20.01 ee Table 0.3	20.0 9a) 0.3	01 20 01 20 31 0.57	0.84	9 19	.99	19.98 0.98		(88) (89)
(89)m= Mear	ation fac	tor for g	ains for 0.92	19.99 rest of 0 0.86 the res	20 dwelling 0.7 t of dwe	, h2	20 ,m (se 0.49 T2 (fe	20.01 ee Table 0.3 ollow ste	9a) 0.3	0, Th2 (°C) 01 20 01 0.57 to 7 in Ta	19.9 0.84 ble 9c)	9 19 I 0.	.99 96	19.98 0.98		(88) (89)
(89)m= Mear (90)m=	ation fac 0.98 n interna 18.85	tor for g 0.96 I temper	ains for 0.92 ature in 19.41	19.99 rest of 0 0.86 the res 19.68	20 dwelling 0.7 t of dwe 19.91	I, h2	20 ,m (se 0.49 1 T2 (fo 19.99	20.01 ee Table 0.3 ollow ste 20	9a) 0.3 0.3 20	a, Th2 (°C) 01 20 31 0.57 to 7 in Ta 0 19.98	0.84 ble 9c)	9 19 • 0. 7 19	.99	19.98 0.98 18.87		(88) (89) (90)
(89)m= Mear (90)m=	ation fac 0.98 n interna 18.85	tor for g 0.96 l temper	ains for 0.92 ature in 19.41	19.99 rest of 0 0.86 the res 19.68	20 dwelling 0.7 t of dwe 19.91	, h2	20 ,m (se 0.49 1 T2 (fo 19.99	20.01 ee Table 0.3 ollow ste 20	9a) 0.3 0.3 20	a, Th2 (°C) 01 20 31 0.57 to 7 in Ta 0 19.98	19.9 0.84 ble 9c) 19.7 fLA = L	9 19 0. 7 19 iving are	.99 96 .22 a ÷ (4)	19.98 0.98 18.87	0.68	(88) (89) (90) (91)
(89)m= Mear (90)m=	ation fac 0.98 n interna 18.85	tor for g 0.96 I temper 19.09	ains for 0.92 ature in 19.41	19.99 rest of 0 0.86 the res 19.68	20 dwelling 0.7 t of dwe 19.91	, h2 Illing	20 ,m (se 0.49 1 T2 (fo 19.99	20.01 ee Table 0.3 ollow ste 20	9a) 0.3 ps 3 20	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0.84 0.84 ble 9c) 19.7 fLA = L	9 19 0. 7 19 iving are	.99 96 .22 a ÷ (4)	19.98 0.98 18.87 =	0.68	(88) (89) (90) (91)
(89)m= Mear (90)m= Mear (92)m=	ation fac 0.98 n interna 18.85 n interna 19.71	tor for g 0.96 l temper 19.09 l temper 19.9	ains for 0.92 ature in 19.41 ature (fu 20.16	19.99 rest of 0 0.86 the res 19.68 or the w 20.38	20 dwelling 0.7 t of dwe 19.91 hole dw 20.58	i, h2 illing	20 ,m (se 0.49 1 T2 (fo 19.99 (g) = fl 20.66	20.01 ee Table 0.3 ollow ste 20 _A × T1 20.68	9a) 0.3 ps 3 20 + (1 20.0	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	19.9 0.84 ble 9c) 19.7 fLA = L 2 20.4	9 19 1 0. 7 19 iving are 5 2	.99 96 .22 a ÷ (4)	19.98 0.98 18.87 =	0.68	(88) (89) (90) (91) (92)
(89)m= Mear (90)m= Mear (92)m= Apply	n interna 18.85 n interna 19.71 y adjustr	tor for g 0.96 l temper 19.09 l temper 19.9 nent to t	ains for 0.92 ature in 19.41 ature (fo 20.16 he mea	19.99 rest of 0 0.86 the res 19.68 or the w 20.38 n interna	20 dwelling 0.7 t of dwe 19.91 hole dw 20.58 al tempe	i, h2 illing rellin	20 ,m (se 0.49 1 T2 (fo 19.99 mg) = fl 20.66 ure fro	20.01 e Table 0.3 ollow ste 20 -A × T1 20.68 m Table	9a) 0.3 ps 3 20 + (1 20.1	9, TH2 (°C) 01 20 31 0.57 to 7 in Ta 0 19.98 - fLA) × T. 68 20.64 where app	19.9 0.84 ble 9c) 19.7 fLA = L 2 20.4 ropriat	9 19 4 0. 7 19 iving are 5 2 9	.99 96 .22 a ÷ (4) 20	19.98 0.98 18.87 = 19.72	0.68	(88) (89) (90) (91) (92)
(89)m= Mear (90)m= Mear (92)m= Apply (93)m=	ation fac 0.98 n interna 18.85 n interna 19.71 y adjustr 19.71	tor for g 0.96 I temper 19.09 I temper 19.9 nent to t	ains for 0.92 ature in 19.41 ature (fo 20.16 he mea 20.16	19.99 rest of 0 0.86 the res 19.68 or the w 20.38 n interna 20.38	20 dwelling 0.7 t of dwe 19.91 hole dw 20.58 al tempe 20.58	I, h2	20 ,m (se 0.49 1 T2 (fd 19.99 (g) = fl 20.66 ure fro 20.66	20.01 ee Table 0.3 ollow ste 20 -A × T1 20.68 m Table 20.68	9a) 0.3 ps 3 20 + (1 20.1 4e, 7 20.1	9, TH2 (°C) 01 20 31 0.57 to 7 in Ta 0 19.98 fLA) × T. 68 20.64 where app 68 20.64	19.9 0.84 ble 9c) 19.7 fLA = L 2 20.4 ropriat	9 19 1 0. 7 19 iving are 5 2 9 5 2	.99 96 .22 a ÷ (4) 20	19.98 0.98 18.87 = 19.72	0.68	(88) (89) (90) (91) (92) (93)
(89)m= Mear (90)m= Mear (92)m= Apply (93)m= 8. Sp	ation fac 0.98 n interna 18.85 n interna 19.71 y adjustr 19.71 pace hea	tor for g 0.96 l temper 19.09 l temper 19.9 nent to t 19.9 ting req	ains for 0.92 ature in 19.41 ature (fo 20.16 he mea 20.16 uiremen	19.99 rest of 0 0.86 the res 19.68 or the w 20.38 n interna 20.38 t	20 dwelling 0.7 t of dwe 19.91 hole dw 20.58 al tempe 20.58	l, h2	20 ,m (se 0.49 1 T2 (fd 19.99 (g) = fl 20.66 ure fro 20.66	20.01 ee Table 0.3 ollow ste 20 -A × T1 20.68 m Table 20.68	ble s 20.1 9a) 0.3 ps 3 20 + (1 20.1 4e, 20.1	9, TH2 (°C) 01 20 31 0.57 to 7 in Ta 0 19.98 fLA) × T 68 20.64 where app 68 20.64	19.9 0.84 ble 9c) 19.7 fLA = L 2 20.4 ropriat 20.4	9 19 1 0. 7 19 iving are 5 2 9 5 2	.99 96 .22 a ÷ (4) 20	19.98 0.98 18.87 = 19.72 19.72	0.68	(88) (89) (90) (91) (92) (93)
(89)m= Mear (90)m= Mear (92)m= Apply (93)m= 8. Sp Set T	ation fac 0.98 n interna 18.85 n interna 19.71 y adjustr 19.71 pace hea Fi to the n	tor for g 0.96 l temper 19.09 l temper 19.9 nent to t 19.9 ting req mean int	ains for 0.92 ature in 19.41 20.16 he mea 20.16 uiremen ternal te	19.99 rest of 0 0.86 the res 19.68 or the w 20.38 n interna 20.38 t mperatu	20 dwelling 0.7 t of dwe 19.91 hole dw 20.58 al tempe 20.58	i, h2	20 ,m (se 0.49 1 T2 (fo 19.99 eg) = fl 20.66 ure fro 20.66	20.01 ee Table 0.3 ollow ste 20 -A × T1 20.68 m Table 20.68	ble § 20.1 9a) 0.3 20 + (1 20.1 20.1 20.1 20.1 20.1 20.1 20.1 20.	9, 112 (°C) 01 20 31 0.57 to 7 in Ta 0 19.98 - fLA) × T. 68 20.64 where app 68 20.64 e 9b, so th	19.9 0.84 ble 9c) 19.7 fLA = L 2 20.4 ropriat 20.4	9 19 9 19 0. 7 19 iving are 5 2 9 5 2 9 5 2 9 (76)n	.99 96 .22 a ÷ (4) 20 10	19.98 0.98 18.87 = 19.72 19.72	0.68	(88) (89) (90) (91) (92) (93)
(89)m= Mear (90)m= Mear (92)m= Apply (93)m= 8. Sp Set T the u	ation fac 0.98 n interna 18.85 n interna 19.71 y adjustr 19.71 pace hea ri to the n utilisation	tor for g 0.96 I temper 19.09 I temper 19.9 nent to t 19.9 ting req mean int factor fo	ains for 0.92 ature in 19.41 ature (fo 20.16 he mea 20.16 uiremen ternal te or gains	rest of o 0.86 the res 19.68 or the w 20.38 n interna 20.38 t mperatu using T	20 dwelling 0.7 t of dwe 19.91 hole dw 20.58 al tempe 20.58 ure obta able 9a	relling	20 ,m (se 0.49 172 (fd 19.99 g) = fl20.66ure fro20.66d at ste	20.01 ee Table 0.3 ollow ste 20 -A × T1 20.68 m Table 20.68 ep 11 of	ble s 20.1 9a) 0.3 ps 3 20 + (1 20.1 20.1 20.1 Tabl	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	19.9 0.84 ble 9c) 19.7 fLA = L 2 20.4 ropriat 20.4 at Ti,m	9 19 0. 7 19 iving are 5 2 9 5 2 1=(76)n	.99 96 .22 a ÷ (4) 20 n and	19.98 0.98 18.87 = 19.72 19.72 re-calc	0.68	(88) (89) (90) (91) (92) (93)

Utilis	ation fac	tor for g	ains, hm	n:										
(94)m=	0.98	0.96	0.93	0.87	0.74	0.55	0.36	0.37	0.62	0.86	0.96	0.98		(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (84	4)m			•			•			
(95)m=	647.13	721.2	740.94	725.58	622.68	453.63	287.41	287.27	468.34	610.07	623.82	615.84		(95)
Mont	hly aver	age exte	ernal terr	perature	e from Ta	able 8								
(96)m=	4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9		(96)
Heat	loss rate	e for me	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	-			
(97)m=	1195.7	1164.59	1043.62	902.88	682.13	464.08	288.32	288.3	488.07	745.99	1010.55	1158.38		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	408.14	297.96	225.19	127.66	44.24	0	0	0	0	101.12	278.45	403.64		_
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	1886.4	(98)
Spac	e heatin	g require	ement in	kWh/m²	?/year]	27.09	(99)
9a. En	erav rea	auiremer	nts – Ind	ividual h	eating s	vstems i	ncludina	ı micro-C	CHP)			L		
Spac	e heatii	าต:												
Fract	ion of sp	bace hea	at from s	econdar	y/supple	mentary	system					Γ	0	(201)
Fract	ion of sp	bace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =			Ī	1	(202)
Fract	ion of to	tal heati	na from	main sv	stem 1			(204) = (2	02) × [1 –	(203)] =		ļ	1	(204)
Effici	ency of	main sna	ace heat	ina syste								l I	90.7	
Effici				omontor	v hootin	aovetor	o 0/					l		
EIIICI		seconda	ry/suppi i	ementar 1	y neaung I	g system r	1, 70 I			ī.		l	0	(208)
-	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Spac	e heatin	g require	ement (c	alculate	d above) I)	1	1			1			
	408.14	297.96	225.19	127.66	44.24	0	0	0	0	101.12	278.45	403.64		
(211)n	า = {[(98)m x (20	(4)] + (2´	10)m } x	100 ÷ (2	206)								(211)
	449.99	328.51	248.28	140.75	48.77	0	0	0	0	111.49	307	445.03		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,1012}	2	2079.82	(211)
Spac	e heatin	g fuel (s	econdar	y), kWh/	month									
= {[(98)m x (20	01)] + (2 ⁻	14) m } › I	< 100 ÷ (208)	i						,		
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								lota	il (kWh/yea	ar) = Sum(2)	215) _{15,10} 12	=	0	(215)
Water	heating)												
Outpu	101.76	ater hea	ter (calc	ulated a	bove)	121.9	126.26	140.76	142.22	162.06	172	197.25		
Efficio	nov of w	notor boo	174.27	154.57	149.05	131.0	120.20	140.70	142.52	102.00	173	107.25	80.6	
				04.00	00.7	00.0	00.0	00.0	00.0	04.0	00.54	07.04	80.0	(217)
(217)m=	07.21	00.79	00	04.00	02.7	80.8	80.6	80.6	80.6	04.Z	00.94	07.24		(217)
Fuel fc (219)n	or water $n = (64)$	m x 100	KVVN/m) ∸ (217)	onth Im										
(219)m=	219.89	193.01	202.65	182.11	180.95	163.52	156.65	174.64	176.57	192.47	199.9	214.65		
		1	1	1	1	1	1	Tota	I = Sum(2	19a) ₁₁₂ =	1	·	2257	(219)
Annua	al totals									k	Wh/year	. L	kWh/vea	`´´ r
Space	heating	fuel use	ed, main	system	1						-	[2079.82	
Water	heating	fuel use	d										2257	Ħ
	. 9													

