	Project Name Project Number	Riverpark Gardens 07-14-40410									
A	Revision SAP Assessor ssessor Reference		- Beverley Rosso 0								
		Design SAP Input Data <sup>-</sup>	Table								
	Description	Reference/Source		Comments							
	Roof (Flat)	Calculated	0.11	Spec given by Architect							
	Roof (Terrace)	Calculated	0.11	Spec given by Architect							
	External Wall (Ground)	Calculated	0.15	Spec given by Architect							
	External Wall (Upper Floors)	Calculated	0.16	Spec given by Architect							
	Exposed Wall (Unheated Corridor)	Calculated	0.18	Spec given by Architect							
Fabric U-values (W/m²K)	Party Wall		0.00	Fully filled cavity with effective sealing at all exposed edges and in line with insulations layers in abutting elements							
	Ground Floor	Calculated	0.11	Spec given by Architect							
	Windows / Roof Light	Specification	1.40								
	Doors	Specification	1.00								
	y-value	Specification	CBA details	Based on Dense weight aggregate blocks with λ (thermal conductivity) not exceeding 1.33 W/mK.							
	Thermal mass	Indicative	Medium								
	Airtightness m3/(hr.m <sup>2</sup> )	Specification	3.0								
Ventilation	Mechanical Ventilation	Specification	MVHR	Assumed Nuaire MRXBOX95-WH1							
	Main Heating System	Specification	Combi	Assumed Baxi neta-tec 24GA							
Heating	Controls	Specification	Programmer, room thermostat, TRV's with delayed start thermostat and Weather compensator.								
	Water Heating	Specification	From Main heating system								
	Water Heating	Specification	FGHRS	Assumed Zenex GasSaver							
	Secondary Heating System	Specification	N/A								
Renewables		Specification	Photovotaic panels	Assumed 6 kWp over development							
Low energy lighting		Specification	100%								

	Prepared By:	]	
	Checked By:	Aymon Winter	
REVISION	DESCRIPTION OF AN	IENDMENTS	DATE
-	first issue		28/11/2014





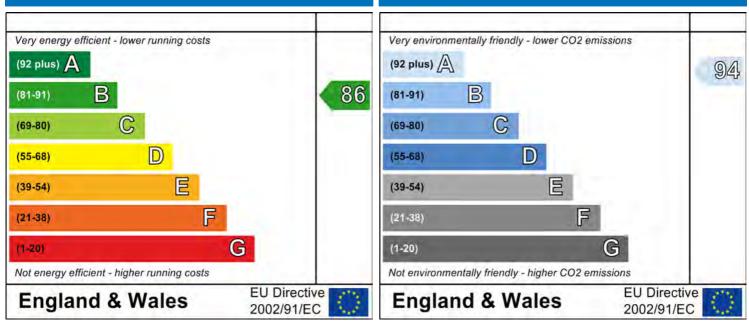
Dwelling type: Date of assessment: Produced by: Total floor area: Mid floor Flat 29 October 2014 Aymon Winter 67.3000030517578 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

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

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

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

# **Regulations Compliance Report**

,	on:			
sessed By:	Aymon Winter (S	TRO014511)	Building Type: Flat	
welling Details:				
W DWELLING	DESIGN STAGE		Total Floor Area: 67.3m <sup>2</sup>	
e Reference :	Development at I	Riverpark Gardens	Plot Reference: Unit 1 01	
ldress :				
lient Details:				
me:	Jamie			
ldress :	Campbell, 43 Ta	nner Street, Greater London, Lo	ondon, SE13PL	
•		within the SAP calculations. ations compliance.		
a TER and DEI	3			
	ting system: Mains	gas		
iel factor: 1.00 (	- /		17.24 kg/m²	
-	oxide Emission Rate Dioxide Emission Ra		17.24 kg/m² 8.83 kg/m²	ок
b TFEE and DF			0.03 kg/m-	UN
	ergy Efficiency (TFE	E)	42.87 kWh/m <sup>2</sup>	
-	nergy Efficiency (DF		33.44 kWh/m <sup>2</sup>	
				ОК
Fabric U-value	es			
Element		Average	Highest	
External		0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wa Floor	11	0.00 (max. 0.20) 0.16 (max. 0.25)	- 0.16 (max. 0.70)	ОК ОК
Roof		(no roof)	0.16 (max. 0.70)	UK
Opening	S	1.34 (max. 2.00)	1.40 (max. 3.30)	ок
a Thermal brid				
Thermal	bridging calculated	from linear thermal transmittan	ces for each junction	
Air permeabil	ity			
Air permea Maximum	bility at 50 pascals		3.00 (design value) 10.0	ок
Maximum				
Heating efficie	ency			
		Database: (rev 367, produc Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK	s or underfloor heating - mains gas	

# **Regulations Compliance Report**

5 Cylinder insulation			
Hot water Storage:	Nominal cylinder loss: 0.0 Permitted by DBSCG: 2.2		
Primary pipework insulated:	Yes	,	ОК
6 Controls			
Space heating controls	Programmer, room therm	lostat and TRVs	ОК
Hot water controls:	Cylinderstat		OK
	Independent timer for DH	W	OK
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with	n low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Continuous supply and extrac	ct system		
Specific fan power:		0.42	
Maximum		1.5	OK
MVHR efficiency:		91%	
Minimum		70%	OK
9 Summertime temperature			
Overheating risk (Thames va	lley):	Slight	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: East		7.56m²,	
Windows facing: West		6.21m²,	
Ventilation rate:		3.00	
Blinds/curtains:		Light-coloured curtain or roller Closed 100% of daylight hours	
10 Key features			
Air permeablility		3.0 m <sup>3</sup> /m <sup>2</sup> h	
Doors U-value		1 W/m²K	

Photovoltaic array

Address: Located in: Region: UPRN: Date of assessm Date of certificat Assessment type Transaction type Tenure type: Related party dis Thermal Mass Pa Water use <= 12 PCDF Version:	te: e: sclosure: arameter:	29 Oct 28 Nov New d New d Unkno No rel Indica	es valley tober 2014 vember 2014 Iwelling design sta Iwelling	-									
Property description	n:												
Dwelling type: Detachment: Year Completed:		Flat 2014											
Floor Location: Floor 0		Floor 67.3 n	area:		Storey height 2.7 m								
Living area:			m <sup>2</sup> (fraction 0.38	(4)	2.7 111								
Front of dwelling fa	aces:	South											
Opening types:													
Name: Main Door	Source: Manufacturer	S	ype: Solid	Glazing:	0.05	Argon:	Frame: PVC-U						
East window West Window	SAP 2012 SAP 2012		Vindows Vindows		0.05, soft coat 0.05, soft coat	Yes Yes	PVC-U PVC-U						
<b>Name:</b> Main Door	Gap: mm		Frame Facto	<b>or: g-value:</b>	<b>U-value:</b>	<b>Area:</b> 2.27	<b>No. of Openings:</b>						
East window West Window	16mm or i 16mm or i		0.7 0.7	0.63 0.63	1.4 1.4	7.56 6.21	1 1						
Name: Main Door East window West Window	Type-Name:	e	ocation: external wall external wall external wall	Orient: South East West		Width: 0 0 0	Height: 0 0 0						
Overshading: Opaque Elements:		Averaç	ge or unknown										
Type: External Elements	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall: Kappa:						
external wall sheltered wall Exposed Floor over o Internal Elements	27.51 20.98 orrid&196	16.04 0	11.47 20.98	0.16 0.18 0.16	0 0.4	False False	N/A N/A N/A						
<u>Party Elements</u> party wall Party Ceiling Party floor	28.4 67.3 63.34						N/A N/A N/A						

Thermal bridges:

Property Details: Unit 1 01

Thermal bridges:	User-definer Length 7.12 22.54 10.8 2.7 59.47 2.7 5.64 8.1	d (individual PS <b>Psi-value</b> 0.401 0.021 0.048 -0.06 0.001 0.055 0.32 0	I-values) E1 E4 E16 E17 E7 E18 E20 P3	Y-Value = 0.1086 Steel lintel with perforated steel base plate Jamb Corner (normal) Corner (inverted internal area greater than external area) Party floor between dwellings (in blocks of flats) Party wall between dwellings Exposed floor (normal) Intermediate floor between dwellings (in blocks of flats)
Ventilation:				
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	Number of v Ductwork: I	igned) ith heat recover wet rooms: Kitc nsulation, rigid nstallation Sche	hen + 1	2
Main heating system:				
Main heating system:	Gas boilers Fuel: mains Info Source Database: ( Brand name Model: Neta Model qualit (Combi boile Systems wit Central hea	: Boiler Databas rev 367, produce : Baxi a-tec Combi fier: 24 GA er) :h radiators ting pump : 20° temperature: E d ock: Yes	se ct index ( 13 or late	016684) Efficiency: Winter 87.3 % Summer: 89.9
Main heating Control:				
Main heating Control:	Programme Control code	r, room thermo e: 2106	stat and	IKVS
Secondary heating system:				
Secondary heating system: Water heating:	None			
Water heating:	Water code Fuel :mains Hot water c Cylinder vol Cylinder ins Primary pipe Cylinderstat Cylinder in H Flue Gas He	gas ylinder ume: 180 litres ulation: Factory ework insulatior	75 mm n: True rue stem:	060001)

Brand name: Zenex Model: GasSaver SMadgaquatifiatseGS-1

#### Others:

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: 0.6 Tilt of collector: Horizontal Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

			User D	etails:						
Assessor Name:	Aymon Wir	nter		Strom	a Num	ber:		STRO	014511	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versio	on: 1.0.1.14	
			Property	Address:	Unit 1 C	)1				
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor				<b>a(m²)</b> 67.3	(1a) x	<b>Av. He</b>	<b>ight(m)</b>	(2a) =	Volume(m <sup>3</sup> ) 181.71	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(	(1d)+(1e)+	(1n)	67.3	(4)			-		_
Dwelling volume			L		(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	181.71	(5)
2. Ventilation rate:										
	main heating	secono heatin		other		total			m <sup>3</sup> per hour	•
Number of chimneys	0	+ 0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	+ 0		0	i = Г	0	x 2	20 =	0	(6b)
Number of intermittent far	ובבביים וא					0	x ^	10 =	0	(7a)
Number of passive vents						0	× ′	10 =	0	(7b)
Number of flueless gas fir	es				Г	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	
lefiltertien der te ebieren		(60) (66)	\.( <b>7</b> _).( <b>7</b> _).(	70)	F			1		-
Infiltration due to chimney If a pressurisation test has be					continue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in th			( ))				-7		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or	timber frame	or 0.35 fo	r masonr	y constr	uction			0	(11)
if both types of wall are pro deducting areas of openin			g to the great	er wall are	a (after					
If suspended wooden fl			r 0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent			,						0	(13)
Percentage of windows	and doors dr	aught strippe	d						0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o			-	•	•	etre of e	nvelope	area	3	(17)
If based on air permeabili	-								0.15	(18)
Air permeability value applies	•	on test has been	done or a deg	gree air pei	rmeability i	is being us	sed			٦
Number of sides sheltered Shelter factor				(20) = 1 -	0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate incorporati	ng shelter fac	tor		(21) = (18)		- / 1				(20)
Infiltration rate modified for	•								0.13	(21)
	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe					·					
, <u>, , , , , , , , , , , , , , , , , , </u>	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
	)m : 4	I	I	1					I	
Wind Factor (22a)m = (22           (22a)m = 1.27         1.25	.)m ÷ 4 1.23 1.1	1.08 0.95	5 0.95	0.92	1	1.08	1.12	1.18		
	I	ļ							I	

Adjust	ed infiltr	ation rat	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m			-	_	
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
		ctive air al ventila	-	rate for t	the appli	cable ca	se						0.5	(23a)
				endix N (2	23b) = (23a	i) x Fmv (e	equation (N	(5)) othe	rwise (23h	) = (23a)			0.5	(23a)
		• •	0 11		allowing f	, (	• •	<i>,,</i> .		) (200)			0.5	
					Ũ		``		, ,	2b)m + (2	23h) v [*	1 _ (23c)	77.35	(23c)
(24a)m=	<b></b>	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	]	(24a)
										2b)m + (2			1	
(24b)m=				0	0	0		0	0	0	0	0	1	(24b)
	whole h		tract ver	L	or positiv			n from c	utside		-		1	
,					•	•				5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) lf	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 = (22	b)m othe	erwise (2	4d)m = (	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
	r	<u> </u>	·	· · · ·	a) or (24b	, <u> </u>	, <u>,</u>	, 	(25)			i	1	
(25)m=	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	J	(25)
3. He	at losse	s and he	eat loss	paramet	er:									
ELEN	<b>IENT</b>	Gros		Openin		Net Ar		U-valu		AXU		k-value		Xk
_		area	(m²)	r	ן <sup>2</sup>	A ,r	n²	W/m2	:Κ	(W/ł	<)	kJ/m²∙l	K k	J/K
Doors	_					2.27	X	1	= [	2.27				(26)
	ws Type					7.56		/[1/( 1.4 )+	L	10.02				(27)
Windo	ws Type	92				6.21	x1/	/[1/( 1.4 )+	0.04] =	8.23				(27)
Floor						3.96	x	0.16	=	0.6336				(28)
Walls	Type1	27.5	51	16.0	4	11.47	× ×	0.16	=	1.84				(29)
Walls	Type2	20.9	98	0		20.98	3 X	0.17	=	3.52				(29)
Total a	area of e	lements	, m²			52.45	5							(31)
Party v	wall					28.4	x	0	=	0				(32)
Party f	loor					63.34	ļ							(32a)
Party of	ceiling					67.3					Γ		$\neg$	(32b)
							ated using	formula 1	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	h 3.2	
					lls and part	titions		(26) (20)	(22)					
		ss, W/K :		U)				(26)(30)		(00) . (00	)) . ( <b>00</b> -)	(00.)	26.52	(33)
		Cm = S(	. ,	0		1.1/				.(30) + (32		(32e) =	8074.6	(34)
					÷ TFA) ir			a a ia a lu tha		tive Value:		abla 1f	250	(35)
	•	ad of a de			constructi	on are not	known pr	ecisely life	e maicative	values of		adie II		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix k	<						5.7	(36)
if details	s of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)								
	abric he								(33) +	(36) =			32.21	(37)
Ventila	ation hea	i	i	d monthly	1				i	= 0.33 × (2		r	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

(38)m=	16.54	16.35	16.16	15.2	15.01	14.05	14.05	13.86	14.44	15.01	15.39	15.77		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	48.75	48.56	48.37	47.42	47.22	46.27	46.27	46.08	46.65	47.22	47.61	47.99		
Heat In	es nara	meter (l	· HLP), W/	m²k						Average = = (39)m ÷	Sum(39)1	12 /12=	47.37	(39)
(40)m=	0.72	0.72	0.72	0.7	0.7	0.69	0.69	0.68	0.69	0.7	0.71	0.71		
(,											Sum(40)1	L	0.7	(40)
Numbe	er of day	/s in mo	nth (Tab	le 1a)			-					۰ 		
	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 ene	rgy requi	irement:								kWh/ye	ar:	
if TF	A > 13.9		N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	-13.9	)2)] + 0.(	)013 x ( <sup>-</sup>	TFA -13.		.18		(42)
	A £ 13.9		ater usag	no in litre	e nor da	ve hV ve	erade -	(25 v NI)	+ 36		0.5	05		(43)
Reduce	the annua	al average	hot water person per	usage by	5% if the a	welling is	designed t			se target o		5.95		(43)
	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	Table 1c x	(43)						
(44)m=	94.54	91.1	87.67	84.23	80.79	77.35	77.35	80.79	84.23	87.67	91.1	94.54		
Enerav a	content of	hot water	used - cal	culated m	onthly $= 4$	190 x Vd.r	n x nm x D	) ) Tm / 360(			m(44) <sub>112</sub> = ables 1b. 1		1031.37	(44)
(45)m=	140.2	122.62	126.54	110.32	105.85	91.34	84.64	97.13	98.29	114.54	125.03	135.78		
(40)11-	140.2	122.02	120.04	110.02	100.00	51.54	04.04	57.15			m(45) <sub>112</sub> =	L	1352.29	(45)
lf instant	aneous w	ater heati	ng at point	of use (no	o hot water	<sup>.</sup> storage),	enter 0 in	boxes (46				L		
(46)m=	21.03	18.39	18.98	16.55	15.88	13.7	12.7	14.57	14.74	17.18	18.76	20.37		(46)
	storage													
			) includir						ame ves	sei		180		(47)
Otherw	•	o stored	and no ta hot wate		-			. ,	ers) ente	er '0' in (	47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m watei	<sup>.</sup> storage	, kWh/ye	ear			(48) x (49)	) =			0		(50)
,			eclared o											
		-	factor fr		le 2 (kW	h/litre/da	iy)					0		(51)
	•	from Ta		011 4.5								0		(52)
			m Table	2b								0		(53)
Energy	lost fro	m watei	<sup>.</sup> storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter	(50) or (	(54) in (8	55)									0		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	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)

Primary circu Primary circu	`	,			59)m = (	(58) ÷ 36	65 × (41)	m			0	]	(58)
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)	-		
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss o	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 21.95	19.82	21.95	21.24	21.95	21.24	21.95	21.95	21.24	21.95	21.24	21.95		(61)
Total heat re	quired for	water h	eating ca	alculatec	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 162.1	5 142.44	148.48	131.55	127.8	112.58	106.59	119.07	119.53	136.49	146.27	157.73		(62)
Solar DHW inpu	it calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0'	if no sola	r contributi	on to wate	er heating)	1	
(add additior	al lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix G	S)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 23.67	18.01	15.1	11.51	10.77	9.35	8.68	9.92	10.03	12.21	17.35	24		(63) (G2)
Output from	water hea	ter											
(64)m= 138.4	7 124.44	133.38	120.04	117.03	103.23	97.91	109.16	109.5	124.28	128.93	133.72		
							Outp	out from wa	ater heater	r (annual)₁	12	1440.09	(64)
Heat gains fi	om water	heating.	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	1] + 0.8 x	(46)m	+ (57)m	+ (59)m	1	
(65)m= 52.1	45.73	47.56	41.99	40.68	35.68	33.63	37.78	37.99	43.57	46.88	50.63	ĺ	(65)
include (5	7)m in calo	ulation	u of (65)m	onlv if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	r munitv h	ieatina	
·	gains (see		. ,	-	<b>,</b>		- J				,	J	
Metabolic ga													
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 130.7	_	130.73	130.73	130.73	130.73	130.73	130.73	130.73	130.73	130.73	130.73		(66)
Lighting gair	s (calcula	I ted in Ar	n Dendix	L equat	ion I 9 o	rl9a)a	lso see <sup>-</sup>	Table 5				1	
(67)m= 42.76	<u>`</u>	30.88	23.38	17.48	14.76	15.94	20.72	27.82	35.32	41.22	43.94	]	(67)
Appliances g												I	
(68)m= 284.9	<u> </u>	280.45	264.59	244.57	225.75	213.17	210.22	217.67	233.53	253.56	272.38	]	(68)
Cooking gair								_		200.00	212.00	I	()
(69)m= 50.25	`	50.25	50.25	50.25	50.25	50.25	50.25	50.25	50.25	50.25	50.25	1	(69)
	_			50.25	50.25	50.25	50.25	50.25	50.25	50.25	50.25	l	(00)
Pumps and f			3	3	3	3	3	3	3	3	3	1	(70)
						3	3	3	3	3	3	J	(10)
Losses e.g.		<u> </u>	· · · · · · · · · · · · · · · · · · ·	, `	<u> </u>	07.45	07.45	07.45	07.45	07.45	07.45	1	(74)
(71)m= -87.1		-87.15	-87.15	-87.15	-87.15	-87.15	-87.15	-87.15	-87.15	-87.15	-87.15		(71)
Water heatin	<del>, , ,</del>	, <u> </u>			i		·				i	1	
(72)m= 70.03	68.05	63.92	58.32	54.68	49.56	45.2	50.78	52.76	58.57	65.12	68.06		(72)
Total intern		:			(66)	m + (67)m	n + (68)m +	- (69)m + (		1)m + (72)	m	1	
(73)m= 494.5		472.09	443.12	413.55	386.89	371.15	378.55	395.08	424.24	456.72	481.2		(73)
6. Solar gai													
Solar gains ar		-					tions to co		e applicab		ion.	<b>a</b> .	
Orientation:	Access F Table 6d		Area m²		Flu Tal	x ole 6a	Т	g_ able 6b	Та	FF able 6c		Gains (W)	

Chontation	Table 6d	m²	Table 6a	9_ Tabl		Table 6c		(W)		
	).9x 1	x 7.56	× 19.64	x 0.	63 ×	0.7	= [	45.38	(76)	

	_			_														
East	0.9x	1	x		7.56	6	x	3	8.42	x		0.63	×	0.7		=	88.77	(76)
East	0.9x	1	x		7.56	6	x	6	3.27	x		0.63	×	0.7		=	146.19	(76)
East	0.9x	1	x		7.56	6	x	g	2.28	x		0.63	×	0.7		=	213.21	(76)
East	0.9x	1	x		7.56	6	x	1	13.09	x		0.63	×	0.7		=	261.29	(76)
East	0.9x	1	x		7.56	6	x	1	15.77	x		0.63	×	0.7		=	267.48	(76)
East	0.9x	1	x		7.56	6	x	1	10.22	x		0.63	×	0.7		=	254.65	(76)
East	0.9x	1	x		7.56	6	x	g	4.68	x		0.63	×	0.7		=	218.74	(76)
East	0.9x	1	x	Γ	7.56	6	x	7	3.59	x		0.63	×	0.7		=	170.02	(76)
East	0.9x	1	x		7.56	6	x	4	5.59	x		0.63	x	0.7		=	105.33	(76)
East	0.9x	1	x		7.56	6	x	2	4.49	x		0.63	×	0.7		=	56.58	(76)
East	0.9x	1	x		7.56	6	x	1	6.15	x		0.63	x	0.7		=	37.32	(76)
West	0.9x	0.77	x		6.21	1	x	1	9.64	x		0.63	x	0.7		=	37.27	(80)
West	0.9x	0.77	x		6.21	1	x	3	8.42	<b>x</b>		0.63	x	0.7		=	72.92	(80)
West	0.9x	0.77	x		6.21	1	x	6	3.27	x		0.63	x	0.7		=	120.08	(80)
West	0.9x	0.77	x		6.21	1	x	g	2.28	x		0.63	x	0.7		=	175.13	(80)
West	0.9x	0.77	x		6.21	1	x	1	13.09	x		0.63	×	0.7		=	214.63	(80)
West	0.9x	0.77	x		6.21	1	x	1	15.77	x		0.63	×	0.7		=	219.72	(80)
West	0.9x	0.77	x		6.21	1	x	1	10.22	x		0.63	×	0.7		=	209.18	(80)
West	0.9x	0.77	x		6.21	1	x	g	4.68	x		0.63	x	0.7		=	179.68	(80)
West	0.9x	0.77	x		6.21	1	x	7	3.59	x		0.63	×	0.7		=	139.66	(80)
West	0.9x	0.77	x		6.21	1	x	4	5.59	x		0.63	×	0.7		=	86.52	(80)
West	0.9x	0.77	x		6.21	1	x	2	4.49	x		0.63	×	0.7		=	46.48	(80)
West	0.9x	0.77	x		6.21	1	x	1	6.15	x		0.63	×	0.7		=	30.65	(80)
Solar g	ains in	watts, ca	lculate	d fo	or each	mont	h			(83)m	n = Su	m(74)m	.(82)m					
(83)m=	82.65	161.68	266.27		88.34	475.93		487.2	463.83	398	.42	309.69	191.8	5 103.06	67.	97		(83)
-		nternal ar		<u> </u>	<u>,</u>	. ,	<u> </u>		1					_			I	(2.4)
(84)m=	577.22	652.44	738.36	8	31.46	889.48	8 8	74.08	834.98	776	.98	704.76	616.1	559.78	549	.17		(84)
7. Me	an inter	nal temp	erature	(he	eating	seaso	n)											_
Temp	erature	during he	eating p	beri	iods in	the liv	/ing	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa		tor for ga		1	<u> </u>		Ť		,								I	
	Jan	Feb	Mar	-	Apr	Мау	_	Jun	Jul		ug	Sep	Oct			ec		
(86)m=	0.98	0.94	0.86	(	0.68	0.49		0.34	0.24	0.2	27	0.46	0.76	0.94	0.9	98		(86)
		l tempera	ature in	-	<u> </u>	a T1 (	follo	ow ste	ps 3 to 7	7 in T	able	9c)					I	
(87)m=	20.62	20.75	20.9	2	20.98	21		21	21	2	1	21	20.97	20.8	20.	59		(87)
Temp	erature	during he	eating p	beri	iods in	rest o	of dv	velling	from Ta	able 9	9, Th	2 (°C)						
(88)m=	20.32	20.32	20.32	2	20.34	20.34		20.35	20.35	20.	35	20.35	20.34	20.33	20.	33		(88)
Utilisa	ation fac	tor for ga	ins for	res	st of dw	velling	, h2	,m (se	e Table	9a)								
(89)m=	0.97	0.93	0.83	-	0.64	0.46	Τ	0.3	0.21	0.2	23	0.41	0.72	0.93	0.9	98		(89)
Mean	Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)																	
(90)m=	19.98	20.11	20.24	-	20.33	20.34		20.35	20.35	20.	-	20.35	20.32	2 20.17	19.	97		(90)
				1	I				L	1				ving area ÷ (4			0.38	(91)

Mean	interna	l temper	ature (fo	or the wh	ole dwel	llina) = fl	_A × T1 ·	+ (1 – fL	A) × T2					
(92)m=	20.23	20.36	20.49	20.58	20.59	20.6	20.6	20.6	20.6	20.57	20.41	20.21		(92)
Apply	adjustn	nent to t	he mear	interna	l tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	20.08	20.21	20.34	20.43	20.44	20.45	20.45	20.45	20.45	20.42	20.26	20.06		(93)
8. Spa	ace hea	ting requ	uirement											
						ed at ste	ep 11 of	Table 9t	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation		<u> </u>	using Ta					r		r		I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm	i	0.40	0.04	0.04	0.04	0.40	0.70	0.00	0.07		(04)
(94)m=	0.97	0.93	0.83	0.65	0.46	0.31	0.21	0.24	0.42	0.73	0.93	0.97		(94)
			,	4)m x (8-	<u> </u>	070.00	470.40	400 70	005.00	440.47	540.54	505.00	l	(95)
(95)m=	558.27	606.91	616.02	538.57	412.19	270.69	178.18	186.73	295.89	449.17	518.51	535.03		(93)
(96)m=	11y avera	age exte	6.5	8.9	e from Ta	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		_									7.1	4.2		(30)
пеаі (97)m=	769.28	743.26	669.69	546.61	412.84	270.71	178.18	186.73	- (96)m 296.11	J 463.66	626.44	761.08		(97)
									)m – (95)			701.00		(07)
(98)m=	156.99	91.63	39.92	5.79	0.48	0	0.02	0		10.78	77.71	168.18		
(00)11-	100.00	01.00	00.02	0.70	0.40	Ŭ	ů		l per year (				551.5	(98)
-		_						TUIA	i per year i	(KWII/yeai	) = Sum(9	0)15,912 =	551.5	4
Space	e heatin	g require	ement in	kWh/m²	²/year								8.19	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heatir	-												_
Fracti	on of sp	ace hea	it 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 heati	ng from	main sys	stem 1			(204) = (20	02) × [1 – (	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								92.9	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ar
Space					d above)		0 di	, lug	Cop			200		
•	156.99	91.63	39.92	5.79	0.48	0	0	0	0	10.78	77.71	168.18		
(211)m	n – {[(98	)m x (20	4)] + (21	I   (1) m } x	100 ÷ (2	06)			II					(211)
(211)	168.99	98.63	42.98	6.23	0.52	0	0	0	0	11.61	83.65	181.04		(=)
								Tota	l (kWh/yea				593.65	(211)
Snac	a haatin	a fual (e	econdar	y), kWh/	month						1			
•		•		(100 ÷ (										
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15.1012</sub>	=	0	(215)
Water	heating													
	-		ter (calc	ulated a	bove)									
	138.47	124.44	133.38	120.04	117.03	103.23	97.91	109.16	109.5	124.28	128.93	133.72		
Efficier	ncy of w	ater hea	ter										87.3	(216)
(217)m=	88.66	88.38	87.89	87.42	87.31	87.3	87.3	87.3	87.3	87.5	88.26	88.73		(217)
Fuel fo	r water	heating,	kWh/mo	onth									I	
(219)m	<u>1 = (64)</u>	<u>m x 100</u>	) ÷ (217)	m					· · · · ·				l	
(219)m=	156.18	140.79	151.77	137.32	134.04	118.24	112.15	125.03	125.43	142.04	146.08	150.71		_
								Tota	I = Sum(21	19a) <sub>112</sub> =			1639.78	(219)

Annual totals Space heating fuel used, main system 1		kWh/year	<b>kWh/year</b> 593.65
Water heating fuel used			1639.78
Electricity for pumps, fans and electric keep	p-hot		
mechanical ventilation - balanced, extract	or positive input from outside	116.3	9 (230a)
central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (23	0a)(230g) =	191.39 (231)
Electricity for lighting			302.03 (232)
Electricity generated by PVs			-456.3 (233)
10a. Fuel costs - individual heating systen	ns:		
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 x 0.01	= 20.6588490370886 (240)
Space heating - main system 2	(213) x	0 x 0.01	= 0 (241)
Space heating - secondary	(215) x	13.19 x 0.01	= 0 (242)
Water heating cost (other fuel)	(219)	3.48 x 0.01	= 57.06 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01	= 25.24 (249)
(if off-peak tariff, list each of (230a) to (230a) Energy for lighting	g) separately as applicable and ap (232)	pply fuel price according to 13.19 × 0.01	
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 × 0.01	= 0 (252)
Appendix Q items: repeat lines (253) and (2 Total energy cost (24	254) as needed 45)(247) + (250)(254) =		262.81 (255)
11a. SAP rating - individual heating system	ms		
Energy cost deflator (Table 12) Energy cost factor (ECF) [(2	255) x (256)] ÷ [(4) + 45.0] =		0.42 (256) 0.98 (257)
SAP rating (Section 12)			86.29 (258)
12a. CO2 emissions – Individual heating s	systems including micro-CHP		
	<b>Energy</b> kWh/year	<b>Emission factor</b> kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	128.23 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	354.19 (264)
Space and water heating	(261) + (262) + (263) + (264) =	:	482.42 (265)
Electricity for pumps, fans and electric keep	p-hot (231) x	0.519 =	99.33 (267)

Electricity for lighting	(232) x	0.519	=	156.76	(268)
Energy saving/generation technologies Item 1		0.519	=	-236.82	(269)
Total CO2, kg/year		sum of (265)(271) =		501.69	(272)
CO2 emissions per m²		(272) ÷ (4) =		7.45	(273)
El rating (section 14)				94	(274)
13a. Primary Energy					
	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	=	724.25	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2000.53	(264)
Space and water heating	(261) + (262) + (263) + (2	64) =		2724.78	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	587.55	(267)
Electricity for lighting	(232) x	0	=	927.24	(268)
Energy saving/generation technologies Item 1		3.07	=	-1400.83	(269)
'Total Primary Energy		sum of (265)(271) =		2838.74	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		42.18	(273)

## SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 November 2014

Property Details: Unit 1 01

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shut Ventilation rate during Overheating Details: Summer ventilation h Transmission heat los	es: eter: ters: g hot wea eat loss	coeffic		Thame Yes 1 South Averag None Indicat False Light-c 3 ( Wir	England Thames valley Yes 1 South Average or unknown None Indicative Value Medium							
Summer heat loss co				32.2 212.11				(P2)				
Overhangs:												
Orientation:	Ratio:		Z_overhangs:									
East (East window) West (West Window)	0 0		1 1									
Solar shading:												
<b>Orientation:</b> East (East window) West (West Window)	<b>Z blind</b> 0.6 0.6	ls:	<b>Solar access:</b> 0.9 0.9	<b>C</b> 1 1		<b>Z summer:</b> 0.54 0.54		(P8) (P8)				
Solar gains:												
Orientation East (East window) West (West Window)	0.9 x 0.9 x	<b>Area</b> 7.56 6.21	<b>Flux</b> 117.51 117.51	<b>g_</b> 0.63 0.63	<b>FF</b> 0.7 0.7	<b>Shading</b> 0.54 0.54 <b>Total</b>	<b>Gains</b> 190.4 156.4 346.8	(P3/P4)				
Internal gains:												
Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass tempera Threshold temperature <b>Likelihood of high int</b>	temperat ture incre	ement			June 383.89 752.02 3.55 16 0.25 19.8 Not significant	July 368.15 714.94 3.37 17.9 0.25 21.52 Slight	August 375.55 680.65 3.21 17.8 0.25 21.26 Slight	(P5) (P6) (P7)				
Assessment of likelih	ood of h	igh inte	ernal temperatu	re:	<u>Slight</u>							



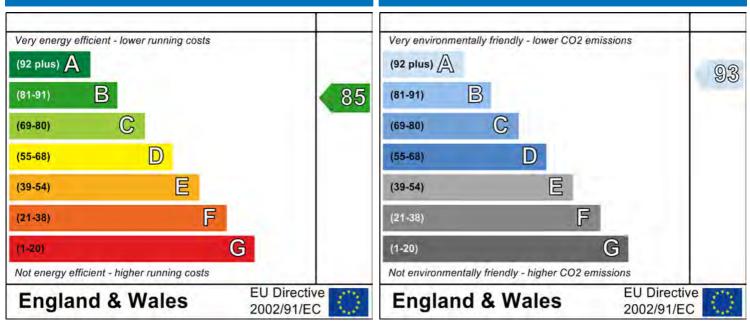
Dwelling type: Date of assessment: Produced by: Total floor area: Mid floor Flat 29 October 2014 Aymon Winter 71.8899993896484 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

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

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

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

# **Regulations Compliance Report**

	ion:			
ssessed By:	Aymon Winter (S	TRO014511)	Building Type: Flat	
<b>Dwelling Details</b>	:			
EW DWELLING	G DESIGN STAGE		Total Floor Area: 71.89m <sup>2</sup>	
ite Reference :	Development at	Riverpark Gardens	Plot Reference: Unit 1 03	
ddress :				
Client Details:				
ame:	Jamie			
ddress :	Campbell, 43 Ta	nner Street, Greater London, Lo	ondon, SE13PL	
		within the SAP calculations.		
	ete report of regula	ations compliance.		
a TER and DE				
uel for main hea uel factor: 1.00	ating system: Mains	gas		
	ioxide Emission Rate	e (TER)	19.1 kg/m²	
-	Dioxide Emission Ra	. ,	10.47 kg/m <sup>2</sup>	ОК
Ib TFEE and D				
arget Fabric En	ergy Efficiency (TFE	E)	53.38 kWh/m <sup>2</sup>	
welling Fabric E	Energy Efficiency (DF	FEE)	44.06 kWh/m <sup>2</sup>	
				OK
2 Fabric U-valu		•		
Elemen	t	Average	Highest	
Externel	L woll			
External Party w		0.16 (max. 0.30)	0.18 (max. 0.70)	OK
Party wa		0.00 (max. 0.20)	-	ОК
Party wa Floor		0.00 (max. 0.20) 0.16 (max. 0.25)	- 0.16 (max. 0.70)	OK OK
Party wa	all	0.00 (max. 0.20)	-	ОК
Party wa Floor Roof Opening	all gs	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20)	- 0.16 (max. 0.70) 0.11 (max. 0.35)	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal	all gs dging I bridging calculated	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20)	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30)	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabil	all gs dging I bridging calculated lity	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00)	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea	all gs dging I bridging calculated	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00)	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value)	OK OK OK
Party wa Floor Roof Opening <b>2a Thermal brid</b> Thermal <b>3 Air permeabi</b> Air permea Maximum	all gs dging I bridging calculated lity ability at 50 pascals	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00)	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea Maximum	all gs dging I bridging calculated lity ability at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittan	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea Maximum 4 Heating effici	all gs dging I bridging calculated lity ability at 50 pascals	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittant	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea Maximum 4 Heating effici	all gs dging I bridging calculated lity ability at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittant Database: (rev 367, product Boiler systems with radiator	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea Maximum	all gs dging I bridging calculated lity ability at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittant Database: (rev 367, product Boiler systems with radiator Brand name: Baxi	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea Maximum	all gs dging I bridging calculated lity ability at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittant Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea Maximum	all gs dging I bridging calculated lity ability at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittant Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea Maximum 4 Heating effici	all gs dging I bridging calculated lity ability at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittant Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	OK OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabi Air permea Maximum 4 Heating effici	all gs dging I bridging calculated lity ability at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittant Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi)	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	OK OK OK
Party wa Floor Roof Opening 2a Thermal brie Thermal 3 Air permeabi Air permea Maximum 4 Heating effici Main Heat	all gs dging I bridging calculated lity ability at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) 0.11 (max. 0.20) 1.34 (max. 2.00) from linear thermal transmittant from linear thermal transmittant Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUKS	- 0.16 (max. 0.70) 0.11 (max. 0.35) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	OK OK OK

# **Regulations Compliance Report**

5 Cylinder insulation											
Hot water Storage:	Nominal cylinder loss: 0.										
<b>_</b>	Permitted by DBSCG: 2.	10 kWh/day	<b>.</b>								
Primary pipework insulated	l: Yes		OK								
6 Controls	Controls										
	Space heating controls Programmer, room thermostat and TRVs										
Hot water controls:	Cylinderstat		OK								
Deilen interleelu	Independent timer for DF	100	OK								
Boiler interlock:	Yes		ОК								
7 Low energy lights		400.0%									
Percentage of fixed lights v	vith low-energy fittings	100.0%	OK								
Minimum		75.0%	ОК								
8 Mechanical ventilation											
Continuous supply and ext	ract system										
Specific fan power:		0.42									
Maximum		1.5	OK								
MVHR efficiency:		91%	<b>.</b>								
Minimum		70%	OK								
9 Summertime temperature											
Overheating risk (Thames	valley):	Slight	OK								
Based on:											
Overshading:		Average or unknown									
Windows facing: East		5.56m²,									
Windows facing: West		5.67m²,									
Windows facing: South		2.16m²,									
Ventilation rate:		3.00									
Blinds/curtains:		Light-coloured curtain or rolle									
		Closed 100% of daylight hou	Irs								
10 Key features											
Air permeablility		3.0 m³/m²h									
Doors U-value		1 W/m²K									
		0.44344/ 014									

0.11 W/m<sup>2</sup>K

Roofs U-value Photovoltaic array

Property Details. Of	111 1 03										
Address:											
Located in:		Engla	nd								
Region:		-	es valley								
UPRN:											
Date of assessm	ent	29 00	tober 2014								
Date of certificat			ovember 2014								
Assessment type			dwelling design sta	Ane							
5.			New dwelling								
Transaction type		Unkn	0								
Tenure type:	alogura		lated party								
Related party dis			ative Value Mediun	2							
Thermal Mass Pa			True	1							
Water use <= 12	zo intres/per	367 sonzuay:	nue								
PCDF Version:		307									
Property description	ו:										
Dwelling type:		Flat									
Detachment:		That									
Year Completed:		2014									
•											
Floor Location:		Floo	r area:		Storey height	:					
Floor 0		71.89	m²		2.7 m						
Living area:		26.47	m <sup>2</sup> (fraction 0.36	58)							
Front of dwelling fa	aces:	North	-								
Opening types:											
Name:	Source:	-	Туре:	Glazing:		Argon:	Frame:				
Main door	Manufacturer		Solid	5		5	PVC-U				
east window	SAP 2012		Windows	low-F. Fn =	0.05, soft coat	Yes	PVC-U				
West window	SAP 2012		Windows		0.05, soft coat	Yes	PVC-U				
south window	SAP 2012		Windows		0.05, soft coat	Yes	PVC-U				
	_					_		_			
Name:	Gap:		Frame Fact	-	U-value:	Area:	No. of O	penings:			
Main door	mm		0.7	0	1	2.15	1				
east window	16mm oi		0.7	0.63	1.4	5.56	1				
West window	16mm oi		0.7	0.63	1.4	5.67	1				
south window	16mm oi	r more	0.7	0.63	1.4	2.16	1				
Name:	Type-Name	<u>.</u>	Location:	Orient:		Width:	Height:				
Main door	Type Name		External wall	North		0	0				
east window			External wall	East		0	0				
West window			External wall	West		0	0				
south window			External wall	South		0	0				
Overshading:		Avera	ge or unknown								
Opaque Elements:											
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtair	wall v	appa:			
External Elements		opennys.		U-value.	Nu value.	Guitall		սրիս.			
External wall	66.32	15.54	50.78	0.16	0	False		N/A			
sheltered wall	13.09	0	13.09	0.18	0.4	False		N/A			
Roof Terrace	9.79	0	9.79	0.18	0.4	i aist		N/A N/A			
exposed floor	9.79 35.8	U	7.17	0.16	U			N/A N/A			
	33.0			0.10				N/A			
Internal Elements Party Elements											
PALLY FIRMANTS											
	17 /7							NI/A			
party walls party ceiling	17.47 61.87							N/A N/A			

party floor 35.86	N/A								
Thermal bridges:									
Thermal bridges:	User-defined (individual PSI-values) Y-Value = 0.0843 Length Psi-value 7.12 0.401 E1 Steel lintel with perforated steel base plate								
	7.120.401E1Steer inter with periorated steer base plate21.850.021E4Jamb30.020.001E7Party floor between dwellings (in blocks of flats)2.70.055E18Party wall between dwellings8.10.048E16Corner (normal)18.120.32E20Exposed floor (normal)10.690.08E14Flat roof12.940P3Intermediate floor between dwellings (in blocks of flats)								
Ventilation:									
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True								
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 0 2 3								
Main heating system:									
Main heating system:	Boiler systems with radiators or underfloor heating Gas boilers and oil boilers Fuel: mains gas Info Source: Boiler Database Database: (rev 367, product index 016684) Efficiency: Winter 87.3 % Summer: 89.9 Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi boiler) Systems with radiators								
	Central heating pump : 2013 or later Design flow temperature: Design flow temperature >45°C Room-sealed Boiler interlock: Yes Delayed start								
Main heating Control:									
Main heating Control:	Programmer, room thermostat and TRVs Control code: 2106								
Secondary heating system:									
Secondary heating system:	None								
Water heating:									
Water heating:	From main heating system Water code: 901 Fuel :mains gas Hot water cylinder Cylinder volume: 180 litres Cylinder insulation: Factory 75 mm Primary pipework insulation: True								

Cylinderstat: True Cylinder in heated space: True Flue Gas Heat Recovery System: Database (rev 367, product index 060001) Brand name: Zenex Model: GasSaver SMadelaquettifietseGS-1

#### Others:

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: 0.7 Tilt of collector: Horizontal Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