Electricity for pumps, fans and electric keep-hot

central heating pump:		130]	(230c)
boiler with a fan-assisted flue		45]	(230e)
Total electricity for the above, kWh/year	sum of (230	a)(230g) =	175	(231)
Electricity for lighting			319.06	(232)
Electricity generated by PVs			-858.4	(233)
10a. Fuel costs - individual heating systems:				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	3.1 × 0.01 =	64.4745	(240)
Space heating - main system 2	(213) x	0 x 0.01 =	0	(241)
Space heating - secondary	(215) x	0 x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.1 × 0.01 =	69.97	(247)
Pumps, fans and electric keep-hot	(231)	11.46 × 0.01 =	20.06	(249)
(if off-peak tariff, list each of (230a) to (230g) se Energy for lighting	parately as applicable and approximately as applicable and approximately (232)	ply fuel price according to 11.46 × 0.01 =	Table 12a 36.56	(250)
Additional standing charges (Table 12)			106	(251)
	one of (233) to (235) x)	11.46 × 0.01 =	-08 37	-
		11.40	-90.37	
Appendix Q items: repeat lines (253) and (254)	as needed			
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(2)	as needed 247) + (250)(254) =		198.6875	(255)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systems	as needed 247) + (250)(254) =		198.6875	(255)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)	as needed 247) + (250)(254) =		0.47	(255) (256)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x (255)	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] =		<u>198.6875</u> <u>0.47</u> <u>0.8146</u>	(255) (256) (257)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x (SAP rating (Section 12)	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] =		198.6875 0.47 0.8146 88.6357	(255) (256) (257) (258)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x SAP rating (Section 12)12a. CO2 emissions – Individual heating system	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ms including micro-CHP		198.6875 0.47 0.8146 88.6357	(255) (256) (257) (258)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x SAP rating (Section 12)12a. CO2 emissions – Individual heating system	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ms including micro-CHP Energy kWh/year	Emission factor kg CO2/kWh	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea](255)](256)](257)](258)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x (100)SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ms including micro-CHP Energy kWh/year (211) x	Emission factor kg CO2/kWh	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea 411.8](255)](256)](257)](258) Ar](261)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x - Image: SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ms including micro-CHP Energy kWh/year (211) x (215) x	Emission factor kg CO2/kWh	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea 411.8 0](255)](256)](257)](258) Ar](261)](263)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x - 10)SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heating	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ms including micro-CHP Energy kWh/year (211) x (215) x (219) x	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 =	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea 411.8 0 446.89	(255) (256) (257) (258) (258) (261) (263) (264)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) × 0SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heating	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ ms including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) =	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 =	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea 411.8 0 446.89 858.69](255)](256)](257)](258) ar](261)](263)](264)](265)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x (100)SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-hot	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ ms including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 =	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea 411.8 0 446.89 858.69 90.48](255)](256)](257)](258) (258) (261)](261)](264)](265)](267)
Appendix Q items: repeat lines (253) and (254) Total energy cost (245)(2 11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x 1000 multiple 12)SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-hotElectricity for lighting	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ ms including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 = 0.198 =	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea 411.8 0 446.89 858.69 90.48 164.95](255)](256)](257)](258) (258)](261)](264)](265)](267)](268)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-hotElectricity for lightingEnergy saving/generation technologiesItem 1	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ ms including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	Emission factor kg CO2/kWh 0.198 0 0 0.198 0 0.198 0 0.517 0.517 0.517 0.517 0.517	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea 411.8 0 446.89 858.69 90.48 164.95 -454.09](255)](256)](257)](258) (261)](264)](265)](265)](267)](268)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-hotElectricity for lightingEnergy saving/generation technologiesItem 1Total CO2, kg/year	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ ms including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x sun	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 = 0.198 = 0.517 = 0.517 = 0.517 = 0.529 = n of (265)(271) =	198.6875 0.47 0.8146 88.6357 Emissions kg CO2/yea 411.8 0 446.89 858.69 90.48 164.95 -454.09 660.02](255)](256)](257)](258)](261)](263)](265)](265)](267)](268)](269)](269)](272)

EI rating (section 14)			[92	(274)
13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.02	=	2121.42	(261)
Space heating (secondary)	(215) x	0	= [0	(263)
Energy for water heating	(219) x	1.02	=	2302.14	(264)
Space and water heating	(261) + (262) + (263) + (264) =		[4423.55	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	2.92	=	511	(267)
Electricity for lighting	(232) x	0	=	931.64	(268)
Energy saving/generation technologies Item 1		2.92	= [-2506.53	(269)
'Total Primary Energy	sum	of (265)(271) =	[3359.67	(272)
Primary energy kWh/m²/year	(272)	÷ (4) =	[48.25	(273)

Code for Sustainable Homes Report

Assessor and House	Details			
Assessor Name: Property Address:	Andrew Simpson Flat 2 28 Greville Street London EC1N 8SU	Assessor Number:	STRO005087	
Buiding regulation as	ssessment			
TER			kg/m²/year 17.53	

DER

11.78 The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10) Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

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

Total Energy Type CO2 Emissions for Codes Levels 6

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

Result:

Credits awarded for Ene 1 = 3.7

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 37.54

Credits awarded for Ene 2 = 7.4

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

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

Reduction in CO2 emissions Credits awarded for Ene 7 = 2

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

The following requirements must also be met:

· Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.

Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.

Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.

All technologies must be accounted for by SAP

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

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

Property Details: Fla	at 2							
Address: Located in: Region: UPRN:		Flat 2 Engla Than	2, 28 Greville Street and nes valley	, London, EC1N 8	SU			
Date of assessme Date of certificat Assessment type	ent: :e: ::	10 O 10 O New	ctober 2013 ctober 2013 dwelling design sta	ae				
Transaction type	:	New	dwelling	5				
Tenure type:	alacura	Unkn	own					
Thermal Mass Pa	irameter:	Indic	ative Value Medium	1				
Dwelling designe	ed to use les	s than 125	litres per Perso	n per day: True)			
Property description	1:							
Dwelling type: Detachment:		Flat Mid-t	errace					
Year Completed:		2013						
Floor Location:		Floc	r area:		Storey height	:		
Floor 0		54.20	m^2	0)	2.4 m			
Living area: Front of dwelling fa	aces:	27.56 North	m ² (fraction 0.50	8)				
Opening types:								
Name:	Source:		Туре:	Glazing:		Argon:	Fram	ne:
d1	Manufacturer		Solid			Vee	Wood	
w1 w2	Manufacturer		Windows Windows	IOW-E, En =	= 0.05, soft coat	res Yes		
w3	Manufacturer		Windows	low-E, En =	= 0.05, soft coat	Yes		
Name:	Gap:		Frame Facto	or: g-value:	U-value:	Area:	No. c	of Openings:
d1	mm 16mm o	r moro	0.7	0	1.1	1.92	1	
w2	16mm o	r more	0.7	0.63	1.4 1.4	3.04 3.04	1	
w3	16mm o	r more	0.7	0.63	1.4	4.58	1	
Name:	Type-Name	e:	Location:	Orient:		Width:	Heig	ht:
d1			Stair wall	East		0.915	2.1	
w1			Main wall	South		2.25	1.35	
w3			Main wall	North		3.39	1.35	
Overshading:		Very	Little					
Opaque Elements:								
Type: (Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall:	Kappa:
<u>External Elements</u> Main wall	34.765	10.66	24.1	0.19	0	False		N/A
Stair wall	12.57	1.92	10.65	0.18	0	False		N/A
Roof	9.272	0	9.27	0.16	0			N/A
Internal Elements								
Party wall	16							N/A

Thermal bridges:

Party wall 2

24.704

N/A

Thermal bridges	:	User-defined	d (individua	al PSI-values) Y-Value = 0.1653
	Ammoniad	Length	PSI-va	llue
	Approved source	8.79 7.90	0.5	
		12.3	0.04	lamh
	Approved source	15.67	0.03	Intermediate floor between dwellings
	Approved source	7.62	0.28	Flat roof with parapet
	Approved source	7.68	0.09	Corner (normal)
	Approved source	2.56	-0.09	Corner (inverted)
	Approved source	5.12	0.06	Party wall between dwellings
	Approved source	6.25	0	Intermediate floor between dwellings (in blocks of flats)
	Approved source	1.52	0.02	Roof (insulation at rafter level)
Ventilation:				
Pressure test:		Yes (As desi	gned)	
Ventilation:		Natural vent	ilation (ex	tract fans)
Number of chim	neys:	0		
Number of open	flues:	0		
Number of fans:		2		
Number of sides	sheltered:	3 F		
Main beating sys	tem·	5		
Main heating sys	stom:	Contral boat	ing system	s with radiators or underfloor beating
Main heating sys	stem.	Gas hoilers :	and oil boil	ers
		Fuel: mains		
		Info Source:	Manufact	urer Declaration
		Manufacture	er's data	
		Efficiency: 8	9.8% (SEE	DBUK2009)
		Condensing	combi with	n automatic ignition
		Fuel Burning	у Туре: Мо	dulation
		Systems wit	h radiators	
		Pump in hea	it space: Y	es
Main heating Cor	ntrol:			
Main heating Co	ntrol:	Time and te	mperature	zone control
		Control code	e: 2110	
		Boiler interlo	ock: Yes	
Secondary heatin	ng system:			
Secondary heati	ng system:	None		
Water heating:				
Water heating:		From main h	neating sys	tem
		Water code:	901	
		Fuel :mains	gas	
		No hot wate	r cylinder	
Othors		Solar panel:	False	
Chiefs.		atom dand ton	:66	
Electricity tariff:		standard tar	Iff	
In Smoke Contro	DI Area:		tony	
conservatory:	to.	INU CONSERVA	itol y	
Low energy light	15:	IUU70	an / cubur	han
FPC language:		Euw rise urb Fnalish	arr / Subul	שמו
Wind turbing		No		
			o 1	
Photovoltaics:		Priotovoital	<u>ic I</u> ak nowor:	0.75
		Tilt of collec	tor 20°	0.75

Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

		User [Details:					
Assessor Name: Software Name:	Andrew Simpson Stroma FSAP 2009	9	Stroma Nun Software Ve	nber: ersion:		STRO Versio	005087 n: 1.5.0.55	
		Property	Address: Flat 2					
Address :	Flat 2, 28 Greville St	reet, London, E	C1N 8SU					
1. Overall dwelling dimer	nsions:							
Ground floor		Are	a(m²) 54.26 (1a) x	Ave Hei	ght(m) 4	(2a) =	Volume(m ³) 130.224	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)	+(1n)	54.26 (4)					
Dwelling volume			(3a)+(3	b)+(3c)+(3d)·	+(3e)+	(3n) =	130.224	(5)
2. Ventilation rate:	· .						<u>,</u> ,	
	main Se heating he	econdary eating	other	total			m ³ per hour	
Number of chimneys	0 +	0 +	0 =	0	x 4	= 0	0	(6a)
Number of open flues	0 +	0 +	0 =	0	x 2	20 =	0	(6b)
Number of intermittent fan	s	L	I	2	x 1	0 =	20	(7a)
Number of passive vents			[0	x 1	0 =	0	(7b)
Number of flueless gas fire	es		[0	x 4	0 =	0] (7c)
			L			۱ ۲۰۰۰		J
						Air ch	anges per hou	ur _
Infiltration due to chimney	s, flues and fans = $(6a)$	(+(6b)+(7a)+(7b)+	(7c) =	20	÷	- (5) =	0.15	(8)
Number of storeys in the	e dwelling (ns)	<i>a, proceed to (17),</i>	otherwise continue	110111 (9 <i>)</i> 10 (1	0)	ſ	0	
Additional infiltration					[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber fr	rame or 0.35 fo	r masonry cons	truction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value corresp gs); if equal user 0.35	oonding to the grea	ter wall area (after					_
If suspended wooden flo	oor, enter 0.2 (unseale	ed) or 0.1 (seal	ed), else enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0						0	(13)
Percentage of windows	and doors draught str	ipped	0.05 50.0 - (1.1)	1001			0	(14)
Window infiltration			$0.25 - [0.2 \times (14) \div$	100] =	(45)		0	(15)
	50 everenced in evel		(0) + (10) + (11) + (0)	(12) + (13) +	(15) =		0	(16)
Air permeability value, d	150, expressed in cubi	C metres per not $(1) \div 201+(8)$ otherw	our per square r	netre of er	ivelope	area	5	(17)
Air permeability value applies	if a pressurisation test has	been done or a de	aree air permeability	v is beina use	əd	l	0.4	(18)
Number of sides on which	sheltered		g. e e un permeasing	, ie zenig det		[3	(19)
Shelter factor			(20) = 1 - [0.075 x	(19)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor		(21) = (18) x (20) =			[0.31	(21)
Infiltration rate modified fo	r monthly wind speed					-		_
Jan Feb M	Mar Apr May	Jun Jul	Aug Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7							
(22)m= 5.4 5.1 5	5.1 4.5 4.1	3.9 3.7	3.7 4.2	4.5	4.8	5.1		
Wind Factor $(22a)m = (22)$)m ÷ 4							
(22a)m= 1.35 1.27 1	.27 1.12 1.02	0.98 0.92	0.92 1.05	1.12	1.2	1.27		
	I I	I	· · ·	<u> </u>				

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m	-		-		
	0.42	0.4	0.4	0.35	0.32	0.3	0.29	0.29	0.33	0.35	0.38	0.4		
Calcu	late effec	ctive air	change	rate for t	he appli	cable ca	se							
lf ext	haust air h	eat pump	using App	endix N. (2	² 3b) = (23a) x Fmv (e	equation (N	(5)) othe	rwise (23b) = (23a)			0	(23a)
lf bal	anced with	heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (from	n Table 4h) =) (200)			0	
a) If	halance	d mech	anical ve	ntilation	with he		actor (Moli	HR) (24a	n = (2)	2b)m + ('	23h) 🗸 [1	l – (23c)	0 ∸ 1001	(230)
(24a)m=				0		0	0		0	0	0		÷ 100]	(24a)
().if	halance	d mech:	l - anical ve	ntilation	without	heat rec	overv (N	<u> </u>	1 - (22)	2h)m + (;	23h)			. ,
(24b)m=				0	0	0		0	0		0	0		(24b)
c) If	whole h	ouse ex	I tract ver	L tilation (or positiv	e input v	/entilatio	n from c	L outside					
0) 11	if (22b)n	n < 0.5 ×	(23b), t	hen (24	c) = (23b); otherv	vise (24	c) = (22t	o) m + 0.	5 × (23b)			
(24c)m=	= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	e input	ventilatio	on from l	oft					
	if (22b)n	n = 1, th	en (24d)	m = (22l	b)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0.59	0.58	0.58	0.56	0.55	0.55	0.54	0.54	0.55	0.56	0.57	0.58		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (240	c) or (24	d) in boy	(25)					
(25)m=	0.59	0.58	0.58	0.56	0.55	0.55	0.54	0.54	0.55	0.56	0.57	0.58		(25)
3. He	at losse	s and he	eat loss	paramet	er:									
ELEN	MENT	Gros	SS	Openin	igs	Net Ar	ea	U-valu	he	AXU		k-value)	A X k
_		area	(m²)	r	1 ²	A ,n	n²	W/m2	.Κ	(W/I	<)	kJ/m²∙l	<	kJ/K
Doors	_					1.92	×	1.1	= [2.112				(26)
Windo	ws Type	e 1				3.04	x1/	/[1/(1.4)+	0.04] =	4.03				(27)
Windo	ws Type	92				3.04	x1/	/[1/(1.4)+	0.04] =	4.03				(27)
Windo	ws Type	93				4.58	x1/	/[1/(1.4)+	0.04] =	6.07				(27)
Walls	Type1	34.7	76	10.6	6	24.1	x	0.19	=	4.58				(29)
Walls	Type2	12.5	57	1.92	2	10.65	x	0.18	=	1.92				(29)
Roof		9.2	7	0		9.27	x	0.16	=	1.48				(30)
Total a	area of e	lements	, m²			56.60	7							(31)
Party	wall					16	x	0	=	0				(32)
Party	wall					24.7	x	0	=	0			\neg	(32)
* for wir	ndows and	roof wind	ows, use e	ffective wi	indow U-va	alue calcula	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	3.2	
** inclue	de the area	as on both	sides of in	nternal wal	ls and part	itions		(26) (20)	(22) -					
Fabric		55, VV/K :	= 5 (A X	0)				(20)(30)	((20)	(20) . (20) · (22-)	(22-)	24.22	(33)
Thorm		CIII = S((AXK) tor (TM	0 – Cm	· TEA) in	k l/m2k			((20)	(30) + (32)	2) + (32a).	(32e) =	7118.568	1 (34)
For dos	ial mass	parame	eter (Tivir	f = Cm -	- IFA) In	i KJ/III-K	known nr	onisoly the	indicativo		TMEalum	blo 1f	250	(35)
can be	used inste	ad of a de	tailed calc	ulation.	constructi	on are not	KIIOWII pi	ecisely life	, muicative	values of	11111 11110			
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						9.36	(36)
if details	s of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			33.58	(37)
Ventila	ation hea	at loss ca	alculated	l monthl	y			-	(38)m	= 0.33 × (25)m x (5)	_	I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m=	25.32	24.9	24.9	24.15	23.7	23.49	23.29	23.29	23.8	24.15	24.51	24.9		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	58.9	58.48	58.48	57.73	57.28	57.07	56.87	56.87	57.38	57.73	58.09	58.48		
				((10)	Average =	Sum(39)1.	12 /12=	57.78	(39)
Heat Id	ss para	$\frac{1}{100}$	HLP), ₩/ Γ_1.₀₀	/m²K	1.06	1.05	1.05	1.05	(40)m	= (39)m ÷	(4)	1.09		
(40)m=	1.09	1.08	1.08	1.06	1.06	1.05	1.05	1.05	1.06		1.07 Sum(40),	1.08	1.06	(40)
Numbe	er of day	/s in mo	nth (Tab	le 1a)					,	werage -	Oum(40)1.		1.00	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assum	ed occi	inancy	N								1.0	150		(12)
if TF	A > 13. A £ 13.	9, N = 1 9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.	9)	130		(42)
Annual	averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		77.3	3216		(43)
Reduce not more	the annua e that 125	al average litres per	hot water person per	usage by : ^r day (all w	5% if the a rater use, l	lwelling is hot and co	designed t ld)	to achieve	a water us	se target o	f			
1	lan	Feb	Mar	Apr	May	lun		Δυσ	Sen	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	Oep	001	INOV	Dec		
(44)m=	85.05	81.96	78.87	75.78	72.68	69.59	69.59	72.68	75.78	78.87	81.96	85.05		
-					and by A	400 ··· \/			-	Fotal = Su	m(44) ₁₁₂ =	- (-1)	927.859	(44)
Energy c			usea - cai		ontniy = 4.			1 m / 3600		th (see Ta				
(45)m=	126.43	110.58	114.11	99.48	95.46	82.37	76.33	87.59	88.63	103.3	112.75	122.44	4040.40	
lf instant	aneous w	vater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	i otal = Su	m(45) ₁₁₂ =	• L	1219.48	(43)
(46)m= Water	18.97 storage	16.59	17.12	14.92	14.32	12.36	11.45	13.14	13.3	15.49	16.91	18.37		(46)
a) If ma	anufactu	urer's de	clared lo	oss facto	r is knov	vn (kWh	/day):					0		(47)
Tempe	rature f	actor fro	m Table	2b			• •					0		(48)
Energy	lost fro	om water	[.] storage	, kWh/ye	ear			(47) x (48)) =			0		(49)
If manu	ufacture	r's decla	ared cylir	nder loss	factor is	s not kno	own:							
Cylinde	er volum	ne (litres) includir	ng any s	olar stor	age with	in same					0		(50)
It con Other	nmunity h wise if no	eating and stored ho	l no tank in t water (th	i dwelling, is includes	enter 110 instantan	litres in bo eous coml	ox (50) bi boilers) (enter '0' in	box (50)					
Hot wa	ter stor	ane loss	factor fr	om Tabl	e 2 (kW	h/litre/da	av)		2011 (00)			0		(51)
Volume	e factor	from Ta	ble 2a	oni rabi	0 2 (· J /					0		(52)
Tempe	rature f	actor fro	m Table	2b								0		(53)
Energy	lost fro	om water	⁻ storage	, kWh/ye	ear			((50) x (51) x (52) x	(53) =		0		(54)
Enter (49) or (54) in (5	5)	·								0		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	n				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)