Assessor Name:       Aymon Winter       Stroma Number:       STRO14511         Software Varsion:       Version:       1.0.1.14         Property Address:       Image: Control of the second of the secon				User D	etails:								
Property Address: Unit 1 03Address:1. Overall dwalling dimensions:Area(m <sup>2</sup> )Volume(m <sup>3</sup> )Ground floorVolume(m <sup>3</sup> )Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)Area(m <sup>2</sup> )Volume(m <sup>3</sup> )Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)TriseVolume(m <sup>3</sup> )Overall group of the set of the	Assessor Name:	Aymon Wir	nter		Strom	a Num	ber:		STRO014511				
Adverse :         I. Overall divelling dimensions:         Area(m <sup>3</sup> )       Av. Height(m)       Volume(m <sup>3</sup> )         Ground floor       71.89       (a) × 40 =       (a) + 10 =         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)       71.89       (a) + 30 + 30 + 30 + 30 + 30 + 30 + 30 + 3	Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versio	on: 1.0.1.14			
Area(m <sup>2</sup> )       Av. Height(m)       Volume(m <sup>2</sup> )         Ground floor       (2a)       Colspan="2">Colspan="2"         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)       Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1d)+(1d)+(1d)+(1d)+(1d)+(1d)+(1d)+(1d				Property .	Address:	Unit 1 C	)3						
Area(m <sup>2</sup> )Av. Height(m)Volume(m <sup>2</sup> )Ground floor71.89(1a) ×2.7(2a) =194.1(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)71.89(4)194.1(5)Dwelling volume(3a)+(3b)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a													
Ground floor71.89(1a) x2.7(2a) =194.1(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)71.89(2a)194.1(3a)Output(2a)+(1b)+(1c)+(1c)+(1c)+(1e)+(1n)71.89(2a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	1. Overall dwelling dimer	nsions:		_	( A)								
Developme $(3)+(3)+(3)+(3)+(3)+(3)+(3)+(3)+(3)+(3)+$	Ground floor				· ,	(1a) x			(2a) =	. ,	_		
2. Ventilation rate:main heating heatingsecondary heating heatingothertotalm³ per hourNumber of chimneys $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ Number of open flues $0$ $0$ $0$ $10$ $0$ <t< td=""><td>Total floor area TFA = (1a</td><td>ı)+(1b)+(1c)+(</td><td>1d)+(1e)+(</td><td>In) 7</td><td>'1.89</td><td>(4)</td><td></td><td></td><td></td><td></td><td></td></t<>	Total floor area TFA = (1a	ı)+(1b)+(1c)+(	1d)+(1e)+(	In) 7	'1.89	(4)							
main heating heatingscondary heating heatingothertotalm³ per hourNumber of chimneys0+0=0<40 =	Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	194.1	(5)		
Number of chimneysheating 0+0=0×40×400(6a)Number of open flues0+0=0×200(6b)Number of intermittent fans0×10=0(7a)Number of passive vents0×10=0(7c)Number of flueless gas fires0×40=0(7c)Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\bullet$ $\bullet$ $\bullet$ $\bullet$ Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ Number of storeys in the dwelling (ns) $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ Additional infiltration(19)-1b.0.1 = $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ Structural infiltration(19)-1b.0.1 = $\bullet$ </td <td>2. Ventilation rate:</td> <td></td>	2. Ventilation rate:												
Number of chimneys $0$ + $0$ + $0$ = $0$ x40 = $0$ $(6a)$ Number of open flues $0$ + $0$ + $0$ = $0$ x20 = $0$ $(6b)$ Number of intermittent fans $0$ $x 10 =$ $0$ $(7a)$ $0$ $(7a)$ Number of passive vents $0$ $x 10 =$ $0$ $(7a)$ Number of flueless gas fires $0$ $x 40 =$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ $0$ $+$ $(6) =$ $0$ If a passurisation test has been carried out or is intended, proceed to $(17)$ , otherwise continue from $(9)$ to $(16)$ $0$ $(6)$ Number of storeys in the dwelling (ns) $((a)$ $((a)$ $((b)$ $((b)$ Additional infiltration $0.25$ for steel or timber frame or $0.35$ for masonry construction $((a)$ $((b)$ If both types of wall are present, use the value corresponding to the greater wall are (after deducting areas of openings); if equal user $0.36$ $(10)$ $(11)$ If suspended wooden floor, enter $0.2$ (unsealed)) or $0.1$ (sealed), else enter $0$ $0$ $(12)$ If no draught lobby, enter $0.05$ , expressed in cubic metres per hour per square metre of envelope area $3$ $(17)$ If based on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $3$ $(17)$ Air permeability value, g50, expressed in cubic metres per hour per square metre of envelope area $3$ </td <td></td> <td></td> <td></td> <td></td> <td>other</td> <td></td> <td>total</td> <td></td> <td></td> <td>m<sup>3</sup> per houi</td> <td>•</td>					other		total			m <sup>3</sup> per houi	•		
Number of intermittent fans $0$ $x10 =$ $0$ $(7a)$ Number of passive vents $0$ $x10 =$ $0$ $(7b)$ Number of flueless gas fires $0$ $x40 =$ $0$ $(7c)$ Air changes per hourInfiltration due to chinneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0$ $+(6) =$ $0$ $(9)$ Air changes per hourInfiltration due to chinneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0$ $+(6) =$ $0$ $(9)$ Number of storeys in the dwelling (ns)Additional infiltration $(9)$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionIf both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal use $0.35$ If suspended wooden floor, enter 0.2 (unsealed), ol 0.1 (sealed), else enter 0OOIf suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0OOOInfiltration rate(B) + (10) + (11) + (12) + (13) + (15) =OOInfiltration rate(B) + (10) + (11) + (12) + (13) + (15) =OOOOInfiltration rate(B) + (10) + (11) + (12) + (13)	Number of chimneys	0			0	=	0	X 4	40 =	0	(6a)		
Number of passive vents Number of gassive vents Number of flueless gas fires $0$ $\times 10 =$ $0$ (7c) $0$ $\times 40 =$ $0$ (7c) Adr changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $0$ +(6) = $0$ (6) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration Structural infiltration Structural infiltration : 0.25 for steel or timber frame or 0.35 for masonry construction if both types of well are present, use the value corresponding to the greater well 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 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration At permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Aur permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Aur permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Aur permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Aur permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Aur permeability value q50, expressed in cubic metres per permeability is being used Number of sides sheltered Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)me <u>5.1 5 4.9 4.4 4.3 </u>	Number of open flues	0	+ 0	+	0	] = [	0	x2	20 =	0	(6b)		
Number of flueless gas fires 0 x 40 = 0 (7c) Air changes per hour Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 0 + $(5) =$ 0 (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9)-1]xo.1 = 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of opening); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (13) Percentage of windows and doors draught stripped 0 (14) Window infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 1f based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16) Air permeability value, q50, expressed in cubic metres per air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = (2) [19] Cancer (22) [19] Cancer (22) = (2) [19] Cancer (22) [10] Cancer (22) [10] Cancer (22) [10] Cancer (22) [10] Cancer (22) [	Number of intermittent far	is				- _ _	0	x ^	10 =	0	(7a)		
Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =0+ (6) =0(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(9)(10)Additional infiltration(9)-1)x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(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 0.350(12)If no draught lobby, enter 0.05, else enter 00(12)(13)Percentage of windows and doors draught stripped0(13)Window infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)0.15Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used0Number of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.13Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.13Infiltration rate modified for monthly wind speed33.83.744.34.5Monthly average wind speed from Table 7(22)m 551.554.94.4Wind Fac	Number of passive vents					Г	0	x ^	10 =	0	(7b)		
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) = 0 + (5) = 0$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9) to (16) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area Air permeability value, ap50, expressed in cubic metres per hour per square metre of envelope area Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Number of sides sheltered Mumber of sides sheltered Monthly average wind speed from Table 7 (22)me 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4 Wind Factor (22a)m = (22)m ÷ 4	Number of flueless gas fir	es				Γ	0	x 4	40 =	0	(7c)		
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) = 0 + (5) = 0$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9) to (16) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area Air permeability value, ap50, expressed in cubic metres per hour per square metre of envelope area Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Number of sides sheltered Mumber of sides sheltered Monthly average wind speed from Table 7 (22)me 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4 Wind Factor (22a)m = (22)m ÷ 4									Air ch	anges per ho	 ur		
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration $[(9)-1]\times 0.1 = 0$ (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration $0.25 \cdot [0.2 \times (14) \pm 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area <i>3</i> (17) If based on air permeability value, then (18) = [(17) $\pm 20]+(8)$ , otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate modified for monthly wind speed $\boxed{20} = 1 - [0.075 \times (19)] =$ Infiltration rate modified for monthly wind speed $\boxed{21} = (18) \times (20) =$ $\boxed{21} = (18) \times (20) =$ $\boxed{21} = (51) - 5 - 4.9 - 4.4 - 4.3 - 3.8 - 3.8 - 3.7 - 4 - 4.3 - 4.5 - 4.7$ Wind Factor (22a)m = (22)m + 4 $\boxed{22}$ (2b) = 5.1 - 5 - 4.9 - 4.4 - 4.3 - 3.8 - 3.8 - 3.7 - 4 - 4.3 - 4.5 - 4.7	Infiltration due to chimney	s flues and fa	ans - (6a) + (6b) +	(7a)+(7b)+(	7c) =	Г		_	1		-		
Additional infiltration((9)-1)x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(11)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) + 100] =(16)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)0.15Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used(19)Number of sides sheltered2(19)Shelter factor(21) = (18) × (20) =0.13Infiltration rate incorporating shelter factor(21) = (18) × (20) =0.13Infiltration rate modified for monthly wind speed01.3Monthly average wind speed from Table 710.133.8(22)me5.154.94.44.33.8Wind Factor (22a)m = (22)m ÷ 444.33.83.744.34.5Wind Factor (22a)m = (22)m ÷ 40000.130	•					continue fro	-		÷ (3) =	0	(0)		
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - [0.2 x (14) ± 100] =Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area(17)If based on air permeability value, then (18) = [(17) ± 20]+(8), otherwise (18) = (16)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredNumber of sides sheltered1nfiltration rate incorporating shelter factor(20) = 1 - [0.075 x (19)] =1nfiltration rate modified for monthly wind speed1nfiltration rate modified for monthly wind speed1nfiltration rate modified for Table 7(22)m=(22)m=5.154.94.44.33.83.744.34.44.34.34.44.34.44.34.44.34.44.34.44.54.7111213	Number of storeys in th	e dwelling (ns	;)							0	(9)		
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 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration nate $0.25 - [0.2 \times (14) + 100] =$ 0  (14) Window infiltration $0.25 - [0.2 \times (14) + 100] =$ 0  (15) Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) + 20] + (8)$ , otherwise $(18) = (16)$ $Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 \times (19)] =0.13  (21)Infiltration rate modified for monthly wind speed\boxed{2  (19)}0.13  (21)Infiltration rate modified for monthly wind speed\boxed{2  (2)} = 1 - [0.075 \times (19)] =0.13  (21)Infiltration rate modified for monthly wind speed\boxed{2  (20)} = 1 - [0.075 \times (19)] =0.13  (21)Infiltration rate modified for monthly wind speed\boxed{2  (20)} = 1 - [0.075 \times (19)] =0.13  (21)Infiltration rate modified for monthly wind speed\boxed{2  (20)} = 1 - [0.075 \times (19)] =0.13  (21)Infiltration rate modified for monthly wind speed\boxed{2  (20)} = 1 - [0.075 \times (19)] =0.13  (21)Infiltration rate modified for monthly wind speed\boxed{2  (20)} = 1 - [0.075 \times (19)] =0.13  (21)Infiltration rate modified for monthly wind speed\boxed{2  (21)} = (18) \times (20) =\boxed{2  (22)} = 5.1  5  4.9  4.4  4.3  3.8  3.8  3.7  4  4.3  4.5  4.7Wind Factor (22a)m = (22)m \div 4$	Additional infiltration							[(9)	-1]x0.1 =	0	(10)		
deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.15Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0Number of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 \times (19)] =0.13Infiltration rate modified for monthly wind speed013Monthly average wind speed from Table 7014(22)m=5.154.94.44.33.83.744.3Wind Factor (22a)m = (22)m ÷ 44.44.33.8Wind Factor (22a)m = (22)m ÷ 4						•	uction			0	(11)		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.15Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used2Number of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 \times (19)] =0.13Infiltration rate modified for monthly wind speed0(13)JanFebMarAprMayJunJulAugSepOctMonthly average wind speed from Table 7(22) m = $5.1$ $5$ $4.9$ Wind Factor (22a)m = (22)m ÷ 44.3 $3.8$ $3.7$ $4$ $4.3$ Wind Factor (22a)m = (22)m ÷ 4 $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$				to the great	er wall are	a (after							
If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) + 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)0.15Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0Number of sides sheltered2Shelter factor(20) = 1 - [0.075 \times (19)] =Infiltration rate modified for monthly wind speed0.13Monthly average wind speed from Table 70.13(22)m=5.154.94.44.33.83.7Wind Factor (22a)m = (22)m ÷ 44		- · ·		0.1 (seale	ed), else	enter 0				0	(12)		
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0(15)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3(17)If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ 0.15(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0(15)Number of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.85Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.13Infiltration rate modified for monthly wind speed0(21)(19)Monthly average wind speed from Table 7(22)m = $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$	If no draught lobby, ent	er 0.05, else e	enter 0							0	=		
Infiltration rate(10)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3(17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.15(18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.15(18)Number of sides sheltered2(19)0.85(20)Shelter factor(20) = 1 - [0.075 x (19)] =0.85(20)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.13(21)Infiltration rate modified for monthly wind speed00.13(21)Monthly average wind speed from Table 720.154.94.44.33.83.744.34.54.7Wind Factor (22a)m = (22)m ÷ 4Wind Factor (22a)m = (22)m ÷ 4	Percentage of windows	and doors dra	aught stripped							0	(14)		
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.15Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.15Number of sides sheltered2Shelter factor(20) = 1 - [0.075 x (19)] =Infiltration rate incorporating shelter factor(21) = (18) x (20) =Infiltration rate modified for monthly wind speed0.13Monthly average wind speed from Table 7(22)m=5.154.94.44.33.83.744.34.34.54.7	Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)		
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)		
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used				•	•	•	etre of e	nvelope	area	3	(17)		
Number of sides sheltered $2$ (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $0.85$ (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.13$ (21)Infiltration rate modified for monthly wind speed $0.13$ (21)Infiltration rate modified for monthly wind speed $0.13$ (21)Monthly average wind speed from Table 7 $0.13$ (22)m= $(22)m=$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$	•									0.15	(18)		
Shelter factor(20) = 1 - $[0.075 \times (19)] =$ (20)Infiltration rate incorporating shelter factor(21) = $(18) \times (20) =$ 0.85(20)Infiltration rate modified for monthly wind speed0.13(21)Infiltration rate modified for monthly wind speedJanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7(22)m=5.154.94.44.33.83.744.34.54.7Wind Factor (22a)m = (22)m ÷ 4			on test has been d	one or a deg	gree air pei	rmeability	is being us	sed					
Infiltration rate incorporating shelter factor       (21) = (18) × (20) =       0.13       (21)         Infiltration rate modified for monthly wind speed $\overline{Jan}$ Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Monthly average wind speed from Table 7 $(22)m=$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m ÷ 4					(20) = 1 -	0.075 x (1	9)] =						
Infiltration rate modified for monthly wind speed $ \begin{array}{c c} \hline Jan & Feb & Mar & Apr & May & Jun & Jul & Aug & Sep & Oct & Nov & Dec \\ \hline Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7Wind Factor (22a)m = (22)m \div 4$		ng shelter fac	tor								4		
JanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7 $(22)m=$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$		0								0.10			
$(22)m = \begin{bmatrix} 5.1 & 5 & 4.9 & 4.4 & 4.3 & 3.8 & 3.8 & 3.7 & 4 & 4.3 & 4.5 & 4.7 \end{bmatrix}$ Wind Factor (22a)m = (22)m ÷ 4		<u> </u>		Jul	Aug	Sep	Oct	Nov	Dec				
Wind Factor (22a)m = (22)m $\div$ 4	Monthly average wind spe	ed from Table	e 7										
	· · · · · ·			3.8	3.7	4	4.3	4.5	4.7				
	Wind Factor (22a)m = (22	)m ÷ 4	•							-			
		<u> </u>	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18				

Adjust	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	: (21a) x	(22a)m				_	
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
	ate effec echanica		-	rate for t	he appli	cable ca	se	-				-	-	(00-)
				andix N (2	3h) - (23g	a) × Fmv (e	auation (	N5)) othe	nwieg (23h	) - (232)			0.5	(23a)
		• •	0 11		, ,	or in-use f		<i>,,</i> .	,	) – (200)			0.5	(23b)
			-	-	-					⊃h.\	00h) [	4 (00~)	77.35	(23c)
a) II (24a)m=	i	0.27	0.27	0.25	0.25	0.23	0.23	0.23	a)m = (2.0)	2b)m + (2 0.25	230) × [ 0.26	0.26	) ÷ 100] ]	(24a)
												0.20	]	(240)
D) II (24b)m=								0	D = (22)	2b)m + (2 0	230)	0	1	(24b)
	-		-	_				-		0	0	0	J	(240)
,					•	ve input v o); otherv				.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
,						ve input erwise (2				0.51		-	-	
(24d)m=		0	0	0	0	0	0		0	0	0	0	1	(24d)
		change	rate - er	ter (24a	) or (24t	) or (24	L c) or (24	L d) in boy	x (25)				1	
(25)m=	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	1	(25)
								1	1			I	J	
			eat loss p					11 -1		A \/ 11		1 -1	_	
ELEN	IENI	Gros area		Openin rr	-	Net Ar A ,r		U-val W/m2		A X U (W/ł	<)	k-valu kJ/m²·		A X k kJ/K
Doors						2.15	x	1	=	2.15				(26)
Windo	ws Type	1				5.56	x1	/[1/( 1.4 )+	0.04] =	7.37				(27)
Windo	ws Type	2				5.67	x1	/[1/( 1.4 )+	0.04] =	7.52				(27)
Windo	ws Type	3				2.16	x1	/[1/( 1.4 )+	0.04] =	2.86				(27)
Floor						35.8	x	0.16	=	5.728				(28)
Walls 7	Гуре1	66.3	32	15.5	4	50.78	3 X	0.16	=	8.12				(29)
Walls 7	Type2	13.0	)9	0		13.09	) X	0.17	=	2.2				(29)
Roof		9.79	9	0		9.79	x	0.11	=	1.08				(30)
Total a	rea of e	lements	, m²			125								(31)
Party v	vall					17.47	, X	0	=	0				(32)
Party f	loor					35.86	3				Ī		$\neg \vdash$	(32a)
Party o	eiling					61.87	,				Ī		$\neg \vdash$	(32b)
			ows, use e sides of in				ated using	g formula 1	/[(1/U-valı	ıe)+0.04] a	s given in	paragrapl	h 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30	) + (32) =				37.03	(33)
Heat c	apacity	Cm = S(	(Axk)						((28).	.(30) + (32	2) + (32a).	(32e) =	11757.4	1 (34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
	-		ere the de tailed calci		construct	ion are not	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
					using Ap	pendix ł	<						10.53	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.15 x (3	1)							L	

Total fa	abric he	at loss							(33) +	(36) =			47.56	(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=	17.67	17.46	17.26	16.24	16.03	15.01	15.01	14.81	15.42	16.03	16.44	16.85		(38)
Heat tr	ansfer o	coefficier	nt, W/K		-	-	_		(39)m	= (37) + (3	38)m	_	_	
(39)m=	65.23	65.03	64.82	63.8	63.6	62.58	62.58	62.37	62.99	63.6	64.01	64.41		
Heat lo	oss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷		12 /12=	63.75	(39)
(40)m=	0.91	0.9	0.9	0.89	0.88	0.87	0.87	0.87	0.88	0.88	0.89	0.9	]	
Numb			nth (Tab						,	Average =	Sum(40)1.	12 /12=	0.89	(40)
NUMDE	Jan	Feb	nth (Tab Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			1		I	1	1			1	I	1	1	
4. Wa	ater heat	ting enei	rgy requi	irement:								kWh/y	ear:	
Accum		inonov I	N										1	(40)
		ıpancy, l 9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	)013 x ( <sup>-</sup>	TFA -13.		29		(42)
	A £ 13.9										·		۹.	
								(25 x N) to achieve		se taraet o		8.61		(43)
		-				hot and co	-			J. J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	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)					-	
(44)m=	97.48	93.93	90.39	86.84	83.3	79.75	79.75	83.3	86.84	90.39	93.93	97.48		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )		Total = Su hth (see Ta	· · ·		1063.37	(44)
(45)m=	144.55	126.43	130.46	113.74	109.14	94.18	87.27	100.14	101.34	118.1	128.91	139.99	]	
										I Total = Su	l m(45) <sub>112</sub> =	=	1394.25	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)	) to (61)					
(46)m=	21.68	18.96	19.57	17.06	16.37	14.13	13.09	15.02	15.2	17.71	19.34	21		(46)
	storage		includir	na anv so	olar or M	////HRS	storane	within sa	me ves	مما		180	1	(47)
-		. ,				enter 110	-			501		160		(47)
		-			-			ombi boil	ers) ente	er '0' in (	47)			
Water	storage	loss:											_	
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
			-	, kWh/ye				(48) x (49)	=			0		(50)
,						or is not h/litre/da						0	1	(51)
			ee secti		(							•	J	(01)
		from Ta										0	]	(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
			-	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter	(50) or (	(54) in (5	o5)									0		(55)

Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
(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 Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
	•	•	,	for each		59)m = (	(58) ÷ 36	65 × (41)	m				I	
(mod	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	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=	21.95	19.82	21.95	21.24	21.95	21.24	21.95	21.95	21.24	21.95	21.24	21.95		(61)
Total h	eat req	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	166.5	146.25	152.41	134.98	131.08	115.41	109.21	122.09	122.58	140.04	150.15	161.94		(62)
Solar DH	W input	calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	30.95	25.36	21.12	14.02	11.52	9.63	8.95	10.21	10.32	15.01	24.07	31.13	I	(63) (G2)
Output	from w	ater hea	ter											
(64)m=	135.55	120.89	131.29	120.96	119.57	105.78	100.27	111.88	112.26	125.03	126.08	130.81		
		•					•	Outp	out from wa	ater heate	r (annual)₁	12	1440.37	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m	]	
(65)m=	53.55	46.99	48.86	43.13	41.77	36.62	34.5	38.78	39	44.75	48.17	52.03		(65)
inclu	ide (57)	m in calo	ulation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	and 5a	):	-		-				-		
		ıs (Table												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	137.47	137.47	137.47	137.47	137.47	137.47	137.47	137.47	137.47	137.47	137.47	137.47		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see <sup>-</sup>	Table 5		1		]	
(67)m=	45.67	40.56	32.99	24.97	18.67	15.76	17.03	22.14	29.71	37.72	44.03	46.94		(67)
Applia	nces da	ins (calc	ulated ir	Append	dix L. ea	uation L	13 or L1	u 3a), also	see Ta	ble 5			1	
(68)m=	301	304.12	296.25	279.49	258.34	238.46	225.18	222.06	229.93	246.68	267.84	287.72		(68)
Cookir	na aains	(calcula	ted in A	ppendix	L. equat	ion L15	or L15a	), also se	e Table	5			1	
(69)m=	51.04	51.04	51.04	51.04	51.04	51.04	51.04	51.04	51.04	51.04	51.04	51.04		(69)
Pumps	and fai	ns gains	(Table 5	Ба)									1	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	se.g. ev	, aporatic	n (nega	ı tive valu	es) (Tab	le 5)			1		1		4	
(71)m=	-91.64	-91.64	-91.64	-91.64	-91.64	, -91.64	-91.64	-91.64	-91.64	-91.64	-91.64	-91.64		(71)
Water	heating	gains (T	able 5)										I	
(72)m=	71.98	69.93	, 65.68	59.9	56.15	50.87	46.38	52.13	54.17	60.15	66.91	69.94		(72)
Total i	nternal	gains =		-	-	(66)	m + (67)m	n + (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m	1	
(73)m=	518.5	514.47	494.78	464.23	433.02	404.95	388.45	396.18	413.67	444.42	478.63	504.45		(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.

Orientat	ion:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ FF Table 6b Table 6c			Gains (W)		
East	0.9x	1	x	5.56	x	19.64	x	0.63	x	0.7	=	33.37	(76)
East	0.9x	1	x	5.56	x	38.42	×	0.63	x	0.7	=	65.28	(76)
East	0.9x	1	x	5.56	x	63.27	×	0.63	x	0.7	=	107.51	(76)
East	0.9x	1	x	5.56	x	92.28	×	0.63	x	0.7	=	156.8	(76)
East	0.9x	1	x	5.56	x	113.09	×	0.63	x	0.7	=	192.17	(76)
East	0.9x	1	x	5.56	x	115.77	x	0.63	x	0.7	=	196.72	(76)
East	0.9x	1	x	5.56	x	110.22	x	0.63	x	0.7	=	187.28	(76)
East	0.9x	1	x	5.56	x	94.68	x	0.63	x	0.7	=	160.87	(76)
East	0.9x	1	x	5.56	x	73.59	×	0.63	x	0.7	=	125.04	(76)
East	0.9x	1	x	5.56	x	45.59	x	0.63	x	0.7	=	77.47	(76)
East	0.9x	1	x	5.56	x	24.49	x	0.63	x	0.7	=	41.61	(76)
East	0.9x	1	x	5.56	x	16.15	x	0.63	x	0.7	=	27.44	(76)
South	0.9x	0.77	x	2.16	x	46.75	x	0.63	x	0.7	=	30.86	(78)
South	0.9x	0.77	x	2.16	x	76.57	x	0.63	x	0.7	=	50.54	(78)
South	0.9x	0.77	x	2.16	x	97.53	x	0.63	x	0.7	=	64.38	(78)
South	0.9x	0.77	x	2.16	x	110.23	x	0.63	x	0.7	=	72.77	(78)
South	0.9x	0.77	x	2.16	x	114.87	x	0.63	x	0.7	=	75.83	(78)
South	0.9x	0.77	x	2.16	x	110.55	×	0.63	x	0.7	=	72.98	(78)
South	0.9x	0.77	x	2.16	x	108.01	x	0.63	x	0.7	=	71.3	(78)
South	0.9x	0.77	x	2.16	x	104.89	x	0.63	x	0.7	=	69.24	(78)
South	0.9x	0.77	x	2.16	x	101.89	x	0.63	x	0.7	=	67.26	(78)
South	0.9x	0.77	x	2.16	x	82.59	x	0.63	x	0.7	=	54.52	(78)
South	0.9x	0.77	x	2.16	x	55.42	x	0.63	x	0.7	=	36.58	(78)
South	0.9x	0.77	x	2.16	x	40.4	×	0.63	x	0.7	=	26.67	(78)
West	0.9x	0.77	x	5.67	x	19.64	x	0.63	x	0.7	=	34.03	(80)
West	0.9x	0.77	x	5.67	x	38.42	x	0.63	x	0.7	=	66.58	(80)
West	0.9x	0.77	x	5.67	x	63.27	x	0.63	x	0.7	=	109.64	(80)
West	0.9x	0.77	x	5.67	x	92.28	x	0.63	x	0.7	=	159.91	(80)
West	0.9x	0.77	x	5.67	x	113.09	x	0.63	x	0.7	=	195.97	(80)
West	0.9x	0.77	x	5.67	x	115.77	x	0.63	x	0.7	=	200.61	(80)
West	0.9x	0.77	x	5.67	x	110.22	x	0.63	x	0.7	=	190.99	(80)
West	0.9x	0.77	x	5.67	x	94.68	x	0.63	x	0.7	=	164.06	(80)
West	0.9x	0.77	x	5.67	x	73.59	x	0.63	x	0.7	=	127.52	(80)
West	0.9x	0.77	x	5.67	x	45.59	×	0.63	x	0.7	=	79	(80)
West	0.9x	0.77	x	5.67	x	24.49	×	0.63	x	0.7	=	42.44	(80)
West	0.9x	0.77	x	5.67	x	16.15	×	0.63	x	0.7	=	27.99	(80)

Solar g	Solar gains in watts, calculated for each month $(83)m = Sum(74)m \dots (82)m$												
(83)m=	98.27	182.4	281.54	389.48	463.97	470.3	449.57	394.17	319.82	210.98	120.63	82.1	(83)
Total g	ains – ii	nternal a	ind solar	(84)m =	= (73)m -	+ (83)m	, watts						
(84)m=	616.77	696.88	776.32	853.7	896.98	875.25	838.02	790.36	733.49	655.4	599.26	586.55	(84)

7. Me	ean inter	nal temp	perature	(heating	season	)								
							from Tal	ole 9, Th	1 (°C)				21	(85)
Utilis	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)		. ,					]
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.97	0.93	0.81	0.64	0.46	0.33	0.36	0.58	0.87	0.97	0.99		(86)
Mear	n interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	20.34	20.49	20.7	20.89	20.98	21	21	21	20.99	20.87	20.58	20.31		(87)
Temp	perature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.16	20.16	20.17	20.18	20.18	20.19	20.19	20.2	20.19	20.18	20.18	20.17		(88)
Utilis	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.98	0.96	0.91	0.78	0.59	0.4	0.27	0.3	0.52	0.83	0.96	0.99		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to <sup>-</sup>	7 in Tabl	le 9c)				
(90)m=	19.58	19.72	19.92	20.1	20.17	20.19	20.19	20.2	20.18	20.09	19.82	19.55		(90)
	L		1			1		<u> </u>	1	fLA = Livin	g area ÷ (4	4) =	0.37	(91)
Mear	n interna	l temper	ature (fo	or the wh	ole dwe	llina) = f	LA x T1	+ (1 – fL	A) x T2			I		]
(92)m=	19.86	20.01	20.21	20.39	20.47	20.49	20.49	20.49	20.48	20.38	20.1	19.83		(92)
Apply	/ adjustr	nent to t	he mear	interna	l temper	i ature fro	n I Table	e 4e, whe	ere appro	opriate	ļ			
(93)m=	19.71	19.86	20.06	20.24	20.32	20.34	20.34	20.34	20.33	20.23	19.95	19.68		(93)
8. Sp	ace hea	iting requ	uirement				1	1						
	Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate													
the u	-	factor fo	<u> </u>	<u> </u>	1								I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		tor for g	r	1	0.0	0.44	0.00	0.04	0.50	0.00	0.00	0.00	l	(94)
(94)m=	0.98	0.96	0.91	0.78	0.6	0.41	0.28	0.31	0.53	0.83	0.96	0.98		(94)
(95)m=	604.27	hmGm 668.54	, VV = (94 704.26	+)III X (64 667.09	4)m 537.81	358.34	233.97	245.72	388.82	544.48	573.8	577.19		(95)
		age exte					200.07	240.12	000.02	0+.+0	070.0	011.10		(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
								I x [(93)m		I 1				
(97)m=	1005.07	r	878.82	723.79	547.98	, 359.1	234.03	245.83	392.45	612.27	822.3	997.36		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Nh/mon <sup>-</sup>	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	298.19	204.34	129.87	40.82	7.56	0	0	0	0	50.44	178.92	312.6		
								Tota	l per year	(kWh/year	.) = Sum(9	8)15,912 =	1222.75	(98)
Spac	e heatin	g require	ement in	kWh/m²	²/year								17.01	(99)
9a. En	nergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
-	e heatii	-												_
		bace hea				mentary	y system						0	(201)
Fract	ion of sp	bace hea	at from m	nain syst	em(s)			(202) = 1	– (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Effici	ency of	main spa	ace heat	ing syste	em 1								92.9	(206)
Effici	ency of	seconda	ry/suppl	ementar	y heatin	g systen	า, %						0	(208)
														_

	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	r
Space			r · · ·	alculate	, i								1	
	298.19	204.34	129.87	40.82	7.56	0	0	0	0	50.44	178.92	312.6		
(211)m			<u> </u>	0)m } x						- /			1	(211)
	320.98	219.96	139.8	43.94	8.14	0	0	0 Tota	0 I (kWh/yea	54.29	192.6	336.49		
Creat	- heatin	a fuel (a						TOTA	ii (KVVII/yea	ar) =0um(2	11)15,1012	7	1316.2	(211)
•				y), kWh/ ‹ 100 ÷ (/										
(215)m=	r i i i i i i i i i i i i i i i i i i i	0	0	0	0	0	0	0	0	0	0	0	]	
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>		0	(215)
Water	heating	I												1
Output				ulated al									1	
	135.55	120.89	131.29	120.96	119.57	105.78	100.27	111.88	112.26	125.03	126.08	130.81		1,040
		ater hea	1	07.04	07.45	07.0	07.0	07.0	07.0	00.00	00.04	00.40	87.3	(216)
(217)m=		88.92	88.57	87.94	87.45	87.3	87.3	87.3	87.3	88.03	88.81	89.12	]	(217)
		-	kWh/mo (217) ÷ (											
. ,	152.19	135.96	148.23	137.55	136.72	121.17	114.85	128.16	128.59	142.03	141.97	146.78	]	
								Tota	I = Sum(2	19a) <sub>112</sub> =			1634.2	(219)
	I totals									k\	Nh/year	•	kWh/year	-
Space	heating	fuel use	ed, main	system	1								1316.2	]
Water	heating	fuel use	d										1634.2	
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t								
mech	anical v	entilatior	n - balan	iced, ext	ract or p	ositive i	nput fron	n outside	Ð			124.32		(230a)
centra	al heatin	g pump:	:									30	]	(230c)
boiler	with a f	an-assis	sted flue									45	]	(230e)
Total e	electricity	/ for the	above, l	<wh td="" yea<=""><td>r</td><td></td><td></td><td>sum</td><td>of (230a).</td><td>(230g) =</td><td></td><td></td><td>199.32</td><td>(231)</td></wh>	r			sum	of (230a).	(230g) =			199.32	(231)
Electric	city for li	ghting											322.61	(232)
Electric	city gene	erated by	y PVs										-532.34	(233)
			-	eating sy	stems:									<b>]</b>
						Fu kW	<b>el</b> /h/year			Fuel P (Table			<b>Fuel Cost</b> £/year	
Space	heating	- main s	system 1			(21	1) x			3.4	8	x 0.01 =	45.8038611204661	(240)
Space	heating	- main s	system 2	2		(21:	3) x			0		x 0.01 =	0	(241)
Space	heating	- secon	dary			(21	5) x			13.	19	x 0.01 =	0	(242)
Water	heating	cost (otł	her fuel)			(219	9)			3.4	8	x 0.01 =	56.87	(247)
Pumps	s, fans a	nd elect	ric keep	.hot		(23	1)			13.		x 0.01 =	26.29	(249)
-				not			'			10.			20.25	
		ff, list ea			230g) se			licable a	nd apply		<u>ce acc</u> or	ding to	Table 12a	-
	eak tari / for ligh	ff, list ea			230g) se		/ as appl	licable a	nd apply		ce accor			(250)

	one of (233) to (235) x)	13.19 × 0	0.01 = 0 (252)
Appendix Q items: repeat lines (253) and (254)	) as needed		
Total energy cost (245)	(247) + (250)(254) =		291.52 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255) >	(256)] ÷ [(4) + 45.0] =		1.05 (257)
SAP rating (Section 12)			85.39 (258)
12a. CO2 emissions – Individual heating syste	ems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	r Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	= 284.3 (261)
Space heating (secondary)	(215) x	0.519	= 0 (263)
Water heating	(219) x	0.216	= 352.99 (264)
Space and water heating	(261) + (262) + (263) + (26	34) =	637.29 (265)
Electricity for pumps, fans and electric keep-ho	ot (231) x	0.519 =	= 103.45 (267)
Electricity for lighting	(232) x	0.519 =	= 167.43 (268)
Energy saving/generation technologies Item 1		0.519 =	-276.29 (269)
Total CO2, kg/year		sum of (265)(271) =	631.88 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	8.79 (273)
El rating (section 14)			93 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22	= 1605.77 (261)
Space heating (secondary)	(215) x	3.07	= 0 (263)
Energy for water heating	(219) x	1.22	= 1993.72 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	3599.49 (265)
Electricity for pumps, fans and electric keep-ho	ot (231) x	3.07	= 611.92 (267)
Electricity for lighting	(232) x	0 =	= 990.41 (268)
Energy saving/generation technologies Item 1		3.07	-1634.3 (269)
'Total Primary Energy		sum of (265)(271) =	3567.53 (272)

(272) ÷ (4) =

Primary energy kWh/m²/year

(273)

49.62

## SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 November 2014

#### Property Details: Unit 1 03

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shut Ventilation rate during Overheating Details:	es: eter: ters:	ather (a	ich):	Flat England Thames valley Yes 1 North Average or unknown None Indicative Value Medium False Light-coloured curtain or roller blind 3 ( Windows open half the time)							
Summer ventilation h Transmission heat los			ient:	192.16				(P1)			
Summer heat loss co				47.6 239.73				(P2)			
Overhangs:											
Orientation:	Ratio:		Z_overhangs:								
East (east window)	0		1								
West (West window) South (south window)	0		1 1								
· · ·	0		1								
Solar shading:											
		J		<b>•</b> • • • •		7					
Orientation:	Z blinc	15:	Solar access:	Over	hangs:	Z summer:					
East (east window)	0.6	15:	0.9	1	nangs:	0.54		(P8)			
East (east window) West (West window)	0.6 0.6	15:	0.9 0.9		nangs:	0.54 0.54		(P8)			
East (east window) West (West window) South (south window)	0.6	15:	0.9		nangs:	0.54		. ,			
East (east window) West (West window) South (south window) Solar gains:	0.6 0.6		0.9 0.9 0.9	1 1 1		0.54 0.54 0.54		(P8)			
East (east window) West (West window) South (south window) Solar gains: Orientation	0.6 0.6 0.6	Area	0.9 0.9 0.9 <b>Flux</b>	1 1 1 <b>9</b> _	FF	0.54 0.54 0.54 <b>Shading</b>	Gains	(P8)			
East (east window) West (West window) South (south window) Solar gains: Orientation East (east window)	0.6 0.6 0.6	<b>Area</b> 5.56	0.9 0.9 0.9 <b>Flux</b> 117.51	1 1 1 <b>g_</b> 0.63	<b>FF</b> 0.7	0.54 0.54 0.54 <b>Shading</b> 0.54	140.03	(P8)			
East (east window) West (West window) South (south window) Solar gains: Orientation	0.6 0.6 0.6	Area	0.9 0.9 0.9 <b>Flux</b>	1 1 1 <b>9</b> _	FF	0.54 0.54 0.54 <b>Shading</b>		(P8)			
East (east window) West (West window) South (south window) Solar gains: Orientation East (east window) West (West window)	0.6 0.6 0.6	<b>Area</b> 5.56 5.67	0.9 0.9 0.9 <b>Flux</b> 117.51 117.51	1 1 <b>9</b> _ 0.63 0.63	<b>FF</b> 0.7 0.7	0.54 0.54 0.54 <b>Shading</b> 0.54 0.54	140.03 142.8 51.95	(P8)			
East (east window) West (West window) South (south window) Solar gains: Orientation East (east window) West (West window)	0.6 0.6 0.6	<b>Area</b> 5.56 5.67	0.9 0.9 0.9 <b>Flux</b> 117.51 117.51	1 1 <b>9</b> _ 0.63 0.63	<b>FF</b> 0.7 0.7	0.54 0.54 0.54 <b>Shading</b> 0.54 0.54 0.54	140.03 142.8 51.95	(P8) (P8)			
East (east window) West (West window) South (south window) Solar gains: Orientation East (east window) West (West window) South (south window) Internal gains Total summer gains Summer gain/loss ratio Mean summer external	0.6 0.6 0.9 x 0.9 x 0.9 x	<b>Area</b> 5.56 5.67 2.16	0.9 0.9 0.9 <b>Flux</b> 117.51 117.51 112.21	1 1 1 0.63 0.63 0.63 0.63 <b>Ju</b> 40 <sup>°</sup> 756 3.1	FF 0.7 0.7 0.7 0.7 1.95 5.02 5	0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54	140.03 142.8 51.95 334.77 <b>August</b> 393.18 693.25 2.89 17.8	(P8) (P8) (P3/P4)			
East (east window) West (West window) South (south window) Solar gains: Orientation East (east window) West (West window) South (south window) Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass tempera	0.6 0.6 0.9 x 0.9 x 0.9 x	<b>Area</b> 5.56 5.67 2.16	0.9 0.9 0.9 <b>Flux</b> 117.51 117.51 112.21	1 1 1 0.63 0.63 0.63 0.63 Ju 40 <sup>°</sup> 756 3.1	FF 0.7 0.7 0.7 0.7 0.7	0.54 0.54 0.54 0.54 0.54 0.54 0.54 0.54	140.03 142.8 51.95 334.77 <b>August</b> 393.18 693.25 2.89	(P8) (P8) (P3/P4) (P5)			
East (east window) West (West window) South (south window) Solar gains: Orientation East (east window) West (West window) South (south window) Internal gains Total summer gains Summer gain/loss ratio Mean summer external	0.6 0.6 0.9 x 0.9 x 0.9 x	Area 5.56 5.67 2.16	0.9 0.9 0.9 <b>Flux</b> 117.51 117.51 112.21	1 1 1 0.63 0.63 0.63 0.63 Jui 40° 756 3.1 16 0.2 19.	FF 0.7 0.7 0.7 0.7 0.7	0.54 0.54 0.54 0.54 0.54 0.54 0.54 Total July 385.45 720.22 3 17.9 0.25	140.03 142.8 51.95 334.77 <b>August</b> 393.18 693.25 2.89 17.8 0.25	(P8) (P8) (P3/P4) (P5) (P6)			



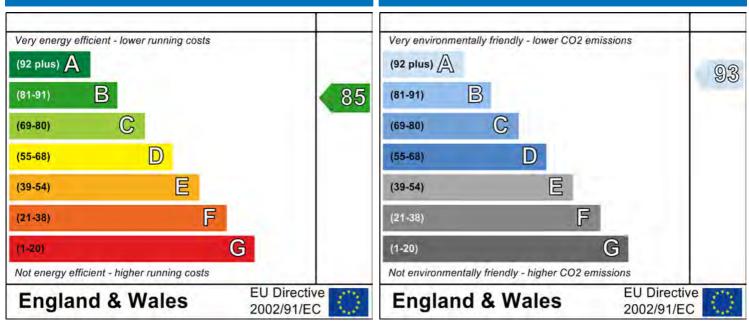
Dwelling type: Date of assessment: Produced by: Total floor area: Mid floor Flat 29 October 2014 Aymon Winter 50.2599983215332 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

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

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

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

# **Regulations Compliance Report**

	on:			
sessed By:	Aymon Winter (S	TRO014511)	Building Type: Flat	
welling Details:	:			
EW DWELLING	DESIGN STAGE		Total Floor Area: 50.26m <sup>2</sup>	
te Reference :	Development at F	Riverpark Gardens	Plot Reference: unit 102	
dress :				
Client Details:				
ame:	Jamie			
ddress :	Campbell, 43 Tar	nner Street, Greater London, Lo	ondon, SE13PL	
	rs items included vector in the second se	within the SAP calculations.		
a TER and DEI				
	ting system: Mains	jas		
uel factor: 1.00 (	(mains gas)	-		
-	oxide Emission Rate		20.27 kg/m <sup>2</sup>	
b TFEE and DI	Dioxide Emission Ra	ate (DER)	11.39 kg/m²	OK
	ergy Efficiency (TFE	E)	51.06 kWh/m²	
-	nergy Efficiency (DF		42.61 kWh/m <sup>2</sup>	
<b>.</b>		,		ОК
2 Fabric U-valu	es			
Element	t	Average	Highest	
		0.1.0000000000000000000000000000000000		
External		0.17 (max. 0.30)	0.18 (max. 0.70)	OK
Party wa		0.00 (max. 0.20)	-	ОК
Party wa Floor		0.00 (max. 0.20) 0.16 (max. 0.25)	0.18 (max. 0.70) - 0.16 (max. 0.70)	
Party wa Floor Roof	II	0.00 (max. 0.20)	- 0.16 (max. 0.70)	ОК
Party wa Floor Roof Opening	s	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof)	-	OK OK
Party wa Floor Roof Opening 2a Thermal brid Thermal	ll s Iging bridging calculated	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof)	- 0.16 (max. 0.70) 1.40 (max. 3.30)	OK OK
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil	ll s Iging bridging calculated ity	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00)	- 0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction	OK OK
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil	ll s Iging bridging calculated	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00)	- 0.16 (max. 0.70) 1.40 (max. 3.30)	OK OK
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil Air permea Maximum	ll s lging bridging calculated ity bility at 50 pascals	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00)	- 0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction 3.00 (design value)	ок ок ок
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil Air permea Maximum	ll s lging bridging calculated ity ibility at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00)	0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	ок ок ок
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil Air permea Maximum	ll s lging bridging calculated ity ibility at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00) from linear thermal transmittand	0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	ок ок ок
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil Air permea Maximum	ll s lging bridging calculated ity ibility at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00) from linear thermal transmittand Database: (rev 367, product Boiler systems with radiator Brand name: Baxi	- 0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	ок ок ок
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil Air permea Maximum	ll s lging bridging calculated ity ibility at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00) from linear thermal transmittand Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi	- 0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	ок ок ок
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil Air permea Maximum	ll s lging bridging calculated ity ibility at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00) from linear thermal transmittand Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA	- 0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0	ок ок ок
Party wa Floor Roof Opening a Thermal brid Thermal Air permeabil Air permea Maximum	ll s lging bridging calculated ity ibility at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00) from linear thermal transmittand Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi)	0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	ок ок ок
Party wa Floor Roof Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating efficie	ll s lging bridging calculated ity ibility at 50 pascals ency	0.00 (max. 0.20) 0.16 (max. 0.25) (no roof) 1.33 (max. 2.00) from linear thermal transmittand Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA	0.16 (max. 0.70) 1.40 (max. 3.30) ces for each junction 3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	ок ок ок

# **Regulations Compliance Report**

5 Cylinder insulation			
Hot water Storage:	Nominal cylinder loss: 0.0	-	
	Permitted by DBSCG: 2.7	10 kWh/day	
Primary pipework insulated:	Yes		OK
6 Controls			
Space heating controls	Programmer, room therm	nostat and TRVs	ОК
Hot water controls:	Cylinderstat		ОК
	Independent timer for DH	IW	ОК
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with	low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Continuous supply and extrac	t system		
Specific fan power:	-	0.42	
Maximum		1.5	ОК
MVHR efficiency:		91%	
Minimum		70%	OK
9 Summertime temperature			
Overheating risk (Thames val	ley):	Medium	ОК
Based on:			
Overshading:		Average or unknown	
Windows facing: East		9.86m²,	
Ventilation rate:		2.00	
Blinds/curtains:		Light-coloured curtain or roller blin	nd
		Closed 100% of daylight hours	
10 Key features			
Air permeablility		3.0 m <sup>3</sup> /m <sup>2</sup> h	

Doors U-value Photovoltaic array 3.0 m³/m²h 1 W/m²K

Property Details: ur	nit 102							
Address: Located in: Region: UPRN: Date of assessm Date of certifica Assessment type Transaction type Tenure type: Related party di Thermal Mass Pa Water use <= 12 PCDF Version:	te: e: e: sclosure: arameter:	28 Nov New dv New dv Unknov No rela Indicati	s valley ober 2014 ember 2014 velling design sta velling	-				
Property description	ו:							
Dwelling type: Detachment: Year Completed: Floor Location: Floor 0 Living area: Front of dwelling f	aces:	Flat 2014 Floor 50.26 r 24.31 r West			Storey height: 2.7 m	-		
Opening types:								
Name: Main door East Windows	Source: Manufacturer SAP 2012	Sc	/pe: Ilid indows	Glazing: low-E, En =	0.05, soft coat	Argon: Fra PVC Yes PVC		e:
<b>Name:</b> Main door East Windows	<b>Gap:</b> mm 16mm or i	nore	<b>Frame Facto</b> 0.7 0.7	or: g-value: 0 0.63	<b>U-value:</b> 1 1.4	<b>Area:</b> 2.14 9.86	<b>No. o</b> 1 1	f Openings:
Name: Main door East Windows	Type-Name:	ex	ocation: ternal wall ternal wall	Orient: South East		Width: 0 0	Heigh 0 0	nt:
Overshading:		Average	e or unknown					
Opaque Elements:		, e						
Type: External Elements	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall:	Kappa:
external wall sheltered wall Exposed floor over c Internal Elements	27.51 20.98 omm <b>20</b> . <b>£</b> ]6space	12 0	15.51 20.98	0.16 0.18 0.16	0 0.4	False False		N/A N/A N/A
Party Elements party walls party ceiling party floor	28.4 50.27 30.21							N/A N/A N/A
Thermal bridges:								
Thermal bridges:		User-de <b>Lengt</b> 5.32			ue = 0.1188 lintel with perforat	ed steel base p	late	

			•	
[Approved]	13.09 27.3 2.7 5.4 5.52 6.47 8.1 16.99 4.05	0.021 0.001 0.048 0.06 0.32 0.032 0.055 0 0.24	E4 E7 E16 E18 E20 E21 E18 P3 P8	Jamb Party floor between dwellings (in blocks of flats) Corner (normal) Party wall between dwellings Exposed floor (normal) Exposed floor (inverted) Party wall between dwellings Intermediate floor between dwellings (in blocks of flats) Exposed floor (inverted)
Ventilation:				
Pressure test: Ventilation:	Number of Ductwork:	signed) vith heat recov wet rooms: Ki Insulation, rigi Installation Sch	tchen + 1 id	
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 0 0 3 3			
Main heating system:				
Main heating system:	Gas boilers Fuel: main Info Sourc Database: Brand nam Model: Ne Model qua (Combi bo Systems w Central he	s and oil boilers s gas e: Boiler Datab (rev 367, prod he: Baxi ta-tec Combi lifier: 24 GA iler) vith radiators ating pump : 20 w temperature: ed rlock: Yes	s hase luct index ( 013 or late	lerfloor heating 016684) Efficiency: Winter 87.3 % Summer: 89.9 er ow temperature >45°C
Main heating Control:				
Main heating Control:	Programm Control co	er, room therm de: 2106	nostat and	TRVs
Secondary heating system:				
Secondary heating system: Water heating:	None			
Water heating:	Water cod Fuel :main Hot water Cylinder vo Cylinder in Primary pi Cylindersta	s gas cylinder blume: 180 litre sulation: Facto pework insulati	es ry 75 mm on: True	

Flue Gas Heat Recovery System: Database (rev 367, product index 060001) Brand name: Zenex

#### Model: GasSaver SMadelaqueallifiatseGS-1

Others:	
Electricity tariff:	Standard Tariff
In Smoke Control Area:	Unknown
Conservatory:	No conservatory
Low energy lights:	100%
Terrain type:	Low rise urban / suburban
EPC language:	English
Wind turbine:	No
Photovoltaics:	Photovoltaic 1
	Installed Peak power: 0.5
	Tilt of collector: Horizontal
	Overshading: None or very little
	Collector Orientation: South
Assess Zero Carbon Home:	No

Assessor Name: Aymon Winter Stroma FSAP 2012 Stroma Number: STRO014511 Software Name: Stroma FSAP 2012 Stroma FSAP 2012 Version: Version: Version: 1.0.1.14 Property Address: Unit 102 Address : 1. Overall dwelling dimensions: Ground floor Area (1a)+(1b)+(1c)+(1d)+(1e)+(1n)) S028 (4) Dwelling volume (a)+(1b)+(1c)+(1d)+(1e)+(1e)+(1e)+(1e)+(1e)+(1e)+(1e)+(1e				User D	etails:							
Property Address; unit 102Address :1. Overall dwelling dimensions:Area(m <sup>2</sup> )Volume(m <sup>3</sup> )Ground floorVolume(m <sup>3</sup> )Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)So 26(1a) xVolume(m <sup>3</sup> )Overail of the secondary of	Assessor Name:	Aymon Wir	nter		Strom	a Num	ber:		STRO	014511		
Advance of the set of	Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versio	on: 1.0.1.14		
Area(m <sup>2</sup> )       Volume(m <sup>2</sup> )         Ground floor       Volume(m <sup>2</sup> )         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)       Society       Volume(m <sup>2</sup> )         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)       Society       Volume(m <sup>2</sup> )         Mathering         Volume(m <sup>2</sup> )         Mathering         Volume(m <sup>2</sup> )         Volume(m <sup>2</sup> )         Mathering         Volume(m <sup>2</sup> )         Volume(m <sup>2</sup> )         Volume(m <sup>2</sup> )				Property	Address:	unit 102	2					
Area(m <sup>2</sup> )Av. Height(m)Volume(m <sup>2</sup> )Ground floor $50.26$ $(1a) \times 2.7$ $(2a) = 135.7$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ $50.26$ $(4)$ $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = (15.7)$ $(5)$ Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = (15.7)$ $(5)$ $(5)$ $(5)$ $(5)$ 2. Vernitation ratesmain heating heat												
Ground floor50.26(1a) x2.7(2a) =(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)S0.26(4)Duelling volume(2a)+(3b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	1. Overall dwelling dimer	nsions:		_	( A)							
Developme $(3a)+(3b)+(3c)+(3d)+(3e)+,(3n) = 135.7$ $(5)$ 2. Ventilation rate:main meating 0secondary heating 0othertotalm³ per hourNumber of chimneys $0$ $+$ $0$ $+$ $0$ $=$ $0$ $x40$ $0$ $(6a)$ Number of open flues $0$ $+$ $0$ $=$ $0$ $x40$ $0$ $(6a)$ Number of open flues $0$ $+$ $0$ $=$ $0$ $x20$ $0$ $(7a)$ Number of passive vents $0$ $x10$ $0$ $0$ $(7a)$ Number of passive vents $0$ $x40$ $0$ $(7c)$ Number of tileless gas fires $0$ $x40$ $0$ $(7c)$ Number of storeys in the dwelling (ns) $Additonal infiltration(9)(9)Additional infiltration:0.2510.2x (14) \pm 100] =(11)I but ypes of wild are present, use the value corresponding to the greater wall area (after dedecting rates of openings); if aqual user 0.35(12)(13)Percentage of windows and doors draught stripped(10)(12)(13)(14)(16)Number of sides sheltered(20)(10)(15)(16)Air permeability value, qb0, expressed in cubic metres per hour tere (12) + (10) + (11) + (12) + (13) + (15) =(16)I' in orbandity value agains at a present, use the value corresponding to the greater wall area (after dedecting rates of openings); if again user 0.35(12)(12)I' in other 0.25, expressed$	Ground floor				· ,	(1a) x			(2a) =	. ,	_	
2. Ventilation rate:main heating heatingsecondary heating heatingothertotalm³ per hourNumber of chimneys $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ Number of open flues $0$ $0$ $0$ $10$ $0$ <t< td=""><td>Total floor area TFA = (1a</td><td>ı)+(1b)+(1c)+(</td><td>(1d)+(1e)+</td><td>(1n) 5</td><td>0.26</td><td>(4)</td><td></td><td></td><td></td><td></td><td></td></t<>	Total floor area TFA = (1a	ı)+(1b)+(1c)+(	(1d)+(1e)+	(1n) 5	0.26	(4)						
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Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used       3       (19)         Number of sides sheltered       3       (19)         Shelter factor       (20) = 1 - [0.075 x (19)] =       0.78       (20)         Infiltration rate incorporating shelter factor       (21) = (18) x (20) =       0.12       (21)         Infiltration rate modified for monthly wind speed       Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Monthly average wind speed from Table 7       (22)m=       5.1       5       4.9       4.4       4.3       3.8       3.7       4       4.3       4.5       4.7         Wind Factor (22a)m = (22)m ÷ 4       Image: Aug       Image				•	•	•	etre of e	nvelope	area	3	(17)	
Number of sides sheltered3Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $0.78$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.12$ Infiltration rate modified for monthly wind speed $0.12$ $(21)$ Infiltration rate modified for monthly wind speed $0.12$ $(21)$ Monthly average wind speed from Table 7 $(22)m =$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$	•	-								0.15	(18)	
Shelter factor(20) = 1 - $[0.075 \times (19)] =$ (20)Infiltration rate incorporating shelter factor(21) = $(18) \times (20) =$ 0.12(21)Infiltration rate modified for monthly wind speed $0.12$ (21)Infiltration rate modified for monthly wind speedJanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7(22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m ÷ 4			on test has been	done or a deg	gree air pei	rmeability	is being us	sed				
Infiltration rate incorporating shelter factor       (21) = (18) × (20) =       0.12       (21)         Infiltration rate modified for monthly wind speed       Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Monthly average wind speed from Table 7       (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m ÷ 4					(20) = 1 -	0.075 x (1	9)] =				- · ·	
Infiltration rate modified for monthly wind speed $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		ng shelter fac	tor								4	
JanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7 $(22)m=$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div 4$	•	•								0.12		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				n Jul	Aug	Sep	Oct	Nov	Dec			
Wind Factor (22a)m = (22)m ÷ 4	Monthly average wind spe	ed from Tabl	e 7									
	· · · · · · · · · · · · · · · · · · ·	- I I		3.8	3.7	4	4.3	4.5	4.7			
	Wind Factor (22a)m = (22	)m ÷ 4								-		
		<u> </u>	1.08 0.9	5 0.95	0.92	1	1.08	1.12	1.18			

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N. (2	3b) = (23a	a) x Fmv (e	equation (1	N5)) , other	rwise (23b	) = (23a)			0.5	(23a)
			• • •		, ,	, ,		n Table 4h)		) (200)			0.5	
			-	-	-					2h)m ± (	23P) ^ [-	1 – (23c)	77.35 ÷ 100]	(23c)
(24a)m=	<b></b>	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	÷ 100]	(24a)
								MV) (24b				0.20		
(24b)m=					0				0		0	0		(24b)
			_		or positiv	-	<u>entilatio</u>	on from c				-		
					•	•		c) = (22b		.5 × (23b	))			
(24c)m=	, <i>,</i>	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft			<u> </u>		
	r`´´	· ·	r <u>í</u>	<u>`</u>	,	<u> </u>	<u> </u>	0.5 + [(2	,	<u> </u>		<b></b>	I	()
(24d)m=		0	0	0	0	0	0	0	0	0	0	0		(24d)
	<b></b>			<u>``</u>	, <u>,</u>	<u> </u>	<u>, , , , , , , , , , , , , , , , , , , </u>	d) in box	r í				I	
(25)m=	0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. He	at losse	s and he	eat loss	oaramete	er:									
ELEN	IENT	Gros area		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·ł		X k //K
Doors		arca	(11)			2.14		1	= [	2.14		N0/111 -1		(26)
Windo	ws					9.86		/[1/( 1.4 )+	י	13.07	$\dashv$			(27)
Floor						20.06		0.16	= [					(28)
							_			3.2096				
Walls		27.5		12		15.51		0.16		2.48				(29)
Walls		20.9		0		20.98	_	0.17	=	3.52				(29)
		elements	, m²			68.55	5							(31)
Party						28.4	x	0	=	0			_ └──	(32)
Party f						30.21					l			(32a)
Party of	-					50.27								(32b)
				effective wi Internal wall			ated using	formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				24.43	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	7843.5	(34)
Therm	al mass	parame	ter (TM	<sup>-</sup> = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	-	sments wh ad of a de			constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						8.14	(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) =			32.57	(37)
Ventila	ation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (	25)m x (5)	)	I	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	11.71	11.58	11.45	10.8	10.67	10.02	10.02	9.89	10.28	10.67	10.93	11.19		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	44.28	44.15	44.02	43.37	43.24	42.59	42.59	42.46	42.85	43.24	43.5	43.76		_
Stroma	FSAP 201	2 Version	: 1.0.1.14	(SAP 9.92)	- http://ww	ww.stroma	.com			Average =	Sum(39)1	12 /12=	43.3 <b>β</b> age	2 of 38)

Heat loss parameter (HLP), W/m <sup>2</sup> K (40)m = $(39)m \div (4)$		
(40)m= 0.88 0.88 0.88 0.86 0.86 0.85 0.85 0.84 0.85 0.86 0.87 0.87		
Average = Sum(40) <sub>112</sub> /12=	0.86	(40)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
(41)m=         31         28         31         30         31         30         31         30         31         30         31		(41)
4. Water heating energy requirement: kWh/year	:	
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1		(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 74.52 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)		(43)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Hot water usage in litres per day for each month $Vd,m =$ factor from Table 1c x (43)		
(44)m= 81.97 78.99 76.01 73.03 70.05 67.07 67.07 70.05 73.03 76.01 78.99 81.97		
Total = Sum(44) <sub>112</sub> =	894.26	(44)
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)		
(45)m=         121.56         106.32         109.71         95.65         91.78         79.2         73.39         84.22         85.22         99.32         108.41         117.73		
Total = $Sum(45)_{112}$ = If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	1172.52	(45)
(46)m= 18.23 15.95 16.46 14.35 13.77 11.88 11.01 12.63 12.78 14.9 16.26 17.66		(46)
Water storage loss:		
Storage volume (litres) including any solar or WWHRS storage within same vessel 180		(47)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day):		(48)
Temperature factor from Table 2b   0		(49)
Energy lost from water storage, kWh/year(48) x (49) =0b) If manufacturer's declared cylinder loss factor is not known:0		(50)
Hot water storage loss factor from Table 2 (kWh/litre/day)       0         If community heating see section 4.3       0		(51)
Volume factor from Table 2a 0		(52)
Temperature factor from Table 2b		(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ Enter (50) or (54) in (55)       0		(54) (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m$		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	4	(56)
		(57)
(57)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(57)
Primary circuit loss (annual) from Table 30Primary circuit loss calculated for each month $(59)m = (58) \div 365 \times (41)m$		(58)
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)		

Combi	loss ca	lculated	for ea	ach	month (	61)m =	(60	) ÷ 36	65 × (41)	)m									
(61)m=	21.95	19.82	21.9	95	21.24	21.95	2	1.24	21.95	21	1.95	21.24	21.9	95	21.24	21.	95		(61)
Total h	neat req	uired for	wate	r he	eating ca	alculate	d fo	r eac	h month	(62	2)m =	0.85 × (	(45)m	+	(46)m +	(57)	m +	(59)m + (61)m	
(62)m=	143.51	126.14	131.	66	116.89	113.73	10	0.44	95.34	10	6.16	106.46	121.	26	129.65	139	.68		(62)
Solar DI	HW input	calculated	using	Appe	endix G or	Appendi	х Н (	negati	ve quantity	/) (er	nter '0	' if no sola	r contr	ibut	ion to wate	er hea	ting)		
(add a	dditiona	al lines if	FGH	RS	and/or V	VWHR	S ap	plies	, see Ap	pen	ndix (	G)							
(63)m=	0	0	0		0	0		0	0		0	0	0		0	C	)		(63)
FHRS	23.58	18.43	15.6	63	10.98	9.58	8	3.11	7.52	8	.63	8.74	11.	В	17.58	23.	85		(63) (G2)
Output	t from w	ater hea	ter																
(64)m=	119.93	107.72	116.	03	105.91	104.14	9	2.32	87.82	97	7.53	97.72	109.	47	112.07	115	.83		
									-		Out	out from wa	ater he	ate	r (annual)	12		1266.47	(64)
Heat g	jains fro	m water	heati	ng,	kWh/ma	onth 0.2	25 ´	[0.85	× (45)m	ı + (	61)n	n] + 0.8 x	× [(46	)m	+ (57)m	+ (5	9)m	]	
(65)m=	45.91	40.31	41.9	97	37.11	36	3	1.64	29.89	33	3.49	33.65	38.5	51	41.36	44.	63		(65)
inclu	ude (57)	m in calo	ulatio	on o	of (65)m	only if	cylir	nder i	s in the a	dwe	lling	or hot w	ater i	s fi	rom com	mun	ity h	eating	
5. Int	ternal ga	ains (see	e Tab	le 5	and 5a)	):													
Metab	olic gair	ns (Table	5) V	Vatt	ŝ														
metab	Jan	Feb	 		Apr	May		Jun	Jul	4	Aug	Sep	0	ct	Nov	D	ес		
(66)m=	101.87	101.87	101.	-	101.87	101.87	+	)1.87	101.87		1.87	101.87	101.		101.87	101			(66)
Liahtin	a aains	(calcula	ted in	n Ap	pendix l	equa	tion	L9 o	r L9a). a	lso	see	L Table 5							
(67)m=	33.27	29.55	24.0	<u> </u>	18.19	13.6	-	1.48	12.41	<u> </u>	5.13	21.64	27.4	8	32.07	34.	19		(67)
Applia	nces da	ins (calc	ulate	d in	Append	lix L. ec	uat	ion L	13 or L1	і За).	also	see Ta	ble 5						
(68)m=		223.05	217.		204.99	189.48	· ·	74.9	165.15	ŕ	2.86	168.64	180.	93	196.44	211	.02		(68)
Cookir	na aains	s (calcula	i ted ir	n Ap	pendix	L. equa	tion	L15	u or L15a`	). al	SO SE	e Table	5						
(69)m=	46.88	46.88	46.8	<u> </u>	46.88	46.88	-	6.88	46.88	<b></b>	5.88	46.88	46.8	88	46.88	46.	88		(69)
		I ns gains			a)														
(70)m=	3	3	3		3	3		3	3		3	3	3		3	3	3		(70)
		I /aporatic	l n (ne				l hle '												
(71)m=	-67.91	-67.91	-67.9	-	-67.91	-67.91	-	57.91	-67.91	-6	7.91	-67.91	-67.	91	-67.91	-67	.91		(71)
		gains (T						_			-			-			-		
(72)m=	61.7	59.98	56.4	<u></u>	51.55	48.39	4	3.95	40.17	45	5.01	46.73	51.7	'6	57.44	59.	99		(72)
		gains =													(1)m + (72)				
(73)m=		396.42	381.	55	358.57	335.31	31	14.16	301.57	r `	7.84	320.85	344.		369.79	389	.04		(73)
· ·	lar gains			<u> </u>			1						<u> </u>						
			using :	solar	flux from	Table 6a	and	assoc	iated equa	tions	s to co	onvert to th	ie appl	icat	ole orientat	ion.			
Orienta	ation: /	Access F	actor	r	Area			Flu	x			g_			FF			Gains	
	-	Table 6d			m²				ole 6a		Т	able 6b		Т	able 6c			(W)	
East	0.9x	1		x	9.8	6	x	1	9.64	x		0.63	X	Γ	0.7		=	59.18	(76)
East	0.9x	1		x	9.8	6	x		8.42	x		0.63	۲ × آ	F	0.7	╡	=	115.77	(76)
East	0.9x	1		x	9.8		x	6	3.27	x		0.63	۲×	Γ	0.7		=	190.66	(76)

x

0.7

=

x

9.86

x

92.28

x

0.63

East

0.9x

1

278.07

(76)

	-														
East	0.9x	1	x	9.8	86	x	11	13.09	×	0.63	x	0.7	=	340.79	(76)
East	0.9x	1	x	9.8	86	x	11	15.77	x	0.63	x	0.7	=	348.86	(76)
East	0.9x	1	x	9.8	86	x	11	10.22	x	0.63	x	0.7	=	332.13	(76)
East	0.9x	1	x	9.8	86	x	9	4.68	x	0.63	x	0.7	=	285.29	(76)
East	0.9x	1	x	9.8	86	x	7	3.59	x	0.63	×	0.7	=	221.75	(76)
East	0.9x	1	x	9.8	86	x	4	5.59	x	0.63	×	0.7	=	137.38	(76)
East	0.9x	1	x	9.8	86	x	2	4.49	x	0.63	<b>x</b>	0.7	=	73.79	(76)
East	0.9x	1	x	9.8	86	x	1	6.15	x	0.63	×	0.7	=	48.67	(76)
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m =	Sum(74)m	(82)m	-	-	_	
(83)m=	59.18	115.77	190.66	278.07	340.79	34	48.86	332.13	285.29	221.75	137.38	73.79	48.67		(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m	+ (8	33)m ,	, watts						•	
(84)m=	458.75	512.19	572.22	636.64	676.09	66	63.02	633.7	593.13	542.6	481.38	443.59	437.71		(84)
7 Me	an inter	nal temr	perature	(heating	season	)			2		•	•		•	
			neating p	` ·		<i>´</i>	area f	rom Tab	ole 9 T	՝h1 (°Ը)				21	(85)
-		-	ains for I			-			, io 0, i	( 0)				21	(00)
Ullise	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.98	0.96	0.91	0.77	0.59		0.41	0.3	0.33	0.54	0.83	0.96	0.98		(86)
											0.00	0.00	0.00	J	()
		i	ature in	-	· · ·		i			- <u>'</u>			i	1	()
(87)m=	20.43	20.57	20.76	20.93	20.99		21	21	21	20.99	20.9	20.65	20.4		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	ble 9,	Th2 (°C)				_	
(88)m=	20.18	20.19	20.19	20.2	20.2	2	0.21	20.21	20.21	20.21	20.2	20.2	20.19		(88)
Utilisa	ation fac	ctor for a	ains for 1	est of d	welling,	h2,	m (se	e Table	9a)					-	
(89)m=	0.97	0.95	0.88	0.73	0.54	-	0.36	0.24	, 0.27	0.48	0.79	0.95	0.98		(89)
Mean	interna	l tompor	ature in t	the rest	of dwoll	ina	T2 (fc	llow ste	ne 3 ta	7 in Tabl				1	
(90)m=		19.82	20	20.15	20.19	<u> </u>	0.21	20.21	20.21	20.21	20.14	19.9	19.66	1	(90)
(00)=	10.00	10.02	20	20.10	20.10	<u> </u>	0.21	20.21	20.21			ing area ÷ (4		0.48	(91)
												J (	,	0.40	(0.)
		<u>i</u>	<u> </u>			-	<u> </u>		<u>`</u>	$fLA) \times T2$				1	(22)
(92)m=	20.04	20.18	20.37	20.53	20.58		0.59	20.59	20.59		20.51	20.26	20.02		(92)
		1	i		· ·	1			<i>.</i>	nere appro	r <u> </u>		40.07	1	(02)
(93)m=	19.89	20.03	20.22	20.38	20.43	2	0.44	20.44	20.44	20.44	20.36	20.11	19.87		(93)
			uirement						<b>T</b> . I. I.			(70)			
			ernal ter or gains (			ned	at ste	ep 11 of	Iable	9b, so tha	it II,m=	:(76)m an	d re-calo	culate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
l Utilisa			ains, hm		may	I	oun		, 1018				200	1	
(94)m=	0.97	0.95	0.88	0.74	0.55		0.37	0.26	0.29	0.5	0.8	0.94	0.98	]	(94)
Usefu	l gains.	hmGm	, W = (94	l)m x (84	4)m	-				1			1	1	
(95)m=	446.17	485.77	506.32	470.65	, 373.3	24	48.54	163.66	171.67	269.94	385.78	419.08	428.05		(95)
Month	ly aver	age exte	rnal tem	perature	e from T	abl	e 8			1	ļ	-	I	1	
(96)m=	4.3	4.9	6.5	8.9	11.7	-	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rat	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93)	 m— (96)m	]	-	Į	1	
(97)m=	690.45	668	603.85	497.74	377.39	-	48.82	163.67	171.71		421.88	565.98	685.6	]	(97)
I	I	1			l					1	ı	1	1	1	

Space	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=	181.74	122.46	72.56	19.5	3.04	0	0	0	0	26.86	105.77	191.61		_
								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	723.55	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year							[	14.4	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	ı micro-C	CHP)					
•	e heatir	-										r		٦
						mentary			(004)				0	(201)
				nain syst				(202) = 1 -		(000)]		l	1	(202)
			•	main sy:				(204) = (2	02) × [1 –	(203)] =			1	(204)
				ing syste									92.9	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ו, % ו						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		ř. – –	r È		r	Í	0			26.96	105 77	101.61		
(	181.74	122.46	72.56	19.5	3.04	0	0	0	0	26.86	105.77	191.61		
(211)m	$1 = \{[(98) \\ 195.63 \}$	)m x (20 131.82	4)] + (2 <sup>2</sup> 78.11	10)m } x 20.99	100 ÷ (2 3.28	206) 0	0	0	0	28.91	113.85	206.26		(211)
	195.65	131.02	70.11	20.99	3.20	0	0		l (kWh/yea				778.85	(211)
Snace	hoatin	a fual (s	econdar	y), kWh/	month					,	- 715,1012	Ĺ	110.00	
•		- ·		y), ۲۷۱۱/ د 100 ÷ (										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
			1		1			Tota	l Il (kWh/yea	ar) =Sum(2	1 215) <sub>15,1012</sub>	=	0	(215)
Water	heating	]										L		1
Output				ulated a	bove)									
	119.93	107.72	116.03	105.91	104.14	92.32	87.82	97.53	97.72	109.47	112.07	115.83		-
	-	ater hea		i	i	i	r		i		i		87.3	(216)
(217)m=		88.66	88.28	87.69	87.37	87.3	87.3	87.3	87.3	87.8	88.54	88.9		(217)
Fuel fo	r water	heating, m x 100	kWh/m ) ÷ (217)	onth										
	134.98	121.49	131.43	120.77	119.19	105.76	100.59	111.71	111.94	124.68	126.57	130.29		
								Tota	I = Sum(2	19a) <sub>112</sub> =			1439.39	(219)
Annua	I totals									k	Wh/year		kWh/year	-
Space	heating	fuel use	ed, main	system	1								778.85	
Water	heating	fuel use	d									[	1439.39	]
Electric	city for p	oumps, f	ans and	electric	keep-ho	t						-		_
mech	anical v	entilatio	n - balar	nced, ext	ract or p	ositive ii	nput fron	n outside	Э			86.92		(230a)
		ig pump										30		(230c)
		• • •	sted flue											(230e)
				م\∧/⊾ /	-				of (220a)	(220~)		45	404.0-	-
	-		above, I	kWh/yea	ll.			sum	of (230a).	(230g) =			161.92	(231)
Electric	city for li	ighting											235.01	(232)
Electric	city gen	erated b	y PVs										-380.25	(233)

10a. Fuel costs - individual heating systems:					
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)		<b>Fuel Cost</b> £/year	
Space heating - main system 1	(211) x	3.48 ×	0.01 = 2	7.103822053940	8 (240)
Space heating - main system 2	(213) x	0 ×	0.01 =	0	(241)
Space heating - secondary	(215) x	13.19 ×	0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48 ×	0.01 =	50.09	(247)
Pumps, fans and electric keep-hot	(231)	13.19 ×	0.01 =	21.36	(249)
(if off-peak tariff, list each of (230a) to (230g) sep Energy for lighting	earately as applicable and app (232)		ding to Ta	able 12a 31	(250)
Additional standing charges (Table 12)				120	(251)
	one of (233) to (235) x)	13.19 ×	0.01 =	0	(252)
Appendix Q items: repeat lines (253) and (254) aTotal energy cost(245)(24)	ns needed 17) + (250)(254) =		Γ	249.55	(255)
11a. SAP rating - individual heating systems					
Energy cost deflator (Table 12)				0.42	(256)
Energy cost factor (ECF) [(255) x (2	256)] ÷ [(4) + 45.0] =			1.1	(257)
SAP rating (Section 12)				84.65	(258)
12a. CO2 emissions – Individual heating system	ns including micro-CHP				
12a. CO2 emissions – Individual heating system	ns including micro-CHP Energy kWh/year	Emission factor kg CO2/kWh	or	Emissions	
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy		or = [		
	<b>Energy</b> kWh/year	kg CO2/kWh	-	kg CO2/yea	ar T
Space heating (main system 1)	Energy kWh/year (211) x	kg CO2/kWh	= [	kg CO2/yea	ar (261)
Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x	kg CO2/kWh 0.216 0.519	= [	kg CO2/yea 168.23 0	ar ](261) ](263)
Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 0.519	= [	kg CO2/yea 168.23 0 310.91	ar ](261) ](263) ](264)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 0.519 0.216	= [ = [ = [	kg CO2/yea 168.23 0 310.91 479.14	ar (261) (263) (264) (265)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	kg CO2/kWh 0.216 0.519 0.216 0.519	= [ = [ = [	kg CO2/yea 168.23 0 310.91 479.14 84.03	ar ](261) ](263) ](264) ](265) ](267)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.216 0.519 0.519	= [ = [ = [ = [	kg CO2/yea 168.23 0 310.91 479.14 84.03 121.97	ar (261) (263) (264) (265) (267) (268)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.216 0.519 0.519 0.519	= [ = [ = [ = [	kg CO2/yea 168.23 0 310.91 479.14 84.03 121.97 -197.35	ar (261) (263) (264) (265) (265) (267) (268) (269)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.216 0.519 0.519 0.519 0.519 0.519 0.519	= [ = [ = [ = [	kg CO2/yea 168.23 0 310.91 479.14 84.03 121.97 -197.35 487.8	ar (261) (263) (264) (265) (267) (268) (268) (269) (272)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m<sup>2</sup></b>	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.216 0.519 0.519 0.519 0.519 0.519 0.519	= [ = [ = [ = [	kg CO2/yea 168.23 0 310.91 479.14 84.03 121.97 -197.35 487.8 9.71	ar (261) (263) (264) (265) (265) (267) (268) (269) (272) (273)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year <b>CO2 emissions per m<sup>2</sup></b> El rating (section 14)	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 0.519 0.216 0.519 0.519 0.519 0.519 0.519 0.519	= [ = [ = [ = [	kg CO2/yea 168.23 0 310.91 479.14 84.03 121.97 -197.35 487.8 9.71	ar (261) (263) (264) (265) (265) (267) (268) (269) (272) (273)

Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	1756.06	(264)
Space and water heating	(261) + (262) + (263) + (264)	4) =		2706.25	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	497.09	(267)
Electricity for lighting	(232) x	0	=	721.49	(268)
Energy saving/generation technologies Item 1		3.07	=	-1167.36	(269)
		3.07		-1107.30	(203)
'Total Primary Energy		sum of (265)(271) =		2757.47	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		54.86	(273)

## SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 November 2014

Property Details: unit 102

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shut Ventilation rate during Overheating Details:	es: eter: ters:	ather (a	ich):	False Light-colou	-	roller blind		
Summer ventilation h Transmission heat los Summer heat loss co	ss coeffi	cient:	ient:	89.56 32.6 122.13				(P1) (P2)
Overhangs:								
Orientation:	Ratio:		Z_overhangs:					
East (East Windows)	0		1					
Solar shading:								
<b>Orientation:</b> East (East Windows)	<b>Z blind</b> 0.6	ls:	<b>Solar access:</b> 0.9	<b>Ove</b> r 1	rhangs:	<b>Z summer:</b> 0.54		(P8)
Solar gains:								
Orientation		Area	Flux	<b>g</b> _	FF	Shading	Gains	
East (East Windows)	0.9 x	9.86	117.51	0.63	0.7	0.54 <b>Total</b>	248.32 248.32	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass tempera Threshold temperature <b>Likelihood of high int</b>	tempera ture incre	ement	-	31 57 4.7 16 0.2 20		<b>July</b> 298.57 546.89 4.48 17.9 0.25 22.63 <b>Medium</b>	August 304.84 523.3 4.28 17.8 0.25 22.33 Medium	(P5) (P6) (P7)
Assessment of likelih	ood of h	igh inte	ernal temperatur	<b>'е:</b> <u>Ме</u>	<u>edium</u>			



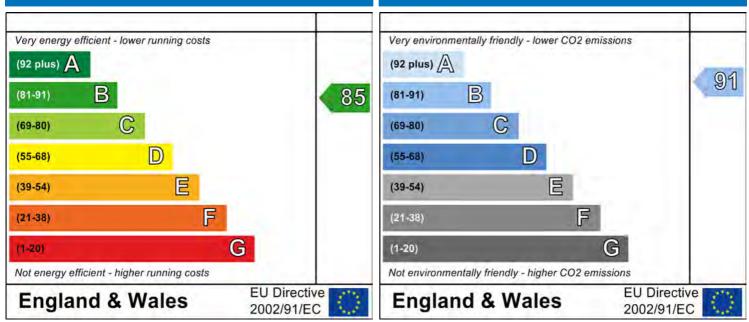
Dwelling type: Date of assessment: Produced by: Total floor area: Mid floor Flat 29 October 2014 Aymon Winter 101.26000213623 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

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

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

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

# **Regulations Compliance Report**

Project Informati	ion:			
ssessed By:	Aymon Winter (S	TRO014511)	Building Type: Flat	
Dwelling Details	•	,		
	DESIGN STAGE		Total Floor Area: 101.26m <sup>2</sup>	
ite Reference :		Riverpark Gardens	Plot Reference: Unit 201	
ddress :				
Client Details:				
ame:	Jamie			
ddress :	Campbell, 43 Ta	nner Street, Greater London, Lo	ondon, SE13PL	
•		within the SAP calculations.		
a TER and DE	ete report of regula	itions compliance.		
	Rating system: Mains	026		
uel factor: 1.00 (		900		
	oxide Emission Rate	e (TER)	18.78 kg/m²	
welling Carbon	Dioxide Emission Ra	ate (DER)	10.61 kg/m²	OK
b TFEE and D				
-	ergy Efficiency (TFE		61.09 kWh/m <sup>2</sup>	
welling Fabric E	Energy Efficiency (DF	-EE)	52.13 kWh/m <sup>2</sup>	ок
2 Fabric U-valu	es			
Element	-	Average	Highest	
External		0.16 (max. 0.30)	0.18 (max. 0.70)	OK
Party wa	all	0.00 (max. 0.20)	-	OK
Floor		(no floor) 0.11 (max. 0.20)	0.11 (max. 0.35)	ок
Poof		· · · · · · · · · · · · · · · · · · ·	1.40 (max. 3.30)	
Roof Opening	IS	1 37 (max 200)		OK
Roof Opening a Thermal brid	·	1.37 (max. 2.00)	1.40 (max. 3.30)	OK
Opening 2a Thermal brid	dging	1.37 (max. 2.00) from linear thermal transmittan		OK
Opening 2a Thermal brid	dging bridging calculated	, , ,		OK
Opening a Thermal brid? Thermal Air permeabil	dging bridging calculated	, , ,		ОК
Opening a Thermal brid Thermal Air permeabil Air permea	dging I bridging calculated lity ability at 50 pascals	, , ,	ces for each junction 3.00 (design value)	
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging I bridging calculated lity ability at 50 pascals	from linear thermal transmittant Database: (rev 367, product	ces for each junction 3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	

# **Regulations Compliance Report**

5 Cylinder insulation			
Hot water Storage:	Nominal cylinder loss: 0.0	•	
	Permitted by DBSCG: 2.1	0 kWh/day	
Primary pipework insulated:	Yes		OK
6 Controls			
	5		
Space heating controls	Programmer, room thermo	ostat and IRVs	OK
Hot water controls:	Cylinderstat		OK
Doilor intorlook:	Independent timer for DH	vv	OK
Boiler interlock: 7 Low energy lights	Yes		ОК
		4.00.0%	
Percentage of fixed lights wit	n low-energy fittings	100.0%	OK
Minimum		75.0%	ОК
8 Mechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:		0.42	
Maximum		1.5	OK
MVHR efficiency:		91%	01/
Minimum		70%	OK
9 Summertime temperature			
Overheating risk (Thames va	illey):	Slight	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: South		11.31m²,	
Windows facing: East		9.55m²,	
Windows facing: West		10.02m²,	
Roof windows facing: South		0.89m <sup>2</sup>	
Ventilation rate:		4.00	الم ما
Blinds/curtains:		Light-coloured curtain or roller	olina
		Closed 100% of daylight hours	
10 Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1 W/m²K	
Roofs U-value		0.11 W/m²K	
Distant de la factoria de la comp			

Photovoltaic array

Property	Dotaile	Unit 201
FIUDELLA		

Property Details: L	Jnit 201						
Address:							
Located in:		Eng	land				
Region:		-	mes valley				
UPRN:			5				
Date of assessn	nent:	29 (	October 2014				
Date of certifica			November 2014				
				2			
Assessment typ			v dwelling design stage	e			
Transaction typ	e:		v dwelling				
Tenure type:			nown				
Related party d			related party				
Thermal Mass P	arameter:	Ind	cative Value Medium				
Water use <= 1	25 litres/pers	son/day:	True				
PCDF Version:		367					
Property description	on:						
Dwelling type:		Flat					
Detachment: Year Completed:		201	4				
Floor Location:			or area:		Storey height	:	
					5 6	•	
Floor 0			29 m <sup>2</sup>		2.7 m		
Floor 1		33.0	97 m²		3.4 m		
Living area: Front of dwelling	faces:	34.: Sou	2 m <sup>2</sup> (fraction 0.337) th				
Opening types:							
Name:	Source:		Type:	Glazing:		Argon:	Frame:
Main door	Manufacturer		Solid	orazing.		, a goin	PVC-U
south window	SAP 2012		Windows		= 0.05, soft coat	Yes	PVC-U
East window	SAP 2012		Windows		= 0.05, soft coat	Yes	PVC-U
West window	SAP 2012		Windows		= 0.05, soft coat	Yes	PVC-U
south roof light	Manufacturer		Roof Windows	IOW-E, EN =	0.05, soft coat	Yes	PVC-U
Name:	Gap:		Frame Factor	: g-value:	U-value:	Area:	No. of Openings
Main door	mm		0.7	0	1	2.14	1
south window	16mm or	more	0.7	0.63	1.4	11.31	1
East window	16mm or		0.7	0.63	1.4	9.55	1
West window	16mm or	more	0.7	0.63	1.4	10.02	1
south roof light	16mm or		0.7	0.63	1.3	0.89	1
	- N						
Name:	Type-Name	2:	Location:	Orient:		Width:	Height:
Main door			Sheltered wall	South		0	0
south window			external wall	South		0	0
East window			external wall	East		0	0
West window			external wall	West		0	0
south roof light			Top Floor roof	South		0	0
		-					
Overshading:		Ave	rage or unknown				
Opaque Elements:							
Туре:	Gross area:	Opening	s: Net area:	U-value:	Ru value:	Curtain	wall: Kappa:
External Elements							
external wall	167.03	30.88	136.15	0.16	0	False	N/A
Sheltered wall	16.18	2.14	14.04	0.18	0.43	False	N/A
	00.07	0.00	00.00	0.44	•		N1/2

0.89

0

33.08

28.86

0.11

0.11

0

0

33.97

28.86

Top Floor roof

terrace buildup

N/A

N/A

Internal Elements	
Party Elements	
party wall	11.49
Party Floor	67.3

1.49

#### N/A N/A

#### Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0628 Length **Psi-value** 15.77 0.401 Steel lintel with perforated steel base plate E1 33.12 0.021 E4 Jamb 1.8 0.027 F3 Sill 24.85 Intermediate floor within a dwelling 0.14 E6 37.45 0.08 E14 Flat roof Party wall between dwellings 2.7 0.055 E18 Corner (normal) 24.3 0.048 E16 Corner (inverted internal area greater than external area) 2.7 -0.06 E17 43.53 0.001 E7 Party floor between dwellings (in blocks of flats) Intermediate floor within a dwelling 4.26 0 P2 Ρ5 Roof (insulation at rafter level) 8.9 0.08 Yes (As designed) Pressure test: Ventilation: Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True 0 Number of chimneys: Number of open flues: 0 Number of fans: 0 0 Number of passive stacks: Number of sides sheltered: 2 Pressure test: 3 Boiler systems with radiators or underfloor heating Main heating system: Gas boilers and oil boilers Fuel: mains gas Info Source: Boiler Database Database: (rev 367, product index 016684) Efficiency: Winter 87.3 % Summer: 89.9 Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi boiler) Systems with radiators Central heating pump : 2013 or later Design flow temperature: Design flow temperature >45°C Room-sealed Boiler interlock: Yes Delayed start Main heating Control: Programmer, room thermostat and TRVs Control code: 2106 Secondary heating system: None