Primar	y circuit	loss (an	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	/ factor fi	rom Tab	le H5 if t	here is s	solar wat	er heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	43.34	37.72	40.19	37.37	37.04	34.32	35.46	37.04	37.37	40.19	40.42	43.34		(61)
Total h	eat req	uired for	water h	eating ca	alculated	l for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	169.78	148.3	154.3	136.85	132.49	116.69	111.79	124.63	126	143.49	153.17	165.79		(62)
Solar DH	-IW input	calculated	using App	endix G or	· Appendix	H (negativ	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter	•				•		•	•			
(64)m=	169.78	148.3	154.3	136.85	132.49	116.69	111.79	124.63	126	143.49	153.17	165.79		
								Outp	but from w	ater heate	r (annual)₁	12	1683.2824	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	52.87	46.2	47.99	42.42	41	35.97	34.24	38.38	38.81	44.39	47.6	51.55		(65)
inclu	ide (57)	m in calo	ulation	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal g	ains (see	e Table 5	5 and 5a):	-		-				-	-	
Metab	olic gair	ns (Table	5) Wat	ts										
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94	108.94		(66)
Lightin	g gains	(calcula	ted in A	pendix	L, equat	ion L9 oi	r L9a), a	lso see ⁻	Table 5					
(67)m=	35.28	31.33	25.48	19.29	14.42	12.17	13.15	17.1	22.95	29.14	34.01	36.26		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5			I	
(68)m=	236.23	238.68	232.51	219.36	202.76	187.15	176.73	174.28	180.46	193.61	210.21	225.81		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a), also se	e Table	5	ļ	Į	I	
(69)m=	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71	47.71		(69)
Pumps	and fa	ns dains	(Table (1										
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10		(70)
Losses		i vaporatio	n (nega	ı tive valu	u es) (Tab	l le 5)								
(71)m=	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63	-72.63		(71)
Water	L heating	ι αains (T	able 5)											
(72)m=	71.07	68.75	64.5	58.92	55.11	49.96	46.03	51.59	53.91	59.67	66.11	69.29		(72)
Total i	nternal	gains =	l			(66)	l m + (67)m	I 1 + (68)m +	⊦ (69)m + i	l (70)m + (7	1 1)m + (72)	m		
(73)m=	436.6	432.79	416.51	391.59	366.3	343.31	329.94	336.99	351.34	376.44	404.35	425.37		(73)
6. So	lar gain:	S:												
Solar g	ains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	ne applicat	ole orientat	ion.		
Orienta	ation: /	Access F	actor	Area		Flu	х		g_		FF		Gains	
	-	Table 6d		m²		Tał	ole 6a	т	ahle 6h	т	ahle 6c		$(\Lambda\Lambda)$	

	Т	able 6d	m²		Table 6a			Table 6b		Table 6c	(W)		
North	0.9x	1	x	4.58	x	10.73	x	0.63	×	0.7	=	19.5	(74)
North	0.9x	1	x	4.58	x	20.36	x	0.63	×	0.7	=	37.01	(74)

North	0.9x	1	x		4.58] x	3	33.31	x	0.63	×	0.7	=	60.55	(74)
North	0.9x	1	x		4.58	Ī×	5	54.64	x	0.63	×	0.7	=	99.32	(74)
North	0.9x	1	x		4.58] ×	7	75.22	×	0.63	×	0.7	=	136.73	(74)
North	0.9x	1	x		4.58	Ī×	8	34.09	x	0.63	×	0.7	=	152.86	(74)
North	0.9x	1	x		4.58	Ī×	7	79.12	x	0.63	×	0.7	=	143.82	(74)
North	0.9x	1	x		4.58] ×	6	61.56	x	0.63	×	0.7	=	111.91	(74)
North	0.9x	1	x		4.58	Ī×	4	11.09	x	0.63	×	0.7	=	74.68	(74)
North	0.9x	1	x		4.58	Ī×	2	24.81	x	0.63	×	0.7	=	45.11	(74)
North	0.9x	1	x		4.58	Ī×	1	3.22	x	0.63	×	0.7	=	24.03	(74)
North	0.9x	1	x		4.58	×		8.94	x	0.63	×	0.7	=	16.26	(74)
South	0.9x	1	x		3.04	x	4	17.32	x	0.63	×	0.7	=	57.1	(78)
South	0.9x	1	x		3.04	×	4	17.32	x	0.63	×	0.7	=	57.1	(78)
South	0.9x	1	x		3.04	x	7	7.18	x	0.63	×	0.7	=	93.13	(78)
South	0.9x	1	x		3.04	x	7	7.18	x	0.63	×	0.7	=	93.13	(78)
South	0.9x	1	x		3.04	x	g	94.25	x	0.63	x	0.7	=	113.72	(78)
South	0.9x	1	x		3.04	x	g	94.25	x	0.63	×	0.7	=	113.72	(78)
South	0.9x	1	x		3.04	×	1	05.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x		3.04	×	1	05.11	x	0.63	x	0.7	=	126.83	(78)
South	0.9x	1	x		3.04	×	1	08.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x		3.04	×	1	08.55	x	0.63	x	0.7	=	130.97	(78)
South	0.9x	1	x		3.04	x	1	08.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x		3.04	×	1	08.9	x	0.63	x	0.7	=	131.39	(78)
South	0.9x	1	x		3.04	x	1	07.14	x	0.63	x	0.7	=	129.27	(78)
South	0.9x	1	x		3.04	x	1	07.14	x	0.63	×	0.7	=	129.27	(78)
South	0.9x	1	x		3.04	x	1	03.88	x	0.63	×	0.7	=	125.34	(78)
South	0.9x	1	x		3.04	x	1	03.88	x	0.63	×	0.7	=	125.34	(78)
South	0.9x	1	x		3.04	x	9	99.99	x	0.63	×	0.7	=	120.65	(78)
South	0.9x	1	x		3.04	x	g	99.99	x	0.63	×	0.7	=	120.65	(78)
South	0.9x	1	x		3.04	×	8	35.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x		3.04	×	8	35.29	x	0.63	x	0.7	=	102.91	(78)
South	0.9x	1	x		3.04	×	5	56.07	x	0.63	x	0.7	=	67.65	(78)
South	0.9x	1	x		3.04	x	5	56.07	x	0.63	×	0.7	=	67.65	(78)
South	0.9x	1	x		3.04	×	4	10.89	x	0.63	x	0.7	=	49.34	(78)
South	0.9x	1	x		3.04	x	4	10.89	x	0.63	x	0.7	=	49.34	(78)
Solar	aaine in	watte cal	culator	l for e	ach mon	th			(83)m	– Sum(74)m	(82)m				
(83)m=	133.7	223.26	287.98	352.9	8 398.6	8	415.64	402.36	362	2.6 315.98	250.9	3 159.33	114.93	7	(83)
Total	gains –	internal an	nd solai	. (84)n	n = (73)r	n +	(83)m	, watts	I				1	_	
(84)m=	570.3	656.05	704.49	744.5	7 764.9	8	758.95	732.3	699	.59 667.31	627.3	7 563.68	540.31		(84)
7. M	ean inte	rnal tempe	erature	(heati	ng seas	on)									
Tem	perature	e during he	eating p	eriods	in the li	iving	g area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilis	ation fa	ctor for gai	ins for	living a	area, h1	,m (see Ta	ble 9a)							

	tor for g		iving are	<i>a</i> ,,	(000 10						
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

(86)m=	0.97	0.95	0.9	0.82	0.66	0.48	0.32	0.33	0.56	0.81	0.95	0.98		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	20.27	20.45	20.66	20.83	20.96	20.99	21	21	20.98	20.86	20.51	20.27		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	20.01	20.02	20.02	20.03	20.04	20.04	20.05	20.05	20.04	20.03	20.03	20.02		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.97	0.94	0.88	0.78	0.6	0.41	0.24	0.26	0.49	0.77	0.94	0.97		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.09	19.34	19.62	19.85	20	20.04	20.05	20.05	20.03	19.9	19.44	19.1		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.69	19.9	20.15	20.35	20.49	20.52	20.53	20.53	20.51	20.39	19.98	19.69		(92)
Apply	adjustn	nent to tl	ne mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.69	19.9	20.15	20.35	20.49	20.52	20.53	20.53	20.51	20.39	19.98	19.69		(93)
8. Spa	ace hea	ting requ	uirement	t										
Set Ti	i to the r	nean int	ernal ter	mperatur	re obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	linsation	Fob	Mar		May	lup	lul	Δυσ	Son	Oct	Nov	Dec		
Utilisa	ation fac	tor for a	ains hm	<u>.</u>	iviay	Jun	Jui	Aug	Jeh	001	INOV	Dec		
(94)m=	0.96	0.93	0.88	0.8	0.63	0.44	0.28	0.29	0.53	0.79	0.94	0.97		(94)
Usefu	l gains,	hmGm ,	W = (94	4)m x (84	1 4)m									
(95)m=	549.75	612.79	620.65	593.12	, 483.81	335.64	206.26	206.21	350.76	492.76	527.79	522.63		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9		(96)
Heat I	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	894.51	871.7	780.66	672.31	503.19	338.03	206.41	206.41	356.58	553.52	754.34	865.23		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mon	th = 0.02	24 x [(97))m – (95)m] x (4′	1)m			
(98)m=	256.5	173.99	119.05	57.02	14.41	0	0	0	0	45.21	163.11	254.89		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	1084.19	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								19.98	(99)
9a. En	ergy rec	uiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)			-		
Space	e heatir	ng:												
Fracti	on of sp	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =		ĺ	1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								90.7	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g syster	ו, %						0	(208)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Αυα	Sep	Oct	Nov	Dec	kWh/ve	 ar
Space	e heatin	g require	ement (c	alculate	d above)		1 / 149	000	000		200	Ktvin yo	~
	256.5	173.99	119.05	57.02	14.41	0	0	0	0	45.21	163.11	254.89		
(211)m	n = {[(98)m x (20	4)] + (21	• I 0)m } x	100 ÷ (2					L	L			(211)
、 · ,	282.8	191.83	131.26	62.86	15.89	0	0	0	0	49.84	179.84	281.03		
						1	1	Tota	l (kWh/yea	ar) =Sum(2	2 11) _{15,1012}	=	1195.35	(211)

Space heating fuel (secondary), kWh/month = {[(98)m x (201)] + (214) m } x 100 ÷ (208) (215)m 0 0 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) =Sum(215),....12= (215)0 Water heating Output from water heater (calculated above) 169.78 148.3 154.3 136.85 132.49 116.69 111.79 124.63 126 143.49 153.17 165.79 Efficiency of water heater 80.6 (216)80.6 82.81 (217)m= 86.39 85.76 84.71 83.33 81.49 80.6 80.6 85.51 (217)80.6 86.43 Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$ (219)m= 196.53 172.94 182.15 164.23 162.59 144.78 138.7 154.62 156.33 173.27 179.13 191.81 Total = Sum(219a)_{1...12} 2017.08 (219) Annual totals kWh/year kWh/year Space heating fuel used, main system 1 1195.35 Water heating fuel used 2017.08 Electricity for pumps, fans and electric keep-hot central heating pump: 130 (230c) boiler with a fan-assisted flue (230e) 45 Total electricity for the above, kWh/year sum of (230a)...(230g) = (231) 175 Electricity for lighting 249.2 (232)Electricity generated by PVs (233)-643.810a. Fuel costs - individual heating systems: Fuel **Fuel Price** Fuel Cost kWh/year (Table 12) £/year x 0.01 = (211) x Space heating - main system 1 37.056 (240)3.1 Space heating - main system 2 (213) x x 0.01 = (241)0 0 Space heating - secondary (215) x x 0.01 = (242)0 0 (219)x 0.01 = Water heating cost (other fuel) 3.1 62.53 (247)(231) Pumps, fans and electric keep-hot x 0.01 = (249) 11.46 20.06 (if off-peak tariff, list each of (230a) to (230g) separately as applicable and apply fuel price according to Table 12a x 0.01 = Energy for lighting (232)(250) 11.46 28.56 Additional standing charges (Table 12) 106 (251)one of (233) to (235) x) x 0.01 = (252) 11.46 -73.78 Appendix Q items: repeat lines (253) and (254) as needed (245)...(247) + (250)...(254) = (255) Total energy cost 180.4188 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) (256) 0.47 $[(255) \times (256)] \div [(4) + 45.0] =$ Energy cost factor (ECF) (257)0.8543

SAP rating (Section 12)			88.0827 (258)
12a. CO2 emissions – Individual heating systems	including micro-CHF	ט	
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.198 =	236.68 (261)
Space heating (secondary)	(215) x	0 =	0 (263)
Water heating	(219) x	0.198 =	399.38 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	636.06 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.517 =	90.48 (267)
Electricity for lighting	(232) x	0.517 =	128.83 (268)
Energy saving/generation technologies Item 1		0.529 =	-340.57 (269)
Total CO2, kg/year		sum of (265)(271) =	514.8 (272)
CO2 emissions per m ²		(272) ÷ (4) =	9.49 (273)
El rating (section 14)			93 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.02 =	1219.26 (261)
Space heating (secondary)	(215) x	0 =	0 (263)
Energy for water heating	(219) x	1.02 =	2057.42 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	3276.68 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	2.92 =	511 (267)
Electricity for lighting	(232) x	0 =	727.65 (268)
Energy saving/generation technologies Item 1		2.92 =	-1879.9 (269)
'Total Primary Energy		sum of (265)(271) =	2635.44 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	48.57 (273)

Code for Sustainable Homes Report

Assessor and House Details												
Assessor Name: Property Address:	Andrew Simpson Flat 3 28 Greville Street London EC1N 8SU	Assessor Number:	STRO005087									
Buiding regulation as	sessment											
			kg/m²/year									

16.6

TER

DER The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10) Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

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

Total Energy Type CO2 Emissions for Codes Levels 6

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

Result:

Credits awarded for Ene 1 = 3.8

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 51.23

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

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

Reduction in CO2 emissions

Credits awarded for Ene 7 = 2

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

The following requirements must also be met:

Where not provided by accredited external renewables there must be a direct supply of energy produced to the dwelling under assessment.

Where covered by the Microgeneration Certification Scheme (MCS), technologies under 50kWe or 300kWth must be certified.

Combined Heat and Power (CHP) schemes above 50kWe must be certified under the CHPQA standard.

All technologies must be accounted for by SAP.

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

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

Property Details: Flat 3

Address:	Flat 3, 28 Greville Street, London, EC1N 8SU
Located in:	England
Region:	Thames valley
UPRN:	
Date of assessment:	10 October 2013
Date of certificate:	10 October 2013
Assessment type:	New dwelling design stage
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Medium
Dwelling designed to use less than	125 litres per Person per day: True

Property descriptio	n:					
Dwelling type: Detachment: Year Completed:		Flat Mid-terrace 2013				
Floor Location:		Floor area:		Storey height	:	
Floor 0		110.62 m ²		2.4 m		
Living area:		28.56 m^2 (fraction 0	258)			
Front of dwelling f	faces:	East	2007			
Opening types:						
Name:	Source:	Type:	Glazing:		Argon:	Frame:
d1	Manufacturer	Solid				Wood
w1	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
w2	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
w3	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
w4	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
w5	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
w6	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
w7	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
w8	Manufacturer	Windows	low-E, En =	0.05, soft coat	Yes	
Name:	Gap:	Frame Fac	ctor: g-value:	U-value:	Area:	No. of Openings:
d1	mm	0.7	0	1.4	1.92	1
w1	16mm or more	0.7	0.63	1.4	3.04	1
w2	16mm or more	0.7	0.63	1.4	3.04	1
w3	16mm or more	0.7	0.63	1.4	3.04	1
w4	16mm or more	0.7	0.63	1.4	3.04	1
w5	16mm or more	0.7	0.63	1.4	1.55	1
w6	16mm or more	0.7	0.63	1.4	1.55	1
w7	16mm or more	0.7	0.63	1.4	0.65	1
w8	16mm or more	0.7	0.63	1.4	4.58	1
Name:	Type-Name:	Location:	Orient:		Width:	Height:
d1	51	Stair wall	East		0.915	2.1
w1		Main wall	South		2.25	1.35
w2		Main wall	South		2.25	1.35
w3		Main wall	South		2.25	1.35
w4		Main wall	South		2.25	1.35
w5		Main wall	North		1.15	1.35
w6		Main wall	West		1.15	1.35
w7		Main wall	West		0.48	1.35
w8		Main wall	North		3.39	1.35

Overshading:		Very Lit	tle										
Opaque Elements:													
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Карра:						
External Elements	<u>82.8</u>	20 / 9	62 31	0.10	0	Falso	N/A						
Stair wall	27.528	1.92	25.61	0.19	0	False	N/A						
Roof	110.62	0	110.62	0.12	0	1 4150	N/A						
Internal Elements													
<u>Party Elements</u> Party wall	40.704						N/A						
Thermal bridges:													
Thermal bridges:		User-de	fined (individua	I PSI-values) Y-Val	ue = 0.1421								
C C		Length	n PSI-va	ue									
	Approved source	16.05	0.5	Steel lintel with	perforated steel ba	ise plate							
	Approved source	15.15	0.04	Sill									
	Approved source	30	0.05	Jamb	ar baturaan durallin								
	Approved source	50.59 60.24	0.07	Flat roof with na	ranet	iys							
	Approved source	21.6	0.09	Corner (normal)	Тарст								
	Approved source	12	-0.09	Corner (inverted)								
Ventilation:													
Pressure test:		Yes (As	designed)										
Ventilation:		Natural	ventilation (ext	ract fans)									
Number of chimne	eys: Fluos:	0											
Number of fans.	iues.	2	2										
Number of sides s	sheltered:	3	3										
Pressure test:		5											
Main heating syste	em:												
Main heating syst	em:	Central	heating system	s with radiators or	underfloor heating	1							
5 5 5		Gas boi	ers and oil boile	ers									
		Fuel: m	ains gas										
		Info So	urce: Manufactu	irer Declaration									
		Manufa	cturer's data										
		Conden	y: 89.8% (SED sing combi with	BUK2009)									
		Fuel Bu	rning Type: Mo	dulation									
		System	s with radiators										
		Pump ir	Pump in heat space: Yes										
Main heating Cont	rol:												
Main heating Con	trol:	Time ar	d temperature	zone control									
		Control	code: 2110										
		Boiler ir	Boiler interlock: Yes										
Secondary heating	system:												
Secondary heating	g system:	None											
Water heating:													
Water heating:		From m	ain heating syst	em									
		Water c	ode: 901										
		Fuer :m	airis yas water cylinder										
		NOTIOL	mater cynnucl										

Solar panel: False

Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics:

standard tariff Unknown No conservatory 100% Low rise urban / suburban English No <u>Photovoltaic 1</u> Installed Peak power: 1.5 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

User Details:												
Assessor Name: Software Name:	Andrew Simpson Stroma FSAP 2009	9	Stroma Nun Software Ve	nber: ersion:		STRO Versio	005087 n: 1.5.0.55					
		Property	Address: Flat 3									
Address :	Flat 3, 28 Greville St	reet, London, E	C1N 8SU									
1. Overall dwelling dimer	nsions:											
Ground floor		Are	a(m²) 10.62 (1a) x	Ave He	ight(m) .4	(2a) =	Volume(m ³) 265.488	(3a)				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $110.62 $ (4)												
Dwelling volume			(3a)+(3	b)+(3c)+(3d))+(3e)+	.(3n) =	265.488	(5)				
2. Ventilation rate:	· .						<u> </u>					
	main Se heating he	econdary eating	other	total			m ³ per hour					
Number of chimneys	0 +	0 +	0 =	0	x 4	40 =	0	(6a)				
Number of open flues	0 +	0 +	0 =	0	x 2	20 =	0	(6b)				
Number of intermittent fan	s	L	I	2	x 1	0 =	20	(7a)				
Number of passive vents			[0	x 1	0 =	0	(7b)				
Number of flueless gas fire	es		[0	x 4	40 =	0] (7c)				
			L					J				
						Air ch	anges per hou	ur				
Infiltration due to chimney	s, flues and fans = $(6a)$	(+(6b)+(7a)+(7b)+	(7c) =	20	16)	÷ (5) =	0.08	(8)				
Number of storeys in the	en carried out or is intended a dwalling (ns)	a, proceed to (17),	otherwise continue	110m (9) to (1	16)	Г	0					
Additional infiltration					[(9)-	1]x0.1 =	0	(10)				
Structural infiltration: 0.2	25 for steel or timber fr	rame or 0.35 fo	r masonry cons	truction			0	(11)				
if both types of wall are pre deducting areas of opening	esent, use the value corresp gs); if equal user 0.35	oonding to the grea	ter wall area (after					_				
If suspended wooden flo	oor, enter 0.2 (unseale	ed) or 0.1 (seal	ed), else enter 0				0	(12)				
If no draught lobby, ente	er 0.05, else enter 0						0	(13)				
Percentage of windows	and doors draught str	ipped	0.05 50.0 - (1.1)	1001			0	(14)				
Window infiltration			$0.25 - [0.2 \times (14) \div$	100] =	(45)		0	(15)				
	50 everenced in evel		(0) + (10) + (11) + (0)	(12) + (13) +	- (15) =		0	(16)				
Air permeability value, d	150, expressed in cubi	C metres per not $(1) \div 201+(8)$ otherw	our per square r	netre of el	ivelope	area	5	(17)				
Air permeability value applies	if a pressurisation test has	been done or a de	aree air permeability	v is beina us	ed	l	0.33	(18)				
Number of sides on which	sheltered		g. e e un permeasing	, <i>ie zenig</i> de		[3	(19)				
Shelter factor			(20) = 1 - [0.075 x	(19)] =			0.78	(20)				
Infiltration rate incorporation	ng shelter factor		(21) = (18) x (20) =	:			0.25	(21)				
Infiltration rate modified fo	r monthly wind speed							_				
Jan Feb N	Mar Apr May	Jun Jul	Aug Sep	Oct	Nov	Dec						
Monthly average wind spe	ed from Table 7											
(22)m= 5.4 5.1 5	5.1 4.5 4.1	3.9 3.7	3.7 4.2	4.5	4.8	5.1						
Wind Factor $(22a)m = (22)$)m – 4											
(22a)m= 1.35 1.27 1	.27 1.12 1.02	0.98 0.92	0.92 1.05	1.12	1.2	1.27						
	I I	I	· · ·	_II								

Adjusted in	nfiltration ra	ate (allow	ing for sl	helter an	d wind s	speed) =	(21a) x	(22a)m					
0.	34 0.32	0.32	0.28	0.26	0.25	0.23	0.23	0.26	0.28	0.3	0.32		
Calculate	effective ai	r change	rate for t	the appli	cable ca	se			•	-			
If mecha			and NL (C))))))))))))))))))))))))))))))	а) — Г ана (4	· ····································) (00-)			0	(23a)
If exhaust	air neat pump	o using App	enaix IN, (2	23D) = (238	a) × Fmv (e		NO)), Othe	rwise (23b) = (23a)			0	(23b)
If balance	a with heat re	covery: em		allowing	or in-use t	actor (from	n Table 4n	i) =				0	(23c)
a) If bala	anced mec	nanical v	entilation	with he	at recove	ery (MV	HR) (24a T	a)m = (22	2b)m + (23b) × [1 – (23c)	÷ 100] I	(24-)
(24a)m=	0 0	0	0	0	0	0	0	0	0	0	0		(248)
b) If bala	anced mec	hanical v	entilation	without	heat red	covery (ľ	MV) (24t T	o)m = (22	2b)m + (2	23b)		l	(0.41-)
(24b)m=	0 0	0	0	0	0	0	0	0	0	0	0		(240)
c) If who	ble house e	xtract ve	ntilation (or positiv	/e input v	ventilatio	on from (22)	outside	E w (22h				
(24c)m-	$\frac{20}{0}$ $\frac{1}{0}$ $\frac{1}{0}$	× (230),		c) = (23k)			C = (22)	$\frac{1}{1}$ 0.	.5 × (23L		0	l	(24c)
									0	0	0		(210)
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$													
(24d)m= 0.	56 0.55	0.55	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
Effective	air chang	e rate - e	nter (24a	u) or (24t) or (24	c) or (24	d) in bo	x (25)					
(25)m= 0.	56 0.55	0.55	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
				1	1	1	1	1	1	1		<u>I</u>	
3. Heat ic	sses and r	ieat loss		er:							le volue		
ELEMEN	are:	a (m²)	openin	igs 1 ²	Net Ar A ,r	ea n²	W/m2	ue 2K	A X U (W/I	K)	kJ/m²-l	, <	ахк kJ/K
Doors					1.92	x	1.4	=	2.688				(26)
Windows -	Гуре 1				3.04 $\times 1/[1/(1.4) + 0.04] =$		4.03	=			(27)		
Windows -	Гуре 2				3.04		/[1/(1.4)+	0.04] =	4.03	=			(27)
Windows ⁻	Tvpe 3				3.04		/[1/(1.4)+	0.04] =	4 03	\exists			(27)
Windows -	Type 4				3.04		/[1/(1.4)+	0.041 -	4.03	\exists			(27)
Windows ⁻	Type 5				1 55		/[1/(1 4)+	0.041 -	2.05	\exists			(27)
Windows ⁻					1.55		/[1/(1 /)]	0.041	2.05	\exists			(27)
Windows	Type 0				1.55		/[1/(1.4))	0.04]	2.05	\exists			(27)
Windows					0.65		/[1/(1.4)+	0.04] =	0.86	\exists			(27)
					4.58		/[1/(1.4)+	0.04] =	6.07	╡╷			(27)
vvalis Type		2.8	20.4	9	62.31	×	0.19	=	11.84			\dashv	(29)
Walls Type	e2 27	.53	1.92	2	25.61	X	0.18	=	4.61			$_$ $_$	(29)
Roof	11(0.62	0		110.6	2 X	0.12	=	13.27				(30)
Total area	of element	s, m²			220.94	48							(31)
Party wall					40.7	x	0	=	0				(32)
* for windows	s and roof win	dows, use	effective w	indow U-va	alue calcul	ated using	g formula 1	l/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	3.2	
Eabric boo	e areas on boi	T sides of i	nternal wal , 1 1)	is and par	titions		(26) (30)) + (32) -					(22)
Hoot conc	a 1055, VV/M	、= 3 (A X S(A マレ)	. 0)				(20)(00)	(/20)	(30) + (3)	2) ± (220)	(320) -	59.58	
i icai capa	ony oni ≓ c	<u>,,,,,,</u> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						((20).	(30) + (34	≤, + (J2d).	(520) =	13119.3	<u>კი (34)</u>

Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m²K

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

Indicative Value: Medium

(35)