From main heating system

Water code: 901 Fuel :mains gas Hot water cylinder Cylinder volume: 180 litres Cylinder insulation: Factory 75 mm Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Flue Gas Heat Recovery System: Database (rev 367, product index 060001) Brand name: Zenex Model: GasSaver SMadelaquetIiflatseGS-1

#### Others:

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 Tilt of collector: Horizontal Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

User Details:											
Assessor Name:	Aymon Wi	nter			Strom	a Num	ber:		STRO	014511	
Software Name:	Stroma FS		2		Softwa	are Ver	rsion:		Versic	on: 1.0.1.14	
			Р	roperty .	Address	: Unit 20	1				
Address :											
1. Overall dwelling dimer	nsions:										
				Area	a(m²)		Av. Hei	ight(m)	-	Volume(m <sup>3</sup> )	_
Ground floor				6	57.29	(1a) x	2	2.7	(2a) =	181.68	(3a)
First floor				3	3.97	(1b) x	3	3.4	(2b) =	115.5	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 101.26 (4)											
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 29$											(5)
2. Ventilation rate:										-	
	main heating		econdar eating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	<u> </u> + ר	0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	- - +   -	0	ī + Г	0	- 1 - [	0	x 2	20 =	0	(6b)
Number of intermittent far	IS IS						0	x 1	10 =	0	(7a)
Number of passive vents						L L	0	x 1	10 =	0	] (7b)
Number of flueless gas fir	es						0	x 4	40 =	0	] (7c)
<u>j</u>						L					
									Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and f	ans = (6a	a)+(6b)+(7	a)+(7b)+(	7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be			ed, procee	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			_
Number of storeys in the	e dwelling (n	S)								0	(9)
Additional infiltration				0.05 (				[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre-							uction			0	(11)
deducting areas of opening			oonanig to	uno grout		a (anor					
If suspended wooden flo			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente										0	(13)
Percentage of windows	and doors di	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2		-	(45)		0	(15)
Infiltration rate		ما اند من اد			(8) + (10)					0	(16)
Air permeability value, o If based on air permeabilit				•	•	•	etre of e	nvelope	area	3	(17)
Air permeability value applies	-						is beina us	sed		0.15	(18)
Number of sides sheltered				0 0, 4 405	gi e e un per	, no alonity	ie seing de			2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fac	tor			(21) = (18	) x (20) =				0.13	(21)
Infiltration rate modified for	r monthly wir	nd speed									
Jan Feb I	Mar Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Tab	e 7									
(22)m= 5.1 5 4	1.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind Fac	ctor (22	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted	infiltra	tion rat	e (allowi	ing for sl	nelter ar	nd wind s	speed) =	: (21a) x	(22a)m					
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate			-	rate for t	he appl	icable ca	ise		•	•	•			
		l ventila		ondix N (2	(26) = (22)	a) × Fmv (e	oquation (	N5)) othe	nuico (22)	(220)			0.5	(23a)
			• • •		, ,	for in-use f				<i>)</i> – (238)			0.5	(23b)
			-		•				,	2h)m i i	(22h) v [	1 (22a)	77.35	(23c)
· –	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	a) = (2 0.24)	0.25	0.26	1 – (23c) 0.26	÷ 100]	(24a)
``						heat red						0.20		(_ · · ·)
(24b)m=		0							0		0	0		(24b)
			_		-	ve input			_					, , ,
,					•	o); other				.5 × (23	b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,						ve input						-		
	<u> </u>		r , ,	r ·	r –	erwise (2	<u> </u>	0.5 + [(2	22b)m² x	0.5]			l	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
		-	·	<u> </u>	í	b) or (24	<del>, ```</del>	<u>,                                     </u>	1 .	1	1	1	I	
(25)m=	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26		(25)
3. Heat	losses	and he	eat loss	paramet	er:									
ELEME	NT	Gros area		Openin rr		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·ł		A X k ⟨J/K
Doors						2.14	x	1	=	2.14				(26)
Windows	з Туре	1				11.3	1 x1	/[1/( 1.4 )+	- 0.04] =	14.99	1			(27)
Windows	з Туре	2				9.55	x1	/[1/( 1.4 )+	- 0.04] =	12.66				(27)
Windows	з Туре	3				10.02	<u>2</u> x1	/[1/( 1.4 )+	- 0.04] =	13.28				(27)
Rooflight	S					0.89	x1	/[1/(1.3) +	0.04] =	1.157				(27b)
Walls Ty	pe1	167.	03	30.8	8	136.1	5 X	0.16	=	21.78				(29)
Walls Ty	pe2	16.1	8	2.14		14.04	4 X	0.17	=	2.35			$\exists$	(29)
Roof Ty	pe1	33.9	97	0.89	)	33.08	3 X	0.11	=	3.64			i —	(30)
Roof Ty	pe2	28.8	36	0		28.86	3 X	0.11		3.17			$\dashv$	(30)
Total are	a of el	ements	, m²			246.0	4				I			(31)
Party wa						11.49	→ ×	0	=	0				(32)
Party floo						67.3					[		$\dashv$	(32a)
* for windo ** include t	ws and i					alue calcui		g formula d	1/[(1/U-vali	ue)+0.04] a	l as given in	n paragraph	 3.2	(===)
Fabric he					•			(26)(30	) + (32) =				75.12	(33)
Heat can	acity C	Cm = S(	(Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	14426.66	(34)

Thermal mass parameter (TMP =  $Cm \div TFA$ ) in kJ/m<sup>2</sup>K

|--|

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

250

(35)

15.45	(36)
	· · ·
90.57	(37)
	(38)
115.36	(39)
1.14	(40)
	(41)
	( )
0.81	
ar.	
	(42)
	(43)
1194.4	(44)
1194.4	(44)
1194.4	(44)
1194.4	(44)
	_
	_
	(45) (46)
	(45)
	(45) (46)
	(45) (46)
	(45) (46)
	(45) (46) (47)
	(45) (46) (47) (48)
	(45) (46) (47) (48) (49) (50)
	(45) (46) (47) (48) (49)
	(45) (46) (47) (48) (49) (50)

		m water (54) in (5	-	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54) (55)
Water	storage	loss cal	culated	or each	month			((56)m = (	55) × (41)	m		-	1	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
						x [(50) – (			7)m = (56)	m where (			ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Drimor			nual) fra	m Toble								0		(58)
	•	loss (ar loss cal	,			59)m = (	(58) ÷ 36	65 x (41)	m			0	1	(00)
	•						. ,	• • •		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=	21.95	19.82	21.95	21.24	21.95	21.24	21.95	21.95	21.24	21.95	21.24	21.95		(61)
Total h	eat requ	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	
(62)m=	184.31	161.83	168.48	148.99	144.53	127.02	119.97	134.43	135.06	154.6	166.04	179.19		(62)
Solar DH	HW input of	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contributi	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	47.11	35.67	29.54	18.28	13.5	10.73	10	11.35	11.47	20.55	34.97	48.01		(63) (G2)
Output	from w	ater hea	ter											
(64)m=	137.21	126.16	138.94	130.71	131.03	116.28	109.96	123.08	123.6	134.05	131.07	131.18		_
								Outp	out from wa	ater heatei	(annual)	12	1533.27	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m	]	
(65)m=	59.47	52.17	54.21	47.79	46.25	40.48	38.08	42.89	43.16	49.59	53.46	57.77		(65)
inclu	ıde (57)	m in calo	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	
5. Int	ernal ga	ains (see	Table 5	and 5a	):									
Metab	olic gain	s (Table	5), Wat	ts		-								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	165.05	165.05	165.05	165.05	165.05	165.05	165.05	165.05	165.05	165.05	165.05	165.05		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	57.58	51.14	41.59	31.49	23.54	19.87	21.47	27.91	37.46	47.56	55.51	59.18		(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=	385.6	389.6	379.51	358.05	330.95	305.48	288.47	284.47	294.55	316.02	343.11	368.58		(68)
Cookir	ig gains	(calcula	ted in A	opendix	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m=	54.26	54.26	54.26	54.26	54.26	54.26	54.26	54.26	54.26	54.26	54.26	54.26		(69)
Pumps	and fai	ns gains	(Table &	ōa)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)				-				
(71)m=	-110.04	-110.04	-110.04	-110.04	-110.04	-110.04	-110.04	-110.04	-110.04	-110.04	-110.04	-110.04		(71)
Water	heating	gains (T	able 5)											
(72)m=	79.94	77.64	72.86	66.37	62.16	56.22	51.18	57.64	59.94	66.66	74.24	77.65		(72)
Total i	nternal	gains =				(66)	m + (67)m	n + (68)m +	+ (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	635.39	630.65	606.24	568.18	528.92	493.85	473.4	482.3	504.23	542.51	585.15	617.68		(73)

#### 6. Solar gains:

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

-		Access Facto		Area m <sup>2</sup>	a and	Flux Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	x	9.55	×	19.64	×	0.63	×	0.7	=	57.32	(76)
East	0.9x	1	x	9.55	×	38.42	x	0.63	×	0.7	=	112.13	(76)
East	0.9x	1	x	9.55	x	63.27	x	0.63	x	0.7	=	184.67	(76)
East	0.9x	1	x	9.55	×	92.28	×	0.63	×	0.7	=	269.33	(76)
East	0.9x	1	x	9.55	×	113.09	×	0.63	x	0.7	=	330.07	(76)
East	0.9x	1	x	9.55	x	115.77	x	0.63	x	0.7	=	337.89	(76)
East	0.9x	1	x	9.55	×	110.22	×	0.63	×	0.7	=	321.68	(76)
East	0.9x	1	x	9.55	×	94.68	x	0.63	x	0.7	=	276.32	(76)
East	0.9x	1	x	9.55	x	73.59	x	0.63	x	0.7	=	214.78	(76)
East	0.9x	1	x	9.55	×	45.59	x	0.63	x	0.7	=	133.06	(76)
East	0.9x	1	x	9.55	×	24.49	×	0.63	x	0.7	=	71.47	(76)
East	0.9x	1	x	9.55	×	16.15	×	0.63	×	0.7	=	47.14	(76)
South	0.9x	0.77	x	11.31	×	46.75	×	0.63	x	0.7	=	161.6	(78)
South	0.9x	0.77	x	11.31	x	76.57	x	0.63	x	0.7	=	264.66	(78)
South	0.9x	0.77	x	11.31	×	97.53	×	0.63	x	0.7	=	337.12	(78)
South	0.9x	0.77	x	11.31	×	110.23	×	0.63	x	0.7	=	381.02	(78)
South	0.9x	0.77	x	11.31	x	114.87	x	0.63	x	0.7	=	397.05	(78)
South	0.9x	0.77	x	11.31	×	110.55	×	0.63	x	0.7	=	382.11	(78)
South	0.9x	0.77	x	11.31	x	108.01	x	0.63	x	0.7	=	373.34	(78)
South	0.9x	0.77	x	11.31	×	104.89	x	0.63	x	0.7	=	362.57	(78)
South	0.9x	0.77	x	11.31	×	101.89	x	0.63	x	0.7	=	352.17	(78)
South	0.9x	0.77	x	11.31	×	82.59	×	0.63	×	0.7	=	285.46	(78)
South	0.9x	0.77	x	11.31	×	55.42	×	0.63	x	0.7	=	191.55	(78)
South	0.9x	0.77	x	11.31	×	40.4	×	0.63	×	0.7	=	139.64	(78)
West	0.9x	0.77	x	10.02	x	19.64	×	0.63	x	0.7	=	60.14	(80)
West	0.9x	0.77	x	10.02	×	38.42	×	0.63	×	0.7	=	117.65	(80)
West	0.9x	0.77	x	10.02	x	63.27	X	0.63	x	0.7	=	193.76	(80)
West	0.9x	0.77	x	10.02	×	92.28	×	0.63	x	0.7	=	282.58	(80)
West	0.9x	0.77	x	10.02	×	113.09	×	0.63	x	0.7	=	346.32	(80)
West	0.9x	0.77	x	10.02	×	115.77	×	0.63	x	0.7	=	354.52	(80)
West	0.9x	0.77	x	10.02	×	110.22	×	0.63	x	0.7	=	337.52	(80)
West	0.9x	0.77	x	10.02	×	94.68	×	0.63	x	0.7	=	289.92	(80)
West	0.9x	0.77	x	10.02	×	73.59	×	0.63	×	0.7	=	225.35	(80)
West	0.9x	0.77	x	10.02	×	45.59	×	0.63	×	0.7	=	139.61	(80)
West	0.9x	0.77	x	10.02	×	24.49	×	0.63	×	0.7	=	74.99	(80)
West	0.9x	0.77	x	10.02	×	16.15	×	0.63	×	0.7	=	49.46	(80)

			-										
Rooflights		x	0.8	39	X	42.08	×	0.63	×	0.7	=	14.86	(82)
Rooflights	S 0.9x 1	x	0.8	39	x	77.73	x	0.63	x	0.7	=	27.46	(82)
Rooflights	S 0.9x 1	x	0.8	39	<b>x</b> 1	19.58	x	0.63	x	0.7	=	42.24	(82)
Rooflights	S 0.9x 1	x	0.8	39	x	165.6	) x [	0.63	x	0.7	=	58.5	(82)
Rooflights	3 0.9x 1	x	0.8	39	x 1	97.99	) x [	0.63	x	0.7	=	69.94	(82)
Rooflights	3 0.9x 1	x	0.8	39	x 2	01.14	) x [	0.63	x	0.7	=	71.05	(82)
Rooflights	3 0.9x 1	x	0.8	39	x 1	92.08	) x [	0.63	×	0.7	=	67.85	(82)
Rooflights	3 0.9x 1	x	0.8	39	x 1	67.82	) x [	0.63	x	0.7	=	59.28	(82)
Rooflights	3 0.9x 1	x	0.6	39	x 1	35.82	) x [	0.63	x	0.7	=	47.98	(82)
Rooflights	S 0.9x 1	x	0.8	39	x s	89.76	) x [	0.63	x	0.7	=	31.71	(82)
Rooflights	S 0.9x 1	x	0.8	39	x	51.57	) x [	0.63	×	0.7	=	18.22	(82)
Rooflights	3 0.9x 1	x	3.0	39	x;	35.21	) x [	0.63	x	0.7	=	12.44	(82)
Solar gai	ins in watts,	calculated	l for eac	h month			(83)m =	Sum(74)m .	(82)m				
(83)m= 2	293.93 521.9	757.79	991.43	1143.38	1145.56	1100.39	988.0	9 840.27	589.82	356.23	248.67		(83)
Total gai	ins – internal	and solar	· (84)m =	= (73)m ·	+ (83)m	, watts				- <b>!</b>		1	
(84)m= 9	929.31 1152.5	5 1364.03	1559.61	1672.3	1639.42	1573.79	1470.3	9 1344.49	1132.34	941.38	866.35	]	(84)
7 Mear	n internal tem	perature	(heating	season	)	1		_!		•	1	4	
						from Tok		- - - - - - - - - - - - - - - - - - -				04	
-	rature during				-		bie 9, i	m ( C)				21	(85)
	on factor for	-		ea, h1,m I	i (see Ta	1	<u> </u>	1		1	1	1	
	Jan Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec		
(86)m=	0.99 0.97	0.91	0.79	0.61	0.44	0.32	0.35	0.57	0.86	0.97	0.99		(86)
L							0.00	0.57	0.00	0.97	0.33	J	(00)
∟ Mean ir	nternal tempe	I		i ea T1 (fo		1	1		0.00	0.97	0.99	J	(00)
	nternal tempe 20.03 20.28	I		ea T1 (fo 20.96		1	1		20.79	20.35	19.98	]	(87)
(87)m=	20.03 20.28	erature in 20.58	living ar 20.84	20.96	ollow ste 20.99	21	7 in Ta 21	ble 9c) 20.98		I	I	]	
(87)m=		erature in 20.58	living ar 20.84	20.96	ollow ste 20.99	21	7 in Ta 21	ble 9c) 20.98 Th2 (°C)		I	I	]	
(87)m= 2 Temper (88)m= 7	20.03 20.28 rature during 19.95 19.95	20.58 heating p	living an 20.84 eriods ir 19.97	20.96 n rest of 19.97	dwelling	21 21 21 21 19.98	7 in Ta 21 able 9, 19.99	ble 9c) 20.98 Th2 (°C)	20.79	20.35	19.98	]	(87)
(87)m= Temper (88)m= Utilisatio	20.03         20.28           rature during         19.95           19.95         19.95           on factor for	erature in 20.58 heating p 19.96 gains for i	living ar 20.84 eriods ir 19.97 rest of d	20.96 n rest of 19.97 welling,	dwelling 19.98 19.98 19.98	21 21 21 19.98 29 from Ta 19.98 20 Table	7 in Ta 21 able 9, 19.99	ble 9c) 20.98 Th2 (°C) 19.98	20.79 19.97	20.35	19.98 19.96	] ] ]	(87)
(87)m=	20.03 20.28 rature during 19.95 19.95	20.58 heating p	living an 20.84 eriods ir 19.97	20.96 n rest of 19.97	dwelling	21 21 21 21 19.98	7 in Ta 21 able 9, 19.99	ble 9c) 20.98 Th2 (°C)	20.79	20.35	19.98	] ] ]	(87)
(87)m= 2 Temper (88)m= 7 Utilisatio (89)m= 7	20.03         20.28           rature during         19.95           19.95         19.95           on factor for	erature in 20.58 heating p 19.96 gains for 0.89	living ar 20.84 eriods ir 19.97 rest of d 0.74	20.96 n rest of 19.97 welling, 0.55	dwelling 19.98 h2,m (se 0.37	21 21 from Ta 19.98 ee Table 0.24	7 in Ta 21 able 9, 19.99 9a) 0.28	ble 9c) 20.98 Th2 (°C) 19.98 0.49	20.79 19.97 0.81	20.35	19.98 19.96	] ] ]	(87)
(87)m= 2 Temper (88)m= 2 Utilisatio (89)m= 2 Mean in	20.03         20.28           rature during         19.95         19.95           on factor for         0.98         0.96	erature in 20.58 heating p 19.96 gains for 0.89	living ar 20.84 eriods ir 19.97 rest of d 0.74	20.96 n rest of 19.97 welling, 0.55	dwelling 19.98 h2,m (se 0.37	21 21 from Ta 19.98 ee Table 0.24	7 in Ta 21 able 9, 19.99 9a) 0.28	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49	20.79 19.97 0.81	20.35	19.98 19.96	] ] ]	(87)
(87)m= 2 Temper (88)m= 2 Utilisatio (89)m= 2 Mean in	20.03         20.28           rature during         19.95           19.95         19.95           on factor for         0.98           0.98         0.96           nternal temper	erature in 20.58 heating p 19.96 gains for 0.89 erature in	living ar 20.84 eriods ir 19.97 rest of d 0.74 the rest	20.96 n rest of 19.97 welling, 0.55 of dwelli	20.99 dwelling 19.98 h2,m (se 0.37	21 21 from Ta 19.98 ee Table 0.24	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 to	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0.7 in Tabl 19.97	20.79 19.97 0.81 <b>e 9c)</b> 19.83	20.35 19.97 0.96	19.98 19.96 0.99 19.05	] ] ] 	(87) (88) (89)
(87)m= 2 Temper (88)m= 2 Utilisation (89)m= 2 Mean in (90)m= 2	20.03         20.28           rature during           19.95         19.95           on factor for           0.98         0.96           nternal tempe           19.09         19.34	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62	living ar 20.84 eriods in 19.97 rest of d 0.74 the rest 19.86	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95	dwelling 19.98 h2,m (se 0.37 ing T2 (f	eps 3 to 7 21 from Ta 19.98 ee Table 0.24 follow ste 19.98	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 to 19.99	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0 7 in Tabl 19.97	20.79 19.97 0.81 <b>e 9c)</b> 19.83	20.35 19.97 0.96 19.42	19.98 19.96 0.99 19.05	0.34	(87) (88) (89) (90)
(87)m= 2 Temper (88)m= 2 Utilisatio (89)m= 2 Mean in (90)m= 2 Mean in	20.03         20.28           rature during         19.95           19.95         19.95           on factor for         0.96           nternal tempe         19.34           nternal tempe         19.34	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62	living ar 20.84 eriods ir 19.97 rest of d 0.74 the rest 19.86 r the wh	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95	Dellow ste 20.99 dwelling 19.98 h2,m (se 0.37 ing T2 (f 19.98 lling) = f	21 21 21 21 21 2 5 19.98 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 to 19.99 + (1 –	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0 7 in Tabl 19.97 fLA) x T2	20.79 19.97 0.81 e 9c) 19.83 LA = Livi	20.35 19.97 0.96 19.42 ng area ÷ (4	19.98 19.96 0.99 19.05 4) =	0.34	(87) (88) (89) (90) (91)
(87)m= 2 Temper (88)m= 2 Utilisatio (89)m= 2 Mean irr (90)m= 2 Mean irr (92)m= 2 (92)m=	20.03         20.28           rature         during           19.95         19.95           on factor for         0.96           nternal         temper           19.09         19.34           nternal         temper           19.41         19.66	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62 erature (fo 19.94	living ar 20.84 eriods ir 19.97 rest of d 0.74 the rest 19.86 r the wh 20.19	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 ole dwe 20.29	bllow ste 20.99 dwelling 19.98 h2,m (se 0.37 ing T2 (f 19.98 lling) = f 20.32	21 21 3 from Ta 19.98 20.24 0.24 000 ste 19.98 LA × T1 20.33	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 to 19.99 + (1 – 20.33	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0.7 in Tabl 19.97 fLA) × T2 20.31	20.79 19.97 0.81 e 9c) 19.83 iLA = Livi 20.15	20.35 19.97 0.96 19.42	19.98 19.96 0.99 19.05	] ] ] 	(87) (88) (89) (90)
(87)m= 2 Temper (88)m= 7 Utilisatio (89)m= 7 Mean in (90)m= 7 Mean in (92)m= 7 Apply a	20.03         20.28           rature during         19.95           19.95         19.95           on factor for         0.96           nternal tempe         19.09           19.09         19.34           nternal tempe         19.41           19.41         19.66           idjustment to         19	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62 erature (fo 19.94 the mean	living ar 20.84 eriods ir 19.97 rest of d 0.74 the rest 19.86 r the wh 20.19 n interna	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 nole dwe 20.29 I temper	Dilow ster         20.99         dwelling         19.98         h2,m (se         0.37         ing T2 (f         19.98         lling) = f         20.32         ature from	21         21         from Ta         19.98         ee Table         0.24         follow stee         19.98         ELA × T1         20.33         om Table	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 to 19.99 + (1 – 20.33 e 4e, w	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0.7 in Tabl 19.97 fLA) × T2 20.31 here approx	20.79 19.97 0.81 e 9c) 19.83 LA = Livi 20.15 opriate	20.35 19.97 0.96 19.42 ng area ÷ (4 19.74	19.98 19.96 0.99 19.05 4) = 19.37	] ] ] 0.34	(87) (88) (89) (90) (91) (92)
(87)m= 2 Temper (88)m= 2 Utilisatio (89)m= 2 Mean irr (90)m= 2 Mean irr (92)m= 2 Apply a (93)m= 2	20.03         20.28           rature during           19.95         19.95           on factor for           0.98         0.96           nternal tempe           19.41         19.66           idjustment to         19.26	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62 erature (fo 19.94 the mean 19.79	living ar 20.84 eriods in 19.97 rest of d 0.74 the rest 19.86 or the wh 20.19 interna 20.04	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 ole dwe 20.29	bllow ste 20.99 dwelling 19.98 h2,m (se 0.37 ing T2 (f 19.98 lling) = f 20.32	21 21 3 from Ta 19.98 20.24 0.24 000 ste 19.98 LA × T1 20.33	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 to 19.99 + (1 – 20.33	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0.7 in Tabl 19.97 fLA) × T2 20.31 here approx	20.79 19.97 0.81 e 9c) 19.83 iLA = Livi 20.15	20.35 19.97 0.96 19.42 ng area ÷ (4	19.98 19.96 0.99 19.05 4) =	] ] 	(87) (88) (89) (90) (91)
(87)m= 2 Temper (88)m= 7 Utilisatio (89)m= 7 Mean in (90)m= 7 Mean in (90)m= 7 Mean in (92)m= 7 Apply a (93)m= 7 8. Space	20.03         20.28           rature during         19.95           19.95         19.95           on factor for         0.96           nternal tempe         19.09           19.09         19.34           nternal tempe         19.41           19.66         19.51           odjustment to         19.26           19.26         19.51	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62 erature (fo 19.94 the mean 19.79 quirement	living ar 20.84 eriods ir 19.97 rest of d 0.74 the rest 19.86 r the wh 20.19 interna 20.04	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 nole dwe 20.29 temper 20.14	20.99         dwelling         19.98         h2,m (se         0.37         ing T2 (f         19.98         lling) = f         20.32         ature from         20.17	21 21 21 21 21 21 21 21 20.24 20.33 20.18	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 to 19.99 + (1 – 20.33 e 4e, w 20.18	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.7 in Tabl 0.49 0.7 in Tabl 19.97 fLA) × T2 20.31 here approximation (Construction) 20.16	20.79 19.97 0.81 e 9c) 19.83 LA = Livi 20.15 opriate 20	20.35 19.97 0.96 19.42 ng area ÷ (4 19.74 19.59	19.98 19.96 0.99 19.05 4) = 19.37 19.22	]	(87) (88) (89) (90) (91) (92)
(87)m= 2 Temper (88)m= 7 Utilisation (89)m= 7 Mean in (90)m= 7 Mean in (92)m= 7 Apply a (93)m= 7 8. Space Set Ti to	20.03         20.28           rature during           19.95         19.95           on factor for           0.98         0.96           nternal tempe           19.09         19.34           nternal tempe           19.41         19.66           idjustment to           19.26         19.51           ce heating rego           o the mean in	erature in 20.58 heating p 19.96 gains for r 0.89 erature in 19.62 erature (fo 19.94 the mean 19.79 quirement nternal ter	living ar 20.84 eriods ir 19.97 rest of d 0.74 the rest 19.86 r the wh 20.19 n interna 20.04	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 nole dwe 20.29 I temper 20.14 re obtair	20.99         dwelling         19.98         h2,m (se         0.37         ing T2 (f         19.98         lling) = f         20.32         ature from         20.17	21 21 21 21 21 21 21 21 20.24 20.33 20.18	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 to 19.99 + (1 – 20.33 e 4e, w 20.18	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.7 in Tabl 0.49 0.7 in Tabl 19.97 fLA) × T2 20.31 here approximation (Construction) 20.16	20.79 19.97 0.81 e 9c) 19.83 LA = Livi 20.15 opriate 20	20.35 19.97 0.96 19.42 ng area ÷ (4 19.74 19.59	19.98 19.96 0.99 19.05 4) = 19.37 19.22	]	(87) (88) (89) (90) (91) (92)
(87)m= 2 Temper (88)m= 4 Utilisatio (89)m= 4 Mean in (90)m= 4 Mean in (92)m= 4 Mean in (92)m= 4 Set Ti to the utilis	20.0320.28rature during19.9519.95on factor for0.980.96nternal tempe19.0919.34nternal tempe19.4119.66idjustment to19.2619.51ce heating regoo the mean insation factor	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62 erature (fo 19.94 the mean 19.79 quirement for gains	living ar 20.84 eriods in 19.97 rest of d 0.74 the rest 19.86 r the wh 20.19 n interna 20.04 mperatur using Ta	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 ole dwe 20.29 I temper 20.14 re obtair able 9a	Dilow ster         20.99         dwelling         19.98         h2,m (second)         0.37         ing T2 (f         19.98         lling) = f         20.32         ature from from from from from from from from	21 21 from Ta 19.98 ee Table 0.24 follow ste 19.98 LA × T1 20.33 om Table 20.18 ep 11 of	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 tr 19.99 + (1 – 20.33 e 4e, w 20.18 Table	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0.7 in Tabl 19.97 fLA) × T2 20.31 here appro- 20.16 9b, so tha	20.79 19.97 0.81 e 9c) 19.83 LA = Livi 20.15 ppriate 20 t Ti,m=	20.35 19.97 0.96 19.42 ng area ÷ (4 19.74 19.59 (76)m an	19.98 19.96 0.99 19.05 4) = 19.37 19.22 d re-calc	]	(87) (88) (89) (90) (91) (92)
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(87)m= 2 Temper (88)m= 4 Utilisatio (89)m= 4 Mean in (90)m= 4 Mean in (92)m= 4 Mean in (92)m= 4 Set Ti to the utilisatio Utilisatio	20.0320.28ratureduring19.9519.95on factor for0.980.96nternaltempe19.0919.34nternaltempe19.4119.66idjustment to19.2619.51ce heating rego the mean insation factorJanFebon factor for	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62 erature (fo 19.94 the mean 19.79 quirement for gains Mar gains, hm	living ar 20.84 eriods in 19.97 rest of d 0.74 the rest 19.86 r the wh 20.19 n interna 20.04 mperatur using Ta Apr :	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 ole dwe 20.29 I temper 20.14 re obtair able 9a May	Dilow ster         20.99         dwelling         19.98         h2,m (second)         0.37         ing T2 (f         19.98         lling) = f         20.32         ature from 20.17         ned at st         Jun	21 21 21 21 21 21 21 21 21 20.38 20.33 20.33 20.18 20.18 20.18 20.18	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 tr 19.99 + (1 – 20.33 e 4e, w 20.18 Table Aug	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0.7 in Table 19.97 fLA) × T2 20.31 here appro- 20.16 9b, so that 5 Sep	20.79 19.97 0.81 e 9c) 19.83 LA = Livi 20.15 priate 20 t Ti,m= Oct	20.35 19.97 0.96 19.42 ng area ÷ (4 19.74 19.59 (76)m an Nov	19.98 19.96 0.99 19.05 4) = 19.37 19.22 d re-calc Dec	]	(87) (88) (89) (90) (91) (92) (93)
(87)m= 2 Temper (88)m= 6 Utilisatio (89)m= 6 Mean in (90)m= 6 M	20.03       20.28         rature during       19.95         19.95       19.95         on factor for       0.96         nternal tempe       19.09         19.09       19.34         nternal tempe       19.41         19.26       19.51         ce heating region       19.51         co the mean in       sation factor         Jan       Feb         on factor for       0.98         0.98       0.95	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62 erature (fo 19.94 the mean 19.79 quirement for gains Mar gains, hm 0.88	living ar 20.84 eriods ir 19.97 rest of d 0.74 the rest 19.86 r the wh 20.19 n interna 20.04 mperatur using Ta Apr : 0.75	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 of dwelli 20.29 I temper 20.14 re obtain able 9a May 0.56	Dilow ster         20.99         dwelling         19.98         h2,m (second)         0.37         ing T2 (f         19.98         lling) = f         20.32         ature from from from from from from from from	21 21 21 19.98 22 19.98 20.24 20.33 20.33 20.18 20.18 20.18	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 tr 19.99 + (1 – 20.33 e 4e, w 20.18 Table	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0.7 in Tabl 19.97 fLA) × T2 20.31 here appro- 20.16 9b, so tha	20.79 19.97 0.81 e 9c) 19.83 LA = Livi 20.15 ppriate 20 t Ti,m=	20.35 19.97 0.96 19.42 ng area ÷ (4 19.74 19.59 (76)m an	19.98 19.96 0.99 19.05 4) = 19.37 19.22 d re-calc	]	(87) (88) (89) (90) (91) (92)
(87)m= 2 Temper (88)m= 4 Utilisatio (89)m= 4 Mean in (90)m= 4 Mean in (92)m= 4 Mean in (92)m= 4 Set Ti to the utilisatio (94)m= 4 Utilisatio (94)m= 4 Utilisatio	20.0320.28ratureduring19.9519.95on factor for0.980.96nternaltempe19.0919.34nternaltempe19.4119.66idjustment to19.2619.51ce heating rego the mean insation factorJanFebon factor for	erature in 20.58 heating p 19.96 gains for 0.89 erature in 19.62 erature (for 19.94 the mean 19.79 quirement for gains Mar gains, hm 0.88 0.88 0.88 0.88	living ar 20.84 eriods ir 19.97 rest of d 0.74 the rest 19.86 r the wh 20.19 n interna 20.04 mperatur using Ta Apr : 0.75	20.96 n rest of 19.97 welling, 0.55 of dwelli 19.95 of dwelli 20.29 I temper 20.14 re obtain able 9a May 0.56	Dilow ster         20.99         dwelling         19.98         h2,m (second)         0.37         ing T2 (f         19.98         lling) = f         20.32         ature from 20.17         ned at st         Jun	21 21 21 21 21 21 21 21 21 20.38 20.33 20.33 20.18 20.18 20.18 20.18	7 in Ta 21 able 9, 19.99 9a) 0.28 eps 3 tr 19.99 + (1 – 20.33 e 4e, w 20.18 Table Aug	ble 9c) 20.98 Th2 (°C) 19.98 0.49 0.49 0.7 in Tabl 19.97 fLA) × T2 20.31 here appro 20.16 9b, so that 0.51	20.79 19.97 0.81 e 9c) 19.83 LA = Livi 20.15 priate 20 t Ti,m= Oct	20.35 19.97 0.96 19.42 ng area ÷ (4 19.74 19.59 (76)m an Nov	19.98 19.96 0.99 19.05 4) = 19.37 19.22 d re-calc Dec	]	(87) (88) (89) (90) (91) (92) (93)

Month	nly aver	age exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an interr	al tempe	erature,	Lm , W =	- =[(39)m :	x [(93)m·	– (96)m	]				
(97)m=	1759.6	1713.47	1555.19	1285.84	971.62	632.89	406.12	427.8	692	1082.26	1445.44	1747.57		(97)
Space	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=	631.57	415.47	260.88	88.72	20.02	0	0	0	0	117.87	392.22	665.31		-
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	2592.06	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								25.6	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	HP)					
•	e heatii	•	at from s	econdar	v/supple	mentary	svstem					I	0	(201)
				nain syst				(202) = 1 -	- (201) =			l	1	(202)
	-			main syst	. ,			(204) = (20)	· · ·	(203)] –				(204)
			•	ing syste				(204) - (2)	02) <b>x</b> [1	(200)] =			92.9	(204)
	-			• •		g systen	n %						0	(208)
Linok	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	<b>_</b>
Space							Jui	Aug	Jeh		NOV	Dec	KVVII/yee	a i
oparo	631.57	415.47	260.88	88.72	20.02	0	0	0	0	117.87	392.22	665.31		
(211)m	ו 1 = {[(98	)m x (20	)4)] + (21	l0)m } x	100 ÷ (2	206)	1			I	I			(211)
()	679.83	447.23	280.82	95.5	21.55	0	0	0	0	126.88	422.19	716.16		· · ·
	I	ļ	ļ			ļ	Į	Tota	l (kWh/yea	ar) =Sum(2	1 211) <sub>15,1012</sub>	=	2790.16	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							I		1
= {[(98	)m x (20	)1)] + (2	14) m } >	(100 ÷ (	208)									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	=	0	(215)
	heating	•												
Output	from w 137.21	ater hea 126.16	ter (calc 138.94	ulated a	bove) 131.03	116.28	109.96	123.08	123.6	134.05	131.07	131.18		
Efficier		ater hea		100.71	101.00	110.20	105.50	120.00	120.0	104.00	101.07	101.10	87.3	(216)
(217)m=		89.28	88.98	88.33	87.64	87.3	87.3	87.3	87.3	88.5	89.23	89.46	07.5	(217)
			kWh/m		01.01	01.0	01.0	0110	01.0	00.0	00.20	00.10		· · ·
		•	) ÷ (217)					-						
(219)m=	153.43	141.31	156.15	147.98	149.52	133.2	125.96	140.99	141.58	151.47	146.89	146.63		_
								Tota	I = Sum(21	19a) <sub>112</sub> =			1735.09	(219)
	al totals									k	Wh/year	I	kWh/year	7
Space	heating	fuel use	ed, main	system	1								2790.16	
Water	heating	fuel use	ed										1735.09	
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								
mech	anical v	entilatio	n - balar	iced, ext	ract or p	ositive i	nput fron	n outside	Ð			190.34		(230a)
centra	al heatir	ig pump	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)

Total electricity for the above, kWh/year	su	m of (230a)(230g) =	265.34 (231)
Electricity for lighting			406.75 (232)
Electricity generated by PVs			-760.49 (233)
10a. Fuel costs - individual heating systems:			
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 × 0.01 =	97.0975601668805 (240)
Space heating - main system 2	(213) x	0 × 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 × 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01 =	60.38 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	35 (249)
(if off-peak tariff, list each of (230a) to (230g) se Energy for lighting	eparately as applicable (232)	and apply fuel price according to 13.19 × 0.01 =	Table 12a
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x	i) 13.19 x 0.01 =	0 (252)
	) as needed (247) + (250)(254) =		366.13 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
	(256)] ÷ [(4) + 45.0] =		1.05 (257)
SAP rating (Section 12)			85.33 (258)
12a. CO2 emissions – Individual heating syste	ems including micro-CF	IP	
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	602.67 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	374.78 (264)
Space and water heating	(261) + (262) + (263) +	+ (264) =	977.45 (265)
Electricity for pumps, fans and electric keep-ho	t (231) x	0.519 =	137.71 (267)
Electricity for lighting	(232) x	0.519 =	211.1 (268)
Energy saving/generation technologies Item 1		0.519 =	-394.7 (269)
Total CO2, kg/year		sum of (265)(271) =	931.58 (272)
CO2 emissions per m²		(272) ÷ (4) =	9.2 (273)
El rating (section 14)			91 (274)
13a. Primary Energy			

	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	=	3403.99	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2116.81	(264)
Space and water heating	(261) + (262) + (263) + (264) =		[	5520.81	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	814.61	(267)
Electricity for lighting	(232) x	0	=	1248.73	(268)
Energy saving/generation technologies					
Item 1		3.07	=	-2334.71	(269)
'Total Primary Energy	sum	of (265)(271) =	[	5249.43	(272)
Primary energy kWh/m²/year	(272)	÷ (4) =	[	51.84	(273)

## SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 November 2014

Property Details: Unit 201

Dwelling type: Located in: Region: Cross ventilation possible: Number of storeys: Front of dwelling faces: Overshading: Overhangs: Thermal mass parameter: Night ventilation: Blinds, curtains, shutters: Ventilation rate during hot weather (ach): Overheating Details:			False Light-colou	5				
Summer ventilation he Transmission heat los			ent:	392.28				(P1)
Summer heat loss coe				90.6 482.85				(P2)
Overhangs:								
Orientation: South (south window) East (East window) West (West window) South (south roof light) Solar shading:	<b>Ratio:</b> 0 0 0 0		<b>Z_overhangs:</b> 1 1 1 1					
, , , , , , , , , , , , , , , , , , ,			<b>.</b>	•		-		
Orientation: South (south window) East (East window) West (West window) South (south roof light)	0.6 0.6 0.6	0.6 0.9 0.6 0.9		<b>Overhangs:</b> 1 1 1 1 1		<b>Z summer:</b> 0.54 0.54 0.54 0.6		(P8) (P8) (P8) (P8)
Solar gains:								
<b>Orientation</b> South (south window) East (East window) West (West window)	0.9 x 0.9 x 0.9 x 1 x	<b>Area</b> 11.31 9.55 10.02 0.89	Flux 112.21 117.51 117.51 204.16	<b>g</b> 0.63 0.63 0.63 0.63	FF 0.7 0.7 0.7 0.7	<b>Shading</b> 0.54 0.54 0.54 0.6 <b>Total</b>	Gains 271.99 240.52 252.35 43.27 808.13	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer external temperature (Thames valley) Thermal mass temperature increment Threshold temperature <b>Likelihood of high internal temperature</b>				49		<b>July</b> 470.4 1278.52 2.65 17.9	August 479.3 1219.9 2.53 17.8	

## SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: <u>Slight</u>



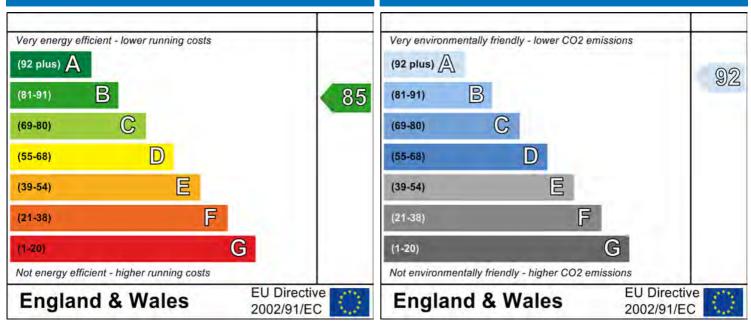
Dwelling type: Date of assessment: Produced by: Total floor area: Top floor Flat 29 October 2014 Aymon Winter 97.1800003051758 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