250

can be ι	ised inste	ad of a de	tailed calc	ulation.										_
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						31.4	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								_
Total fa	abric he	at loss							(33) +	(36) =			90.98	(37)
Ventila	tion hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (25)m x (5)		l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	48.88	48.33	48.33	47.33	46.73	46.45	46.19	46.19	46.88	47.33	47.82	48.33		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	139.86	139.31	139.31	138.31	137.71	137.43	137.17	137.17	137.86	138.31	138.8	139.31		
										Average =	Sum(39)1.	12 /12=	138.38	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K		-			(40)m	= (39)m ÷	(4)			
(40)m=	1.26	1.26	1.26	1.25	1.24	1.24	1.24	1.24	1.25	1.25	1.25	1.26		
										Average =	Sum(40)1.	12 /12=	1.25	(40)
Number of days in month (Table 1a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
													1	
Assumed occupancy, N 2.8185												185		(42)
if TF	A > 13. A £ 13.	9, $N = 1$ 9, $N = 1$	+ 1.70 X	[i - exp	(-0.0003	949 X (17	-A - 15.9)2)] + 0.0	JU13 X (IFA - 13.	9)			
Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ [101,1393] (43)												(43)		
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of (43)														
not more	e that 125	litres per	person pei	r day (all w	ater use, l	hot and co	ld)				-			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	111.25	107.21	103.16	99.12	95.07	91.03	91.03	95.07	99.12	103.16	107.21	111.25		
										Total = Su	m(44) ₁₁₂ =	=	1213.6716	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,n	n x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	165.38	144.64	149.26	130.13	124.86	107.74	99.84	114.57	115.94	135.11	147.49	160.16		
					_		_		-	Total = Su	m(45) ₁₁₂ =	-	1595.1219	(45)
lf instan	taneous w	ater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)					
(46)m=	24.81	21.7	22.39	19.52	18.73	16.16	14.98	17.19	17.39	20.27	22.12	24.02		(46)
Water	storage	loss:				<i></i>							I	
a) If m	anufacti	urer's de	clared lo	oss facto	r is knov	wn (kWh	/day):					0		(47)
Tempe	erature f	actor fro	m Table	2b								0		(48)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (48)) =			0		(49)
If man	ufacture	r's decla	ared cylir	nder loss	s factor is	s not kno	own:					_	l	(50)
Cylina	er volun) incluali	ng any s	olar stor	age with	in same					0		(50)
If con	nmunity h rwigg if ng	eating and	l no tank ir t watar (th	i dwelling,	enter 110	litres in bo	x (50)	ontor '0' in	boy (50)					
Utriel			water (th		instantan		, voliers)	enter U IN	JUX (30)				l	
Hot wa	ater stor	age loss	tactor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	om water	storage	, kWh/ye	ear			((50) x (51) x (52) x	(53) =		0		(54)

Enter	(49) or (54) in (5	5)									0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Prima	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Prima	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)	1		
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m=	50.96	46.03	50.96	48.88	48.45	44.89	46.39	48.45	48.88	50.96	49.32	50.96		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	216.34	190.67	200.22	179.01	173.31	152.63	146.23	163.02	164.82	186.07	196.8	211.12		(62)
Solar D	HW input	calculated	using App	endix G o	r Appendix	: H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(64)m=	216.34	190.67	200.22	179.01	173.31	152.63	146.23	163.02	164.82	186.07	196.8	211.12		-
								Outp	out from wa	ater heate	r (annual)₁	12	2180.2277	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]														
(65)m=	67.73	59.6	62.37	55.49	53.63	47.05	44.79	50.21	50.77	57.67	61.37	65.99		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	s (Table	<u>5), Wat</u>	ts		-								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11	169.11		(66)
Lightir	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5	-	-			
(67)m=	60.72	53.93	43.86	33.2	24.82	20.95	22.64	29.43	39.5	50.16	58.54	62.41		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-			
(68)m=	406.63	410.85	400.22	377.58	349.01	322.15	304.21	299.99	310.62	333.26	361.83	388.69		(68)
Cooki	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)), also se	ee Table	5			_	
(69)m=	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73	54.73		(69)
Pump	s and fa	ns gains	(Table s	5a)										
(70)m=	10	10	10	10	10	10	10	10	10	10	10	10		(70)
Losse	s e.g. ev	aporatic	on (nega	tive valu	es) (Tab	ole 5)	-				-			
(71)m=	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74	-112.74		(71)
Water	heating	gains (T	able 5)									-		
(72)m=	91.03	88.69	83.83	77.07	72.08	65.34	60.21	67.48	70.51	77.51	85.23	88.7		(72)
Total	internal	gains =	:			(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72))m		
(73)m=	679.49	674.57	649.01	608.95	567.01	529.55	508.16	518	541.74	582.02	626.71	660.9		(73)
6. So	lar gains	s:												

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

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

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

West	0.9x	1	×		1 55	1 x	x 111.22 x		1 🗴 Г	0.63	٦ x	0.7	=	68.42	(80)
West	0.9x	1			0.65	1 x		11.22] ~ L] _ K [0.63		0.7		28.69	(80)
West	0.9x	1	×		1.55	י 1 ×		16.05	і ц і х Г	0.63	ا_ x	0.7	= -	71.39	(80)
West	0.9x	1	×		0.65	ן א [16.05	」 1 × 「	0.63	ا_ ×	0.7	=	29.94	(80)
West	0.9x	1	×		1.55	ı x [1	12.64	1 × [0.63	۲ × ۲	0.7	= =	69.3	(80)
West	0.9x	1	×		0.65	×	1	12.64	i . [0.63	×	0.7	=	29.06	(80)
West	0.9x	1	×		1.55	i ×	9	98.03	i × ſ	0.63	- ×	0.7	= =	60.31	(80)
West	0.9x	1	×		0.65	j ×	g	98.03	i × [0.63	۲ × ۲	0.7	= =	25.29	(80)
West	0.9x	1	×		1.55	İ ×		73.6	i × [0.63	×	0.7	=	45.28	(80)
West	0.9x	1	×		0.65	İ ×		73.6	i × ľ	0.63	- ×	0.7	=	18.99	(80)
West	0.9x	1	×		1.55	İ ×	4	16.91	İ x Ī	0.63	×	0.7	=	28.86	(80)
West	0.9x	1	×		0.65	İ ×	4	16.91	İ x [0.63	×	0.7	=	12.1	(80)
West	0.9x	1	×		1.55	İ ×	2	24.71	İ x Ī	0.63	- ×	0.7	=	15.2	(80)
West	0.9x	1	×		0.65	×	2	24.71	İ × Ī	0.63	×	0.7	=	6.37	(80)
West	0.9x	1	×		1.55	×	1	6.39	İ×Ī	0.63	×	0.7	=	10.08	(80)
West	0.9x	1	×		0.65	İ ×	1	6.39	İ x Ī	0.63	- ×	0.7	=	4.23	(80)
Solar ((83)m=	gains in 271.85	watts, ca 455.68	llculate 589.66	d for e	ach mon 17 804.0	th 1	831.5	807.93	(83)m 736.7	= Sum(74)m 76 646.82	. <mark>(82)m</mark> 512.98	3 324.34	233.43	1	(83)
Total g	gains – ir	nternal a	nd sola	r (84)r	n = (73)r	n + ((83)m	, watts	-						
(84)m=	951.33	1130.25	1238.66	1329.	02 1371.0)2 1	361.05	1316.09	1254.	76 1188.55	1095	951.05	894.32		(84)
7. Me	ean inter	nal temp	erature	(heat	ng seaso	on)									
7. Me Temp	ean inter perature	nal temp during h	erature eating	(heat) period	ng seaso s in the li	on) ving	area	from Tat	ole 9,	Th1 (°C)				21	(85)
7. Me Temp Utilisa	ean inter perature ation fac	nal temp during he tor for ga	erature eating ains for	(heat period living	ng seaso s in the li area, h1,	on) ving ,m (s	area t see Ta	from Tab able 9a)	ole 9,	Th1 (°C)				21	(85)
7. Me Temp Utilisa	ean inter perature ation fac Jan	nal temp during he tor for ga Feb	erature eating ains for Mar	(heat period: living Ap	ng seaso s in the li area, h1, r Ma	on) ving ,m (s y	area f see Ta Jun	from Tab ible 9a) Jul	ole 9, Au	Th1 (°C) g Sep	Oct	Nov	Dec	21	(85)
7. Me Temp Utilisa (86)m=	ean inter perature ation fac Jan 0.99	nal temp during he tor for ga Feb 0.98	erature eating ains for Mar 0.96	(heat beriod: living Ap 0.91	ng seaso s in the li area, h1, r Ma 0.8	on) ving ,m (s y	area f see Ta Jun 0.61	from Tab ble 9a) Jul 0.42	ole 9, Au 0.44	Th1 (°C) g Sep 4 0.71	Oct 0.91	Nov 0.98	Dec 0.99	21	(85)
7. Me Temp Utilisa (86)m= Mear	ean inter perature ation fac Jan 0.99	nal temp during he tor for ga Feb 0.98 I tempera	erature eating ains for Mar 0.96 ature in	(heat beriod living Ap 0.91 living	ng seaso s in the li area, h1, r Ma 0.8 area T1	on) ving ,m (s y (folle	area f see Ta Jun 0.61 ow ste	from Tab able 9a) Jul 0.42 ps 3 to 7	ole 9, Au 0.44 7 in Ta	Th1 (°C) g Sep 4 0.71 able 9c)	Oct 0.91	Nov 0.98	Dec 0.99	21	(85)
7. Me Temp Utilisa (86)m= Mear (87)m=	ean inter perature ation fac Jan 0.99 n interna 19.86	nal temp during he tor for ga Feb 0.98 I tempera 20.07	erature eating p ains for Mar 0.96 ature in 20.34	(heat beriod: living Ap 0.91 living 20.5	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84	on) ving ,m (s y (follo	area f see Ta Jun 0.61 ow ste 20.96	from Tab ble 9a) Jul 0.42 ps 3 to 7 21	ole 9, Au 0.44 7 in Ta 20.9	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93	Oct 0.91 20.66	Nov 0.98 20.16	Dec 0.99 19.87	21	(85) (86) (87)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp	ean inter perature ation fac Jan 0.99 n interna 19.86 perature	nal temp during he tor for ga Feb 0.98 I tempera 20.07 during he	erature eating p ains for Mar 0.96 ature in 20.34 eating	(heat beriod: living Ap 0.91 living 20.5 beriod:	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest o	on) ving ,m (s y (follo t t	area f see Ta Jun 0.61 ow ste 20.96 velling	from Tab ble 9a) Jul 0.42 ps 3 to 7 21 from Ta	Au 0.44 7 in Ta 20.9 able 9	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C)	Oct 0.91 20.66	Nov 0.98 20.16	Dec 0.99 19.87	21	(85) (86) (87)
7. Me Temp Utilisa (86)m= Mear (87)m= Temp (88)m=	ean inter perature ation fac Jan 0.99 n interna 19.86 perature 19.87	nal temp during h tor for ga Feb 0.98 I tempera 20.07 during h 19.88	erature eating ains for Mar 0.96 ature in 20.34 eating 19.88	(heat beriod: living 0.91 living 20.5 beriod: 19.8	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest o 3 19.85	on) ving ,m (s y (follo t of dv	area f see Ta Jun 0.61 cow ste 20.96 welling 19.89	from Tab ble 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89	Au 0.44 7 in Ta 20.9 able 9 19.8	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89	Oct 0.91 20.66	Nov 0.98 20.16 19.88	Dec 0.99 19.87 19.88]]	(85) (86) (87) (88)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa	ean inter perature ation fac Jan 0.99 interna 19.86 perature 19.87 ation fac	nal temp during he tor for ga Feb 0.98 I tempera 20.07 during he 19.88	erature eating ains for 0.96 ature in 20.34 eating 19.88 ains for	(heat beriod: living 0.91 living 20.5 beriod: 19.8 rest o	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest o 3 19.85	on) ving ,m (s y (follet 4 of dv 9	area f see Ta Jun 0.61 20.96 velling 19.89 2,m (se	from Tab able 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table	Die 9, Au 0.44 7 in Ta 20.9 able 9, 19.8 9a)	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89	Oct 0.91 20.66 19.88	Nov 0.98 20.16 19.88	Dec 0.99 19.87 19.88	21]]	(85) (86) (87) (88)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m=	ean inter perature ation fac Jan 0.99 n interna 19.86 perature 19.87 ation fac	nal temp during h tor for ga Feb 0.98 I tempera 20.07 during h 19.88 tor for ga 0.97	erature eating ains for Mar 0.96 ature in 20.34 eating 19.88 ains for 0.94	(heat beriod: living 0.91 living 20.5 beriod: 19.8 rest o 0.88	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.85 4 0.74	on) ving ,m (s y (folle 4 (folle 4 0 0 f dv 9 , h2	area 1 see Ta Jun 0.61 20.96 velling 19.89 2,m (se 0.52	from Tab ble 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31	Au 0.44 7 in Ta 20.9 able 9 19.8 9a) 0.33	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62	Oct 0.91 20.66 19.88	Nov 0.98 20.16 19.88 0.98	Dec 0.99 19.87 19.88 0.99	21]]	(85) (86) (87) (88) (89)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear	ean inter perature ation fac Jan 0.99 n interna 19.86 perature 19.87 ation fac 0.99	nal temp during h tor for ga Feb 0.98 I tempera 20.07 during h 19.88 tor for ga 0.97	erature eating ains for Mar 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in	(heat beriod: living 0.91 living 20.5 beriod: 19.8 rest o 0.88 the re	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.89 4 0.74 s tof dwelling	on) ving ,m (\$ y (foll(\$ 4 of dv 9 1 9 1 9 1	area 1 see Ta Jun 0.61 20.96 welling 19.89 2,m (se 0.52 a T2 (fr	from Tab ble 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste	Au 0.44 7 in Ta 20.9 able 9 19.8 9a) 0.33 eps 3 1	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table	Oct 0.91 20.66 19.88 0.88	Nov 0.98 20.16 19.88 0.98	Dec 0.99 19.87 19.88 0.99	21]]]	(85) (86) (87) (88) (89)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m=	ean internation factor ation factor Jan 0.99 internation 19.86 eerature 19.87 ation factor 0.99 internation 18.4	nal temp during he tor for ga Feb 0.98 I tempera 20.07 during he 19.88 tor for ga 0.97 I tempera 18.69	erature eating ains for 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08	(heat beriod: living 0.91 living 20.5 20.5 20.5 20.5 20.5 20.5 20.5 20.5	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.85 4 0.74 st of dwe 2 2 19.74	on) ving ,m (s y (folle ↓ of dv → ↓ billing ↓	area 1 see Ta Jun 0.61 20.96 velling 19.89 2,m (se 0.52 g T2 (fu 19.87	from Tab able 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste 19.89	Au 0.44 7 in Ta 20.9 able 9 19.8 9a) 0.33 eps 3 1 19.8	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84	Oct 0.91 20.66 19.88 0.88 0.88 e 9c) 19.52	Nov 0.98 20.16 19.88 0.98 18.83	Dec 0.99 19.87 19.88 0.99	21]]]	(85) (86) (87) (88) (89) (90)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m=	ean inter perature ation fac Jan 0.99 interna 19.86 perature 19.87 ation fac 0.99 interna 18.4	nal temp during h tor for ga Feb 0.98 I tempera 20.07 during h 19.88 tor for ga 0.97 I tempera 18.69	erature eating ains for Mar 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08	(heat beriod: living 0.91 living 20.5 20.5 20.5 20.5 20.5 20.5 20.5 20.5	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.85 4 0.74 5 0.74 5 0.74 5 19.74	on) ving ,m (s y (folle (folle (folle) (folle) (folle) (folle) (folle) (folle)) (folle)))))))))))))	area f see Ta Jun 0.61 20.96 velling 19.89 2,m (se 0.52 9 T2 (fu 19.87	from Tab able 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste 19.89	Au 0.44 7 in Ta 20.9 able 9, 19.8 9a) 0.33 eps 3 f 19.8	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84 19.84	Oct 0.91 20.66 19.88 0.88 0.88 e 9c) 19.52 A = Liv	Nov 0.98 20.16 19.88 0.98 18.83	Dec 0.99 19.87 19.88 0.99 18.41 4) =	21]]]] 0.26	(85) (86) (87) (88) (89) (90) (91)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m=	ean inter perature ation fac Jan 0.99 n interna 19.86 perature 19.87 ation fac 0.99 n interna 18.4	nal temp during h tor for ga Feb 0.98 I tempera 20.07 during h 19.88 tor for ga 0.97 I tempera 18.69	erature eating ains for Mar 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08	(heat beriod: living 0.91 living 20.5 beriod: 19.8 rest o 0.88 the re 19.4	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 5 in rest of 3 19.85 4 0.74 5 of dwelling 2 19.74	on) ving ,m (s y (follo 4 of dv 9 1 9 1 9 1 1 1	area f see Ta Jun 0.61 20.96 welling 19.89 2,m (se 0.52 g T2 (fr 19.87	from Tab ble 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste 19.89	Au 0.44 7 in Ta 20.9 able 9, 19.8 9a) 0.33 eps 3 f 19.8	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84 ft - ft A) × T2	Oct 0.91 20.66 19.88 0.88 e 9c) 19.52 .A = Liv	Nov 0.98 20.16 19.88 0.98 18.83 ring area ÷ (4	Dec 0.99 19.87 19.88 0.99 18.41 4) =	21]]] 0.26	(85) (86) (87) (88) (89) (90) (91)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m= Mear (92)m=	ean internation factor Jan 0.99 0 internation factor 19.86 0 erature 19.87 ation factor 0.99 0 internation factor 18.4	nal temp during h tor for ga Feb 0.98 I tempera 20.07 during h 19.88 tor for ga 0.97 I tempera 18.69	erature eating ains for 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08 ature (for 19.4	(heat beriod: living 0.91 living 20.5 20.5 20.5 19.8 rest o 0.88 the rest 19.4	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.85 4 0.74 5 of dwelling 0.74 19.74 st of dwee 2 2 19.74	on) ving ,m (s y (follo y (follo y (follo y (follo y y (follo y	area f see Ta Jun 0.61 0.61 0.61 0.61 20.96 velling 19.89 2,m (se 0.52 g T2 (fu 19.87 19.87 ng) = fl 20.15	from Tab able 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste 19.89	Au 0.44 7 in Ta 20.9 able 9, 19.8 9a) 0.33 eps 3 in 19.8 + (1 - 20.1	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84 fl - fLA) × T2 7 20.12	Oct 0.91 20.66 19.88 0.88 0.88 e 9c) 19.52 A = Liv 19.81	Nov 0.98 20.16 19.88 0.98 18.83 ring area ÷ (4) 19.17	Dec 0.99 19.87 19.88 0.99 18.41 4) =	21]]]]]]]]]]]]]]]]]]]	(85) (86) (87) (88) (89) (90) (91)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m= Mear (92)m= Apply	ean inter perature ation fac Jan 0.99 interna 19.86 perature 19.87 ation fac 0.99 interna 18.4	nal temp during h tor for ga Feb 0.98 I tempera 20.07 during h 19.88 tor for ga 0.97 I tempera 18.69	erature eating ains for 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08 ature (fr 19.4 ne mea	(heat beriod: living 0.91 living 20.5 20.5 20.5 20.5 20.5 20.5 20.5 19.8 rest 0 0.88 the re 19.4 19.7 n inter	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.89 4 0.74 5 of dwelling 4 0.74 st of dwelling 2 2 19.74 whole dw 2 2 20.03 nal temp 20.03	on) ving ,m (s y (follet 4 of dv 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1	area f see Ta Jun 0.61 20.96 velling 19.89 2,m (se 0.52 g T2 (fu 19.87 19.87 ng) = fl 20.15 ure fro	from Tab able 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste 19.89 LA × T1 20.17	Au 0.44 7 in Ta 20.9 able 9, 19.8 9a) 0.33 eps 3 1 19.8 + (1 - 20.1 e 4e. w	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84 fl - fLA) × T2 7 20.12 where approx	Oct 0.91 20.66 19.88 0.88 9 9c) 19.52 A = Liv 19.81 priate	Nov 0.98 20.16 19.88 0.98 18.83 ring area ÷ (4 19.17	Dec 0.99 19.87 19.88 0.99 18.41 4) = 18.79	21]]]]]]]]]]]]]]]]]]]	(85) (86) (87) (88) (89) (90) (91) (92)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m= Mear (90)m= Mear (92)m= Apply (93)m=	ean inter perature ation fac Jan 0.99 interna 19.86 perature 19.87 ation fac 0.99 interna 18.4 interna 18.78 v adjustn 18.78	nal temp during he tor for ga Feb 0.98 I tempera 20.07 during he 19.88 tor for ga 0.97 I tempera 18.69 I tempera 19.04 nent to th 19.04	erature eating ains for 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08 ature (fu 19.4	(heat beriod: living 0.91 living 20.5 beriod: 19.8 rest o 0.88 the re 19.4 cr the 19.7 n inter 19.7	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 5 in rest of 3 19.89 6 dwelling 0.74 0.74 st of dwelling 0.74 2 19.74 whole dw 2 2 20.03 nal temp 2 2 20.03	on) ving ,m (s y (follo y (follo y g, h2 y <	area f see Ta Jun 0.61 0.61 0.61 20.96 welling 19.89 2,m (se 0.52 g T2 (fa 19.87 19.87 ng) = fl 20.15 ure fro 20.15	from Tab ble 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste 19.89 LA × T1 20.17 m Table 20.17	Au 0.44 7 in Ta 20.9 able 9, 19.8 9a) 0.33 eps 3 f 19.8 + (1 - 20.1 e 4e, w 20.1	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84 ft - fLA) × T2 7 20.12 vhere approx 7 20.12	Oct 0.91 20.66 19.88 0.88 e 9c) 19.52 A = Liv 19.81 priate 19.81	Nov 0.98 20.16 19.88 0.98 18.83 ring area ÷ (4 19.17	Dec 0.99 19.87 19.88 0.99 18.41 4) = 18.79	21]]]]]]]]]]]]]]]]]]]	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m= Mear (92)m= Apply (93)m= 8. Sp	ean inter perature ation fac Jan 0.99 interna 19.86 perature 19.87 ation fac 0.99 interna 18.4 18.78 r adjustn 18.78 ace hea	nal temp during he tor for ga Feb 0.98 I tempera 20.07 during he 19.88 tor for ga 0.97 I tempera 18.69 I tempera 19.04 nent to th 19.04 ting requ	erature eating ains for 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08 ature (fi 19.4 ine mea 19.4	(heat beriod: living 0.91 living 20.5 20.5 20.5 20.5 20.5 19.8 rest o 0.88 the re 19.4 19.7 n inter 19.7 t	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.85 4 0.74 5 dwelling 4 0.74 5 19.74 9 20.03 19.74 19.74 whole dw 2 2 20.03 nal temp 2 2 20.03	on) ving ,m (s y (follo i (follo i g, h2 g, h2 elling i i erati 3	area f see Ta Jun 0.61 0.61 0.61 20.96 velling 19.89 2,m (se 0.52 0.52 0.52 0.52 0.52 19.87 19.87 19.87 19.87 19.87 19.87 19.87 19.87	from Tab able 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste 19.89 LA × T1 20.17 m Table 20.17	Au 0.44 7 in Ta 20.9 able 9 19.8 9a) 0.33 eps 3 in 19.8 + (1 - 20.1 e 4e, w 20.1	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84 fl - fLA) × T2 7 20.12 vhere approx 7 20.12	Oct 0.91 20.66 19.88 0.88 0.88 0.88 0.88 0.88 0.88 0.88	Nov 0.98 20.16 19.88 0.98 18.83 ring area ÷ (4 19.17 19.17	Dec 0.99 19.87 19.88 0.99 18.41 4) = 18.79 18.79	21]]]]]]]]]]]]]]]]]]]	(85) (86) (87) (88) (89) (90) (91) (92) (93)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Mear (90)m= Mear (90)m= Mear (92)m= Apply (93)m= 8. Sp Set T	ean inter perature ation fac Jan 0.99 interna 19.86 perature 19.87 ation fac 0.99 interna 18.4 18.78 v adjustn 18.78 v adjustn 18.78 ace hea	nal temp during he tor for ga Feb 0.98 I tempera 20.07 during he 19.88 tor for ga 0.97 I tempera 18.69 I tempera 19.04 nent to th 19.04 ting requ mean inter	erature eating ains for Mar 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08 ature (fr 19.4 ne mea 19.4 iremen ernal te	(heat beriod: living 0.91 living 20.5 Deriod: 19.8 rest o 0.88 the re 19.4 the re 19.7 n inter 19.7 t mpera	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.89 4 0.74 5 dwelling 0.74 0.74 st of dwelling 0.74 st of dwelling 2 2 19.74 whole dw 2 2 20.03 nal temp 2 2 20.03 nal temp 2 2 20.03	on) ving ,m (s y (follet 4 of dv 9 23, h2 9	area f see Ta Jun 0.61 0.61 0.61 20.96 velling 19.89 2,m (se 0.52 g T2 (fu 19.87 19.87 ag T2 (fu 19.87 ag T2 (fu) 19.87 ag T2 (fu) 19.	from Tab able 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ee Table 0.31 ollow ste 19.89 LA × T1 20.17 m Table 20.17	Au 0.44 7 in Ta 20.9 able 9, 19.8 9a) 0.33 2ps 3 1 19.8 + (1 - 20.1 4e, w 20.1 Table	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84 fl - fLA) × T2 7 20.12 where approx 7 20.12 e 9b, so that	Oct 0.91 20.66 19.88 0.88 9 9c) 19.52 A = Liv 19.81 priate 19.81	Nov 0.98 20.16 19.88 0.98 18.83 ring area ÷ (4 19.17 19.17 =(76)m an	Dec 0.99 19.87 19.88 0.99 18.41 4) = 18.79 18.79 18.79 d re-cal	21	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)
7. Ma Temp Utilisa (86)m= Mear (87)m= Temp (88)m= Utilisa (89)m= Utilisa (89)m= Mear (90)m= Mear (90)m= Mear (92)m= Apply (93)m= 8. Sp Set T the ut	ean inter perature ation fac Jan 0.99 interna 19.86 perature 19.87 ation fac 0.99 interna 18.4 interna 18.78 v adjustn 18.78 v adjustn 18.78 ito the r tilisation	nal temp during he tor for ga Feb 0.98 I tempera 20.07 during he 19.88 tor for ga 0.97 I tempera 18.69 I tempera 19.04 nent to th 19.04 ting requ mean inte factor fo	erature eating ains for Mar 0.96 ature in 20.34 eating 19.88 ains for 0.94 ature in 19.08 ature (for 19.4 iremen ernal te r gains	(heat beriod: living 0.91 living 20.5 beriod: 19.8 rest o 0.88 the re 19.4 the re 19.7 n inter 19.7 n inter 19.7 t mpera using	ng seaso s in the li area, h1, r Ma 0.8 area T1 9 20.84 s in rest of 3 19.85 dwelling 2 0.74 st of dwe 2 19.74 whole dw 2 20.03 nal temp 2 20.03 nal temp 2 20.03	on) ving ,m (s y ,m (s y ,m (s y ,m (s y ,m (s y ,m (s y ,m (s y ,m (s) (follow a a a a	area f see Ta Jun 0.61 20.96 welling 19.89 2,m (se 0.52 g T2 (fr 19.87 ng) = fl $20.15ure fro20.15d at sto$	from Tab able 9a) Jul 0.42 ps 3 to 7 21 from Ta 19.89 ce Table 0.31 ollow ste 19.89 LA × T1 20.17 m Table 20.17 ep 11 of	Au 0.44 7 in Ta 20.9 able 9, 19.8 9a) 0.33 eps 3 f 19.8 + (1 - 20.1 4e, w 20.1 Table	Th1 (°C) g Sep 4 0.71 able 9c) 9 20.93 , Th2 (°C) 9 19.89 3 0.62 to 7 in Table 9 19.84 ff - fLA) × T2 7 20.12 vhere approx 7 20.12 vhere approx 7 20.12	Oct 0.91 20.66 19.88 0.88 e 9c) 19.52 A = Liv 19.81 19.81 19.81	Nov 0.98 20.16 19.88 0.98 18.83 ring area ÷ (4 19.17 19.17 (19.17 (76)m an	Dec 0.99 19.87 19.88 0.99 18.41 4) = 18.79 18.79 18.79 d re-cal	21	(85) (86) (87) (88) (89) (90) (91) (91) (92) (93)

Utilisa	ation fac	tor for g	ains, hm	n:										
(94)m=	0.98	0.97	0.93	0.88	0.74	0.54	0.34	0.36	0.64	0.87	0.97	0.99		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m			•	•					
(95)m=	935.38	1091.87	1155.81	1164.43	1020.49	740.23	447.37	446.9	756.72	956.53	921.86	881.13		(95)
Mont	hly aver	age exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1996.63	1956.54	1755.49	1524.78	1146.61	762.77	449.2	449.13	802.47	1246.61	1689.51	1934.69		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	789.57	581.06	446.16	259.46	93.83	0	0	0	0	215.82	552.71	783.85		
								Tota	l per year	(kWh/yeai	⁻) = Sum(9	8)15,912 =	3722.47	(98)
Spac	e heatin	g require	ement in	kWh/m²	/year]	33.65	(99)
9a, En	erav rea	uiremer	nts – Ind	ividual h	eating s	vstems i	ncluding	ı micro-C	CHP)			L		
Spac	e heatir	na:			outing o	,)					
Fract	ion of sp	ace hea	at from s	econdar	y/supple	mentary	system					[0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =			Ī	1	(202)
Fract	ion of to	tal heati	na from	main sv	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficia	ency of i	main sna	ace heat	ing syste					, -			l	00.7	
Efficie				amontor		aoveter	- 0/					l	90.7	
EIIICI	ency of s	seconda	ry/suppi	ementar 1	y neating	g system	1, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Spac	e heatin	g require	ement (c	alculate	d above) I)	1	1	1		1			
	789.57	581.06	446.16	259.46	93.83	0	0	0	0	215.82	552.71	783.85		
(211)n	า = {[(98)m x (20	4)] + (21	10)m } x	100 ÷ (2	06)								(211)
	870.53	640.64	491.91	286.06	103.45	0	0	0	0	237.95	609.38	864.23		
								Tota	al (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	4104.15	(211)
Spac	e heatin	g fuel (s	econdar	y), kWh/	month									
= {[(98	5)m x (20)1)] + (2 ⁻	14) m } >	(100 ÷ (208)									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	al (kWh/yea	ar) =Sum(2	215) _{15,10} 12	=	0	(215)
Water	heating	J												
Output	t from w	ater hea	<u>ter (calc</u>	ulated a	bove)	450.00	440.00	400.00	404.00	400.07	400.0			
	216.34	190.67	200.22	179.01	173.31	152.63	146.23	163.02	164.82	186.07	196.8	211.12		
Efficie	ncy of w	ater nea	iter	1	1	1	1	1	1		1		80.6	(216)
(217)m=	88.32	87.98	87.31	86.29	83.88	80.6	80.6	80.6	80.6	85.73	87.81	88.35		(217)
Fuel fo	or water	heating,	kWh/mo ג י ג (א	onth										
(219)n=	1 = (04) 244.95	216.73	229.31	207.46	206.61	189.37	181.42	202.25	204.49	217.05	224.12	238.96		
. /			1	I	I	1	1	I Tota	I = Sum(2)	19a) _{1 42} =	1	l	2562.73	(219)
Annus	al totals									I12	Wh/vear	. l	kWh/vea	() r
Space	heating	fuel use	ed, main	system	1					K		[4104.15	
Water	heating	fuel แระ	h	-								l I	2562 72	╡
valei	neating	1001 030	u										2002.13	