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

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

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

# **Regulations Compliance Report**

weiling Details:       Total Floor Area: 97.18m <sup>2</sup> EW DWELLING DESIGN STAGE       Total Floor Area: 97.18m <sup>2</sup> Le Reference:       Development at Riverpark Gardens         Plot Reference:       Unit 202         Idress:       Itent Details:         Imme:       Jamie         Idress:       Campbell, 43 Tanner Street, Greater London, London, SE 13PL.         is report covers items included within the SAP calculations.       s not a complete report of regulations compliance. <b>a TER and DER</b> Iten Telenand DER         el for main heating system: Mains gas       Iten and DER         el for main heating system: Mains gas       Iten and DER         el factor: 1.00 (mains gas)       Total Floor         gregt Carbon Dioxide Emission Rate (DER)       10.42 kg/m <sup>2</sup> veiling Carbon Dioxide Emission Rate (DER)       58.91 kWh/m <sup>2</sup> reget Fabric Energy Efficiency (DFEE)       58.91 kWh/m <sup>2</sup> reget Fabric Energy Efficiency (DFEE)       49.48 kWh/m <sup>2</sup> reget Fabric Energy Efficiency (DFEE)       0.00 (max. 0.20)         Fabric U-values       C         Element       Average       Highest         External wall       0.16 (max. 0.20)       0.18 (max. 0.70)       C         Roof       0.11 (max. 0.20)       1.40 (max.	roject Informati	on:			
Re Reference:       Development at Riverpark Gardens       Plot Reference:       Unit 202         Idress:       I	sessed By:	Aymon Winter (S	TRO014511)	Building Type: Flat	
te Reference : Development at Riverpark Gardens : Plot Reference : Unit 202 Idress : Ident Details: Ime Jamie Ideress : Campbell, 43 Tanner Street, Greater London, London, SE13PL. Is report covers items included within the SAP calculations. Is report covers items included the set of	welling Details:				
Item Details:         me:       Jamie         Idress:       Campbell, 43 Tanner Street, Greater London, London, SE13PL.         is report covers items included within the SAP calculations.       s         s not a complete report of regulations compliance.       s         a TER and DER       Itemain heating system: Mains gas         el for main heating system: Mains gas       ife factor: 1.00 (mains gas)         regot Carbon Dioxide Emission Rate (TER)       18.66 kg/m²         velling Carbon Dioxide Emission Rate (DER)       10.42 kg/m²         ob TFEE and DFEE       58.91 kWh/m²         regot Fabric Energy Efficiency (TFEE)       58.91 kWh/m²         regot Fabric Energy Efficiency (DFEE)       49.48 kWh/m²         regot Fabric Energy Efficiency (DFEE)       49.48 kWh/m²         Fabric U-values       C         Element       Average       Highest         External wall       0.16 (max. 0.20)       -         Roof       0.11 (max. 0.25)       0.16 (max. 0.70)       C         Openings       1.37 (max. 2.00)       1.40 (max. 3.30)       C         Thermal bridging       3.00 (design value)       1.00       C         Air permeability       Database: (rev 367, product index 016664)!       Boiler systems with radiators or undeffloor heating - main		DESIGN STAGE		Total Floor Area: 97.18m <sup>2</sup>	
Element         Average         Highest           Element         Average         Highest           External wall         0.16 (max. 0.20)         -           Foor         0.16 (max. 0.20)         -           Foor         0.16 (max. 0.20)         -           Party wall         0.06 (max. 0.20)         -           Roof         0.11 (max. 0.35)         C           Openings         1.37 (max. 2.00)         1.40 (max. 0.35)         C           Atternal bridging calculated from linear thermal transmittances for each junction         C         C           Heating system:         Database: (rev 367, product index 0166644): Boiler systems with radiators or underfloor heating - mains gas Heating wall         3.00 (design value) Maximum         C	te Reference :	Development at F	Riverpark Gardens	Plot Reference: Unit 202	
me: jamie damie damie jamie damie d	ldress :				
Ideress : Campbell, 43 Tanner Street, Greater London, London, SE13PL is report covers items included within the SAP calculations. is not a complete report of regulations compliance. <b>a TER and DER</b> lef for main heating system: Mains gas lef factor: 1.00 (mains gas) Irget Carbon Dioxide Emission Rate (TER) 18.66 kg/m² velling Carbon Dioxide Emission Rate (DER) 10.42 kg/m² ob <b>TFEE and DFEE</b> Irget Fabric Energy Efficiency (TFEE) 58.91 kWh/m² velling Fabric Energy Efficiency (DFEE) 58.91 kWh/m² velling Fabric Energy Efficiency (DFEE) 58.91 kWh/m² <b>Fabric U-values</b> <b>Element Average Highest</b> Etement 0.16 (max. 0.30) 0.18 (max. 0.70) 0 Party wall 0.00 (max. 0.20) - 0 Floor 0.16 (max. 0.25) 0.16 (max. 0.70) 0 Roof 0.11 (max. 0.20) 0.140 (max. 3.30) 0 <b>a Thermal bridging</b> <b>a Thermal bridging</b> calculated from linear thermal transmittances for each junction <b>Air permeability</b> Air permeability at 50 pascals Maximum 0.106 (rev 567, product index 0.166684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 % 0	lient Details:				
is report covers items included within the SAP calculations. is not a complete report of regulations compliance. <b>a TER and DER</b> lef for main heating system: Mains gas lef factor: 1.00 (mains gas) riget Carbon Dioxide Emission Rate (TER) <b>b TFEE and DFEE</b> riget Fabric Energy Efficiency (TFEE) velling Fabric Energy Efficiency (TFEE) <b>f Element</b> External wall 0.16 (max. 0.20) 0.18 (max. 0.70) Party wall 0.00 (max. 0.20) 0.18 (max. 0.70) 0.18 (max. 0.70) 0.18 (max. 0.70) 0.19 (max. 0.20) 0.19 (max. 0.20) 0.19 (max. 0.20) 0.10 (max. 0.20) 0.10 (max. 0.20) 0.11 (max. 0.25) 0.16 (max. 0.70) 0 co 0 penings 1.37 (max. 2.00) 1.40 (max. 3.30) 0 <b>co</b> <b>thremal bridging</b> Air permeability Air permeability at 50 pascals Maximum 10.0 <b>Co</b> <b>Heating efficiency</b> Main Heating system: Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	ame:	Jamie			
is not a complete report of regulations compliance. <b>a TER and DER</b> lef fort main heating system: Mains gas lef factor: 1.00 (mains gas) rrget Carbon Dioxide Emission Rate (TER) 18.66 kg/m <sup>2</sup> velling Carbon Dioxide Emission Rate (DER) 10.42 kg/m <sup>2</sup> <b>b TFEE and DFEE</b> rget Fabric Energy Efficiency (TFEE) 58.91 kWh/m <sup>2</sup> velling Fabric Energy Efficiency (DFEE) 49.48 kWh/m <sup>2</sup> <b>Fabric U-values</b> <b>E lement Average Highest</b> External wall 0.16 (max. 0.30) 0.18 (max. 0.70) 0 Party wall 0.00 (max. 0.20) - Floor 0.16 (max. 0.20) 0.18 (max. 0.70) 0 Qenings 1.37 (max. 2.00) 1.40 (max. 3.30) 0 <b>a Thermal bridging</b> <b>t repreability</b> Air permeability at 50 pascals 3.00 (design value) Maximum 10.0 <b>Heating efficiency</b> Main Heating system: Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model Qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 % 0	ldress :	Campbell, 43 Tar	nner Street, Greater London, Lo	ondon, SE13PL	
a TER and DER         lel for main heating system: Mains gas         lel for main heating system: Mains gas)         irget Carbon Dioxide Emission Rate (TER)       18.66 kg/m²         velling Carbon Dioxide Emission Rate (DER)       10.42 kg/m²         b TFEE and DFEE       58.91 kWh/m²         irget Fabric Energy Efficiency (TFEE)       58.91 kWh/m²         velling Carbon Dioxide Emission Rate (DER)       49.48 kWh/m²         Comparison of the term of t	•				
lel factor: 1.00 (main's gas) riget Carbon Dioxide Emission Rate (TER) 18.66 kg/m <sup>2</sup> velling Carbon Dioxide Emission Rate (DER) 10.42 kg/m <sup>2</sup> O <b>D FTEE and OFEE</b> riget Fabric Energy Efficiency (TFEE) 58.91 kWh/m <sup>2</sup> velling Fabric Energy Efficiency (DFEE) 49.48 kWh/m <sup>2</sup> <b>Fabric U-values</b> Element Average Highest External wall 0.16 (max. 0.30) 0.18 (max. 0.70) C Party wall 0.00 (max. 0.20) - Floor 0.16 (max. 0.25) 0.16 (max. 0.70) C Roof 0.111 (max. 0.25) 0.116 (max. 0.70) C Openings 1.37 (max. 2.00) 1.40 (max. 3.30) C <b>a Thermal bridging</b> Thermal bridging calculated from linear thermal transmittances for each junction <b>Air</b> permeability at 50 pascals 3.00 (design value) Maximum 10.0 C Heating efficiency Main Heating system: Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	-				
Irget Carbon Dioxide Emission Rate (TER) 18.66 kg/m <sup>2</sup> velling Carbon Dioxide Emission Rate (DER) 10.42 kg/m <sup>2</sup> C b TFEE and DFEE Irget Fabric Energy Efficiency (TFEE) 58.91 kWh/m <sup>2</sup> velling Fabric Energy Efficiency (DFEE) 49.48 kWh/m <sup>2</sup> Fabric U-values Element Average Highest External wall 0.16 (max. 0.30) 0.18 (max. 0.70) C Party wall 0.00 (max. 0.20) - Floor 0.16 (max. 0.25) 0.16 (max. 0.70) C Roof 0.111 (max. 0.20) 0.111 (max. 0.35) C Openings 1.37 (max. 2.00) 1.40 (max. 3.30) C a Thermal bridging calculated from linear thermal transmittances for each junction Air permeability at 50 pascals 3.00 (design value) 10.0 C Heating efficiency Main Heating system: Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %		• •	jas		
welling Carbon Dioxide Emission Rate (DER)       10.42 kg/m²       C         b TFEE and DFEE       58.91 kWh/m²       welling Fabric Energy Efficiency (DFEE)       49.48 kWh/m²         arget Fabric Energy Efficiency (DFEE)       49.48 kWh/m²       welling Fabric Energy Efficiency (DFEE)       average       Highest         C Fabric U-values		• •			
b TFEE and DFEE       58.91 kWh/m²         arget Fabric Energy Efficiency (DFEE)       49.48 kWh/m²         c       Fabric U-values         Element       Average       Highest         External wall       0.16 (max. 0.30)       0.18 (max. 0.70)       0         Party wall       0.00 (max. 0.20)       -       0         Floor       0.16 (max. 0.25)       0.16 (max. 0.70)       0         Roof       0.11 (max. 0.20)       0.11 (max. 0.35)       0         Openings       1.37 (max. 2.00)       1.40 (max. 3.30)       0         24 Thermal bridging       Thermal bridging calculated from linear thermal transmittances for each junction       3         Air permeability       3.00 (design value)       10.0       0         Heating efficiency       Database: (rev 367, product index 016684):       Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi)       Goiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi)       Goiler systems 80.0 %       Goiler Systems 80.0 %	-		. ,	-	ок
rrget Fabric Energy Efficiency (TFEE) velling Fabric Energy Efficiency (DFEE) Fabric U-values Element Average Highest External wall 0.16 (max. 0.30) 0.18 (max. 0.70) 0 Party wall 0.00 (max. 0.20) - Floor 0.16 (max. 0.25) 0.16 (max. 0.70) 0 Roof 0.11 (max. 0.25) 0.16 (max. 0.70) 0 Roof 0.11 (max. 0.20) 0.11 (max. 0.35) 0 Openings 1.37 (max. 2.00) 1.40 (max. 3.30) 0 a Thermal bridging Thermal bridging calculated from linear thermal transmittances for each junction Air permeability Air permeability at 50 pascals Maximum 10.0 0 Heating efficiency Main Heating system: Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	-		ale (DER)	10.42 kg/III-	UK
Verificiency (DFEE)       49.48 kWh/m²         Fabric U-values       Comparing the second secon			E)	58.91 kWh/m²	
Fabric U-values         Element       Average       Highest         External wall       0.16 (max. 0.30)       0.18 (max. 0.70)       0         Party wall       0.00 (max. 0.20)       -       0         Floor       0.16 (max. 0.25)       0.16 (max. 0.70)       0         Roof       0.11 (max. 0.20)       0.11 (max. 0.35)       0         Openings       1.37 (max. 2.00)       1.40 (max. 3.30)       0         a Thermal bridging       Thermal bridging calculated from linear thermal transmittances for each junction       Air permeability         Air permeability       3.00 (design value)       0.00       0         Heating efficiency       Database: (rev 367, product index 016684):       0       0         Main Heating system:       Database: (rev 367, product index 016684):       0       0         Boiler systems with radiators or underfloor heating - mains gas       Brand name: Baxi       Model: Neta-tec Combi       Model (combi)       Efficiency 89.0 % SEDBUK2009       0         Minimum 88.0 %       Minimum 88.0 %       D       0       0	-	•••			
ElementAverageHighestExternal wall0.16 (max. 0.30)0.18 (max. 0.70)0Party wall0.00 (max. 0.20)-0Floor0.16 (max. 0.25)0.16 (max. 0.70)0Roof0.11 (max. 0.20)0.11 (max. 0.35)0Openings1.37 (max. 2.00)1.40 (max. 3.30)0Ca Thermal bridging calculated from linear thermal transmittances for each junction0Air permeability3.00 (design value)10.0Air permeability at 50 pascals3.00 (design value)0Main Heating system:Database: (rev 367, product index 016684):aBoiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009mains gas Brand name: Baximains gas Brand name: Baxi Model qualifier: 24 GA (Combi) Bificiency 89.0 % SEDBUK2009mains gas Brand name: Baximains gas Brand name: Baxi					ОК
External wall0.16 (max. 0.30)0.18 (max. 0.70)0Party wall0.00 (max. 0.20)-Floor0.16 (max. 0.25)0.16 (max. 0.70)Roof0.11 (max. 0.20)0.11 (max. 0.35)Openings1.37 (max. 2.00)1.40 (max. 3.30)Ca Thermal bridging-Thermal bridging calculated from linear thermal transmittances for each junction8 Air permeabilityAir permeability at 50 pascals3.00 (design value) 10.0Maximum10.0Ca therating efficiencyMain Heating system:Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %					
Party wall       0.00 (max. 0.20)       -       C         Floor       0.16 (max. 0.25)       0.16 (max. 0.70)       C         Roof       0.11 (max. 0.20)       0.11 (max. 0.35)       C         Openings       1.37 (max. 2.00)       1.40 (max. 3.30)       C         2a Thermal bridging calculated from linear thermal transmittances for each junction       Air permeability         Air permeability       3.00 (design value)       10.0         Maximum       10.0       C         Heating efficiency       Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi       Model: Neta-tec Combi         Model: Neta-tec Combi       Model qualifier: 24 GA (Combi)       Efficiency 89.0 % SEDBUK2009       C         Minimum 88.0 %       C       C       C		-	-	-	01/
Floor0.16 (max. 0.25)0.16 (max. 0.70)0Roof0.11 (max. 0.20)0.11 (max. 0.35)0Openings1.37 (max. 2.00)1.40 (max. 3.30)0 <b>a Thermal bridging</b> Thermal bridging calculated from linear thermal transmittances for each junction <b>Air permeability</b> Air permeability at 50 pascals3.00 (design value) 10.0Maximum10.00 <b>Heating efficiency</b> Main Heating system:Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %O			. ,	0.18 (max. 0.70)	OK OK
Roof0.11 (max. 0.20)0.11 (max. 0.35)OOpenings1.37 (max. 2.00)1.40 (max. 3.30)OThermal bridging calculated from linear thermal transmittances for each junctionAir permeabilityAir permeability3.00 (design value) 10.0Maximum10.0Center of the second		.11	. ,	- 0.16 (max. 0.70)	OK
Openings1.37 (max. 2.00)1.40 (max. 3.30)OCa Thermal bridging Thermal bridging calculated from linear thermal transmittances for each junctionImage: Constraint of the state of the				, ,	OK
a Thermal bridging       Thermal bridging calculated from linear thermal transmittances for each junction         Air permeability       Air permeability at 50 pascals         Maximum       3.00 (design value)         Maximum       10.0         C       Heating efficiency         Main Heating system:       Database: (rev 367, product index 016684):         Boiler systems with radiators or underfloor heating - mains gas         Brand name: Baxi         Model: Neta-tec Combi         Model qualifier: 24 GA         (Combi)         Efficiency 89.0 % SEDBUK2009         Minimum 88.0 %		S	. ,	· · · · · · · · · · · · · · · · · · ·	OK
Air permeability       Air permeability at 50 pascals       3.00 (design value)         Maximum       10.0       0         Heating efficiency       0       0         Main Heating system:       Database: (rev 367, product index 016684):       0         Boiler systems with radiators or underfloor heating - mains gas       0       0         Boiler systems with radiators or underfloor heating - mains gas       0       0         Model: Neta-tec Combi       Model qualifier: 24 GA       0       0         Boiler Systems 89.0 % SEDBUK2009       0       0       0	, ,				
Air permeability at 50 pascals Maximum       3.00 (design value) 10.0       0         Heating efficiency       0         Main Heating system:       Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %       0			from linear thermal transmittan	ces for each junction	
Maximum10.0CHeating efficiencyDatabase: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %C	-				
Main Heating system:Database: (rev 367, product index 016684): Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %Combi Comb	Air bermea	bility at 50 pascals		· • • ,	ок
Boiler systems with radiators or underfloor heating - mains gas Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	•				
Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	Maximum	ency			
Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	Maximum Heating efficie		Database: (rev 367, produc	t index 016684):	
Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	Maximum Heating efficie		Boiler systems with radiator		
(Combi) Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	Maximum Heating efficie		Boiler systems with radiator Brand name: Baxi		
Efficiency 89.0 % SEDBUK2009 Minimum 88.0 %	Maximum Heating efficie		Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi		
Minimum 88.0 %	Maximum Heating efficie		Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA		
	Maximum Heating efficie		Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi)	s or underfloor heating - mains gas	
Secondary heating system: None	Maximum Heating efficie		Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK:	s or underfloor heating - mains gas	
	Maximum Heating efficie		Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK:	s or underfloor heating - mains gas	ок

# **Regulations Compliance Report**

5 Cylinder insulation			
Hot water Storage:	Nominal cylinder loss: 0.0	-	
Primary pinawark insulated	Permitted by DBSCG: 2.1 Yes	u kwn/day	ОК
Primary pipework insulated: 6 Controls	res		UK
0 Controis			
Space heating controls	Programmer, room therm	ostat and TRVs	ок
Hot water controls:	Cylinderstat		OK
	Independent timer for DH	W	OK
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights wit	h low-energy fittings	100.0%	
Minimum		75.0%	ОК
8 Mechanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:	2	0.42	
Maximum		1.5	OK
MVHR efficiency:		91%	
Minimum		70%	OK
9 Summertime temperature			
Overheating risk (Thames va	illey):	Medium	ОК
Based on:			
Overshading:		Average or unknown	
Windows facing: South		17.72m²,	
Windows facing: South		9.97m²,	
Windows facing: West		4.01m²,	
Roof windows facing: South		0.89m²	
Ventilation rate:		2.50	
Blinds/curtains:		Dark-coloured curtain or ro	oller blind
		Closed 100% of daylight h	ours
10 Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1 W/m²K	
Deefe I Lyclue		$0.11 M/m^{2}$	

Roofs U-value Photovoltaic array 0.11 W/m<sup>2</sup>K

Droporty	1 Dotaile	11nit 202	
FIUDELL	v Detalis.		
Property	y Details:		

Property Details: U	nit 202					
Address:						
Located in:		England				
Region:		Thames valley				
UPRN:						
Date of assessm	ent.	29 October 2014				
Date of certifica		28 November 2014				
Assessment type		New dwelling design stage	;			
Transaction type	9:	New dwelling				
Tenure type:		Unknown				
Related party di		No related party				
Thermal Mass Pa	arameter:	Indicative Value Medium				
Water use <= 1	25 litres/person/da	ay: True				
PCDF Version:		367				
Property description	n:					
Dwelling type:		Flat				
Detachment:						
		2014				
Year Completed:						
Floor Location:		Floor area:		Storey height	:	
Floor 0		56.32 m <sup>2</sup>		2.7 m		
Floor 1		40.86 m <sup>2</sup>		3.37 m		
Living area:		40.86 m <sup>2</sup> (fraction 0.448)				
Front of dwelling f	aces:	West				
C C	4005.					
Opening types:						
Name:	Source:	Туре:	Glazing:		Argon:	Frame:
Main door	Manufacturer	Solid	0		C	PVC-U
South window	Manufacturer	Windows	low-E. En =	0.05, soft coat	Yes	PVC-U
East window	Manufacturer	Windows		0.05, soft coat	Yes	PVC-U
West window	Manufacturer	Windows		0.05, soft coat	Yes	PVC-U
south roof light	Manufacturer	Roof Windows		0.05, soft coat	Yes	PVC-U
south root light		Roof Windows	1000-L, LII –	0.00, 3011 0001	103	1 00-0
Name:	Gap:	Frame Factor	: g-value:	U-value:	Area:	No. of Openings:
Main door	mm	0.7	0	1	2.35	1
South window		0.7	0.63	1.4	17.72	1
East window	16mm or more	0.7	0.63	1.4	9.97	1
West window		0.7	0.63	1.4	4.01	1
south roof light	16mm or more	0.7	0.63	1.3	0.89	1
south root light		0.7	0.00	1.0	0.07	
Name:	Type-Name:	Location:	Orient:		Width:	Height:
Main door	rype nume.	sheltered wall	West		0	0
South window		External wall	South		0	0
East window		External wall	South		0	0
West window		External wall				
			West		0	0
south roof light		Sloping roof	South		0	0
Quarchading		Average or unknown				
Overshading:						
Opaque Elements:						
_	Cross grass Open	Not area	U-value:	Ru value:	Curtain	wall: Kappa:
Туре:	Gross area: Oper	nings: Net area:	U-value.	Ru value.	Curtai	ινναπ. καρρα.

J							
External Elements	<u>s</u>						
External wall	125.08	31.7	93.38	0.16	0	False	N/A
sheltered wall	20.98	2.35	18.63	0.18	0.43	False	N/A
Sloping roof	40.6	0.89	39.71	0.11	0		N/A
terrace roof	28.54	0	28.54	0.11	0		N/A

exposed floor	13.08	0.16	N/A
Internal Elements			
Party Elements			
Party walls	28.96		N/A
Party floor	56.32		N/A

#### Thermal bridges:

Thermal bridges:	User-define	User-defined (individual PSI-values) Y-Value = 0.0883						
3	Length	Psi-value						
	16.13	0.401	E1	Steel lintel with perforated steel base plate				
	1.8	0.027	E3	Sill				
	24.62	0.021	E4	Jamb				
	13.45	0	E20	Exposed floor (normal)				
	19.99	0.14	E6	Intermediate floor within a dwelling				
	0	0.001	E7	Party floor between dwellings (in blocks of flats)				
	47.9	0.08	E14	Flat roof				
	16.09	0.048	E16	Corner (normal)				
	10.8	0.055	E18	Party wall between dwellings				
	8.67	0.32	E21	Exposed floor (inverted)				
	7.33	0.32	E20	Exposed floor (normal)				
	6.47	0	P2	Intermediate floor within a dwelling				
	10.73	0	P3	Intermediate floor between dwellings (in blocks of flats)				

Ventilation:	
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 0 3 3
Main heating system:	
Main heating system:	Boiler systems with radiators or underfloor heating Gas boilers and oil boilers Fuel: mains gas Info Source: Boiler Database Database: (rev 367, product index 016684) Efficiency: Winter 87.3 % Summer: 89.9 Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi boiler) Systems with radiators Central heating pump : 2013 or later Design flow temperature: Design flow temperature >45°C Room-sealed Boiler interlock: Yes Delayed start
Main heating Control:	
Main heating Control:	Programmer, room thermostat and TRVs Control code: 2106
Secondary heating system:	
Secondary heating system:	None

Water heating:	
Water heating:	From main heating system Water code: 901 Fuel :mains gas Hot water cylinder Cylinder volume: 180 litres Cylinder insulation: Factory 75 mm Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Flue Gas Heat Recovery System: Database (rev 367, product index 060001) Brand name: Zenex Model: GasSaver SMarl plaquet liffetseGS-1
Others:	
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: 0.9 Tilt of collector: Horizontal Overshading: None or very little Collector Orientation: South
Assess Zero Carbon Home:	No

				User D	etails:						
Assessor Name:	sessor Name: Aymon Winter Stroma Number: STRO						0014511				
Software Name:	Stroma FS		2		Softwa				Versic	on: 1.0.1.14	
			P	roperty <i>i</i>	Address:	Unit 20	2				
Address :											
1. Overall dwelling dimer	nsions:										
				Area	a(m²)		Av. Hei	ght(m)		Volume(m <sup>3</sup> )	_
Ground floor				5	6.32	(1a) x	2	.7	(2a) =	152.06	(3a)
First floor				4	0.86	(1b) x	3.	37	(2b) =	137.7	(3b)
Total floor area TFA = (1a	)+(1b)+(1c)+	(1d)+(1e)-	+(1n	) 9	7.18	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	289.76	(5)
2. Ventilation rate:											
	main heating		condar ating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	+	0	+	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0	¯ +	0	<u> </u> + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	IS					- F	0	<b>x</b> 1	0 =	0	(7a)
Number of passive vents							0	<b>x</b> 1	0 =	0	(7b)
Number of flueless gas fir	es					Γ	0	x 4	40 =	0	(7c)
											_
									Air ch	anges per ho	ur
Infiltration due to chimney	-						0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in th			l, proceed	1 to (17), d	otherwise d	continue fr	om (9) to (	16)		0	(9)
Additional infiltration	e dwennig (na	<i>&gt;)</i>						[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel o	timber fr	ame or	0.35 foi	masonr	v constr	uction	[(0)	110.1 -	0	(10) (11)
if both types of wall are pre										0	
deducting areas of opening					N I						-
If suspended wooden fl		•	d) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente			nnad							0	(13)
Percentage of windows Window infiltration	and doors dr	augnt stri	ppea		0.25 - [0.2	$\mathbf{x}(14) \div 1$	001 -			0	(14)
Infiltration rate							2) + (13) +	- (15) =		0	(15)
Air permeability value, o	150 AVDRASSA	d in cubic	- motro				· · · ·		area	0	(16) (17)
If based on air permeabilit					•	•		inelope	alea	3	(17)
Air permeability value applies							is being us	sed		0.15	
Number of sides sheltered					,	,	<b>j</b>			3	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporati	ng shelter fac	tor			(21) = (18)	) x (20) =				0.12	(21)
Infiltration rate modified for	r monthly wir	nd speed									
Jan Feb I	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Tabl	e 7									
(22)m= 5.1 5 4	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (22	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
Adjuste	ed infiltra	tion rat	e (allowi	ng for sh	nelter ar	nd wind s	speed) =	: (21a) x	(22a)m				-	
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
	ate effect		-	rate for t	he appli	cable ca	se	-					- 	(23a)
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) ×							equation (	N5)) . othe	rwise (23b	) = (23a)			0.5	
If balanced with heat recovery: efficiency in % allowing for														
	balanced		-	-	-					2h)m + (	23b) <b>x</b> [ <sup>,</sup>	1 – (23c)	77.3 - 1001	3 (200)
(24a)m=	r	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	]	(24a)
b) If	balanced	d mecha	anical ve	ntilation	without	heat rec	covery (I	u MV) (24b	)m = (22	2b)m + (	23b)	1	1	
(24b)m=		0	0	0	0	0	0	0	0	0	0	0	]	(24b)
,	whole ho if (22b)m				•	•				.5 × (23t	) ))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(24c)
,	natural v if (22b)m									0.5]			_	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air o	change	rate - er	nter (24a	) or (24	o) or (24	c) or (24	ld) in boy	(25)					
(25)m=	0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. He	at losses	and he	eat loss p	paramete	er:									
ELEN	IENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²⊷		A X k kJ/K
	IENT	Gros	SS	Openin	gs		n²				K)			
ELEN Doors	<b>IENT</b> ws Type	Gros area	SS	Openin	gs	A ,r	m <sup>2</sup>	W/m2	K	(W/	K)			kJ/K
ELEN Doors Windo		Gros area	SS	Openin	gs	A ,r 2.35	m <sup>2</sup> x 2 x <sup>1</sup>	W/m2	K = 0.04] =	(W/ 2.35	K)			kJ/K (26)
ELEN Doors Windov Windov	ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.35	m <sup>2</sup> x 2 x <sup>1</sup>	W/m2	K 0.04] = 0.04] =	(W/ 2.35 23.49	K)			kJ/K (26) (27)
ELEN Doors Windov Windov	ws Type ws Type ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.35 17.72 9.97	m <sup>2</sup> x 2 x <sup>1</sup> x <sup>1</sup>	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/ 2.35 23.49 13.22	K)			kJ/K (26) (27) (27)
ELEN Doors Windov Windov Windov Rooflig	ws Type ws Type ws Type	Gros area 1 2	SS	Openin	gs	A ,r 2.35 17.72 9.97 4.01	m <sup>2</sup> x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup>	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	K 0.04] = 0.04] = 0.04] =	(W/ 2.35 23.49 13.22 5.32				kJ/K (26) (27) (27) (27)
ELEN Doors Windo Windo Windo Rooflig Floor	ws Type ws Type ws Type ghts	Gros area 1 2	ss (m²)	Openin	gs 12	A ,r 2.35 17.72 9.97 4.01 0.89	m <sup>2</sup> x 2 x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>1</sup> x <sup>2</sup>	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.3 )+	K 0.04] =   0.04] =   0.04] =   0.04] =	(W/ 2.35 23.49 13.22 5.32 1.157				kJ/K (26) (27) (27) (27) (27b)
ELEN Doors Windo Windo Windo Rooflig Floor Walls	ws Type ws Type ws Type ghts Type1	Gros area 1 2 3	ss (m <sup>2</sup> )	Openin m	gs <sup>2</sup>	A ,r 2.35 17.72 9.97 4.01 0.89 13.08	m <sup>2</sup> x x1 2 x1 x1 x1 x1 x1 x3 x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.3) + 0.16	K 0.04] =   0.04] =   0.04] =   0.04] =   0.04] =	(W/ 2.35 23.49 13.22 5.32 1.157 2.0928				kJ/K (26) (27) (27) (27) (27b) (28)
ELEN Doors Windov Windov Rooflig Floor Walls	ws Type ws Type ws Type ghts Type1 Type2	Gros area 1 2 3	08 08	Openin m	gs 1 <sup>2</sup>	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38	m <sup>2</sup> x x1 2 x1 x1 x1 x1 x1 x1 x3 x 3 x 3 x x 3 x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.3) + 0.16 0.16	K 0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =   =	(W/ 2.35 23.49 13.22 5.32 1.157 2.0928 14.94				kJ/K (26) (27) (27) (27) (27b) (28) (29)
ELEN Doors Windov Windov Rooflig Floor Walls <sup>-</sup> Roof 1	ws Type ws Type ws Type ghts Type1 Type2 Type1	Gros area 1 2 3 125.1 20.9	55 (m <sup>2</sup> ) 08 6	Openin m 31.7 2.35	gs 1 <sup>2</sup>	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38 18.63	m <sup>2</sup> x x x x x x x x x x x x x x x x x x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.3 ) + 0.16 0.16 0.17	K 0.04] =   0.04] =   0.04] =   0.04] =   =   =   =	(W/ 2.35 23.49 13.22 5.32 1.157 2.0928 14.94 3.11				kJ/K (26) (27) (27) (27) (27b) (28) (29) (29)
ELEN Doors Windo Windo Windo Rooflig Floor Walls <sup>-</sup> Roof 1 Roof 1	ws Type ws Type ws Type ghts Type1 Type2 Type1	Gros area 1 2 3 125.1 20.9 40.1 28.5	08 6 6 14	Openin m 31.7 2.35 0.89	gs 1 <sup>2</sup>	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38 93.38 18.63 39.71	m <sup>2</sup> x 1 x1	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.3 ) + 0.16 0.16 0.17 0.11	K 0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   =	(W// 2.35 23.49 13.22 5.32 1.157 2.0928 14.94 3.11 4.37				kJ/K (26) (27) (27) (27) (27b) (28) (29) (29) (30)
ELEN Doors Windov Windov Rooflig Floor Walls <sup>-</sup> Walls <sup>-</sup> Roof <sup>-</sup> Roof <sup>-</sup> Total a	ws Type ws Type ws Type ghts Type1 Type2 Type2 Type2 urea of ele	Gros area 1 2 3 125.1 20.9 40.1 28.5	08 6 6 14	Openin m 31.7 2.35 0.89	gs 1 <sup>2</sup>	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38 93.38 18.63 39.71 28.54	n <sup>2</sup> x x1 2 x1 x1 x1 3 x 3 x 3 x 3 x 4 x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.3 ) + 0.16 0.16 0.17 0.11	K 0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   =	(W// 2.35 23.49 13.22 5.32 1.157 2.0928 14.94 3.11 4.37				kJ/K (26) (27) (27) (27b) (27b) (28) (29) (29) (30) (30)
ELEN Doors Windov Windov Rooflig Floor Walls <sup>-</sup> Roof 1 Roof 1 Roof 1 Total a Party v	ws Type ws Type ws Type ghts Type1 Type2 Type2 area of ele wall	Gros area 1 2 3 125.1 20.9 40.1 28.5	08 6 6 14	Openin m 31.7 2.35 0.89	gs 1 <sup>2</sup>	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38 18.63 39.71 28.54 228.2	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/(1.3) + 0.16 0.16 0.17 0.11 0.11	K 0.04] =   0.04] =   0.04] =   0.04] =   =   =   =   =   =	(W// 2.35 23.49 13.22 5.32 1.157 2.0928 14.94 3.11 4.37 3.14				kJ/K (26) (27) (27) (27b) (27b) (28) (29) (29) (30) (30) (31)
ELEN Doors Windov Windov Rooflig Floor Walls <sup>-</sup> Roof 1 Roof 1 Roof 1 Total a Party v Party f * for win	ws Type ws Type ws Type ghts Type1 Type2 Type2 area of ele wall	Gross area 1 2 3 125.0 20.9 20.9 20.9 20.9 20.9 20.9 20.9 20	08 18 6 14 , m <sup>2</sup> ows, use e	Openin           m           31.7           2.35           0.89           0           ffective with	gs 2 9	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38 18.63 39.71 28.54 228.2 28.96 56.32 alue calcul	m <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.3 ) + 0.16 0.16 0.17 0.11 0.11 0.11	$\begin{array}{c} K \\ \hline 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ \end{bmatrix}$	(W// 2.35 23.49 13.22 5.32 1.157 2.0928 14.94 3.11 4.37 3.14		kJ/m²-		kJ/K (26) (27) (27) (27b) (27b
ELEN Doors Windov Windov Rooflig Floor Walls <sup>-</sup> Walls <sup>-</sup> Roof <sup>-</sup> Roof <sup>-</sup> Total a Party v Party fl * for win ** includ	ws Type ws Type ws Type ghts Type1 Type2 Type2 area of elo vall loor dows and r	Gross area 1 2 3 125.1 20.9 20.9 20.9 20.9 20.9 20.9 20.9 20.9	08 (m <sup>2</sup> ) 08 6 6 6 7 7 8 6 7 7 8 7 8 8 6 7 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9	Openin m 31.7 2.35 0.89 0 0	gs 2 9	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38 18.63 39.71 28.54 228.2 28.96 56.32 alue calcul	m <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.3 ) + 0.16 0.16 0.17 0.11 0.11 0.11	$\begin{array}{c} K \\ \hline 0.04 \end{bmatrix} = \\ 0.04 \end{bmatrix}$	(W// 2.35 23.49 13.22 5.32 1.157 2.0928 14.94 3.11 4.37 3.14		kJ/m²-		kJ/K (26) (27) (27) (27b) (27b) (27b) (28) (29) (29) (30) (31) (31) (32) (32a)
ELEN Doors Windov Windov Rooflig Floor Walls <sup>-</sup> Walls <sup>-</sup> Roof <sup>-</sup> Roof <sup>-</sup> Roof <sup>-</sup> Total a Party v Party f * for win ** includ Fabric	ws Type ws Type ws Type ghts Type1 Type2 Type2 area of ele vall loor dows and r le the areas	Gross area 1 2 3 125.0 20.9 20.9 20.9 20.9 20.9 20.9 20.9 20	08 08 08 08 08 08 08 08 08 08	Openin m 31.7 2.35 0.89 0 0	gs 2 9	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38 18.63 39.71 28.54 228.2 28.96 56.32 alue calcul	m <sup>2</sup> x x x x x x x x x x x x x x x x x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.3 ) + 0.16 0.16 0.17 0.11 0.11 0.11 0 0 g formula 1	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \\ = \\ \hline \\ = \\ \end{bmatrix} = \\ 1 \\ = \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\$	(W// 2.35 23.49 13.22 5.32 1.157 2.0928 14.94 3.11 4.37 3.14		kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b
ELEN Doors Windo Windo Windo Rooflig Floor Walls <sup>-</sup> Roof 1 Roof 1 Roof 1 Total a Party v Party f * for win ** includ Fabric Heat c	ws Type ws Type ws Type ghts Type1 Type2 Type2 rea of ele vall loor dows and r le the areas heat loss	Gross area 1 2 3 125.1 20.9 40.1 28.5 ements roof windows s on both s, W/K = Cm = S(	08 08 08 08 08 08 08 08 08 08	Openin m 31.7 2.35 0.89 0 ffective wi aternal walk U)	gs <sub>12</sub>	A ,r 2.35 17.72 9.97 4.01 0.89 13.08 93.38 18.63 39.71 28.54 228.2 28.96 56.32 alue calculations	m <sup>2</sup> x x1 x1 x1 x1 x1 x1 x2 x x x x x x x x x x	W/m2 1 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.3 ) + 0.16 0.16 0.17 0.11 0.11 0.11 0 0 g formula 1	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \\ = \\ 0.0$	(W// 2.35 23.49 13.22 5.32 1.157 2.0928 14.94 3.11 4.37 3.14 0		kJ/m²-	K	kJ/K (26) (27) (27) (27b) (27b) (27b) (27b) (28) (29) (29) (30) (30) (31) (32) (32) (32a) (32a) (333) (35) (34)

can be i	used inste	ad of a de	tailed calc	ulation.										
Thermal bridges : S (L x Y) calculated using Appendix K											20.15	(36)		
if details	of therma	al bridging	are not kr	own (36) =	= 0.15 x (3	1)								
Total fabric heat loss (33) + (36) =											93.28	(37)		
Ventila	ation 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=	25	24.72	24.45	23.06	22.78	21.39	21.39	21.11	21.95	22.78	23.33	23.89		(38)
Heat t	eat transfer coefficient, W/K (39)m = (37) + (38)m													
(39)m=	118.28	118	117.73	116.34	116.06	114.67	114.67	114.39	115.23	116.06	116.62	117.17		
Average = Sum(39) 112 /12=Heat loss parameter (HLP), W/m²K $(40)m = (39)m \div (4)$											116.27	(39)		
(40)m=	1.22	1.21	1.21	1.2	1.19	1.18	1.18	1.18	1.19	1.19	1.2	1.21		
Numb	$Average = Sum(40)_{112} / 12=$ mber of days in month (Table 1a)										12 /12=	1.2	(40)	
	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)
A \\/	tor hoo	ting ono		irement:								kWh/ye	oor:	
4. 000	aler nea	ung ene	igy iequ	nement.								K V 11/ y 0	5ai.	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		71		(42)
Annua	l averag	je hot wa						(25 x N)				.61		(43)
		-		usage by : r day (all w		-	-	to achieve	a water us	se target o	ť			
			<u> </u>		i		·		0			Du		
Hot wat	Jan er usage i	Feb	Mar	Apr ach month	May	Jun	Jul	Aug (43)	Sep	Oct	Nov	Dec		
			-						00.00	400.50	404.50	400.47	l	
(44)m=	108.47	104.52	100.58	96.63	92.69	88.75	88.75	92.69	96.63	100.58	104.52	108.47	4400.07	
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	0Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1183.27	(44)
(45)m=	160.85	140.68	145.17	126.56	121.44	104.8	97.11	111.43	112.76	131.42	143.45	155.78		_
lf instan	taneous v	vater heati	ng at point	of use (no	o hot water	· storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1551.46	(45)
(46)m=	24.13	21.1	21.78	18.98	18.22	15.72	14.57	16.71	16.91	19.71	21.52	23.37		(46)
Water	storage	loss:												
Storag	e volum	e (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
		-		nk in dw	-			. ,						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage nanufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature factor from Table 2b											0		(49)	
Energy lost from water storage, kWh/year $(48) \times (49) = 0$												(50)		
b) If manufacturer's declared cylinder loss factor is not known:										-				
		-	factor fi	om Tabl on 4.3	e 2 (kW	h/litre/da	ay)					0		(51)
	•	from Ta										0		(52)
Temperature factor from Table 2b											(53)			

•••		om water (54) in (5	-	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54) (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 cylinde	er contains	s dedicate	d solar sto	<b>1</b> rage, (57)i	n = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	1 7)m = (56)	n where (	H11) is fro	m Append	l lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	3							0		(58)
	•	•	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	ter heatir	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=	21.95	19.82	21.95	21.24	21.95	21.24	21.95	21.95	21.24	21.95	21.24	21.95		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	' (59)m + (61)m	
(62)m=	182.8	160.51	167.12	147.8	143.39	126.03	119.05	133.38	134	153.36	164.69	177.72		(62)
Solar Dł	-IW input of	calculated	using App	endix G oı	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 \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	44.27	32.66	27.5	17.77	13.56	10.64	9.92	11.25	11.37	18.52	32.35	45.5		(63) (G2)
Output	from w	ater hea	ter											
(64)m=	138.53	127.85	139.61	130.04	129.83	115.39	109.14	122.13	122.63	134.84	132.34	132.22		_
		-		-	-			Outp	out from wa	ater heate	r (annual)₁	12	1534.55	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m	]	
(65)m=	58.97	51.73	53.76	47.39	45.87	40.15	37.77	42.54	42.8	49.18	53.01	57.28		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	Table 5	and 5a	):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	162.71	162.71	162.71	162.71	162.71	162.71	162.71	162.71	162.71	162.71	162.71	162.71		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see <sup>-</sup>	Table 5					
(67)m=	56.1	49.82	40.52	30.68	22.93	19.36	20.92	27.19	36.49	46.34	54.08	57.65		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1:	3a), alsc	see Ta	ble 5				
(68)m=	375.65	379.55	369.73	348.81	322.42	297.61	281.03	277.13	286.96	307.87	334.27	359.08		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m=	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98	53.98		(69)
Pumps	and fai	ns gains	(Table &	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
		-108.47	· •	-108.47	-108.47	, 1	-108.47	-108.47	-108.47	-108.47	-108.47	-108.47		(71)
Water	heating	gains (T	able 5)										I	
(72)m=	79.26	76.98	72.25	65.82	61.65	55.77	50.77	57.17	59.45	66.1	73.62	76.99		(72)
Total i	nternal	gains =				(66)	m + (67)m	• • + (68)m +	• ⊦ (69)m + (	l (70)m + (7	1)m + (72)	m	I	
(73)m=	622.23	617.58	593.72	556.53	518.21	483.95	463.94	472.72	494.12	531.53	573.19	604.94		(73)
		I	l	I	I	I		I	I	I	I		I	

#### 6. Solar gains:

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

-		Access Facto		Area m <sup>2</sup>	a and	Flux Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
South	0.9x	0.77	x	17.72	x	46.75	×	0.63	×	0.7	=	253.18	(78)
South	0.9x	0.77	x	9.97	x	46.75	×	0.63	×	0.7	=	142.45	(78)
South	0.9x	0.77	x	17.72	x	76.57	x	0.63	x	0.7	=	414.65	(78)
South	0.9x	0.77	x	9.97	x	76.57	×	0.63	x	0.7	=	233.3	(78)
South	0.9x	0.77	x	17.72	x	97.53	x	0.63	x	0.7	=	528.19	(78)
South	0.9x	0.77	x	9.97	x	97.53	×	0.63	x	0.7	=	297.18	(78)
South	0.9x	0.77	x	17.72	x	110.23	×	0.63	x	0.7	=	596.97	(78)
South	0.9x	0.77	x	9.97	x	110.23	×	0.63	x	0.7	=	335.88	(78)
South	0.9x	0.77	x	17.72	x	114.87	×	0.63	×	0.7	=	622.08	(78)
South	0.9x	0.77	x	9.97	x	114.87	x	0.63	x	0.7	=	350.01	(78)
South	0.9x	0.77	x	17.72	x	110.55	x	0.63	x	0.7	=	598.67	(78)
South	0.9x	0.77	x	9.97	x	110.55	x	0.63	x	0.7	=	336.83	(78)
South	0.9x	0.77	x	17.72	x	108.01	×	0.63	x	0.7	=	584.93	(78)
South	0.9x	0.77	x	9.97	x	108.01	x	0.63	x	0.7	=	329.11	(78)
South	0.9x	0.77	x	17.72	x	104.89	×	0.63	x	0.7	=	568.05	(78)
South	0.9x	0.77	x	9.97	x	104.89	×	0.63	x	0.7	=	319.61	(78)
South	0.9x	0.77	x	17.72	x	101.89	×	0.63	x	0.7	=	551.76	(78)
South	0.9x	0.77	x	9.97	x	101.89	×	0.63	x	0.7	=	310.44	(78)
South	0.9x	0.77	x	17.72	x	82.59	x	0.63	x	0.7	=	447.24	(78)
South	0.9x	0.77	x	9.97	x	82.59	×	0.63	x	0.7	=	251.64	(78)
South	0.9x	0.77	x	17.72	x	55.42	×	0.63	x	0.7	=	300.11	(78)
South	0.9x	0.77	x	9.97	x	55.42	×	0.63	x	0.7	=	168.85	(78)
South	0.9x	0.77	x	17.72	x	40.4	X	0.63	x	0.7	=	218.77	(78)
South	0.9x	0.77	x	9.97	x	40.4	x	0.63	x	0.7	=	123.09	(78)
West	0.9x	0.77	x	4.01	x	19.64	x	0.63	x	0.7	=	24.07	(80)
West	0.9x	0.77	x	4.01	x	38.42	x	0.63	x	0.7	=	47.08	(80)
West	0.9x	0.77	x	4.01	x	63.27	x	0.63	x	0.7	=	77.54	(80)
West	0.9x	0.77	x	4.01	x	92.28	x	0.63	x	0.7	=	113.09	(80)
West	0.9x	0.77	x	4.01	x	113.09	X	0.63	x	0.7	=	138.6	(80)
West	0.9x	0.77	x	4.01	x	115.77	x	0.63	x	0.7	=	141.88	(80)
West	0.9x	0.77	x	4.01	x	110.22	x	0.63	x	0.7	=	135.07	(80)
West	0.9x	0.77	x	4.01	x	94.68	x	0.63	x	0.7	=	116.03	(80)
West	0.9x	0.77	x	4.01	x	73.59	x	0.63	x	0.7	=	90.18	(80)
West	0.9x	0.77	x	4.01	x	45.59	×	0.63	×	0.7	=	55.87	(80)
West	0.9x	0.77	x	4.01	x	24.49	×	0.63	×	0.7	=	30.01	(80)
West	0.9x	0.77	x	4.01	x	16.15	×	0.63	x	0.7	=	19.79	(80)