Electricity for pumps, fans and electric keep-hot

central heating pump:		130]	(230c)
boiler with a fan-assisted flue		45		(230e)
Total electricity for the above, kWh/year	sum of (230	a)(230g) =	175	(231)
Electricity for lighting			428.94	(232)
Electricity generated by PVs			-1287.6	(233)
10a. Fuel costs - individual heating systems:				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating - main system 1	(211) x	3.1 × 0.01 =	127.2288	(240)
Space heating - main system 2	(213) x	0 × 0.01 =	0	(241)
Space heating - secondary	(215) x	0 × 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.1 × 0.01 =	79.44	(247)
Pumps, fans and electric keep-hot	(231)	11.46 × 0.01 =	20.06	(249)
(if off-peak tariff, list each of (230a) to (230g) se Energy for lighting	parately as applicable and app (232)	bly fuel price according to $11.46 \times 0.01 =$	Table 12a 49.16	(250)
Additional standing charges (Table 12)			106	(251)
	one of (233) to (235) x)	11.46 X 0.01 =	147.56	$\Box_{(252)}$
		11.40	-147.56	(232)
Appendix Q items: repeat lines (253) and (254)	as needed			
Appendix Q items: repeat lines (253) and (254) Total energy cost (245)(2	as needed 247) + (250)(254) =		234.3254	(255)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systems	as needed 247) + (250)(254) =		234.3254	(255)
Appendix Q items: repeat lines (253) and (254)Total energy cost11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)	as needed 247) + (250)(254) =		0.47	(255)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) x	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] =		234.3254 0.47 0.7077	(255) (256) (257)
Appendix Q items: repeat lines (253) and (254)Total energy cost11a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) xSAP rating (Section 12)	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] =		234.3254 0.47 0.7077 90.1275	(255) (256) (257) (258)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) xSAP rating (Section 12)12a. CO2 emissions – Individual heating system	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ems including micro-CHP		234.3254 0.47 0.7077 90.1275	(255) (256) (257) (258)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(245	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ms including micro-CHP Energy kWh/year	Emission factor kg CO2/kWh	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea	(255) (256) (257) (258) (258)
Appendix Q items: repeat lines (253) and (254) Total energy cost (245)(2 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) x SAP rating (Section 12) 12a. CO2 emissions – Individual heating system Space heating (main system 1)	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ems including micro-CHP Energy kWh/year (211) x	Emission factor kg CO2/kWh	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea 812.62	(255) (256) (257) (258) (258)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) ×SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ms including micro-CHP Energy kWh/year (211) x (215) x	Emission factor kg CO2/kWh 0.198 = 0 =	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea 812.62 0	(255) (256) (257) (258) (258) ar (261) (263)
Appendix Q items: repeat lines (253) and (254) Total energy cost (245)(2 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) × SAP rating (Section 12) 12a. CO2 emissions – Individual heating syste Space heating (main system 1) Space heating (secondary) Water heating	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ems including micro-CHP Energy kWh/year (211) x (215) x (219) x	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 =	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea 812.62 0 507.42	(255) (256) (257) (258) (258) (258) (261) (263) (264)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) xSAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heating	as needed 247) + (250)(254) = (256)] ÷ [(4) + 45.0] = ems including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) =	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 =	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea 812.62 0 507.42 1320.04	(255) (256) (257) (258) (258) (258) (261) (263) (264) (265)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) xSAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-hot	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ ems including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 =	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea 812.62 0 507.42 1320.04 90.48	(255) (256) (257) (258) (258) (258) (261) (263) (264) (265) (265) (267)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) xSAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-hotElectricity for lighting	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ ems including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	Emission factor kg CO2/kWh 0.198 = 0 = 0.198 = 0.198 =	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea 812.62 0 507.42 1320.04 90.48 221.76	(255) (256) (257) (258) (258) (263) (263) (264) (265) (267) (268)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) ×SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-hotElectricity for lightingEnergy saving/generation technologiesItem 1	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	Emission factor kg CO2/kWh 0.198 0 0 0.198 0 0.198 0.198 0 0.198 0.517 0.517 0.517 0.517 0.517	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea 812.62 0 507.42 1320.04 90.48 221.76	(255) (256) (257) (258) (258) (263) (263) (264) (265) (267) (268) (268)
Appendix Q items: repeat lines (253) and (254)Total energy cost(245)(211a. SAP rating - individual heating systemsEnergy cost deflator (Table 12)Energy cost factor (ECF)[(255) ×SAP rating (Section 12)12a. CO2 emissions – Individual heating systemSpace heating (main system 1)Space heating (secondary)Water heatingSpace and water heatingElectricity for pumps, fans and electric keep-hotElectricity for lightingEnergy saving/generation technologiesItem 1Total CO2, kg/year	as needed (247) + (250)(254) = $(256)] \div [(4) + 45.0] =$ ms including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x sun	Emission factor kg CO2/kWh 0.198 0 0 0.198 0 0.198 0 0.198 0 0.517 0.517 0.517 0.529 0.529 0.529 0.529	234.3254 0.47 0.7077 90.1275 Emissions kg CO2/yea 812.62 0 507.42 1320.04 90.48 221.76 -681.14 951.14	(255) (256) (257) (258) (258) (263) (264) (264) (265) (267) (268) (268) (269) (269)

El rating (section 14)			[92	(274)
13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.02	= [4186.24	(261)
Space heating (secondary)	(215) x	0	=	0	(263)
Energy for water heating	(219) x	1.02	=	2613.98	(264)
Space and water heating	(261) + (262) + (263) + (264) =		[6800.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	2.92	=	511	(267)
Electricity for lighting	(232) x	0	= [1252.49	(268)
Energy saving/generation technologies Item 1		2.92	= [-3759.79	(269)
'Total Primary Energy	sum	of (265)(271) =	[4803.92	(272)
Primary energy kWh/m²/year	(272)	÷ (4) =	[43.43	(273)

Block Compliance WorkSheet: Block a

User Details													
Assessor Name: Software Name:	Andrew Simpson Stroma FSAP	Stroma Number Software Versio	: STRO	005087 n: 1.5.0.55									
		Calculation	on Details										
Dwelling			DER	TER	TFA								
Flat 1			13.65	20.05	69.63								
Flat 2			11.91	17.53	54.26								
Flat 3		10.94	16.6	110.62									

Calculation Summary

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

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





Report Reference: Site Registration: Site Name: Assessor Number: STRO005087 Company: Assessor:

28 Greville Street **Premier Assessors** Andrew Simpson



CERTIFICATION MARK

Code for Sustainable Homes Pre-Assessment Report (Report Reference:)



Site Details	
Site Name:	28 Greville Street
Site Registration:	
Site Address:	Greville Street
City/Town:	Hillingdon
County:	Greater London
Postcode:	EC1N 8SU
No. of Dwellings:	3
No. of Dwelling Types:	1
Planning Authority:	Camden Council
Funding Body:	
Assessor Details	
Company:	Premier Assessors
Assessor Name:	Andrew Simpson
Cert Number:	STR0005087
Address:	24 Carriage Mews
City/Town	Canterbury
County:	Kent
Postcode:	
Tel:	01227 781335
Email:	premierassessors@gmail.com
Client Details	
Company:	M & R Aisenthal & E * D SHEMTOV t/as Palmos Junior
Contact Name:	M & R Aisenthal & E * D SHEMTOV t/as Palmos Junior
Job Title:	Client
Email:	
Tel:	
Address:	
City/Town:	
County:	
Postcode:	
Architect Details	
Company:	Homes Design Ltd
Contact Name:	Ross Lakani
Job Title:	Architect
Email:	rlakani@homesdesignltd.co.uk
Tel:	02089073590
Address:	62 Bellamy Drive
City/Town:	Stanmoro
County:	Middlesex
Postcode:	HA7 2DA
Developer Details	
Company:	M & R Aisenthal & E * D SHEMTOV t/as Palmos Junior
Contact Name:	M & R Aisenthal & E * D SHEMTOV t/as Palmos Junior
Job Title:	Developer
Email:	
Tel:	
Address:	
City/Town:	
County:	
PUSICODE:	



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

Code for Sustain Pre-Assessment R	nable Homes Report (Report Reference	:)		
Development Sum	nmary & Ratings			
Dwelling ID	Dwelling Type	Description	Level	Score
1	Type 1		4	68.76
2	Type 1		4	68.76
3	Type 1		4	68.76

Deviations from Standard

No deviations from standard

STROMA CERTIFIED CODE ASSESSOR

Code for Sustainable Homes Pre-Assessment Report (Report Reference:)

Score Sheet for 28 Greville Street																																			
	ENE WAT MAT SUR WAS POL HE														HEA					٩N		ECO					Summarv								
Dwelling ID	1 2 3 4 5 6 7 8 9 1									2	1	2	3	1	2	1	2	3	1	2	1 2 3 4		4	1 2 3		4	1	23		45		Score Leve			
1	3.9 3.9	2	1	2	2	2	3	1	10	0	0	0	2	4	3	1	1	3	2	4	0	4	3	1	2	2	1	1	1	2	1	68.76	4		
2	3.93.92122201										10	0	0	0	2	4	3	1	1	3	2	4	0	4	3	1	2	2	1	1	1	2	1	68.76	4
3	3.93.921222013												0	0	2	4	3	1	1	3	2	4	0	4	3	1	2	2	1	1	1	2	1	68.76	4

STROMA CERTIFIED CODE ASSESSOR

Summary Score Sheet Dwelling Type: Type 1

Dwelling IDs: 1 to 3

	Score Assessment						
	Credit Score	Credits Available	Sub Total	Credits Available	%	Weighting Factor	Points Score
Energy & CO2 Emissions			1				
ENE 1 Dwelling Emission Rate	3.9	10	17.8	31	57.42	36.4	20.9
ENE 2 Fabric Energy Efficiency	3.9	9					
ENE 3 Energy Display Device	2	2					
ENE 4 Drying Space	1	1					
ENE 5 Energy Labelled White Goods	2	2					
ENE 6 External Lighting	2	2					
ENE 7 Low of Zero Carbon Energy Technologies	2	2					
ENE O Home Office	1	2					
	I	I					
Water	2	E	4	4	44 47	0	4
WAT 1 Internal Water Use	3	5 1	4	0	00.07	9	0
	I	I					
	10	15	10	24	41 (7	7.0	2
MAT 2 Desponsible Sourcing (Pasic Ruilding Elements)	10	15	10	24	41.67	1.2	3
MAT 2 Responsible Sourcing (Einishing Elements)	0	3					
	0	3					
Surface Water Run-off	0	2	2	4	50	2.2	1 1
SUR 1 Management of Surface Water Run-Off from Site	0	2	2	4	50	2.2	1.1
	2	2					
WASIE	1	4	0	0	100	6.4	6.4
WAS 1 Household Waste Stolage and Recycling Facilities	4	4	ŏ	ð	100	0.4	0.4
WAS 2 Constituction site waste wanagement	3 1	3 1					
Pollution		·					
Pollution	1	1	4	4	100	20	20
POL^{-1} Global Warming Potential of Insulants POL^{-2} NOv Emissions	ן ז	י ז	4	4	100	2.0	2.0
	5	5					
HEA 1 Davlighting	2	3	10	12	83.33	1/	11.67
HEA 2 Sound Insulation	4	4	10	12	00.00	14	11.07
HEA 3 Private Snace	0	1					
HEA 4 Lifetime Homes	4	4					
Management	·	-					
MAN 1 Home User Guide	3	3	8	9	88.89	10	8.89
MAN 2 Considerate Constructors Scheme	1	2	-	-			
MAN 3 Construction Site Impacts	2	2					
MAN 4 Security	2	2					
Ecology			·				
ECO 1 Ecological Value of Site	1	1	6	9	66.67	12	8
ECO 2 Ecological Enhancement	1	1					
ECO 3 Protection of Ecological Features	1	1					
ECO 4 Change of Ecological Value of Site	2	4					
ECO 5 Building Footprint	1	2					
	Level Achieved: 4		Total Points Scored: 68.76				

	Report (Report Reference:)
Evidence for F	NF 1 (Dwelling Emission Rate) - Type 1
3.9 credits alloc	ated
Assumptions f	or ENE 1
Evidence for E	NE 2 (Fabric Energy Efficiency) - Type 1
Apartment Detached	atad
ENERGY/ENE2/	Code for sustainable Homes Report
∝ FEEs report	
Assumptions f	or ENE 2
Evidence for E	NE 3 (Energy Display Device) - Type 1
Correctly specifi Correctly specifi	ed display device showing current primary heating fuel consumption data. ed display device showing current consumption data.
ENERGY/ENE3/ Assumptions f	Letter of Intent or ENE 3
Evidence for E	NE 4 (Drying Space) - Type 1
ENERGY/ENE4/	Letter of Intent
Assumptions f	or ENE 4
Evidence for E	NE 5 (Energy Labelled White Goods) - Type 1
A+ rated fridge A rated washing tumble drver) w	& freezers or fridge/freezer machine and dishwasher, AND EITHER a tumble dryer (a washer-dryer would be an acceptable alternative to a standalone ith a B rating or where a tumble dryer is not provided, the EU Energy Efficiency Labelling Scheme Information will be provided
carriere ar yer) vi	
ENERGY/ENE5/	Letter of Intent
ENERGY/ENE5/ & EU Energy Effici	Letter of Intent ency Labelling Scheme Leaflet
ENERGY/ENE5/ & EU Energy Effici Assumptions f	Letter of Intent ency Labelling Scheme Leaflet or ENE 5
ENERGY/ENE5/ & EU Energy Effici Assumptions f Evidence for E	Letter of Intent ency Labelling Scheme Leaflet or ENE 5
ENERGY/ENE5/ & EU Energy Effici Assumptions (Evidence for E Complaint space ENERGY/ENE6/	Letter of Intent ency Labelling Scheme Leaflet or ENE 5 NE 6 (External Lighting) - Type 1 Elighting, no security lighting installed Letter of Intent
ENERGY/ENE5/ & EU Energy Effici Assumptions f Evidence for E Complaint space ENERGY/ENE6/ Assumptions f	Letter of Intent ency Labelling Scheme Leaflet or ENE 5 NE 6 (External Lighting) - Type 1 I lighting, no security lighting installed Letter of Intent or ENE 6
ENERGY/ENE5/ & EU Energy Effici Assumptions f Evidence for E ENERGY/ENE6/ Assumptions f Evidence for E	Letter of Intent ency Labelling Scheme Leaflet or ENE 5 NE 6 (External Lighting) - Type 1 I lighting, no security lighting installed Letter of Intent or ENE 6 NE 7 (Low or Zero Carbon Energy Technologies) - Type 1
ENERGY/ENE5/ & EU Energy Effici Assumptions f Evidence for E Complaint space ENERGY/ENE6/ Assumptions f Evidence for E Contribution of	Letter of Intent ency Labelling Scheme Leaflet or ENE 5 NE 6 (External Lighting) - Type 1 > lighting, no security lighting installed Letter of Intent or ENE 6 NE 7 (Low or Zero Carbon Energy Technologies) - Type 1 ow or zero carbon technologies greater than or equal to 15%
ENERGY/ENE5/ & EU Energy Effici Assumptions f Evidence for E <u>Complaint space</u> ENERGY/ENE6/ Assumptions f Evidence for E Contribution of Assumptions f	Letter of Intent ency Labelling Scheme Leaflet or ENE 5 NE 6 (External Lighting) - Type 1 § lighting, no security lighting installed Letter of Intent or ENE 6 NE 7 (Low or Zero Carbon Energy Technologies) - Type 1 ow or zero carbon technologies greater than or equal to 15% or ENE 7
ENERGY/ENE5/ & EU Energy Effici Assumptions f Evidence for E Complaint space ENERGY/ENE6/ Assumptions f Evidence for E Contribution of Assumptions f	Letter of Intent ency Labelling Scheme Leaflet or ENE 5 NE 6 (External Lighting) - Type 1 ighting, no security lighting installed Letter of Intent or ENE 6 NE 7 (Low or Zero Carbon Energy Technologies) - Type 1 ow or zero carbon technologies greater than or equal to 15% or ENE 7 NE 8 (Cycle Storage) - Type 1
ENERGY/ENE5/ & EU Energy Effici Assumptions f Evidence for E Complaint space ENERGY/ENE6/ Assumptions f Evidence for E Contribution of Assumptions f Evidence for E Ciredit(s) not so	Letter of Intent ency Labelling Scheme Leaflet or ENE 5 NE 6 (External Lighting) - Type 1 i lighting, no security lighting installed Letter of Intent or ENE 6 NE 7 (Low or Zero Carbon Energy Technologies) - Type 1 ow or zero carbon technologies greater than or equal to 15% or ENE 7 NE 8 (Cycle Storage) - Type 1 ight or no compliant cycle storage