Rooflig														
	hts 0.9x	1	×	0.8	9	X	32.08	x	0.63	x	0.7	=	11.33	(82)
Rooflig	hts 0.9x	1	×	0.8	9	x	63.31	) x [	0.63	x	0.7	=	22.36	(82)
Rooflig	hts 0.9x	1	x	0.8	9	<b>x</b>	106.14	) × [	0.63	×	0.7	=	37.49	(82)
Rooflig	hts 0.9x	1	x	0.8	9	<b>x</b>	158.54	) × [	0.63	×	0.7	=	56	(82)
Rooflig	hts 0.9x	1	x	0.8	9	<b>x</b>	198.12	) × [	0.63	×	0.7	=	69.98	(82)
Rooflig	hts 0.9x	1	x	0.8	9	x 2	204.62	) × [	0.63	×	0.7	=	72.28	(82)
Rooflig	hts 0.9x	1	x	0.8	9	<b>x</b>	194.06	) × [	0.63	×	0.7	=	68.55	(82)
Rooflig	hts 0.9x	1	x	0.8	9	<b>x</b>	164.05	) × [	0.63	×	0.7	=	57.95	(82)
Rooflig	hts 0.9x	1	x	0.8	9	x	124.6	×	0.63	x	0.7	=	44.01	(82)
Rooflig	hts 0.9x	1	x	0.8	9	x	75.57	) × [	0.63	×	0.7	=	26.69	(82)
Rooflig	hts 0.9x	1	x	0.8	9	x	40.09	) × [	0.63	×	0.7	=	14.16	(82)
Rooflig	hts 0.9x	1	x	0.8	9	x	26.33	×	0.63	x	0.7	=	9.3	(82)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m														
(83)m=	431.04	717.4	940.41	1101.94	1180.67	1149.66	1117.67	1061.0	64 996.4	781.44	513.14	370.96		(83)
Total g	ains – int	ternal a	nd solar	(84)m =	= (73)m ·	+ (83)m	, watts				•			
(84)m=	1053.26	1334.97	1534.13	1658.48	1698.88	1633.62	1581.61	1534.3	35 1490.52	1312.97	7 1086.32	975.9		(84)
7. Me	an intern	al temp	erature	(heating	season	)	•		· ·				-	
	erature d			`		,	from Tab	ole 9, <sup>-</sup>	Гh1 (°С)				21	(85)
•	ation facto	-	• •			-		,	( )					
0 till 0 t	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m=	0.98	0.94	0.87	0.76	0.61	0.44	0.32	0.34		0.79	0.95	0.98		(86)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $														
iviean	Intornal							7 i.e. T.e						
	i	<u> </u>			· · ·	i	i	<b></b>		20.84	20.43	20.03	1	(87)
(87)m=	20.1	20.38	20.64	20.85	20.96	20.99	21	21	20.98	20.84	20.43	20.03	]	(87)
(87)m= Temp	20.1 erature d	20.38 Juring h	<sup>20.64</sup> eating p	20.85 eriods ir	20.96	20.99 dwelling	21 g from Ta	21 able 9,	20.98 Th2 (°C)	I	- <b>I</b>	I	]	
(87)m=	20.1	20.38	20.64	20.85	20.96	20.99	21	21	20.98 Th2 (°C)	20.84	20.43	20.03 19.92	]	(87) (88)
(87)m= Temp (88)m=	20.1 erature d	20.38 Juring h 19.91	20.64 eating p 19.91	20.85 eriods ir 19.92	20.96 n rest of 19.92	20.99 dwelling 19.94	21 g from Ta 19.94	21 able 9, 19.94	20.98 Th2 (°C)	I	- <b>I</b>	I	]	
(87)m= Temp (88)m=	20.1 erature d 19.91	20.38 Juring h 19.91	20.64 eating p 19.91	20.85 eriods ir 19.92	20.96 n rest of 19.92	20.99 dwelling 19.94	21 g from Ta 19.94	21 able 9, 19.94	20.98 Th2 (°C)	I	- <b>I</b>	I	] ] ]	
(87)m= Temp (88)m= Utilisa (89)m=	20.1 eerature d 19.91 ation facto	20.38 during h 19.91 or for ga 0.92	20.64 eating p 19.91 ains for 1 0.84	20.85 eriods ir 19.92 rest of d 0.71	20.96 n rest of 19.92 welling, 0.55	20.99 dwelling 19.94 h2,m (s 0.37	21 g from Ta 19.94 ee Table 0.24	21 able 9, 19.94 9a) 0.26	20.98 Th2 (°C) 4 19.93 0.45	19.92 0.74	19.92	19.92	] ]	(88)
(87)m= Temp (88)m= Utilisa (89)m=	20.1 eerature d 19.91 ation facto	20.38 during h 19.91 or for ga 0.92	20.64 eating p 19.91 ains for 1 0.84	20.85 eriods ir 19.92 rest of d 0.71	20.96 n rest of 19.92 welling, 0.55	20.99 dwelling 19.94 h2,m (s 0.37	21 g from Ta 19.94 ee Table 0.24	21 able 9, 19.94 9a) 0.26	20.98 Th2 (°C) 19.93 0.45 o 7 in Tabl	19.92 0.74	19.92	19.92	] ] ]	(88)
(87)m= Temp (88)m= Utilisa (89)m= Mean	20.1 eerature d 19.91 ation facto 0.97 internal f	20.38 during h 19.91 or for ga 0.92 tempera	20.64 eating p 19.91 ains for r 0.84 ature in	20.85 eriods ir 19.92 rest of d 0.71 the rest	20.96 n rest of 19.92 welling, 0.55 of dwelli	20.99 dwelling 19.94 h2,m (s 0.37 ng T2 (i	21 g from Ta 19.94 ee Table 0.24 follow ste	21 able 9, 19.94 9a) 0.26 eps 3 t	20.98 Th2 (°C) 19.93 0.45 0 7 in Tabl 19.92	19.92 0.74 e 9c) 19.82	0.93	19.92 0.98 19.07	0.42	(88) (89)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	20.1 perature d 19.91 ation facto 0.97 internal 19.12	20.38 during h 19.91 or for ga 0.92 tempera 19.39	20.64 eating p 19.91 ains for 1 0.84 ature in 19.63	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9	20.99 dwelling 19.94 h2,m (s 0.37 ing T2 (i 19.93	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94	20.98 Th2 (°C) 19.93 0.45 0 7 in Tabl 19.92	19.92 0.74 e 9c) 19.82	19.92 0.93 19.46	19.92 0.98 19.07	0.42	(88) (89) (90)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	20.1 erature d 19.91 ation facto 0.97 internal f 19.12 internal f	20.38 during h 19.91 or for ga 0.92 tempera 19.39	20.64 eating p 19.91 ains for r 0.84 ature in 19.63	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe	20.99 dwelling 19.94 h2,m (s 0.37 ng T2 (i 19.93	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 –	20.98 Th2 (°C) 19.93 0.45 0 7 in Tabl 19.92	19.92 0.74 19.82 iLA = Livi	19.92 0.93 19.46 ng area ÷ (4	19.92 0.98 19.07 4) =	0.42	(88) (89) (90) (91)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	20.1 eerature d 19.91 ation facto 0.97 internal 19.12 internal 19.53	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.81	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34	20.99 dwelling 19.94 h2,m (s 0.37 ing T2 (i 19.93 lling) = 1 20.38	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 – 20.38	20.98 Th2 (°C) 19.93 0.45 0 7 in Tabl 19.92 fLA) × T2 3 20.37	19.92 0.74 e 9c) 19.82 fLA = Livi 20.25	19.92 0.93 19.46	19.92 0.98 19.07	0.42	(88) (89) (90)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply	20.1 erature d 19.91 ation facto 0.97 internal f 19.12 internal f 19.53	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.81 ent to th	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25 interna	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34 temper	20.99 dwelling 19.94 h2,m (s 0.37 ng T2 (i 19.93 lling) = 1 20.38 ature fro	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38 om Table	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 – 20.36 e 4e, w	20.98 Th2 (°C) 19.93 0.45 0 7 in Table 19.92 fLA) × T2 3 20.37 here approx	19.92 0.74 e 9c) 19.82 fLA = Livi 20.25 opriate	19.92 0.93 19.46 ng area ÷ (4 19.87	19.92 0.98 19.07 4) = 19.47	0.42	(88) (89) (90) (91) (92)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m=	20.1 erature d 19.91 ation facto 0.97 internal 19.12 internal 19.53 adjustme 19.38	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.81 ent to th 19.66	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06 ne mean 19.91	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34	20.99 dwelling 19.94 h2,m (s 0.37 ing T2 (i 19.93 lling) = 1 20.38	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 – 20.38	20.98 Th2 (°C) 19.93 0.45 0 7 in Table 19.92 fLA) × T2 3 20.37 here approx	19.92 0.74 e 9c) 19.82 fLA = Livi 20.25	19.92 0.93 19.46 ng area ÷ (4	19.92 0.98 19.07 4) =	0.42	(88) (89) (90) (91)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa	20.1 erature d 19.91 ation facto 0.97 internal f 19.12 internal f 19.53 r adjustmo 19.38 ace heati	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.81 ent to th 19.66 ng requ	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06 ne mean 19.91 uirement	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25 internal 20.1	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34 temper 20.19	20.99 dwelling 19.94 h2,m (s 0.37 ng T2 (i 19.93 lling) = 1 20.38 ature fro 20.23	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38 om Table 20.23	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 – 20.34 e 4e, w 20.25	20.98 Th2 (°C) ↓ 19.93 0.45 0 7 in Tabl ↓ 19.92 fLA) × T2 3 20.37 here appro 3 20.22	19.92 0.74 le 9c) 19.82 fLA = Livi 20.25 opriate 20.1	19.92 0.93 19.46 ng area ÷ (4 19.87 19.72	19.92 0.98 19.07 4) = 19.47 19.32		(88) (89) (90) (91) (92)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set T	20.1 erature d 19.91 ation facto 0.97 internal f 19.12 internal f 19.53 r adjustmo 19.38 ace heati	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.39 tempera 19.66 ng requ	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06 ne mean 19.91 iirement ernal ter	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25 interna 20.1	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34 temper 20.19	20.99 dwelling 19.94 h2,m (s 0.37 ng T2 (i 19.93 lling) = 1 20.38 ature fro 20.23	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38 om Table 20.23	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 – 20.34 e 4e, w 20.25	20.98 Th2 (°C) 19.93 0.45 0 7 in Table 19.92 fLA) × T2 3 20.37 here approx	19.92 0.74 le 9c) 19.82 fLA = Livi 20.25 opriate 20.1	19.92 0.93 19.46 ng area ÷ (4 19.87 19.72	19.92 0.98 19.07 4) = 19.47 19.32		(88) (89) (90) (91) (92)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set T	20.1 erature d 19.91 ation facto 0.97 internal f 19.12 internal f 19.53 adjustmo 19.38 ace heati i to the m	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.39 tempera 19.66 ng requ	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06 ne mean 19.91 iirement ernal ter	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25 interna 20.1	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34 temper 20.19	20.99 dwelling 19.94 h2,m (s 0.37 ng T2 (i 19.93 lling) = 1 20.38 ature fro 20.23	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38 om Table 20.23	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 – 20.34 e 4e, w 20.25	20.98 Th2 (°C) ↓ 19.93 0.45 0 7 in Tabl ↓ 19.92 fLA) × T2 3 20.37 here appro 3 20.22 9b, so tha	19.92 0.74 le 9c) 19.82 fLA = Livi 20.25 opriate 20.1	19.92 0.93 19.46 ng area ÷ (4 19.87 19.72	19.92 0.98 19.07 4) = 19.47 19.32		(88) (89) (90) (91) (92)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set T the ut	20.1 erature d 19.91 ation facto 0.97 internal f 19.12 internal f 19.53 r adjustme 19.38 ace heati i to the m illisation f	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.39 tempera 19.66 ng requ actor fo Feb	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06 ne mean 19.91 Jirement ernal ter or gains o Mar	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25 interna 20.1 nperatur using Ta Apr	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34 temper 20.19 re obtain able 9a	20.99 dwelling 19.94 h2,m (s 0.37 ing T2 (i 19.93 lling) = 1 20.38 ature fro 20.23	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38 cm Table 20.23 tep 11 of	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 – 20.38 4e, w 20.23 Table	20.98 Th2 (°C) 19.93 0.45 0 7 in Tabl 19.92 fLA) × T2 3 20.37 here appro 3 20.22 9b, so tha	19.92 0.74 e 9c) 19.82 fLA = Livi 20.25 opriate 20.1 t Ti,m=	19.92 0.93 19.46 ng area ÷ (* 19.87 19.72 (76)m an	19.92 0.98 19.07 4) = 19.47 19.32 d re-calc		(88) (89) (90) (91) (92)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set T the ut	20.1 erature d 19.91 ation facto 0.97 internal f 19.12 internal f 19.53 adjustme 19.38 ace heati i to the m illisation f	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.39 tempera 19.66 ng requ actor fo Feb	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06 ne mean 19.91 Jirement ernal ter or gains o Mar	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25 interna 20.1 nperatur using Ta Apr	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34 temper 20.19 re obtain able 9a	20.99 dwelling 19.94 h2,m (s 0.37 ing T2 (i 19.93 lling) = 1 20.38 ature fro 20.23	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38 cm Table 20.23 tep 11 of	21 able 9, 19.94 9a) 0.26 eps 3 t 19.94 + (1 – 20.38 4e, w 20.23 Table	20.98 Th2 (°C) 19.93 0.45 0 7 in Tabl 19.92 fLA) × T2 3 20.37 here appro 3 20.22 9b, so tha	19.92 0.74 e 9c) 19.82 fLA = Livi 20.25 opriate 20.1 t Ti,m=	19.92 0.93 19.46 ng area ÷ (* 19.87 19.72 (76)m an	19.92 0.98 19.07 4) = 19.47 19.32 d re-calc		(88) (89) (90) (91) (92)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set T the ut Utilisa (94)m=	20.1 erature d 19.91 ation facto 0.97 internal 19.12 internal 19.53 adjustme 19.38 ace heati i to the m illisation f Jan	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.39 tempera 19.39 tempera 19.66 ng requ actor for Feb or for ga 0.92	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06 ne mean 19.91 lirement ernal ter or gains r Mar ains, hm 0.84	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25 interna 20.1 nperatur using Ta Apr : 0.72	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34 temper 20.19 re obtain able 9a May 0.56	20.99 dwelling 19.94 h2,m (s 0.37 ng T2 (f 19.93 lling) = f 20.38 ature fro 20.23 ned at st	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38 cm Table 20.23 tep 11 of Jul	21 able 9, 19.94 9a) 0.26 20.26 + (1 – 20.38 4e, w 20.23 Table Au	20.98 Th2 (°C) 19.93 0.45 0 7 in Table 19.92 fLA) × T2 3 20.37 here appro 3 20.22 9b, so that 5 Sep	19.92 0.74 e 9c) 19.82 fLA = Livi 20.25 opriate 20.1 t Ti,m= Oct	19.92 0.93 19.46 ng area ÷ (* 19.87 19.72 (76)m an Nov	19.92 0.98 19.07 4) = 19.47 19.32 d re-calc Dec		(88) (89) (90) (91) (92) (93)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set T the ut Utilisa (94)m=	20.1 erature d 19.91 ation facto 0.97 internal f 19.12 internal f 19.53 adjustme 19.38 ace heati i to the m illisation f Jan ation facto 0.97	20.38 during h 19.91 or for ga 0.92 tempera 19.39 tempera 19.81 ent to th 19.66 ng required actor for Feb or for ga 0.92	20.64 eating p 19.91 ains for r 0.84 ature in 19.63 ature (fo 20.06 ne mean 19.91 lirement ernal ter or gains r Mar ains, hm 0.84 W = (94)	20.85 eriods ir 19.92 rest of d 0.71 the rest 19.82 r the wh 20.25 internal 20.1 nperatur using Ta Apr : 0.72 4)m x (8-	20.96 n rest of 19.92 welling, 0.55 of dwelli 19.9 ole dwe 20.34 temper 20.19 re obtain ble 9a May 0.56	20.99 dwelling 19.94 h2,m (s 0.37 ng T2 (f 19.93 lling) = f 20.38 ature fro 20.23 ned at st	21 g from Ta 19.94 ee Table 0.24 follow ste 19.94 fLA × T1 20.38 cm Table 20.23 tep 11 of Jul	21 able 9, 19.94 9a) 0.26 20.26 + (1 – 20.38 4e, w 20.23 Table Au	20.98 Th2 (°C) 19.93 0.45 0 7 in Tabl 19.92 fLA) × T2 3 20.37 here appro 3 20.22 9b, so that g Sep 0.47	19.92 0.74 e 9c) 19.82 fLA = Livi 20.25 opriate 20.1 t Ti,m= Oct	19.92 0.93 19.46 ng area ÷ (* 19.72 (76)m an Nov 0.93	19.92 0.98 19.07 4) = 19.47 19.32 d re-calc Dec		(88) (89) (90) (91) (92) (93)

Mont	nlv avera	aae exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	- =[(39)m :	x [(93)m	– (96)m	]				
(97)m=	1783.7	1741.49	1578.47	1303.4	985.77	645.42	416.57	438.55	705.13	1102.49	1471.43	1772.04		(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 <sup>-</sup>	1)m			
(98)m=	570.25	347.24	215.83	82.19	22.58	0	0	0	0	87.39	333.69	611.08		_
								Tota	l per year	(kWh/year	<sup>.</sup> ) = Sum(9	8)15,912 =	2270.25	(98)
Spac	e heatin	g require	ement in	kWh/m²	/year								23.36	(99)
9a. En	ergy rec	luiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heatir	-	t from o	aaaadam		monton	avetem					ī		(201)
						ementary			(201) -				0	4
												(202)		
												(204)		
Efficiency of main space heating system 1 92.9 (20)											(206)			
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	r
Spac		· ·	<u>```</u>	alculate	d above	)								
	570.25	347.24	215.83	82.19	22.58	0	0	0	0	87.39	333.69	611.08		
(211)n	n = {[(98	)m x (20	4)] + (21	0)m } x	100 ÷ (2	206)	-							(211)
	613.83	373.78	232.33	88.47	24.3	0	0	0	0	94.07	359.19	657.78		-
Total (kWh/year) =Sum(211) <sub>151012</sub> =											2443.75	(211)		
•				y), kWh/										
			<u> </u>	(100 ÷ ()	1									
(215)m=	0	0	0	0	0	0	0	0 Tota	0 II (kWh/yea	0	0	0		
	h	_						TOLA	ii (KVVII/yee	ar) =0um(2	10) <sub>15,10</sub> 12		0	(215)
	heating		ter (calc	ulated al	hove)									
Culpu	138.53	127.85	139.61	130.04	129.83	115.39	109.14	122.13	122.63	134.84	132.34	132.22		
Efficie	ncy of w	ater hea	iter										87.3	(216)
(217)m=	89.38	89.19	88.86	88.29	87.68	87.3	87.3	87.3	87.3	88.3	89.15	89.43	·	(217)
			kWh/m											
` '			) ÷ (217)	1	4 4 0 0 0	400.40	405.04	400.00	4 40 47	450.7	4 40 45	4 47 00		
(219)m=	154.99	143.35	157.12	147.29	148.08	132.18	125.01	139.89	140.47 I = Sum(2	152.7	148.45	147.86	1707.00	
A								TULA	ii = Suiii(2		A/I- /	l	1737.39	(219)
	al totals heating	fueluse	ed main	system	1					K	Wh/year		<b>kWh/year</b> 2443.75	1
	-			oyotom	•							[		J
	-	fuel use											1737.39	J
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								
mech	anical v	entilatio	n - balar	iced, ext	ract or p	ositive ii	nput fron	n outside	Э			185.59		(230a)
centra	al heatin	g pump	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)

Total electricity for the above, kWh/year	SU	m of (230a)(230g) =	260.59 (231)
Electricity for lighting			396.26 (232)
Electricity generated by PVs			-684.44 (233)
10a. Fuel costs - individual heating systems:			
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 × 0.01 =	85.0426324728754 (240)
Space heating - main system 2	(213) x	0 × 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 × 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01 =	60.46 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	34.37 (249)
(if off-peak tariff, list each of (230a) to (230g) a Energy for lighting	separately as applicable (232)	and apply fuel price according to $13.19 \times 0.01 =$	Table 12a 52.27 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x	) 13.19 × 0.01 =	0 (252)
Appendix Q items: repeat lines (253) and (254 <b>Total energy cost</b> (245).	4) as needed (247) + (250)(254) =		352.14 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255)	x (256)] ÷ [(4) + 45.0] =		1.04 (257)
SAP rating (Section 12)			85.49 (258)
12a. CO2 emissions – Individual heating sys	tems including micro-CH	Р	
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	527.85 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	375.28 (264)
Space and water heating	(261) + (262) + (263) +	- (264) =	903.13 (265)
Electricity for pumps, fans and electric keep-h	ot (231) x	0.519 =	135.25 (267)
Electricity for lighting	(232) x	0.519 =	205.66 (268)
Energy saving/generation technologies Item 1		0.519 =	-355.23 (269)
Total CO2, kg/year		sum of (265)(271) =	888.81 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	9.15 (273)
EI rating (section 14)			92 (274)
13a. Primary Energy			

	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	=	2981.38	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2119.62	(264)
Space and water heating	(261) + (262) + (263) + (264) =		[	5101	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	800.02	(267)
Electricity for lighting	(232) x	0	=	1216.53	(268)
Energy saving/generation technologies					
Item 1		3.07	=	-2101.24	(269)
'Total Primary Energy	sum	of (265)(271) =	[	5016.3	(272)
Primary energy kWh/m²/year	(272)	÷ (4) =	[	51.62	(273)

# SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 November 2014

Property Details: Unit 202

Dwelling type: Located in: Region: Cross ventilation pose Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shutt Ventilation rate during Overheating Details:	s: eter: ers:	ather (a	ch):	False Dark-colou	5	roller blind	
Summer ventilation he Transmission heat los Summer heat loss coe	s coeffi	cient:	ent:	239.05 93.3 332.33			(P1) (P2)
Overhangs:							
Orientation: South (South window) South (East window) West (West window) South (south roof light) Solar shading:	<b>Ratio:</b> 0 0 0		<b>Z_overhangs:</b> 1 1 1 1 1 1				
Orientation: South (South window) South (East window) West (West window) South (south roof light) Solar gains:	<b>Z blind</b> 0.85 0.85 0.85 0.6	ls:	<b>Solar access:</b> 0.9 0.9 0.9 1	<b>Over</b> 1 1 1 1	hangs:	<b>Z summer:</b> 0.76 0.76 0.76 0.6	(P8) (P8) (P8) (P8)
<b>Orientation</b> South (South window) South (East window) West (West window)	0.9 x 0.9 x 0.9 x 1 x	<b>Area</b> 17.72 9.97 4.01 0.89	Flux 112.21 112.21 117.51 207.69	<b>g</b> 0.63 0.63 0.63 0.63	FF 0.7 0.7 0.7 0.7	<b>Shading</b> 0.76 0.76 0.76 0.6 <b>Total</b>	<b>Gains</b> 603.7 339.67 143.07 44.02 1130.46 <b>(P3/P4)</b>
Internal gains Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass temperat Threshold temperature Likelihood of high inter	ure incre	ement	-	16! 4.9 16 0.2 21.	0.95 57.61 99 25	<b>July</b> 460.94 1591.4 4.79 17.9 0.25 22.94 <b>Medium</b>	August 469.72 1564.47 (P5) 4.71 (P6) 17.8 0.25 22.76 (P7) Medium

# SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Medium



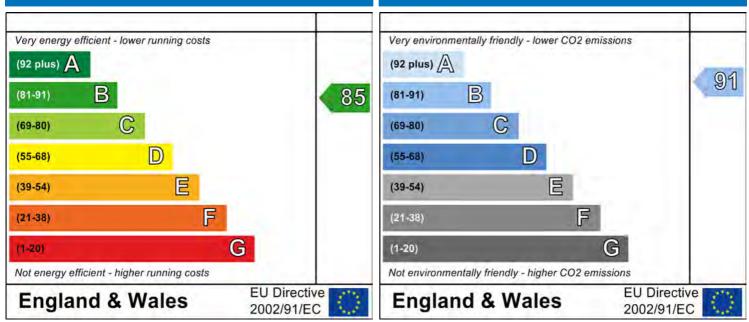
Dwelling type: Date of assessment: Produced by: Total floor area: Ground floor Flat 29 October 2014 Aymon Winter 102.709999084473 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

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

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

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

# **Regulations Compliance Report**

	ion:			
ssessed By:	Aymon Winter (S	TRO014511)	Building Type: Flat	
Owelling Details	:			
	<b>DESIGN STAGE</b>		Total Floor Area: 102.71m <sup>2</sup>	
te Reference :	Development at I	Riverpark Gardens	Plot Reference: unit 203	
ddress :				
Client Details:				
ame:	Jamie			
ddress :	Campbell, 43 Tar	nner Street, Greater London, Lo	ondon, SE13PL	
•	ers items included vers items included version in the second second second second second second second second s	within the SAP calculations. ations compliance.		
a TER and DE				
uel for main hea	ting system: Mains	gas		
uel factor: 1.00 (	. 2,			
•	oxide Emission Rate	· · · ·	18.69 kg/m² 10.98 kg/m²	ок
b TFEE and D	Dioxide Emission Ra	ale (DER)	10.98 kg/m²	UK
	ergy Efficiency (TFE	E)	60.76 kWh/m <sup>2</sup>	
-	Energy Efficiency (DF		54.65 kWh/m <sup>2</sup>	
				ОК
2 Fabric U-valu				
Element	-	Average	Highest	01
External Party wa		0.16 (max. 0.30) 0.00 (max. 0.20)	0.18 (max. 0.70)	OK OK
Floor	111	(no floor)	-	UN
Roof		0.11 (max. 0.20)	0.11 (max. 0.35)	ок
11001		1.38 (max. 2.00)	1.40 (max. 3.30)	OK
Opening	IS			
Opening a Thermal bric Thermal	lging bridging calculated	from linear thermal transmittan	ces for each junction	
Opening a Thermal brid? Thermal Air permeabil	lging bridging calculated lity	from linear thermal transmittand		
Opening a Thermal brid? Thermal Air permeabil	lging bridging calculated	from linear thermal transmittan	ces for each junction 3.00 (design value) 10.0	ок
Opening 2a Thermal bric Thermal 3 Air permeabil Air permea	dging bridging calculated lity ability at 50 pascals	from linear thermal transmittan	3.00 (design value)	ок
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging bridging calculated lity ability at 50 pascals ency	from linear thermal transmittan Database: (rev 367, product	3.00 (design value) 10.0	ок
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging bridging calculated lity ability at 50 pascals	Database: (rev 367, product	3.00 (design value) 10.0	ОК
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging bridging calculated lity ability at 50 pascals ency	Database: (rev 367, product Boiler systems with radiator Brand name: Baxi	3.00 (design value) 10.0 t index 016684):	OK
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging bridging calculated lity ability at 50 pascals ency	Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi	3.00 (design value) 10.0 t index 016684):	ОК
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging bridging calculated lity ability at 50 pascals ency	Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA	3.00 (design value) 10.0 t index 016684):	OK
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging bridging calculated lity ability at 50 pascals ency	Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi)	3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	ок
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging bridging calculated lity ability at 50 pascals ency	Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK2	3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	
Opening 2a Thermal brid Thermal 3 Air permeabil Air permea Maximum 4 Heating effici	dging bridging calculated lity ability at 50 pascals ency	Database: (rev 367, product Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi)	3.00 (design value) 10.0 t index 016684): s or underfloor heating - mains gas	ок

# **Regulations Compliance Report**

5 Cylinder insulation										
Hot water Storage:	Nominal cylinder loss: 0.00	•								
	Permitted by DBSCG: 2.10	) kWh/day								
Primary pipework insulated:	Yes		OK							
6 Controls										
Space heating controls	Programmer, room thermo	stat and TRVs	ОК							
Hot water controls:	Cylinderstat		OK							
	Independent timer for DHV	V	OK							
Boiler interlock:	Yes		OK							
7 Low energy lights										
Percentage of fixed lights with	low-energy fittings	100.0%								
Minimum		75.0%	OK							
8 Mechanical ventilation										
Continuous supply and extract	Continuous supply and extract system									
Specific fan power:	-	0.42								
Maximum		1.5	ОК							
MVHR efficiency:		91%								
Minimum		70%	OK							
9 Summertime temperature										
Overheating risk (Thames valle	ey):	Medium	ОК							
Based on:										
Overshading:		Average or unknown								
Windows facing: West		11.49m²,								
Windows facing: South		19.72m²,								
Windows facing: East		9.55m²,								
Roof windows facing: South		0.89m <sup>2</sup>								
Ventilation rate:		4.00								
Blinds/curtains:										
		Closed 100% of daylight hours	i							
10 Key features										
Air permeablility		3.0 m³/m²h								
Doors U-value		1 W/m²K								
Roofs U-value		0.11 W/m²K								
Photovoltaic array										

Property	Details:	unit 203
i i opoity	Dottanist	

Property Details: (							
Address: Located in: Region: UPRN: Date of assessr Date of certifica Assessment typ Transaction typ Tenure type: Related party of Thermal Mass F Water use <= 7 PCDF Version:	ate: be: be: lisclosure:	England Thames valley 29 October 2014 28 November 2014 New dwelling design stag New dwelling Unknown No related party Indicative Value Medium ay: True 367	e				
Property description	on:						
Dwelling type: Detachment: Year Completed:		Flat 2014					
Floor Location:		Floor area:	S	Storey height	:		
Floor 0 Floor 1		61.85 m²     2.7 m       40.86 m²     3.37 m					
Living area: Front of dwelling	faces:	40.86 m <sup>2</sup> (fraction 0.398) North					
Opening types:							
Name: Main Door	Source: Manufacturer	Type: Solid	Glazing:		Argon:	Frame: PVC-U	
West Windows	SAP 2012	Windows		0.05, soft coat	Yes	PVC-U	
south window East window	SAP 2012 SAP 2012	Windows Windows		0.05, soft coat 0.05, soft coat	Yes Yes	PVC-U PVC-U	
South roof light	Manufacturer	Roof Windows		0.05, soft coat	Yes	PVC-U	
Name: Main Door	Gap: mm	Frame Facto	r: g-value:	U-value:	<b>Area:</b> 2.14	No. of Openings:	
West Windows	16mm or more	0.7	0.63	1.4	11.49	1	
south window	16mm or more	0.7	0.63	1.4	19.72	1	
East window	16mm or more	0.7	0.63	1.4 1.4	9.55 0.89	1	
South roof light	16mm or more	0.7	0.63	1.4	0.87	I	
Namo	Typo Namo:	Location	Oriont		Width:	Hoight	

Name: Type-Name: Location: Orient: Width: Height: Main Door sheltered wall North 0 0 0 0 West Windows External walls West south window External walls South 0 0 East window External walls East 0 0 South roof light sloping roof South 0 0

Average or unknown

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemen	<u>ts</u>						
External walls	157.77	40.76	117.01	0.16	0	False	N/A
sheltered wall	12.84	2.14	10.7	0.18	0.4	False	N/A
sloping roof	42.31	0.89	41.42	0.11	0		N/A
terrace roof	20.17	0	20.17	0.11	0		N/A

Overshading:

# Internal ElementsParty ElementsParty wallsparty floor32.95

#### Thermal bridges

internationageen				
Thermal bridges:	User-define	d (individual P	SI-values)	Y-Value = 0.0895
3	Length	Psi-value	)	
	20.23	0.401	E1	Steel lintel with perforated steel base plate
	37.48	0.021	E4	Jamb
	1.8	0.027	E3	Sill
	22.81	0.14	E6	Intermediate floor within a dwelling
	18.62	0.001	E7	Party floor between dwellings (in blocks of flats)
	21.49	0.048	E16	Corner (normal)
	62.91	0.08	E14	Flat roof
	7.77	0.32	E21	Exposed floor (inverted)
	2.7	0.055	E18	Party wall between dwellings
	6.56	0	P2	Intermediate floor within a dwelling

Ventilation:	
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 0 0 0 2 3
Main heating system:	
Main heating system:	Boiler systems with radiators or underfloor heatingGas boilers and oil boilersFuel: mains gasInfo Source: Boiler DatabaseDatabase: (rev 367, product index 016684) Efficiency: Winter 87.3 % Summer: 89.9Brand name: BaxiModel: Neta-tec CombiModel qualifier: 24 GA(Combi boiler)Systems with radiatorsCentral heating pump : 2013 or laterDesign flow temperature: Design flow temperature >45°CRoom-sealedBoiler interlock: YesDelayed start
Main heating Control:	
Main heating Control:	Programmer, room thermostat and TRVs Control code: 2106
Secondary heating system:	
Secondary heating system:	None
Water heating:	
Water heating:	From main heating system Water code: 901

N/A N/A

Fuel :mains gas Hot water cylinder Cylinder volume: 180 litres Cylinder insulation: Factory 75 mm Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Flue Gas Heat Recovery System: Database (rev 367, product index 060001) Brand name: Zenex Model: GasSaver SMadelaquetIiflatseGS-1

#### Others:

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 Tilt of collector: Horizontal Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

				User D	etails:						
Assessor Name:	Aymon Wi	nter			Strom	a Num	ber:		STRO	014511	
Software Name:	Stroma FS		2		Softwa				Versic	on: 1.0.1.14	
			P	roperty <i>i</i>	Address	unit 20	3				
Address :											
1. Overall dwelling dime	ensions:										
				Area	a(m²)		Av. Hei	ight(m)		Volume(m <sup>3</sup> )	_
Ground floor				6	1.85	(1a) x	2	7	(2a) =	166.99	(3a)
First floor				4	0.86	(1b) x	3.	.37	(2b) =	137.7	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)·	+(1n	1	02.71	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	)+(3e)+	.(3n) =	304.69	(5)
2. Ventilation rate:											
	main heating		condar eating	у	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0	_ + [	0	] + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	_ + _	0	<u> </u> + [	0	ī = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns						0	x 1	0 =	0	(7a)
Number of passive vents							0	<b>x</b> 1	0 =	0	(7b)
Number of flueless gas fi	res						0	x 4	40 =	0	(7c)
						L					
									Air ch	hanges per ho	ur
Infiltration due to chimne	ys, flues and f	ans = ( <mark>6</mark> a)	)+(6b)+(7	a)+(7b)+(	7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has b			l, proceed	d to (17), d	otherwise o	continue fr	om (9) to (	16)		[	_
Number of storeys in th	ne dwelling (na	5)								0	(9)
Additional infiltration				0.05 (				[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0							uction			0	(11)
if both types of wall are p deducting areas of openii			unung io	ine great	er wan are	a (allel					
If suspended wooden f	iloor, enter 0.2	(unseale	d) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else	enter 0								0	(13)
Percentage of windows	s and doors di	aught stri	pped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value,	q50, expresse	ed in cubio	c metre	s per ho	our per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabil										0.15	(18)
Air permeability value applie		on test has l	been don	e or a deg	gree air pe	rmeability	is being us	sed		r	-
Number of sides sheltere Shelter factor	d				(20) = 1 -	[0 075 x (1	9)1 –			2	(19)
	ing chalter for	tor			(20) = (18)		0)] –			0.85	(20)
Infiltration rate incorporat	•				(21) - (10)	, ^ (20) =				0.13	(21)
Infiltration rate modified f		<u> </u>		Jul	Δυσ	Son		Nov	Dec	1	
	Mar Apr	May	Jun	Jui	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp				0.0	07	4	4.0	4.5	4 7	1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J	

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	te (allow	ing for sł	nelter ar	nd wind s	speed) =	= (21a) x	(22a)m					
-	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
			-	rate for t	he appli	cable ca	ise			<u> </u>	1			
		al ventila		and the NL (C						) (00-)			0.5	(23a)
			• • • •		, ,	, ,	•	(N5)) , othe		o) = (23a)			0.5	(23b)
			•		•			m Table 4h	,			4 (00 )	77.35	(23c)
	r	i		i	i	î	<u> </u>		í Ì	<u> </u>	<u>, , ,</u>	1 – (23c)	÷ 100]	(240)
(24a)m=		0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26		(24a)
	-	· · · · · ·	<b></b>	1	1	1	1	MV) (24	Í	1	<u> </u>			(24b)
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(240)
,					•	•		on from 4c) = (22		.5 × (23ł	c)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilati	on or wh	lole hous	se positi	ve input	ventilat	ion from	loft	<u>.</u>				
í	if (22b)n	n = 1, th	en (24d)	)m = (22	o)m othe	erwise (2	24d)m =	0.5 + [(2	22b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - ei	nter (24a	) or (24	o) or (24	c) or (24	4d) in bo	x (25)					
(25)m=	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26		(25)
3. He	at losse	s and he	eat loss	paramet	er:									
ELEN	IENT	Gros area	ss (m²)	Openin rr		Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²∙ł		X k J/K
Doors			<b>、</b>			2.14		1	=	2.14	<i>,</i>			(26)
Windov	ws Type	e 1				11.49	э х	1/[1/( 1.4 )+	- 0.04] =	15.23				(27)
Windo	ws Type	92				19.72	x	1/[1/( 1.4 )+	- 0.04] =	26.14	=			(27)
Windo	ws Type	e 3				9.55	x	1/[1/( 1.4 )+	- 0.04] =	12.66				(27)
Rooflig	ts					0.89		1/[1/(1.4) +	0.04] =	1.246				(27b)
Walls <sup>-</sup>		157.	77	40.7	6	117.0				18.72	= ,			(29)
Walls -		12.8		2.14		10.7				1.8			$\dashv$	(29)
Roof 7		42.3		0.89		41.42				4.56			╡ ├──	(30)
Roof 1	• •	20.7		0.03	<u></u>	20.17		·		2.22			-	(30)
		elements						0.11		2.22	[			
Party v		iementa	,			233.0								(31)
						17.72		0	=	0			╡┝━	(32)
Party f				<i></i>		32.95				) 0.0 <i>4</i>				(32a)
				effective wi nternal wal			lated usin	g tormula :	1/[(1/U-valu	le)+0.04] a	as given in	n paragraph	3.2	
			= S (A x		,			(26)(30	) + (32) =				84.65	(33)
Heat c	apacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	12908.41	(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K

	1	· ·	1	·	1	· •	1	· ·	1 A A	
Ind	icat	ive	Va	lue	: M	ediı	ım			
			•••							

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

250

(35)

can be i	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						20.86	(36)
if details	s of therma	al bridging	are not kri	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			105.51	(37)
Ventila	ation 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=	27.73	27.41	27.09	25.49	25.17	23.57	23.57	23.25	24.21	25.17	25.81	26.45	]	(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	133.24	132.92	132.6	131	130.68	129.08	129.08	128.76	129.72	130.68	131.32	131.96		
11				/						-	Sum(39) <sub>1.</sub>	12 /12=	130.92	(39)
	· · ·	Imeter (H	, 1	r	4.07	4.00	4.00	4.05		= (39)m ÷		4.00	1	
(40)m=	1.3	1.29	1.29	1.28	1.27	1.26	1.26	1.25	1.26	1.27	1.28	1.28	4.07	(40)
Numb	er of day	/s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12/12=	1.27	(40)
	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 enei	rav reau	irement:								kWh/ye	ear:	
			97.040											
		ipancy, l		<b>1</b> 4	( 0 0000	10 · · /T	- 40.0		040/			76		(42)
	A > 13. A £ 13.		+ 1.76 X	[1 - exp	(-0.0003	349 X (11	-A -13.9	)2)] + 0.0	JU13 X (	IFA -13.	.9)			
		,	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		99	.83	]	(43)
		-				-	-	to achieve	a water us	se target o	f		1	
not mor	e that 125	litres per p	berson pei	r day (all w r	ater use, i	not and co	ia) 1						1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					1	
(44)m=	109.81	105.82	101.82	97.83	93.84	89.84	89.84	93.84	97.83	101.82	105.82	109.81		_
Enerav	content of	hot water	used - cal	culated m	onthlv = 4.	190 x Vd.r	n x nm x D	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			<mark>m(44)</mark> 112 = ables 1b. 1		1197.92	(44)
(45)m=	162.84	142.42	146.97	128.13	122.95	106.09	98.31	112.81	114.16	133.04	145.23	157.71	1	
(,											m(45) <sub>112</sub> =		1570.67	(45)
lf instan	taneous v	vater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46						
(46)m=	24.43	21.36	22.05	19.22	18.44	15.91	14.75	16.92	17.12	19.96	21.78	23.66		(46)
	storage												1	
-							-	within sa	ame ves	sel		180		(47)
	•	-			-		) litres in	. ,		· · · (0) : · (	47)			
	storage		not wate	er (this ir	iciudes i	nstantar	ieous co	mbi boil	ers) ente	er U in (	47)			
	•	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0	1	(48)
		actor fro					• /					0	]	(49)
		m water			ear			(48) x (49)	) =			0	]	(50)
		urer's de				or is not						<u> </u>	1	()
		age loss			e 2 (kW	h/litre/da	ay)					0	]	(51)
		neating s		on 4.3									1	
		from Ta		2h								0		(52)
rempe	siature l	actor fro		20								0		(53)

		om water (54) in (5	-	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54) (55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	l m = (56)m	x [(50) – (	L H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	l ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	m Table	<u> </u>							0		(58)
	•	``	,			59)m = (	(58) ÷ 36	65 × (41)	m			-		
(mod	, dified by	factor fi	om 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=	21.95	19.82	21.95	21.24	21.95	21.24	21.95	21.95	21.24	21.95	21.24	21.95		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	184.79	162.25	168.92	149.37	144.89	127.33	120.26	134.76	135.4	154.99	166.46	179.65		(62)
Solar DH	IW input o	calculated	using App	endix G oı	· Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contributi	on to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	50.52	37.08	30.13	18.69	13.73	10.76	10.03	11.38	11.5	21.04	36.78	51.82		(63) (G2)
Output	from w	ater hea	ter											
(64)m=	134.27	125.17	138.78	130.68	131.17	116.57	110.22	123.38	123.9	133.95	129.68	127.83		_
								Outp	out from wa	ater heatei	r (annual)	12	1525.61	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	ı] + 0.8 x	(46)m	+ (57)m	+ (59)m	]	
(65)m=	59.63	52.31	54.35	47.91	46.37	40.59	38.17	43	43.27	49.72	53.6	57.92		(65)
inclu	ıde (57)ı	m in calo	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	
5. Int	ernal ga	ains (see	Table 5	and 5a	):									
Metabo	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	165.79	165.79	165.79	165.79	165.79	165.79	165.79	165.79	165.79	165.79	165.79	165.79		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	58.09	51.59	41.96	31.77	23.75	20.05	21.66	28.16	37.79	47.99	56.01	59.7		(67)
Applia	nces gai	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	389.01	393.05	382.87	361.22	333.88	308.19	291.02	286.99	297.16	318.82	346.15	371.84		(68)
Cookin	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	), also se	e Table	5				
(69)m=	54.34	54.34	54.34	54.34	54.34	54.34	54.34	54.34	54.34	54.34	54.34	54.34		(69)
Pumps	and far	ns gains	(Table 5	ōa)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-110.53	-110.53	-110.53	-110.53	-110.53	-110.53	-110.53	-110.53	-110.53	-110.53	-110.53	-110.53		(71)
Water	heating	gains (T	able 5)											
(72)m=	80.15	77.84	73.06	66.55	62.32	56.37	51.31	57.79	60.09	66.83	74.44	77.85		(72)
Total i	nternal	gains =				(66)	m + (67)m	n + (68)m +	- (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m=	639.86	635.09	610.5	572.14	532.55	497.21	476.6	485.54	507.65	546.24	589.21	622.01		(73)