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



Assumptions for ENE 9

Evidence for WAT 1 (Internal Water Use) - Type 1

Internal water use less than or equal to 105 litres per person per day WATER/WAT1/ Letter of Intent

& Water Report

Assumptions for WAT 1

Evidence for WAT 2 (External Water Use) - Type 1

No individual garden space WATER/WAT2/letter of intent Assumptions for WAT 2

Evidence for MAT 1 (Environmental Impact of Materials) - Type 1

Mandatory requirements met: At least 3 elements rated A+ to D, 10 credits scored

MATERIALS/MAT1/Letter of intent &

Construction methods of each element and green guide scores Assumptions for MAT 1

Evidence for MAT 2 (Responsible Sourcing (Basic Building Elements)) - Type 1

Zero credits or credits not sought

Assumptions for MAT 2

Evidence for MAT 3 (Responsible Sourcing (Finishing Elements)) - Type 1

Zero credits or credits not sought

Assumptions for MAT 3

Evidence for SUR 1 (Management of Surface Water Run-Off from Site) - Type 1

Mandatory Met: Peak rate of run-off and annual volume of run-off is no greater for the developed than for the pre-development. The system has also been designed for local drainage system failure.

Credits not sought, water quality criteria not met/sought.

SURFACE WATER RUN-OFF/SUR1/SUR1 report & Flood Risk Assessment

& SUR1 Summary Report template

Assumptions for SUR 1

Evidence for SUR 2 (Flood Risk) - Type 1

Low flood risk - zone 1

SURFACE WATER RUN-OFF/SUR1/SUR1 report and Flood Risk Assessment

SUR1 Summary Report template

Assumptions for SUR 2

Pre-Assessment Report (Report Reference:)



Evidence for WAS 1 (Household Waste Storage and Recycling Facilities) - Type 1

Mandatory requirements met: Adequate storage of household waste with accessibility in line with checklist WAS 1. Local authority collection: After collection sorting with appropriate internal storage of recyclable materials

WASTE/WAS1/Letter of Intent

Recycling information

Plan showing space for recycling

Checklist IDP

&

&

Assumptions for WAS 1

Evidence for WAS 2 (Construction Site Waste Management) - Type 1

Compliant site waste management plan containing benchmarks, procedures and commitments for the minimizing and diverting 80% waste from landfill in line with the criteria and with Checklist WAS 2a, 2b & 2c

WASTE/WAS2/letter of Intent

Site Waste Management Plan

Assumptions for WAS 2

Evidence for WAS 3 (Composting) - Type 1

Individual compositing facility/facilities

Local authority kitchen waste collection scheme - No Garden

WASTE/WAS3/Letter of Intent &

Checklist IDP

Assumptions for WAS 3

Evidence for POL 1 (Global Warming Potential of Insulants) - Type 1

All insulants have a GWP of less than 5

POLLUTION/POL1/letter of intent

Assumptions for POL 1

Evidence for POL 2 (NOx Emissions) - Type 1

NOx emissions less than or equal to 40mg/kWh

POLLUTION/POL2/letter of intent

Assumptions for POL 2

Evidence for HEA 1 (Daylighting) - Type 1

Kitchen: Average daylight factor of at least 2% Living room: Average daylight factor of at least 1.5% Dining room: Average daylight factor of at least 1.5% Home office: Average daylight factor of at least 1.5%

HEALTH & WELLBEING/HEA1/Plans showing site plan & elevations - see Master Documents Folder

Calculator tool completed

&

Assumptions for HEA 1

Evidence for HEA 2 (Sound Insulation) - Type 1

Robust details have been incorporated

Airborne 8dB higher, impact 8dB lower

HEALTH & WELLBEING/HEA2/4 credits by default

Assumptions for HEA 2



Evidence for HEA 3 (Private Space) - Type 1

Credit not sought or no compliant space provided HEALTH & WELLBEING/HEA3/letter of Intent

& Checklist IDP

&

Plans showing private space Assumptions for HEA 3

Evidence for HEA 4 (Lifetime Homes) - Type 1

All criteria of Lifetime Homes in line with all 16 principals of Lifetime Homes HEALTH & WELLBEING/HEA4/ Letter of Intent

HEA4 Checklist

Assumptions for HEA 4

Evidence for MAN 1 (Home User Guide) - Type 1

All criteria inline with checklist MAN 1 Part 1 - Operational Issues will be met All criteria inline with checklist MAN 1 Part 2 - Site and Surroundings will be met MANAGEMENT/MAN1/letter of Intent

& Checklist MAN1 completed

Assumptions for MAN 1

Evidence for MAN 2 (Considerate Constructors Scheme) - Type 1

Considerate constructors scheme: Best practise only, a score of between 25 - 34, and at least a score of 5 in each section*

Assumptions for MAN 2

Evidence for MAN 3 (Construction Site Impacts) - Type 1

Monitor, report and set targets for water consumption from site activities Adopt best practise policies in respects to air (dust) pollution from site activities Adopt best practise policies in respects to water (ground and surface) pollution 80% of timer reclaimed, re-used or responsibly sourced

MANAGEMENT/ MAN3/Letter of Intent

Checklist MAN3 completed

Assumptions for MAN 3

Evidence for MAN 4 (Security) - Type 1

Secured by design section 1 & 2 compliant

MANAGEMENT/MAN4/Letter of Intent

Assumptions for MAN 4

Evidence for ECO 1 (Ecological Value of Site) - Type 1

Land of low ecological value, achieved through checklist ECO 1. Development site has been identified as low ecological value by a suitably qualified ecologist

ECOLOGY/ECO1/ECO1 Checklist

Assumptions for ECO 1

Evidence for ECO 2 (Ecological Enhancement) - Type 1

Key recommendations and 30% additional recommendations by a suitably qualified ecologist

Assumptions for ECO 2

e for Sustainable Homes Assessment Report (Report Reference:)	COL
Evidence for ECO 3 (Protection of Ecological Features) - Type 1	
Land of low ecological value as identified under ECO 1	
ECOLOGY/ECO3/ECO1 Checklist	
Assumptions for ECO 3	
Evidence for ECO 4 (Change of Ecological Value of Site) - Type 1	
Neutral: Greater than -3 and less than or equal to +3	
Assumptions for ECO A	

Flats ratio of 3:1

Assumptions for ECO 5



Assessor Declaration

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

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

Signed:

Tidina

Andrew Simpson Premier Assessors 10 October 2013



Information about Code for Sustainable Homes

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

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

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

- Energy & CO2 Emissions
 - Dwelling Emission Rate
 - Building Fabric
 - Internal Lighting
 - Drying Space
 - Energy Labelled White Goods
 - External Lighting
 - Low or Zero Carbon Technologies
 - Cycle Storage
 - Home Office
- Water
 - Internal Water Use
 - External Water Use
- Materials
 - Environmental Impact of Materials
 - Responsible Sourcing of Materials Basic Building Elements
 - Responsible Sourcing of Materials Finishing Elements
- Surface Water Run-off
 - Management of Surface Water Run-off from the Development
 - Flood Risk
- Waste
 - $\circ~$ Storage of Non-Recyclable Waste and Recyclable Household Waste
 - Construction Site Waste Management
 - Composting
- Pollution
 - Global Warming Potential of Insulants
 - NOx Emissions



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

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

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

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

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

The two issues with increasing mandatory minimum standards are:

- Dwelling Emission Rate
- Indoor Water Use

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

Fabric Energy Efficiency

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

Lifetime Homes

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

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



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

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

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

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

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



Energy & CO2 Emissions

ENE 1:Dwelling Emission Rate

Available Credits:10

Aim: To limit CO2 emissions arising from the operation of a dwelling and its services in line with current policy on the future direction of regulations.

ENE 2:Fabric Energy Efficiency

Available Credits:9

Aim: To improve fabric energy efficiency performance thus future-proofing reductions in CO2 for the life of the dwelling.

ENE 3:Energy Display Device

Available Credits:2

Aim:To promote the specification of equipment to display energy consumption data, thus empowering dwelling occupants to reduce energy use.

ENE 4:Drying Space

Available Credits:1

Aim: To promote a reduced energy means of drying clothes.

ENE 5: Energy Labelled White Goods

Available Credits:2

Aim: To promote the provision or purchase of energy efficient white goods, thus reducing the CO2 emissions from appliance use in the dwelling.

ENE 6:External Lighting

Available Credits:2

Aim: To promote the provision of energy efficient external lighting, thus reducing CO2 emissions associated with the dwelling.

ENE 7: Low or Zero Carbon Technologies

Available Credits:2

Aim: To limit CO2 emissions and running costs arising from the operation of a dwelling and its services by encouraging the specification of low and zero carbon energy sources to supply a significant proportion of energy demand.

ENE 8:Cycle Storage

Available Credits:2

Aim: To promote the wider use of bicycles as transport by providing adequate and secure cycle storage facilities, thus reducing the need for short car journeys and the associated CO2 emissions.

ENE 9:Home Office

Available Credits:1

Aim:To promote working from home by providing occupants with the necessary space and services thus reducing the need to commute.

Water

WAT 1:Indoor Water Use

Available Credits:5

Aim: To reduce the consumption of potable water in the home from all sources, including borehole well water, through the use of water efficient fittings, appliances and water recycling systems.

WAT 2: External Water Use

Available Credits:1

Aim: To promote the recycling of rainwater and reduce the amount of mains potable water used for external water uses.

Materials

MAT 1: Environmental Impact of Materials

Available Credits:15

Aim: To specify materials with lower environmental impacts over their life-cycle.

MAT 2: Responsible Sourcing of Materials - Basic Building Elements

Available Credits:6

Aim: To promote the specification of responsibly sourced materials for the basic building elements.

MAT 3:Responsible Sourcing of Materials - Finishing Elements

Available Credits:3

Aim: To promote the specification of responsibly sourced materials for the finishing elements.



Surface Water Run-off

SUR 1:Management of Surface Water Run-off from developments

Available Credits:2

Aim: To design surface water drainage for housing developments which avoid, reduce and delay the discharge of rainfall run-off to watercourses and public sewers using SuDS techniques. This will protect receiving waters from pollution and minimise the risk of flooding and other environmental damage in watercourses.

SUR 2:Flood Risk

Available Credits:2

Aim: To promote housing development in low flood risk areas, or to take measures to reduce the impact of flooding on houses built in areas with a medium or high risk of flooding.

Waste

WAS 1:Storage of non-recyclable waste and recyclable household waste

Available Credits:4

Aim: To promote resource efficiency via the effective and appropriate management of construction site waste.

WAS 2: Construction Site Waste Management

Available Credits:3

Aim: To promote resource efficiency via the effective and appropriate management of construction site waste.

WAS 3:Composting

Available Credits:1

Aim: To promote the provision of compost facilities to reduce the amount of household waste send to landfill.

Pollution

POL 1:Global Warming Potential of Insulants

Available Credits:1

Aim: To promote the reduction of emissions of gases with high GWP associated with the manufacture, installation, use and disposal of foamed thermal and acoustic insulating materials.

POL 2:NOx Emissions

Available Credits:3

Aim: To promote the reduction of nitrogen oxide (NOX) emissions into the atmosphere.

Health & Wellbeing

HEA 1:Daylighting

Available Credits:3

Aim: To promote good daylighting and thereby improve quality of life and reduce the need for energy to light the home.

HEA 2:Sound Insulation

Available Credits:4

Aim: To promote the provision of improved sound insulation to reduce the likelihood of noise complaints from neighbours.

HEA 3:Private Space

Available Credits:1

Aim: To improve quality of life by promoting the provision of an inclusive outdoor space which is at least partially private.

HEA 4:Lifetime Homes

Available Credits:4

Aim: To encourage the construction of homes that are accessible and easily adaptable to meet the changing needs of current and future occupants.



Management

MAN 1:Home User Guide

Available Credits:3

Aim: To promote the provision of guidance enabling occupants to understand and operate their home efficiently and make the best use of local facilities.

MAN 2:Considerate Constructors Scheme

Available Credits:3

Aim:To promote the environmentally and socially considerate, and accountable management of construction sites.

MAN 3:Construction Site Impacts

Available Credits:2

Aim: To promote construction sites managed in a manner that mitigates environmental impacts.

MAN 4:Security

Available Credits:2

Aim: To promote the design of developments where people feel safe and secure- where crime and disorder, or the fear of crime, does not undermine quality of life or community cohesion.

Ecology

ECO 1: Ecological value of site

Available Credits:1

Aim: To promote development on land that already has a limited value to wildlife, and discourage the development of ecologically valuable sites.

ECO 2: Ecological enhancement

Available Credits:1

Aim: To enhance the ecological value of a site.

ECO 3: Protection of ecological features

Available Credits:1

Aim: To promote the protection of existing ecological features from substantial damage during the clearing of the site and the completion of construction works.

ECO 4:Change in ecological value of site

Available Credits:4

Aim: To minimise reductions and promote an improvement in ecological value.

ECO 5:Building footprint

Available Credits:2

Aim: To promote the most efficient use of a building's footprint by ensuring that land and material use is optimised across the development.



Disclaimer

The contents of this publication reflect the assessment produced by the licensed Code assessor. Stroma Certification Ltd is not liable for any loss or damage sustained as a consequence of this report or any related information.

Copyright

The Code for Sustainable Homes, name, logo and associated documentation are owned by the Department for Communities and Local Government.

All software, calculation tools, templates and all related material provided by Stroma Certification remains the property of Stroma Certification Ltd.