#### 6. Solar gains:

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

•		Access Facto		Area m <sup>2</sup>	a and	Flux Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
East	0.9x	1	x	9.55	×	19.64	x	0.63	×	0.7	=	57.32	(76)
East	0.9x	1	x	9.55	x	38.42	x	0.63	×	0.7	=	112.13	(76)
East	0.9x	1	x	9.55	x	63.27	x	0.63	x	0.7	=	184.67	(76)
East	0.9x	1	x	9.55	x	92.28	x	0.63	×	0.7	=	269.33	(76)
East	0.9x	1	x	9.55	x	113.09	x	0.63	x	0.7	=	330.07	(76)
East	0.9x	1	x	9.55	x	115.77	x	0.63	x	0.7	=	337.89	(76)
East	0.9x	1	x	9.55	x	110.22	x	0.63	x	0.7	=	321.68	(76)
East	0.9x	1	x	9.55	x	94.68	x	0.63	x	0.7	=	276.32	(76)
East	0.9x	1	x	9.55	x	73.59	x	0.63	x	0.7	=	214.78	(76)
East	0.9x	1	x	9.55	x	45.59	x	0.63	×	0.7	=	133.06	(76)
East	0.9x	1	x	9.55	×	24.49	x	0.63	x	0.7	=	71.47	(76)
East	0.9x	1	x	9.55	×	16.15	x	0.63	×	0.7	=	47.14	(76)
South	0.9x	0.77	x	19.72	x	46.75	x	0.63	x	0.7	=	281.76	(78)
South	0.9x	0.77	x	19.72	×	76.57	x	0.63	x	0.7	=	461.45	(78)
South	0.9x	0.77	x	19.72	x	97.53	x	0.63	x	0.7	=	587.81	(78)
South	0.9x	0.77	x	19.72	×	110.23	x	0.63	x	0.7	=	664.35	(78)
South	0.9x	0.77	x	19.72	x	114.87	x	0.63	x	0.7	=	692.29	(78)
South	0.9x	0.77	x	19.72	x	110.55	x	0.63	x	0.7	=	666.24	(78)
South	0.9x	0.77	x	19.72	x	108.01	x	0.63	x	0.7	=	650.95	(78)
South	0.9x	0.77	x	19.72	x	104.89	x	0.63	x	0.7	=	632.17	(78)
South	0.9x	0.77	x	19.72	x	101.89	x	0.63	x	0.7	=	614.03	(78)
South	0.9x	0.77	x	19.72	x	82.59	x	0.63	×	0.7	=	497.72	(78)
South	0.9x	0.77	x	19.72	x	55.42	x	0.63	x	0.7	=	333.98	(78)
South	0.9x	0.77	x	19.72	x	40.4	x	0.63	×	0.7	=	243.47	(78)
West	0.9x	0.77	x	11.49	x	19.64	x	0.63	x	0.7	=	68.97	(80)
West	0.9x	0.77	x	11.49	x	38.42	x	0.63	×	0.7	=	134.91	(80)
West	0.9x	0.77	x	11.49	×	63.27	x	0.63	×	0.7	=	222.18	(80)
West	0.9x	0.77	x	11.49	x	92.28	x	0.63	x	0.7	=	324.04	(80)
West	0.9x	0.77	x	11.49	x	113.09	x	0.63	×	0.7	=	397.12	(80)
West	0.9x	0.77	x	11.49	×	115.77	x	0.63	×	0.7	=	406.53	(80)
West	0.9x	0.77	x	11.49	x	110.22	x	0.63	x	0.7	=	387.03	(80)
West	0.9x	0.77	x	11.49	×	94.68	x	0.63	x	0.7	=	332.45	(80)
West	0.9x	0.77	x	11.49	x	73.59	x	0.63	×	0.7	=	258.41	(80)
West	0.9x	0.77	x	11.49	x	45.59	x	0.63	×	0.7	=	160.09	(80)
West	0.9x	0.77	x	11.49	×	24.49	x	0.63	×	0.7	=	85.99	(80)
West	0.9x	0.77	x	11.49	×	16.15	x	0.63	×	0.7	=	56.71	(80)

Roofligh														
•	nts <mark>0.9x</mark>	1	х	0.8	9	x	32.08	x	0.63	x	0.7	=	11.33	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x	63.31	x	0.63	x	0.7	=	22.36	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x 1	06.14	×	0.63	x	0.7	=	37.49	(82)
Roofligh	nts <mark>0.9x</mark>	1	×	0.8	9	x 1	58.54	×	0.63	_ × [	0.7	=	56	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x 1	98.12	x	0.63	_ × [	0.7	=	69.98	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x 2	204.62	x	0.63	_ × [	0.7	=	72.28	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x 1	94.06	×	0.63	_ × [	0.7	=	68.55	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x 1	64.05	x	0.63	_ × [	0.7		57.95	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x	124.6	x	0.63	_ × [	0.7	=	44.01	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x	75.57	x	0.63	_ x [	0.7	=	26.69	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x	40.09	x	0.63	_ x [	0.7	=	14.16	(82)
Roofligh	nts <mark>0.9x</mark>	1	x	0.8	9	x	26.33	x	0.63	_ × [	0.7	=	9.3	(82)
Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m =	Sum(74)m .	(82)m				
(83)m=	419.38	730.86	1032.15			1482.93	1	1298.8		817.55	505.61	356.62		(83)
Total g	ains – ii	nternal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts		•		•		1	
(84)m=	1059.24	1365.95	1642.65	1885.86	2022.03	1980.15	1904.82	1784.4	3 1638.88	1363.8	1094.82	978.63		(84)
7. Me	an inter	nal temr	perature	(heating	season	)		-					-	
			neating p	, J		,	from Tab	ole 9 T	հ1 (°C)				21	(85)
		•	• •			-		510 0, 1					21	
Ullisa		<u> </u>	ains for I Mar		May	È	1	A	Con	Out		Dee	1	
	Jan													
(86)m-		Feb		Apr		Jun	Jul	Aug		Oct	Nov	Dec		(86)
(86)m=	0.98	0.95	0.88	0.74	0.58	0.41	0.3	0.33	0.53	0.82	0.96	0.99		(86)
Mean	0.98 interna	0.95 I temper	0.88 ature in	0.74 living are	0.58 ea T1 (fo	0.41 ollow ste	0.3	0.33	0.53 ble 9c)	0.82	0.96	0.99		
	0.98	0.95	0.88	0.74	0.58	0.41	0.3	0.33	0.53					(86) (87)
Mean (87)m=	0.98 interna 19.94	0.95 I temper 20.25	0.88 ature in	0.74 living are 20.84	0.58 ea T1 (fo 20.96	0.41 ollow ste 20.99	0.3 eps 3 to 7 21	0.33 7 in Tat 21	0.53 ble 9c) 20.98	0.82	0.96	0.99	]	
Mean (87)m=	0.98 interna 19.94	0.95 I temper 20.25	0.88 ature in 20.57	0.74 living are 20.84	0.58 ea T1 (fo 20.96	0.41 ollow ste 20.99	0.3 eps 3 to 7 21	0.33 7 in Tat 21	0.53 ble 9c) 20.98 Th2 (°C)	0.82	0.96	0.99	   	
Mean (87)m= Temp (88)m=	0.98 interna 19.94 erature 19.84	0.95 l temper 20.25 during h 19.85	0.88 ature in 20.57 neating p 19.85	0.74 living are 20.84 eriods ir 19.86	0.58 ea T1 (fc 20.96 n rest of 19.86	0.41 bllow ste 20.99 dwelling 19.87	0.3 eps 3 to 7 21 from Ta 19.87	0.33 7 in Tat 21 able 9, 19.88	0.53 ble 9c) 20.98 Th2 (°C)	0.82	0.96	0.99		(87)
Mean (87)m= Temp (88)m=	0.98 interna 19.94 erature 19.84	0.95 l temper 20.25 during h 19.85	0.88 ature in 20.57 neating p	0.74 living are 20.84 eriods ir 19.86	0.58 ea T1 (fc 20.96 n rest of 19.86	0.41 bllow ste 20.99 dwelling 19.87	0.3 eps 3 to 7 21 from Ta 19.87	0.33 7 in Tat 21 able 9, 19.88	0.53 ble 9c) 20.98 Th2 (°C)	0.82	0.96	0.99		(87)
Mean (87)m= Temp (88)m= Utilisa (89)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98	0.95 I temper 20.25 during h 19.85 tor for g 0.94	0.88 ature in 1 20.57 neating p 19.85 ains for r 0.85	0.74 living are 20.84 eriods ir 19.86 rest of do 0.7	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51	0.41 20.99 dwelling 19.87 h2,m (so 0.34	0.3 21 21 3 from Ta 19.87 ee Table 0.22	0.33 7 in Tat 21 able 9, 7 19.88 9a) 0.25	0.53 ble 9c) 20.98 Th2 (°C) 19.87 0.45	0.82 20.79 19.86 0.77	0.96 20.31 19.86	0.99 19.88 19.85		(87) (88)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna	0.95 I temper 20.25 during h 19.85 tor for g 0.94 I temper	0.88 ature in 20.57 neating p 19.85 ains for r 0.85 ature in t	0.74 living are 20.84 eriods ir 19.86 est of de 0.7 the rest	0.58 ea T1 (fo 20.96 n rest of 19.86 welling, 0.51 of dwelli	0.41 20.99 dwelling 19.87 h2,m (se 0.34 ng T2 (f	0.3 eps 3 to 7 21 from Ta 19.87 ee Table 0.22 follow ste	0.33 7 in Tak 21 able 9, 7 19.88 9a) 0.25 eps 3 to	0.53 ble 9c) 20.98 Th2 (°C) 19.87 0.45 0.7 in Tabl	0.82 20.79 19.86 0.77 e 9c)	0.96 20.31 19.86 0.95	0.99 19.88 19.85 0.98		(87) (88) (89)
Mean (87)m= Temp (88)m= Utilisa (89)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98	0.95 I temper 20.25 during h 19.85 tor for g 0.94	0.88 ature in 1 20.57 neating p 19.85 ains for r 0.85	0.74 living are 20.84 eriods ir 19.86 rest of do 0.7	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51	0.41 20.99 dwelling 19.87 h2,m (so 0.34	0.3 eps 3 to 7 21 g from Ta 19.87 ee Table 0.22	0.33 7 in Tat 21 able 9, 7 19.88 9a) 0.25	0.53 0.53 0.98 Th2 (°C) 19.87 0.45 0.45 0.7 in Tabl 19.86	0.82 20.79 19.86 0.77 e 9c) 19.72	0.96 20.31 19.86 0.95 19.29	0.99 19.88 19.85 0.98 18.87		(87) (88) (89) (90)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna	0.95 I temper 20.25 during h 19.85 ttor for g 0.94 I temper	0.88 ature in 20.57 neating p 19.85 ains for r 0.85 ature in t	0.74 living are 20.84 eriods ir 19.86 est of de 0.7 the rest	0.58 ea T1 (fo 20.96 n rest of 19.86 welling, 0.51 of dwelli	0.41 20.99 dwelling 19.87 h2,m (se 0.34 ng T2 (f	0.3 eps 3 to 7 21 from Ta 19.87 ee Table 0.22 follow ste	0.33 7 in Tak 21 able 9, 7 19.88 9a) 0.25 eps 3 to	0.53 0.53 0.98 Th2 (°C) 19.87 0.45 0.45 0.7 in Tabl 19.86	0.82 20.79 19.86 0.77 e 9c) 19.72	0.96 20.31 19.86 0.95	0.99 19.88 19.85 0.98 18.87	0.4	(87) (88) (89)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92	0.95 I temper 20.25 during h 19.85 tor for g 0.94 I temper 19.21	0.88 ature in 1 20.57 neating p 19.85 ains for r 0.85 ature in 1 19.52	0.74 living are 20.84 eriods ir 19.86 rest of dr 0.7 the rest 19.75	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84	0.41 20.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87	0.3 eps 3 to 7 21 g from Ta 19.87 ee Table 0.22 follow ste 19.87	0.33 7 in Tat 21 able 9, 19.88 9a) 0.25 9a) 0.25 19.88	0.53 0.53 0.98 Th2 (°C) 19.87 0.45 0.45 0.7 in Tabl 19.86	0.82 20.79 19.86 0.77 e 9c) 19.72	0.96 20.31 19.86 0.95 19.29	0.99 19.88 19.85 0.98 18.87	0.4	(87) (88) (89) (90)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92	0.95 I temper 20.25 during h 19.85 tor for g 0.94 I temper 19.21	0.88 ature in 1 20.57 neating p 19.85 ains for r 0.85 ature in 1 19.52	0.74 living are 20.84 eriods ir 19.86 rest of dr 0.7 the rest 19.75	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84	0.41 20.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87	0.3 eps 3 to 7 21 g from Ta 19.87 ee Table 0.22 follow ste 19.87	0.33 7 in Tat 21 able 9, 19.88 9a) 0.25 9a) 0.25 19.88	0.53 0.53 0.98 Th2 (°C) 19.87 0.45 0.5 0.5 0.45 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.	0.82 20.79 19.86 0.77 e 9c) 19.72	0.96 20.31 19.86 0.95 19.29	0.99 19.88 19.85 0.98 18.87	0.4	(87) (88) (89) (90)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33	0.95 I temper 20.25 during h 19.85 tor for g 0.94 I temper 19.21 I temper 19.63	0.88 ature in 1 20.57 neating p 19.85 ains for r 0.85 ature in 1 19.52 ature (fo 19.94	0.74 living are 20.84 eriods ir 19.86 rest of dv 0.7 the rest 19.75 r the wh 20.18	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwe 20.28	0.41 ollow ste 20.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 lling) = f 20.32	0.3 eps 3 to 7 21 g from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32	0.33 7 in Tat 21 able 9, 19.88 9a) 0.25 9a) 0.25 19.88 + (1 – 20.32	0.53 0.53 0.98 Th2 (°C) 19.87 0.45 0.5 0.5 0.45 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14	0.96 20.31 19.86 0.95 19.29 ng area ÷ (4	0.99 19.88 19.85 0.98 18.87 4) =	0.4	(87) (88) (89) (90) (91)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33	0.95 I temper 20.25 during h 19.85 tor for g 0.94 I temper 19.21 I temper 19.63	0.88 ature in 1 20.57 neating p 19.85 ains for r 0.85 ature in 1 19.52 ature (fo 19.94	0.74 living are 20.84 eriods ir 19.86 rest of dv 0.7 the rest 19.75 r the wh 20.18	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwe 20.28	0.41 ollow ste 20.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 lling) = f 20.32	0.3 eps 3 to 7 21 g from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32	0.33 7 in Tat 21 able 9, 19.88 9a) 0.25 9a) 0.25 19.88 + (1 – 20.32	0.53 ble 9c) 20.98 Th2 (°C) 19.87 0.45 0.45 0.45 0.45 0.45 fLA) x T2 20.3	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14	0.96 20.31 19.86 0.95 19.29 ng area ÷ (4	0.99 19.88 19.85 0.98 18.87 4) =	           	(87) (88) (89) (90) (91)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33 adjustn 19.18	0.95 I temper 20.25 during h 19.85 tor for g 0.94 I temper 19.21 I temper 19.63 nent to ti 19.48	0.88 ature in 20.57 heating p 19.85 ains for r 0.85 ature in 19.52 ature (fo 19.94 he mean	0.74 living are 20.84 eriods ir 19.86 rest of dr 0.7 the rest 19.75 r the wh 20.18 internal	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwe 20.28 temper	0.41 0.41 0.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 19.87 lling) = f 20.32 ature from	0.3 ps 3 to 7 21 from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32 pm Table	0.33 7 in Tab 21 able 9, 19.88 9a) 0.25 9a) 0.25 eps 3 to 19.88 + (1 – 20.32 4e, wh	0.53 0.53 0.9 20.98 Th2 (°C) 19.87 0.45 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14 ppriate	0.96 20.31 19.86 0.95 19.29 ng area ÷ (4 19.69	0.99 19.88 19.85 0.98 18.87 4) = 19.27	0.4	(87) (88) (89) (90) (91) (92)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33 adjustn 19.18 ace hea i to the r	0.95 I temper 20.25 during h 19.85 etor for g 0.94 I temper 19.21 I temper 19.63 nent to th 19.48 ting required	0.88 ature in 1 20.57 heating p 19.85 ains for r 0.85 ature in 1 19.52 ature (fo 19.94 he mean 19.79 Jirement cernal ter	0.74 living are 20.84 eriods ir 19.86 rest of dr 0.7 the rest 19.75 r the wh 20.18 internal 20.03	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwel 20.28 temper 20.13	0.41 20.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 lling) = f 20.32 ature fro 20.17	0.3 eps 3 to 7 21 from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32 pm Table 20.17	0.33 7 in Tak 21 able 9, 19.88 9a) 0.25 9a) 0.25 eps 3 to 19.88 + (1 – 20.32 4e, wh 20.17	0.53 0.53 0.9 20.98 Th2 (°C) 19.87 0.45 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14 ppriate 19.99	0.96 20.31 19.86 0.95 19.29 ng area ÷ (4 19.69 19.54	0.99 19.88 19.85 0.98 18.87 +) = 19.27 19.12		(87) (88) (89) (90) (91) (92)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33 adjustn 19.18 ace hea i to the r ilisation	0.95 I temper 20.25 during h 19.85 tor for g 0.94 I temper 19.21 I temper 19.63 nent to t 19.48 ting requ mean int factor fo	0.88 ature in 1 20.57 heating p 19.85 ains for r 0.85 ature in 1 19.52 ature (fo 19.94 he mean 19.79 uirement ternal ter or gains to	0.74 living are 20.84 eriods ir 19.86 rest of dr 0.7 the rest 19.75 r the wh 20.18 internal 20.03	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwe 20.28 temper 20.13 re obtain able 9a	0.41 0.41 0.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 lling) = f 20.32 ature fro 20.17 bed at st	0.3 eps 3 to 7 21 from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32 om Table 20.17 ep 11 of	0.33 7 in Tak 21 able 9, 19.88 9a) 0.25 eps 3 to 19.88 + (1 – 20.32 4e, wh 20.17 Table	0.53 0.53 0.9 20.98 Th2 (°C) 19.87 0.45 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14 ppriate 19.99 t Ti,m=(	0.96 20.31 19.86 0.95 19.29 ng area ÷ (4 19.69 19.54 76)m and	0.99 19.88 19.85 0.98 18.87 4) = 19.27 19.12 d re-calc		(87) (88) (89) (90) (91) (92)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the ut	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33 adjustn 19.18 ace hea ito the r ilisation Jan	0.95 I temper 20.25 during h 19.85 etor for g 0.94 I temper 19.21 I temper 19.63 nent to th 19.48 ting required factor for Feb	0.88 ature in 1 20.57 heating p 19.85 ains for r 0.85 ature in 1 19.52 ature (fo 19.94 he mean 19.79 Jirement cr gains to Mar	0.74 living are 20.84 eriods ir 19.86 rest of dr 0.7 the rest 19.75 r the wh 20.18 internal 20.03 nperatur using Ta Apr	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwel 20.28 temper 20.13	0.41 20.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 lling) = f 20.32 ature fro 20.17	0.3 eps 3 to 7 21 from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32 pm Table 20.17	0.33 7 in Tak 21 able 9, 19.88 9a) 0.25 9a) 0.25 eps 3 to 19.88 + (1 – 20.32 4e, wh 20.17	0.53 0.53 0.9 20.98 Th2 (°C) 19.87 0.45 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14 ppriate 19.99	0.96 20.31 19.86 0.95 19.29 ng area ÷ (4 19.69 19.54	0.99 19.88 19.85 0.98 18.87 +) = 19.27 19.12		(87) (88) (89) (90) (91) (92)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the ut	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33 adjustn 19.18 ace hea i to the r illisation Jan ation fac	0.95 I temper 20.25 during h 19.85 tor for g 0.94 I temper 19.21 I temper 19.63 nent to ti 19.48 ting required factor for g	0.88 ature in 1 20.57 heating p 19.85 ains for r 0.85 ature in 1 19.52 ature (fo 19.94 he mean 19.79 uirement cernal ter or gains o Mar ains, hm	0.74 living are 20.84 eriods ir 19.86 rest of dr 0.7 the rest 19.75 r the wh 20.18 internal 20.03 nperatur using Ta Apr :	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwe 20.28 temper 20.13 re obtain ble 9a May	0.41 0.41 0.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 19.87 lling) = f 20.32 ature fro 20.17 ned at st Jun	0.3 ps 3 to 7 21 g from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32 pm Table 20.17 ep 11 of Jul	0.33 7 in Tak 21 able 9, 19.88 9a) 0.25 9a) 0.25 9a) 0.25 19.88 + (1 – 20.32 4e, wł 20.17 Table Aug	0.53 ole 9c) 20.98 Th2 (°C) 19.87 0.45 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14 ppriate 19.99 t Ti,m=( Oct	0.96 20.31 19.86 0.95 19.29 og area ÷ (4 19.69 19.54 76)m and Nov	0.99 19.88 19.85 0.98 18.87 4) = 19.27 19.12 d re-calc Dec		(87) (88) (89) (90) (91) (92) (93)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33 adjustn 19.18 ace hea i to the r illisation Jan ation fac 0.97	0.95 I temper 20.25 during h 19.85 etor for g 0.94 I temper 19.21 I temper 19.63 nent to th 19.48 ting required factor for g 0.93	0.88 ature in 1 20.57 heating p 19.85 ains for r 0.85 ature in 1 19.52 ature (fo 19.94 he mean 19.79 Jirement cr gains to mar ains, hm 0.85	0.74 living are 20.84 eriods ir 19.86 rest of dr 0.7 the rest 19.75 r the wh 20.18 internal 20.03 nperatur using Ta Apr : 0.7	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwe 20.28 temper 20.13 re obtain able 9a May 0.53	0.41 0.41 0.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 lling) = f 20.32 ature fro 20.17 bed at st	0.3 eps 3 to 7 21 from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32 om Table 20.17 ep 11 of	0.33 7 in Tak 21 able 9, 19.88 9a) 0.25 eps 3 to 19.88 + (1 – 20.32 4e, wh 20.17 Table	0.53 0.53 0.9 20.98 Th2 (°C) 19.87 0.45 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14 ppriate 19.99 t Ti,m=(	0.96 20.31 19.86 0.95 19.29 ng area ÷ (4 19.69 19.54 76)m and	0.99 19.88 19.85 0.98 18.87 4) = 19.27 19.12 d re-calc		(87) (88) (89) (90) (91) (92)
Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set Ti the ut Utilisa (94)m=	0.98 interna 19.94 erature 19.84 ation fac 0.98 interna 18.92 interna 19.33 adjustn 19.18 ace hea i to the r illisation Jan ation fac 0.97	0.95 I temper 20.25 during h 19.85 etor for g 0.94 I temper 19.21 I temper 19.63 nent to ti 19.48 ting required factor for factor for g 0.93 hmGm	0.88 ature in 1 20.57 heating p 19.85 ains for r 0.85 ature in 1 19.52 ature (fo 19.94 he mean 19.79 uirement cernal ter or gains o Mar ains, hm	0.74 living are 20.84 eriods ir 19.86 rest of dv 0.7 the rest 19.75 r the wh 20.18 internal 20.03 mperatur using Ta Apr : 0.7	0.58 ea T1 (fc 20.96 n rest of 19.86 welling, 0.51 of dwelli 19.84 ole dwe 20.28 temper 20.13 re obtain able 9a May 0.53	0.41 0.41 0.99 dwelling 19.87 h2,m (so 0.34 ng T2 (f 19.87 19.87 lling) = f 20.32 ature fro 20.17 ned at st Jun	0.3 ps 3 to 7 21 g from Ta 19.87 ee Table 0.22 follow ste 19.87 LA × T1 20.32 pm Table 20.17 ep 11 of Jul	0.33 7 in Tak 21 able 9, 19.88 9a) 0.25 9a) 0.25 9a) 0.25 19.88 + (1 – 20.32 4e, wł 20.17 Table Aug	0.53 ole 9c) 20.98 Th2 (°C) 19.87 0.45 0.45 0.45 0.45 0.45 0.45 fLA) × T2 20.3 nere appro 20.15 9b, so tha Sep 0.47	0.82 20.79 19.86 0.77 e 9c) 19.72 LA = Livir 20.14 ppriate 19.99 t Ti,m=( Oct	0.96 20.31 19.86 0.95 19.29 ng area ÷ (4 19.69 19.54 76)m and Nov 0.94	0.99 19.88 19.85 0.98 18.87 4) = 19.27 19.12 d re-calc Dec		(87) (88) (89) (90) (91) (92) (93)

Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m-	– (96)m	]				
(97)m=	1982.34	1937.46	1761.74	1458.36	1102.07	718.69	461.04	485.78	785.42	1227.58	1634.03	1969.09		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (41	1)m			
(98)m=	708.39	447.8	273.81	94.66	23.09	0	0	0	0	125.11	433.92	751.85		_
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	2858.64	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								27.83	(99)
9a. En	ergy rec	luiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	HP)					
•	e heatir ion of sp	-	at from s	econdary	y/supple	mentary	system					ĺ	0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
				, main sys	. ,			(204) = (20	02) × [1 – (	(203)] =			1	(204)
			•	ing syste									92.9	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ur
Space	e heatin	g require	ement (c	alculated		)								
	708.39	447.8	273.81	94.66	23.09	0	0	0	0	125.11	433.92	751.85		
(211)m	n = {[(98	)m x (20	4)] + (21	0)m } x	100 ÷ (2									(211)
( )	762.53	482.02	294.73	101.9	24.86	0	0	0	0	134.67	467.08	809.31		
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	=	3077.12	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							I		1
•		- ·		(100 ÷ (2										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	=	0	(215)
Water	heating	J										•		-
Output	from w	ater hea	ter (calc	ulated al	oove)									
	134.27	125.17	138.78	130.68	131.17	116.57	110.22	123.38	123.9	133.95	129.68	127.83		-
Efficier	ncy of w	ater hea	iter			-							87.3	(216)
(217)m=	89.48	89.32	89.01	88.37	87.68	87.3	87.3	87.3	87.3	88.54	89.29	89.51		(217)
		•	kWh/mo ) ÷ (217)											
(219)m=	150.07	140.13	155.92	147.87	149.6	133.53	126.26	141.33	141.93	151.29	145.24	142.81		_
								Tota	I = Sum(21	19a) <sub>112</sub> =			1725.98	(219)
	I totals									k\	Nh/year		kWh/year	-
Space	heating	fuel use	ed, main	system	1								3077.12	
Water	heating	fuel use	d										1725.98	]
Electri	city for p	oumps, fa	ans and	electric l	keep-ho	t								
mech	anical v	entilatior	n - balan	ced, ext	ract or p	ositive ir	nput fron	n outside	9			195.16		(230a)
centra	al heatin	ig pump:	:									30		(230c)
boiler	with a f	an-assis	sted flue									45		(230e)

Total electricity for the above, kWh/year	su	m of (230a)(230g) =	270.16 (231)
Electricity for lighting			410.35 (232)
Electricity generated by PVs			-760.49 (233)
10a. Fuel costs - individual heating systems:			
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 × 0.01 =	107.083675119187 (240)
Space heating - main system 2	(213) x	0 × 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 × 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01 =	60.06 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	35.63 (249)
(if off-peak tariff, list each of (230a) to (230g) s Energy for lighting	separately as applicable (232)	and apply fuel price according to $13.19 \times 0.01 =$	Table 12a 54.13 (250)
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x	x) 13.19 x 0.01 =	0 (252)
Appendix Q items: repeat lines (253) and (254	) as needed		
Total energy cost (245)	.(247) + (250)(254) =		376.91 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255)	x (256)] ÷ [(4) + 45.0] =		1.07 (257)
SAP rating (Section 12)			85.05 (258)
12a. CO2 emissions – Individual heating syst	tems including micro-CH	IP	
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	664.66 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	372.81 (264)
Space and water heating	(261) + (262) + (263) -	+ (264) =	1037.47 (265)
Electricity for pumps, fans and electric keep-ho	ot (231) x	0.519 =	140.21 (267)
Electricity for lighting	(232) x	0.519 =	212.97 (268)
Energy saving/generation technologies Item 1		0.519 =	-394.7 (269)
Total CO2, kg/year		sum of (265)(271) =	995.96 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	9.7 (273)
El rating (section 14)			91 (274)
13a. Primary Energy			

	<b>Energy</b> kWh/year	Primary factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	= [	3754.08	(261)
Space heating (secondary)	(215) x	3.07	= [	0	(263)
Energy for water heating	(219) x	1.22	= [	2105.69	(264)
Space and water heating	(261) + (262) + (263) + (264) =		[	5859.77	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	= [	829.38	(267)
Electricity for lighting	(232) x	0	= [	1259.78	(268)
Energy saving/generation technologies					
Item 1		3.07	=	-2334.71	(269)
'Total Primary Energy	sum	of (265)(271) =	[	5614.22	(272)
Primary energy kWh/m²/year	(272)	÷ (4) =	[	54.66	(273)

# SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 November 2014

Property Details: unit 203

Dwelling type: Located in: Region: Cross ventilation pose Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shutt Ventilation rate during Overheating Details:	s: eter: ters:	ather (a	ch):	False			
Summer ventilation he Transmission heat los			ent:	402.2 105.5			(P1)
Summer heat loss coe				507.71			(P2)
Overhangs:							
Orientation: West (West Windows) South (south window) East (East window) South (South roof light) Solar shading:	<b>Ratio:</b> 0 0 0		<b>Z_overhangs:</b> 1 1 1 1				
Orientation:	Z blind	s:	Solar access:	Over	hangs:	Z summer:	
West (West Windows) South (south window) East (East window) South (South roof light)	1 1 1 0.6		0.9 0.9 0.9 1	1 1 1 1		0.9 0.9 0.9 0.6	(P8) (P8) (P8) (P8)
Solar gains:							
Orientation West (West Windows) South (south window) East (East window)	0.9 x 0.9 x 0.9 x 1 x	<b>Area</b> 11.49 19.72 9.55 0.89	Flux 117.51 112.21 117.51 207.69	<b>g</b> 0.63 0.63 0.63 0.63	FF 0.7 0.7 0.7 0.7	<b>Shading</b> 0.9 0.9 0.9 0.6 <b>Total</b>	Gains 482.29 790.4 400.86 44.02 1717.57 ( <b>P3/P4</b> )
Internal gains:							
Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass temperat Threshold temperature Likelihood of high inte	ure incre	ement		229 4.5 16 0.2 20	4.21 97.91 3 5	<b>July</b> 473.6 2191.17 4.32 17.9 0.25 22.47 <b>Medium</b>	August 482.54 2077.46 (P5) 4.09 (P6) 17.8 0.25 22.14 (P7) Medium

# SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature: Medium



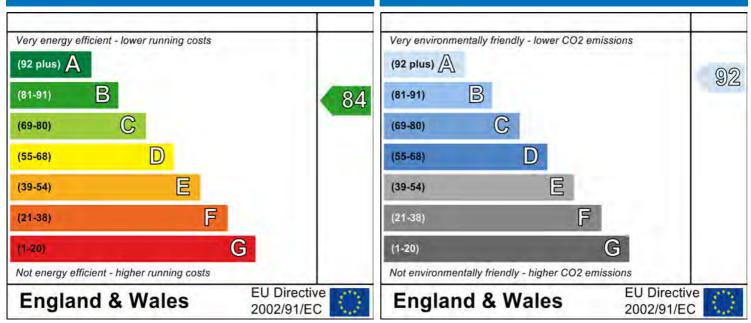
Dwelling type: Date of assessment: Produced by: Total floor area: Ground floor Flat 28 October 2014 Aymon Winter 63.6599998474121 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

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

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

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

# **Regulations Compliance Report**

Assessed By: Dwelling Details: NEW DWELLING I Site Reference : Address :	Aymon Winter (S	TRO014511)	Building Type: Flat	
NEW DWELLING				
Site Reference :				
	JESIGN STAGE		Total Floor Area: 63.66m <sup>2</sup>	
Address :	Development at F	Riverpark Gardens	Plot Reference: Unit G 01	
Client Details:				
Name:	Jamie			
Address :	Campbell, 43 Tar	nner Street, Greater London, Lo	ondon, SE13PL	
-		vithin the SAP calculations. tions compliance.		
1a TER and DER				
	ng system: Mains g	jas		
Fuel factor: 1.00 (m	• •		24.42 km/m2	
-	kide Emission Rate ioxide Emission Ra	. ,	21.42 kg/m² 12.37 kg/m²	ОК
1b TFEE and DFI			12.37 kg/m-	UK
	gy Efficiency (TFEI	Ξ)	63.04 kWh/m²	
-	ergy Efficiency (DF		49.79 kWh/m <sup>2</sup>	
				ОК
2 Fabric U-values	5			
Element		Average	Highest	
External w	all	0.16 (max. 0.30)	0.18 (max. 0.70)	OK
Floor		0.11 (max. 0.25) (no roof)	0.11 (max. 0.70)	OK
Roof Openings		(no roor) 1.34 (max. 2.00)	1.40 (max. 3.30)	ОК
2a Thermal bridg	lina	1.04 (max. 2.00)	1.40 (max. 0.00)	
		from linear thermal transmittan	ces for each junction	
3 Air permeabilit			, ,	
Air permeab Maximum	ility at 50 pascals		3.00 (design value) 10.0	ок
4 Heating efficier	псу			
Main Heatin	g system:	Database: (rev 367, produc Boiler systems with radiator Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi) Efficiency 89.0 % SEDBUK	s or underfloor heating - mains gas	

# **Regulations Compliance Report**

5 Cylinder insulation			
Hot water Storage:	Nominal cylinder loss: Permitted by DBSCG:		
Primary pipework insul		2.10 KWW/ddy	ОК
6 Controls			
Space heating controls	Programmer, room the	ermostat and TRVs	ОК
Hot water controls:	Cylinderstat		ОК
	Independent timer for	DHW	OK
Boiler interlock:	Yes		ОК
7 Low energy lights			
Percentage of fixed light	nts with low-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Continuous supply and	extract system		
Specific fan power:		0.42	
Maximum		1.5	OK
MVHR efficiency:		91%	
Minimum		70%	OK
9 Summertime temperature	e		
Overheating risk (Than	nes valley):	Medium	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: West		6m²,	
Windows facing: West		7.56m²,	
Ventilation rate:		3.00	
Blinds/curtains:			
		Closed 100% of daylight ho	ours
10 Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1 W/m²K	
Floors U-value		0.11 W/m²K	
Photovoltaic array			

Property Details. On						
Address: Located in: Region: UPRN: Date of assessme Date of certificat Assessment type Transaction type Tenure type: Related party dis Thermal Mass Pa Water use <= 12 PCDF Version:	e: : : sclosure:	England Thames valley 28 October 2014 28 November 2014 New dwelling design stage New dwelling Unknown No related party Indicative Value Medium ay: True 367	3			
Property description	:					
Dwelling type: Detachment:		Flat				
Year Completed:		2014				
Floor Location: Floor 0		Floor area: 63.66 m <sup>2</sup>		orey height: .7 m		
Living area: Front of dwelling fa	ices:	25.86 m <sup>2</sup> (fraction 0.406) South	1			
Opening types:						
Name: Main door	Source: Manufacturer	Type: Solid	Glazing:		Argon:	Frame: PVC-U
West windows East windows	SAP 2012 SAP 2012	Windows Windows	low-E, En = 0.0 low-E, En = 0.0		Yes Yes	PVC-U PVC-U
Name: Main door	Gap: mm	Frame Factor	: g-value:	<b>U-value:</b>	<b>Area:</b> 2.27	No. of Openings:
West windows East windows	16mm or more 16mm or more	0.7 0.7	0.63 0.63	1.4 1.4	6.0021 7.56	1 1
Name: Main door	Type-Name:	Location: wall to lobby	Orient: South		Width: 0	Height: 0
West windows		Ground floor External			0	0
East windows		Ground floor External			0	0
Overshading:		Average or unknown				
Opaque Elements:						
Type: C <u>External Elements</u>	Gross area: Oper	nings: Net area:	U-value:	Ru value:	Curtain v	vall: Kappa:
Wall to Corridor	19.66 0	19.66	0.18	0.43	False	N/A
External Wall	66.49 0	66.49	0.15	0	False	N/A
Ground floor Internal Elements	63.66		0.11			N/A
Party Elements party ceiling	62.95					N/A
Thermal bridges:						
Thermal bridges:		User-defined (individual PS Length Psi-value		= 0.055		
		7.12 0.401	E1 Steel lint	el with perforat	ed steel base pla	te

22.23	0.021	E4	Jamb
31.9	0.164	E5	Ground floor (normal)
31.9	0.001	E7	Party floor between dwellings (in blocks of flats)
10.8	0.048	E16	Corner (normal)

Ventilation:	
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test: Main heating system:	0 0 0 0 2 3
Main heating system:	Boiler systems with radiators or underfloor heating Gas boilers and oil boilers Fuel: mains gas Info Source: Boiler Database Database: (rev 367, product index 016684) Efficiency: Winter 87.3 % Summer: 89.9 Brand name: Baxi Model: Neta-tec Combi Model qualifier: 24 GA (Combi boiler) Systems with radiators Central heating pump : 2013 or later Design flow temperature: Design flow temperature >45°C Room-sealed Boiler interlock: Yes Delayed start
Main heating Control:	
Main heating Control:	Programmer, room thermostat and TRVs Control code: 2106
Secondary heating system:	
Secondary heating system: Water heating:	None
Water heating:	From main heating system Water code: 901 Fuel :mains gas Hot water cylinder Cylinder volume: 180 litres Cylinder insulation: Factory 75 mm Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Flue Gas Heat Recovery System: Database (rev 367, product index 060001) Brand name: Zenex Model: GasSaver SMardplaquetIiflatseGS-1
Others:	
Electricity tariff: In Smoke Control Area:	Standard Tariff Unknown

Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics: No conservatory 100% Low rise urban / suburban English No <u>Photovoltaic 1</u> Installed Peak power: 0.6 Tilt of collector: Horizontal Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

			User D	etails:						
Assessor Name: Software Name:	Aymon Win Stroma FSA			Stroma Softwa					014511 on: 1.0.1.14	
		F	Property A	Address:	Unit G	01				
Address :										
1. Overall dwelling dimen	isions:									
Ground floor				<b>a(m²)</b> 3.66	(1a) x	<b>Av. He</b> i	<b>ight(m)</b> 2.7	(2a) =	Volume(m <sup>3</sup> )	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(′	1d)+(1e)+(1	n) 6	3.66	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	171.88	(5)
2. Ventilation rate:	-								<u> </u>	
Number of chimneys Number of open flues	main heating	<b>seconda</b> heating + 0 + 0	ry   +     +	0 0	] = [	<b>total</b> 0 0		40 = 20 =	m <sup>3</sup> per houi	(6a) (6b)
		0		0						
Number of intermittent fan	S				L	0		10 =	0	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	es					0	× 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimneys	-				continue fr	0 0 (9) to (		÷ (5) =	0	(8)
Number of storeys in the			, u to ( <i>11)</i> , t			5111 (0) 10 (	10)		0	(9)
Additional infiltration	U V						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or	timber frame o	r 0.35 foi	r masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening	ns); if equal user (	0.35	-							_
If suspended wooden flo			.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows Window infiltration	and doors dra	aught stripped		0.25 - [0.2	$\mathbf{x}(14) \div 1$	001 -			0	(14)
Infiltration rate				(8) + (10)		-	⊦ (15) =		0	(15)
Air permeability value, c	50 expressed	d in cubic metre						area	0	(16) (17)
If based on air permeabilit							molopo	aioa	0.15	(18)
Air permeability value applies						is being us	sed		0.10	
Number of sides sheltered	l								2	(19)
Shelter factor				(20) = 1 - [	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fact	or		(21) = (18)	) x (20) =				0.13	(21)
Infiltration rate modified fo	<u> </u>	d speed					·		1	
Jan Feb M	/lar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table		·						1	
(22)m= 5.1 5 4	.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
~ ' '	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
		al ventila	-	rate for t	ne appli	cable ca	se					ĺ	0.5	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (	N5)) , othe	rwise (23b	) = (23a)			0.5	(23b)
lf bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h	) =				77.35	(23c)
a) If	balance	d mecha	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (1	23b) × [	1 – (23c)		( /
, (24a)m=	r	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26	-	(24a)
b) If	balance	d mecha	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b	)m = (22	2b)m + (2	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ver	tilation o	or positiv	ve input v	ventilatio	on from a	outside	-	-			
i	if (22b)n	n < 0.5 ×	(23b), t	hen (240	c) = (23b	); other	wise (24	c) = (22k	o) m + 0.	5 × (23b	) 		L	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous						0 51				
(24d)m=	<u> </u>	r = r, ure 0		m = (22t			0	0.5 + [(2)]	0	0.5	0	0		(24d)
			-	nter (24a	-			_			Ů	ů		()
(25)m=	0.28	0.27	0.27	0.25	0.25	0.23	0.23	0.23	0.24	0.25	0.26	0.26		(25)
			I			0.20	0.20	0.20	0.2 .	0.20	0.20	0.20		( - /
				paramete									-	
ELEN	<b>IENT</b>	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·ł		. X k J/K
Doors						2.27	x	1	=	2.27				(26)
Windo	ws Type	e 1				6.002	1 x1	/[1/( 1.4 )+	0.04] =	7.96				(27)
Windo	ws Type	2				7.56	x1.	/[1/( 1.4 )+	0.04] =	10.02				(27)
Floor						63.66	3 x	0.11	=	7.0026				(28)
Walls 7	Type1	19.6	6	0		19.66	3 X	0.17	=	3.28				(29)
Walls <sup>-</sup>	Type2	66.4	19	0		66.49	) X	0.15	=	9.97				(29)
Total a	area of e	lements	, m²			165.6	4							(31)
Party o	ceiling					62.95	5				[			(32b)
				effective wi nternal wall			ated using	formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	n paragraph	3.2	
			= S (A x					(26)(30)	) + (32) =				40.51	(33)
Heat c	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a)	(32e) =	18012.7	(34)
Therm	al mass	parame	ter (TMF	• = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	0		ere the de tailed calc	tails of the ulation.	construct	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix I	<						9.1	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
	abric he									(36) =			49.61	(37)
Ventila		i	· · · · · ·	monthly						= 0.33 × (	<u> </u>		I	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	15.64	15.46	15.28	14.38	14.2	13.29	13.29	13.11	13.66	14.2	14.56	14.92		(38)
			r		a				r	= (37) + (3	r		I	
(39)m=	65.26	65.08	64.9	63.99	63.81	62.91	62.91	62.73	63.27	63.81	64.17	64.54	62.05	(39)
										Average =	Sum(38)	112 / 14=	63.95	(33)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.03	1.02	1.02	1.01	1	0.99	0.99	0.99	0.99	1	1.01	1.01		
Numbe	er of dav	/s in mo	nth (Tab	le 1a)	•	•	•	-	,	Average =	Sum(40)1.	12 /12=	1	(40)
	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)
I														
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		08		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.67		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)			•			
(44)m=	92.04	88.69	85.34	82	78.65	75.3	75.3	78.65	82	85.34	88.69	92.04		
<b>Enorm</b>	contant of	botwator	used col	a data d m	anthly A	100 x Vd x	~ ~ ~ ~ ~ /	Tm / 2600			m(44) <sub>112</sub> =		1004.06	(44)
					· ·			OTm / 3600		-	·		I	
(45)m=	136.49	119.38	123.18	107.4	103.05	88.92	82.4	94.56	95.68	111.51	121.72	132.18	1010.10	
lf instant	aneous w	vater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		l otal = Su	m(45) <sub>112</sub> =	=	1316.48	(45)
(46)m=	20.47	17.91	18.48	16.11	15.46	13.34	12.36	14.18	14.35	16.73	18.26	19.83		(46)
· ·	storage	loss:	1	1	I	I								
Storag	e volum	e (litres)	includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
Otherw Water	vise if no storage	o stored loss:	hot wate	er (this ir	velling, e ncludes i or is kno	nstantar	neous co	n (47) ombi boil	ers) ente	er '0' in (		0	l	(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
0,			storage		ear loss fact	or is not	known:	(48) x (49)	) =			0		(50)
Hot wa	ter stor	age loss		om Tab	le 2 (kW							0		(51)
Volume	e factor	from Ta	ble 2a									0		(52)
Tempe	rature f	actor fro	m Table	2b								0		(53)
•••		om water (54) in (5	<sup>·</sup> storage 55)	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0 0		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	0 er contains	0 s dedicate	0 d solar sto	0 rage (57)	0 = (56)m	$0 \times [(50) - ($	0 H11)] - (5	0 50), else (5	0 7)m = (56)	0 m where (	0 H11) is fro	0 m Append	ix H	(56)
-						1								(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss cal		for each	month (			65 × (41)				0		(58)
	-	· · · · · ·	· · · · · ·	· · · · · ·	· · · · · ·	· · · · · ·		ng and a	· ·	1	r í	i	I	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for ea	ch	month (	61)m =	(60	)) ÷ 36	65 × (41)	)m									
(61)m=	21.95	19.82	21.95	5	21.24	21.95	2	21.24	21.95	2	1.95	21.24	2'	1.95	21.24	21.	95		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	d fo	r eacl	n month	(62	2)m =	0.85 × 0	(45)	)m +	(46)m +	(57)	m +	(59)m + (61)m	
(62)m=	158.44	139.2	145.1	3	128.63	124.99	1	10.16	104.35	1	16.5	116.92	13	3.46	142.96	154	.13		(62)
Solar DI	-IW input	calculated	using A	ppe	ndix G or	Appendi	хH	(negativ	ve quantity	y) (e	enter 'O	' if no sola	r cor	ntribut	ion to wate	er hea	iting)		
(add a	dditiona	l lines if	FGHR	S a	and/or V	VWHRS	S ap	plies,	, see Ap	per	ndix (	G)							
(63)m=	0	0	0		0	0		0	0		0	0		0	0	(	)		(63)
FHRS	31.65	26.07	22.37	7	14.37	11.22	1	9.11	8.45	g	9.67	9.78	1	5.78	25.23	31	.8		(63) (G2)
Output	from w	ater hea	iter																
(64)m=	126.78	113.13	122.7	6	114.26	113.77	1	01.05	95.9	10	06.83	107.14	11	7.68	117.73	122	.33		_
			-								Out	out from w	ater	heate	r (annual)₁	12		1359.37	(64)
Heat g	ains fro	m water	heatir	ıg,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	) + (	(61)n	n] + 0.8 x	x [(4	16)m	+ (57)m	+ (5	9)m	]	
(65)m=	50.87	44.65	46.45	5	41.02	39.75	3	84.88	32.88	3	6.93	37.12	42	2.56	45.78	49.	44		(65)
inclu	de (57)	m in calo	culatio	n o	f (65)m	only if a	cylir	nder is	s in the o	dwe	elling	or hot w	/ate	r is fi	rom com	mun	ity h	eating	
5. Int	ernal g	ains (see	e Table	e 5	and 5a)	):													
	Ŭ	ns (Table			,														
wictab	Jan	Feb	 Ma		Apr	May		Jun	Jul		Aug	Sep	(	Oct	Nov	D	ес		
(66)m=	124.98	124.98	124.9	-+-	124.98	124.98	+	24.98	124.98	-	24.98	124.98	-	4.98	124.98	124			(66)
Liahtin	a aains	ı (calcula	ted in	 Api	pendix I	equa	tion	L9 oi	r L9a), a	lso	see	r Table 5							
(67)m=	40.65	36.11	29.37	<u> </u>	22.23	16.62	-	4.03	15.16	-	9.71	26.45	3	3.58	39.2	41.	78		(67)
Applia	nces da	ins (calc	ulated	in	Append	lix L. ec	uat	tion L	13 or L1	1 3a)	also	) see Ta	ble	5					
(68)m=	271.75	274.57	267.4		252.34	233.24	· •	15.29	203.3	ŕ	)0.48	207.59	-	22.72	241.81	259	.76		(68)
		i (calcula											1 9.5						
(69)m=	49.58	49.58	49.58	÷	49.58	49.58	<b>T</b>	9.58	49.58	<u> </u>	9.58	49.58	<b>1</b>	9.58	49.58	49.	58		(69)
		ns gains																	
(70)m=	3	3	3		3	3	Γ	3	3		3	3		3	3	3	3		(70)
		aporatic		L iter					-		-	_			-				
(71)m=	-83.32	-83.32	-83.3	_	-83.32	-83.32	-	33.32	-83.32	-8	33.32	-83.32	-8	3.32	-83.32	-83	.32		(71)
		gains (T																	
(72)m=	68.37	66.44	62.43	ŕ	56.97	53.43		8.44	44.2	4	9.63	51.56	5	7.21	63.59	66.	45		(72)
		gains =			00.01	00.10									(1)m + (72)		10		( )
(73)m=		471.36	453.5		425.78	397.53	Г	372	356.9	r Ì	54.06	379.84	<u> </u>	07.75	438.84		.24		(73)
. ,	lar gain:	1	400.0	<u>́                                    </u>	420.70	007.00	1	012	000.0			070.04			400.04	102			(10)
			using so	olar	flux from	Table 6a	and	associ	ated equa	ation	s to co	onvert to th	ne ap	oplicat	ole orientat	ion.			
		Access F	0		Area			Flu				g_			FF			Gains	
		Table 6d			m²				ole 6a		Т	able 6b		Т	able 6c			(W)	
West	0.9x	0.77		x	6		x	1	9.64	] x		0.63		×Г	0.7		=	36.03	(80)
West	0.9x	0.77		x	7.5		x		9.64	] ×		0.63	╡	хГ	0.7		=	45.38	(80)
West	0.9x	0.77		x	6		x		8.42	」   ×		0.63	$\dashv$	хГ	0.7	$\neg$	=	70.48	(80)

x

0.63

x

0.7

=

x

7.56

x

38.42

West

0.9x

0.77

88.77

(80)

	_										_			_		
West	0.9x	0.77	×	6	5	x	6	3.27	x	0.63	x	0.7	=	-	116.06	(80)
West	0.9x	0.77	x	7.5	56	x	6	3.27	x	0.63	x	0.7	=	- [	146.19	(80)
West	0.9x	0.77	x	6	5	x	9	2.28	x	0.63	x	0.7	=	- [	169.27	(80)
West	0.9x	0.77	x	7.5	56	x	9	2.28	x	0.63	x	0.7	=	- [	213.21	(80)
West	0.9x	0.77	x	6	;	x	11	13.09	x	0.63	x	0.7	=	- [	207.45	(80)
West	0.9x	0.77	x	7.5	56	x	11	13.09	x	0.63	x	0.7	=	• [	261.29	(80)
West	0.9x	0.77	x	6	;	x	11	15.77	x	0.63	×	0.7	=	• [	212.36	(80)
West	0.9x	0.77	x	7.5	56	x	11	15.77	x	0.63	×	0.7	=	Ē	267.48	(80)
West	0.9x	0.77	x	6	;	x	11	0.22	x	0.63	×	0.7	=	٠Ē	202.18	(80)
West	0.9x	0.77	x	7.5	56	x	11	10.22	x	0.63	×	0.7	=	• [	254.65	(80)
West	0.9x	0.77	x	6	;	x	9	4.68	x	0.63	×	0.7		Ē	173.67	(80)
West	0.9x	0.77	x	7.5	56	x	9	4.68	x	0.63	×	0.7		Ē	218.74	(80)
West	0.9x	0.77	x	6	;	x	7	3.59	x	0.63	×	0.7	=	Ē	134.99	(80)
West	0.9x	0.77	x	7.5	56	x	7	3.59	x	0.63	×	0.7	=	Ē	170.02	(80)
West	0.9x	0.77	x	6	;	x	4	5.59	x	0.63	×	0.7	= -	Ē	83.63	(80)
West	0.9x	0.77	x	7.5	56	x	4	5.59	x	0.63	×	0.7	= -	Ē	105.33	(80)
West	0.9x	0.77	x	6	;	x	2	4.49	x	0.63	×	0.7	= -	Ē	44.92	(80)
West	0.9x	0.77	x	7.5	56	x	2	4.49	x	0.63	×	0.7	=	Ē	56.58	(80)
West	0.9x	0.77	x	6	;	x	1	6.15	x	0.63	×	0.7	=	Ē	29.63	(80)
West	0.9x	0.77	x	7.5	56	x	1	6.15	x	0.63	×	0.7	=	Ē	37.32	(80)
									•					-		
(83)m=	81.4	watts, ca 159.24 nternal a	262.25	382.48	468.74	4	79.84 83)m ,	456.83	<mark>(83)</mark> m 392	= Sum(74)m . .41 305.01	( <mark>82)m</mark> 188.9	5 101.5	66.94			(83)
(83)m=	81.4	159.24	262.25	382.48	468.74	4 4 1 + (8		456.83	ŕŕ	.41 305.01			66.94	_		(83) (84)
(83)m= Total g (84)m=	81.4 ains — i 556.42	159.24 nternal a 630.61	262.25 nd solar 715.75	382.48 (84)m = 808.26	468.74 = (73)m 866.27	4 1 + (8	1 83)m ,	456.83 watts	392	.41 305.01	188.9		I	_		
(83)m= Total g (84)m= 7. Me	81.4 ains – i 556.42 an inter	159.24 nternal a 630.61 nal temp	262.25 nd solar 715.75 erature	382.48 (84)m = 808.26 (heating	468.74 = (73)m 866.27 seaso	4 1 + (8 7 8 8	83)m, 51.84	456.83 watts 813.73	392 756	41 305.01 47 684.85	188.9		I	_	21	(84)
(83)m= Total g (84)m= 7. Me Temp	81.4 Jains – i 556.42 Dan inter	159.24 nternal a 630.61 nal temp during h	262.25 nd solar 715.75 erature eating p	382.48 (84)m = 808.26 (heating eriods ir	468.74 = (73)m 866.27 seaso	4 1 + (8 7 8 8 7 8 8 7 8 7 8 7 8 7 8 7 8 7 8 7	83)m , 51.84 area f	456.83 watts 813.73	392 756	.41 305.01	188.9		I	_	21	
(83)m= Total g (84)m= 7. Me Temp	81.4 Jains – i 556.42 Dean inter Derature	159.24 nternal a 630.61 nal temp during h	262.25 nd solar 715.75 erature eating p ains for l	382.48 (84)m = 808.26 (heating eriods ir iving are	468.74 = (73)m 866.27 seaso n the liv ea, h1,i	4 1 + ({ 8 1 - () 8 1 - () 8 1 - () 8 1 - () 8 1 - () 8 1 1 - () 8 1 - () 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	33)m , 51.84 area f ee Ta	456.83 watts 813.73 rom Tab ble 9a)	392 756 ble 9,	41 305.01 47 684.85 Th1 (°C)	188.9 596.7	1 540.34	529.18	] 3	21	(84)
(83)m= Total g (84)m= 7. Me Temp	81.4 Jains – i 556.42 Dan inter	159.24 nternal a 630.61 nal temp during h	262.25 nd solar 715.75 erature eating p	382.48 (84)m = 808.26 (heating eriods ir	468.74 = (73)m 866.27 seaso	1 + (8 1 + (8 1 8 1 8 1 8 1 8 1 8 1 8 1 8 1	83)m , 51.84 area f	456.83 watts 813.73	392 756 ble 9,	41 305.01 47 684.85 Th1 (°C) Jg Sep	188.9	1 540.34	I	] 3	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	81.4 Jains – i 556.42 Derature ation fac Jan 0.99	159.24 nternal a 630.61 nal temp during h ctor for ga Feb 0.98	262.25 nd solar 715.75 eating p ains for l Mar 0.94	382.48 (84)m = 808.26 (heating eriods ir iving are Apr 0.83	468.74 = (73)m 866.27 seaso h the liv ea, h1,i May 0.66	4 1 + ({ 8 1 1 1 1 1 1 1 1 1 1 1 1 1	33)m , 51.84 area f ee Ta Jun 0.47	456.83 watts 813.73 rom Tak ble 9a) Jul 0.34	392 756 Die 9, Ai	41 305.01 47 684.85 Th1 (°C) Jg Sep 8 0.62	188.9 596.7 Oct	1 540.34 Nov	529.18 Dec	] 3	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean	81.4 pains – i 556.42 perature ation fac Jan 0.99 interna	159.24 nternal a 630.61 during h ctor for ga Feb 0.98	262.25 nd solar 715.75 eating p ains for l Mar 0.94 ature in l	382.48 (84)m = 808.26 (heating eriods ir iving are Apr 0.83 living are	468.74 = (73)m 866.27 seaso n the liv ea, h1,i May 0.66 ea T1 (	4 1 + ({ 8 1 1 1 1 1 1 1 1 1 1 1 1 1	33)m , 51.84 area f ee Ta Jun 0.47 w step	456.83 watts 813.73 rom Tat ble 9a) Jul 0.34 os 3 to 7	392 756 Die 9, Ai 0.3 7 in T	41 305.01 47 684.85 Th1 (°C) Jg Sep 8 0.62 Table 9c)	188.9 596.7 Oct 0.89	1 540.34 Nov 0.98	529.18 Dec 0.99		21	(84) (85) (86)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m=	81.4 pains – i 556.42 perature ation fac Jan 0.99 interna 20.18	159.24 nternal a 630.61 during h ctor for ga Feb 0.98 l tempera 20.35	262.25 nd solar 715.75 eating p eating for l Mar 0.94 ature in 20.59	382.48 (84)m = 808.26 (heating eriods ir iving are Apr 0.83 living are 20.84	468.74 = (73)m 866.27 seaso n the liv ea, h1,r May 0.66 ea T1 ( 20.96	<pre>4 4 1 + (() 8 1 + (() 8 1 + () 8 1 + () 8 1 + () 1 + () 8 1 + () 1</pre>	83)m , 51.84 area f ee Ta Jun 0.47 w step 21	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 os 3 to 7 21	392 756 Die 9, 0.3 7 in T 2	41     305.01       47     684.85       Th1 (°C)       Jg     Sep       8     0.62       able 9c)       1     20.98	188.9 596.7 Oct	1 540.34 Nov	529.18 Dec		21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp	81.4 pains – i 556.42 perature ation fac Jan 0.99 interna 20.18 perature	159.24 nternal a 630.61 nal temp during h ctor for ga Feb 0.98 I tempera 20.35 during h	262.25 nd solar 715.75 eating p ains for l Mar 0.94 ature in l 20.59 eating p	382.48 (84)m = 808.26 (heating eriods ir iving are Apr 0.83 living are 20.84 eriods ir	468.74 = (73)m 866.27 seaso h the liv ea, h1,i May 0.66 ea T1 ( 20.96	. 4 1 + (( 8 1 + (( 8 1 + (() 8 1 + (())) 8 1 + (()) 8 1 + (())) 8 1 + (())) 8 1 + (())) 8 1 + (())) 1	area f ee Ta Jun 0.47 w step 21 velling	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 os 3 to 7 21 from Ta	392 392 756 506 9, 0.3 7 in T 2 806 §	41 305.01 47 684.85 Th1 (°C) 47 Sep 48 0.62 48 0.62 49 0.62 40 0.62 40 0.62 41 20.98 40 0.62 41 0.62	188.9 596.7 Oct 0.89 20.8	1 540.34 Nov 0.98 20.45	529.18 Dec 0.99 20.15		21	(84) (85) (86) (87)
(83)m= Total (2 (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	81.4 pains – i 556.42 perature ation fac Jan 0.99 interna 20.18 perature 20.06	159.24nternal a630.61nal tempduring hctor for gaFeb0.98l tempera20.35during h20.06	262.25 nd solar 715.75 eating p ains for l Mar 0.94 ature in l 20.59 eating p 20.07	382.48 (84)m = 808.26 (heating eriods ir iving are Apr 0.83 living are 20.84 eriods ir 20.08	468.74 = (73)m 866.27 seaso h the liv ea, h1,i May 0.66 ea T1 ( 20.96 h rest c 20.08	<pre>. 4' . 4' . 4' . 8' . 7' . 8' . 7' . 8' . 7' . 7' . 7' . 7' . 7' . 7' . 7' . 7</pre>	83)m , 51.84 area f ee Ta Jun 0.47 w step 21 velling 20.09	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 0s 3 to 7 21 from Ta 20.09	392 392 756 0.3 7 in T 2 able § 20.	41     305.01       .47     684.85       Th1 (°C)       Jg     Sep       .8     0.62       Table 9c)     20.98       .9, Th2 (°C)	188.9 596.7 Oct 0.89	1 540.34 Nov 0.98 20.45	529.18 Dec 0.99		21	(84) (85) (86)
(83)m= Total ( (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	81.4 $ains - i$ $556.42$ $an$ interperature $ation facJan0.99interna20.18perature20.06ation fac$	159.24nternal a630.61nal tempduring hctor for gaFeb0.98l tempera20.35during h20.06ctor for ga	262.25 nd solar 715.75 eating p ains for l Mar 0.94 ature in l 20.59 eating p 20.07	382.48 (84)m = 808.26 (heating eriods ir iving are 0.83 living are 20.84 eriods ir 20.08	468.74 = (73)m 866.27 seaso n the liv ea, h1,r May 0.66 ea T1 ( 20.96 n rest c 20.08 welling	<pre>. 4 1 + (% 8 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7</pre>	83)m , 51.84 area f ee Ta Jun 0.47 w step 21 velling 0.09 m (se	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 os 3 to 7 21 from Ta 20.09 e Table	392           392           756           ble 9,           0.3           7 in T           2           able §           20.           9a)	41       305.01         47       684.85         Th1 (°C)	188.9 596.7 Oct 0.89 20.8	1 540.34 Nov 0.98 20.45 20.08	529.18 Dec 0.99 20.15 20.07		21	(84) (85) (86) (87) (88)
(83)m= Total (2 (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	81.4 pains – i 556.42 perature ation fac Jan 0.99 interna 20.18 perature 20.06	159.24nternal a630.61nal tempduring hctor for gaFeb0.98l tempera20.35during h20.06	262.25 nd solar 715.75 eating p ains for l Mar 0.94 ature in l 20.59 eating p 20.07	382.48 (84)m = 808.26 (heating eriods ir iving are Apr 0.83 living are 20.84 eriods ir 20.08	468.74 = (73)m 866.27 seaso h the liv ea, h1,i May 0.66 ea T1 ( 20.96 h rest c 20.08	<pre>. 4 1 + (% 8 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7</pre>	83)m , 51.84 area f ee Ta Jun 0.47 w step 21 velling 20.09	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 0s 3 to 7 21 from Ta 20.09	392 392 756 0.3 7 in T 2 able § 20.	41       305.01         47       684.85         Th1 (°C)	188.9 596.7 Oct 0.89 20.8	1 540.34 Nov 0.98 20.45	529.18 Dec 0.99 20.15		21	(84) (85) (86) (87)
(83)m= Total (2 (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	81.4 $ains - i$ $556.42$ $an interara interara interara interna0.99ara interna20.18ara interna20.06ara interna0.98ara interna$	159.24nternal a630.61nal tempduring hctor for gaFeb0.98l tempera20.35during h20.06ctor for ga0.97l tempera	262.25 nd solar 715.75 eating p eating for l Mar 0.94 ature in l 20.59 eating p 20.07 ains for r 0.92 ature in t	382.48 (84)m = 808.26 (heating eriods ir iving are Apr 0.83 living are 20.84 eriods ir 20.08 rest of d 0.79 the rest	468.74 = (73)m 866.27 seaso the live a, h1,i May 0.66 a T1 ( 20.96 n rest of 20.08 welling 0.6 of dwe	<pre>. 4 . + (i) . + (i) . 8 . 8 . 7 . 8 . 8 . 8 . 8 . 8 . 8 . 7 . 1 . 6 . 1 . 6 . 1 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 7 . 8 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7</pre>	83)m , 51.84 area f ee Ta Jun 0.47 w step 21 w step 21 w step 21 co.09 m (se 0.4 T2 (fc	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 05 3 to 7 21 from Ta 20.09 e Table 0.27 bllow ste	392           392           756           Dle 9,           Ai           0.3           7 in T           20           9a)           0.3           eps 3	41       305.01         .47       684.85         Th1 (°C)	188.9 596.7 0ct 0.89 20.8 20.08 0.85 e 9c)	1 540.34 Nov 0.98 20.45 20.08 0.97	529.18 Dec 0.99 20.15 20.07 0.99		21	(84) (85) (86) (87) (88) (88) (89)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	81.4jains – i556.42can interperatureation facJan0.99interna20.18perature20.06ation fac0.98	159.24nternal a630.61nal tempduring hctor for gaFeb0.98l tempera20.35during h20.06ctor for ga0.97	262.25 nd solar 715.75 eating p ains for l Mar 0.94 ature in l 20.59 eating p 20.07 ains for r 0.92	382.48 (84)m = 808.26 (heating eriods ir iving are 0.83 living are 20.84 eriods ir 20.08 rest of d 0.79	468.74 = (73)m 866.27 seaso n the liv ea, h1,r May 0.66 ea T1 ( 20.96 n rest c 20.08 welling 0.6	<pre>. 4 . + (i) . + (i) . 8 . 8 . 7 . 8 . 8 . 8 . 8 . 8 . 8 . 7 . 1 . 6 . 1 . 6 . 1 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 7 . 8 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7</pre>	83)m , 51.84 area f ee Ta Jun 0.47 w step 21 velling 0.09 m (se 0.4	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 os 3 to 7 21 from Ta 20.09 e Table 0.27	392           392           756           ble 9,           0.3           7 in T           2           able §           20.           9a)           0.3	.41 $305.01$ .47 $684.85$ Th1 (°C)         Jg       Sep         .8 $0.62$ able 9c)       1         1       20.98         .1 $0.54$ to 7 in Tabl         1       20.08	188.94 596.7 0ct 0.89 20.8 20.08 20.08 20.08 20.08 19.94	1       540.34         1       540.34         Nov       0.98         20.45       20.45         20.08       0.97         19.61       19.61	529.18 Dec 0.99 20.15 20.07 0.99			<ul> <li>(84)</li> <li>(85)</li> <li>(86)</li> <li>(87)</li> <li>(88)</li> <li>(89)</li> <li>(90)</li> </ul>
(83)m= Total (2 (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	81.4 $ains - i$ $556.42$ $an interara interara interara interna0.99ara interna20.18ara interna20.06ara interna0.98ara interna$	159.24nternal a630.61nal tempduring hctor for gaFeb0.98l tempera20.35during h20.06ctor for ga0.97l tempera	262.25 nd solar 715.75 eating p eating for l Mar 0.94 ature in l 20.59 eating p 20.07 ains for r 0.92 ature in t	382.48 (84)m = 808.26 (heating eriods ir iving are Apr 0.83 living are 20.84 eriods ir 20.08 rest of d 0.79 the rest	468.74 = (73)m 866.27 seaso the live a, h1,i May 0.66 a T1 ( 20.96 n rest of 20.08 welling 0.6 of dwe	<pre>. 4 . + (i) . + (i) . 8 . 8 . 7 . 8 . 8 . 8 . 8 . 8 . 8 . 7 . 1 . 6 . 1 . 6 . 1 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 8 . 7 . 7 . 8 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7</pre>	83)m , 51.84 area f ee Ta Jun 0.47 w step 21 w step 21 w step 21 co.09 m (se 0.4 T2 (fc	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 05 3 to 7 21 from Ta 20.09 e Table 0.27 bllow ste	392           392           756           Dle 9,           Ai           0.3           7 in T           20           9a)           0.3           eps 3	.41 $305.01$ .47 $684.85$ Th1 (°C)         Jg       Sep         .8 $0.62$ able 9c)       1         1       20.98         .1 $0.54$ to 7 in Tabl         1       20.08	188.94 596.7 0ct 0.89 20.8 20.08 20.08 20.08 20.08 19.94	1 540.34 Nov 0.98 20.45 20.08 0.97	529.18 Dec 0.99 20.15 20.07 0.99		21	(84) (85) (86) (87) (88) (88) (89)
(83)m= Total (2 (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	81.4         jains – i         556.42         an inter         berature         ation fac         20.18         berature         20.06         ation fac         0.98         interna         19.34	159.24nternal a630.61nal tempduring hctor for gaFeb0.98l tempera20.35during h20.06ctor for ga0.97l tempera19.5	262.25 nd solar 715.75 eating p ains for l Mar 0.94 ature in l 20.59 eating p 20.07 ains for r 0.92 ature in l 19.73	382.48 (84)m = 808.26 (heating eriods ir iving are 0.83 living are 20.84 eriods ir 20.08 rest of dr 0.79 the rest 19.97	468.74 = (73)m 866.27 seaso the live a, h1,i May 0.66 a T1 ( 20.96 a rest c 20.08 welling 0.6 of dwe 20.06	<pre>. 4 . + (% . * % . * * % . * * % . *</pre>	83)m , 51.84 area f ee Ta Jun 0.47 w step 21 velling 0.09 m (se 0.4 T2 (fc 20.09	456.83 watts 813.73 rom Tab ble 9a) Jul 0.34 0.34 0.34 0.34 0.34 0.34 0.34 0.34	392           392           756           ble 9,           0.3           7 in T           2           able §           20           9a)           0.3           20,           9a)           20,	.41 $305.01$ .47 $684.85$ Th1 (°C)         Jg       Sep         .8 $0.62$ able 9c)       1         1       20.98         .1 $0.54$ to 7 in Tabl         1       20.08	188.94 596.7 0ct 0.89 20.8 20.08 20.08 20.08 20.08 19.94	1       540.34         1       540.34         Nov       0.98         20.45       20.45         20.08       0.97         19.61       19.61	529.18 Dec 0.99 20.15 20.07 0.99			<ul> <li>(84)</li> <li>(85)</li> <li>(86)</li> <li>(87)</li> <li>(88)</li> <li>(89)</li> <li>(90)</li> </ul>

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

(93)m=	19.53	19.69	19.93	20.17	20.28	20.31	20.31	20.31	20.3	20.14	19.8	19.5		(93)
8. Sp	ace hea	ting requ	uirement	:										
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.98	0.96	0.92	0.8	0.61	0.42	0.29	0.32	0.56	0.86	0.96	0.99		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m			-						
(95)m=	546.21	608.21	656.45	643.74	531.27	357.58	233.33	245.14	384.66	511.47	520.74	521.43		(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat			i	· · ·			- /	x [(93)m	· ,	-			l .	
(97)m=	993.95	962.6	871.63	721.33	547.31	359.12	233.47	245.41	391.97	608.61	814.89	987.66		(97)
Space		· ·	r	i	nonth, k\	/Vh/mont	h = 0.02	24 x [(97]	)m – (95	)m] x (4	1)m		l .	
(98)m=	333.12	238.15	160.09	55.86	11.93	0	0	0	0	72.27	211.79	346.87		-
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	1430.08	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								22.46	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												
Fracti	on of sp	ace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		·	1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1							:	92.9	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ı, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	l'í
Space	e heatin	g require	ement (c		d above)	)		<u> </u>						
	333.12	238.15	160.09	55.86	11.93	0	0	0	0	72.27	211.79	346.87		
(211)m	n = {[(98	)m x (20	94)] + (21	l0)m } x	100 ÷ (2	06)								(211)
<b>、</b> ,	358.58	256.35	172.33	60.13	12.84	0	0	0	0	77.79	227.97	373.38		
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	=	1539.38	(211)
Space	e heatin	a fuel (s	econdar	v). kWh/	month									J
•			14) m } x	• •										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water	heating	1												1
Output	from w	ater hea	ter (calc	ulated a	bove)									
	126.78	113.13	122.76	114.26	113.77	101.05	95.9	106.83	107.14	117.68	117.73	122.33		_
Efficier	ncy of w	ater hea	ter										87.3	(216)
(217)m=	89.17	89.05	88.75	88.14	87.54	87.3	87.3	87.3	87.3	88.27	88.95	89.21		(217)
		•	kWh/mo											
			) ÷ (217)		405.55	445	400.07	100.07	100 -0	100.01	100.07	407.40		
(219)m=	142.19	127.04	138.32	129.64	129.96	115.75	109.85	122.37	122.73	133.31	132.35	137.13		٦.
_	_							l ota	I = Sum(2				1540.66	(219)
	I totals	fuel	d main	oveter	1					k	Wh/year	, 	kWh/year	1
space	neating	iuel USE	ed, main	system	I								1539.38	

				<b></b>	-
Water heating fuel used				1540.66	
Electricity for pumps, fans and electric ke				-	
mechanical ventilation - balanced, extra	act or positive input from ou	utside	110.09		(230a)
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year		sum of (230a)(230g) =		185.09	(231)
Electricity for lighting				287.18	(232)
Electricity generated by PVs				-456.3	(233)
10a. Fuel costs - individual heating sys	tems:				
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)		<b>Fuel Cost</b> £/year	
Space heating - main system 1	(211) x	3.48	x 0.01 =	53.570425492955	9 (240)
Space heating - main system 2	(213) x	0	x 0.01 =	0	(241)
Space heating - secondary	(215) x	13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)	3.48	x 0.01 =	53.61	(247)
Pumps, fans and electric keep-hot	(231)	13.19	x 0.01 =	24.41	(249)
(if off-peak tariff, list each of (230a) to (2 Energy for lighting	30g) separately as applica (232)	ble and apply fuel price act	cording to $\begin{bmatrix} x & 0.01 \end{bmatrix}$	Table 12a 37.88	(250)
Additional standing charges (Table 12)			-	120	(251)
	one of (233) to (23	35) x) 13.19	x 0.01 =	0	(252)
Appendix Q items: repeat lines (253) and	d (254) as needed	10.10	1		]()
Total energy cost	(245)(247) + (250)(254) =			289.48	(255)
11a. SAP rating - individual heating sys	stems				
Energy cost deflator (Table 12)				0.42	(256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =			1.12	(257)
SAP rating (Section 12)				84.39	(258)
12a. CO2 emissions – Individual heatin	ig systems including micro-	-CHP			
	<b>Energy</b> kWh/year	<b>Emission f</b> akg CO2/kW		<b>Emissions</b> kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	332.51	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	332.78	(264)
Space and water heating	(261) + (262) + (26	ô3) + (264) =		665.29	(265)
Electricity for pumps, fans and electric k	eep-hot (231) x	0.519	=	96.06	(267)
Electricity for lighting	(232) x	0.519	=	149.05	(268)
Energy saving/generation technologies					-

					_
Item 1		0.519	=	-236.82	(269)
Total CO2, kg/year		sum of (265)(271) =		673.58	(272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =		10.58	(273)
El rating (section 14)			[	92	(274)
13a. Primary Energy					
	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	=	1878.04	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	1879.6	(264)
Space and water heating	(261) + (262) + (263) + (26	4) =	[	3757.65	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	568.23	(267)
Electricity for lighting	(232) x	0	=	881.65	(268)
Energy saving/generation technologies Item 1		3.07	=	-1400.83	(269)
'Total Primary Energy		sum of (265)(271) =		3806.7	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		59.8	(273)

# SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 November 2014

Property Details: Unit G 01

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shut Ventilation rate during Overheating Details:	es: eter: ters: g hot wea	-		Yes 1 South Averag None Indicat False	s valley e or unknown ive Value Medium ndows open half th	e time)		(P1)
Transmission heat los Summer heat loss co	ss coeffic			49.6				
Overhangs:	emcient:			219.78				(P2)
<b>Orientation:</b> West (West windows)	Ratio:		<b>Z_overhangs:</b>					
West (East windows)	0		1					
Solar shading:								
Orientation:	Z blinds	5:	Solar access:	C	)verhangs:	Z summer:		
West (West windows) West (East windows)	1 1		0.9 0.9	1 1		0.9 0.9		(P8) (P8)
Solar gains:								
Orientation West (West windows) West (East windows)	0.9 x 0.9 x	<b>Area</b> 6 7.56	<b>Flux</b> 117.51 117.51	<b>g_</b> 0.63 0.63	<b>FF</b> 0.7 0.7	Shading 0.9 0.9 Total	<b>Gains</b> 251.94 317.33 569.27	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass tempera Threshold temperature Likelihood of high int	temperat ture incre	ment	5.		June 369 973.29 4.43 16 0.25 20.68 <b>Slight</b>	<b>July</b> 353.9 923.17 4.2 17.9 0.25 22.35 <b>Medium</b>	August 361.06 861.88 3.92 17.8 0.25 21.97 Slight	(P5) (P6) (P7)
Assessment of likelih	ood of hi	gh inte	rnal temperatur	e:	Medium			



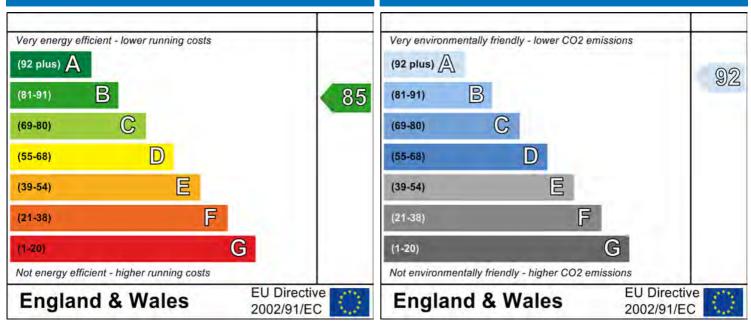
Dwelling type: Date of assessment: Produced by: Total floor area: Ground floor Flat 28 October 2014 Aymon Winter 67.870002746582 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

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

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

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

# **Regulations Compliance Report**

EW DWELLING	Aymon Winter (S	TRO014511)	Building Type: Flat	
Dwelling Details: IEW DWELLING ite Reference :			Dunung iype. Fiat	
ite Reference :	DESIGN STAGE		Total Floor Area: 67.87m <sup>2</sup>	
	Development at F	Riverpark Gardens	Plot Reference: Unit G 02	
ddress :				
Client Details:				
lame:	Jamie			
ddress :	Campbell, 43 Tar	nner Street, Greater London, Lo	ondon, SE13PL	
his report cover	s items included v	vithin the SAP calculations.		
•		tions compliance.		
1a TER and DER				
	ng system: Mains (	jas		
uel factor: 1.00 (n	• /			
•	xide Emission Rate		20.34 kg/m <sup>2</sup>	OK
b TFEE and DF	ioxide Emission Ra	ile (DER)	11.15 kg/m²	OK
	gy Efficiency (TFE	=)	58.84 kWh/m²	
-	ergy Efficiency (DF		47.36 kWh/m <sup>2</sup>	
0		,		ОК
2 Fabric U-value	S			
Element		Average	Highest	
External v	vall	0.16 (max. 0.30)	0.18 (max. 0.70)	OK
Floor		0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof Openings		(no roof) 1.35 (max. 2.00)	1.40 (max. 3.30)	ОК
2a Thermal bridg		1.00 (max. 2.00)	1.40 (max. 5.56)	OR
		from linear thermal transmittan	ces for each junction	
3 Air permeabilit	00			
	pility at 50 pascals		3.00 (design value)	
Maximum			10.0	OK
4 Heating efficie	ncy			
Main Heatin		Database: (rev 367, produc	t index 016684):	
		Boiler systems with radiator	s or underfloor heating - mains gas	
		Brand name: Baxi		
		Model: Neta-tec Combi		
		Model qualifier: 24 GA		
		(Combi) Efficiency 89.0 % SEDBUK	2009	
		-	2003	
		Minimum 88.0 %		OK

# **Regulations Compliance Report**

5 Cylinder insulation			
Hot water Storage:	Nominal cylinder loss: 0.0	•	
	Permitted by DBSCG: 2.1	0 kWh/day	
Primary pipework insulated	: Yes		OK
6 Controls			
Space heating controls	Programmer, room therm	ostat and TRVs	OK
Hot water controls:	Cylinderstat		OK
	Independent timer for DH	W	OK
Boiler interlock:	Yes		OK
7 Low energy lights		400.0%	
Percentage of fixed lights w	hth low-energy fittings	100.0%	01/
Minimum		75.0%	ОК
8 Mechanical ventilation			
Continuous supply and extr	act system		
Specific fan power:		0.42	
Maximum		1.5	OK
MVHR efficiency:		91%	
Minimum		70%	OK
9 Summertime temperature			
Overheating risk (Thames	valley):	Slight	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: South		1.98m²,	
Windows facing: East		13.42m²,	
Ventilation rate:		3.00	P 1
Blinds/curtains:		Light-coloured curtain or roller t	olina
		Closed 100% of daylight hours	
10 Key features			
Air permeablility		3.0 m³/m²h	
Doors U-value		1 W/m²K	
Floors U-value		0.11 W/m²K	
		········	

Photovoltaic array

# SAP Input

Address: Located in: Region: UPRN: Date of assessme Date of certificat Assessment type Transaction type Tenure type: Related party dis Thermal Mass Pa Water use <= 12 PCDF Version:	ent: te: e: sclosure: arameter:	28 Oc 28 No New c New c Unkno No rel Indica	es valley tober 2014 vember 2014 dwelling design sta dwelling	-			
Property description	n:						
Dwelling type: Detachment: Year Completed: Floor Location: Floor 0 Living area: Front of dwelling fa		67.87	r area: m² m² (fraction 0.41		Storey height 2.7 m	:	
Opening types:							
Name: main door south window East Window	Source: Manufacturer SAP 2012 SAP 2012	S	Fype: Solid Windows Windows		0.05, soft coat 0.05, soft coat	Argon: Yes Yes	Frame: PVC-U PVC-U PVC-U
Name: main door south window East Window	<b>Gap:</b> mm 16mm or 16mm or		<b>Frame Facto</b> 0.7 0.7 0.7	<b>or: g-value:</b> 0 0.63 0.63	<b>U-value:</b> 1 1.4 1.4	<b>Area:</b> 2.44 1.98 13.42	No. of Openings: 1 1 1
Name: main door south window East Window	Type-Name	s e	Location: sheltered wall external wall external wall	Orient: West South East		Width: 0 0 0	Height: 0 0 0
Overshading: Opaque Elements:		Avera	ge or unknown				
Type: C External Elements external wall sheltered to storage wall to corridor ground floor Internal Elements internal walls	Gross area: 50.52 18.66 23.3 67.87 64.21	Openings: 15.4 0 0	Net area: 35.12 18.66 23.3	U-value: 0.15 0.15 0.18 0.11	Ru value: 0 0.54 0.43	Curtain False False False	wall: Kappa: N/A N/A N/A N/A N/A
Party Elements Party ceiling	67.87						N/A

Thermal bridges:

Property Details: Unit G 02

# **SAP Input**

Thermal bridges:				Y-Value = 0.0607
	Length	Psi-value		Steel lintel with perforated steel base plate
	8.1 22.04	0.401 0.021	E1 E4	Steel lintel with perforated steel base plate Jamb
	34.25	0.021	E4 E5	Ground floor (normal)
	34.25	0.104	E7	Party floor between dwellings (in blocks of flats)
	10.8	0.048	E16	Corner (normal)
Ventilation:				
Pressure test:	Yes (As des	sianed)		
Ventilation:		ith heat recove	ery	
		wet rooms: Kit	•	
	Ductwork:	Insulation, rigio	b	
	Approved I	nstallation Sche	eme: True	
Number of chimneys:	0			
Number of open flues:	0			
Number of fans:	0			
Number of passive stacks:	0			
Number of sides sheltered:	3			
Pressure test: Main heating system:	3			
Main heating system:	Boiler syste	ms with radiat	ors or und	lerfloor heating
main noating ofotonin		and oil boilers		
	Fuel: mains	s gas		
	Info Source	e: Boiler Databa	ase	
			uct index (	016684) Efficiency: Winter 87.3 % Summer: 89.9
	Brand nam			
		a-tec Combi		
	Model qual			
	(Combi boi			
	•	th radiators		
		iting pump : 20		
	Room-seale	•	Design no	ow temperature >45°C
	Boiler inter			
	Delayed sta			
Main heating Control:				
Main heating Control:	Programme Control coc	er, room thermo	ostat and	TRVs
Secondary heating system:		0. 2100		
Secondary heating system:	None			
Water heating:				
Water heating:		heating system	ו	
	Water code			
	Fuel :mains	•		
	Hot water of	cylinder lume: 180 litre:	c	
		sulation: Factor		
	-	ework insulation	-	
	Cylindersta			
		heated space:	True	
		eat Recovery S		
		(rev 367, prod	-	060001)
	Brand nar			
	Model: Ga			
	Model qua	alifier: GS-1		

# **SAP Input**

#### 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: 0.7 Tilt of collector: Horizontal Overshading: None or very little Collector Orientation: South No

Assess Zero Carbon Home:

			User [	Details:						
Assessor Name:	Aymon Wir	nter		Strom	a Num	ber:		STRO	014511	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versio	on: 1.0.1.14	
			Property	Address	Unit G	02				
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor				<b>a(m²)</b> 67.87	(1a) x	<b>Av. He</b>	i <b>ght(m)</b> 7	(2a) =	Volume(m <sup>3</sup> ) 183.25	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(	(1d)+(1e)+	.(1n)	67.87	(4)			-		_
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	183.25	(5)
2. Ventilation rate:										
	main heating	secon heati		other		total			m <sup>3</sup> per hour	•
Number of chimneys	0	+ 0	<u> </u>	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	 +		0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	IS		L		- L	0	x 1	10 =	0	(7a)
Number of passive vents						0	<b>x</b> 1	10 =	0	(7b)
Number of flueless gas fir	es				Г	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	
lefiltertien der te skinnen	- (l		$(7a) \cdot (7b) \cdot (7b)$		F			1		-
Infiltration due to chimney If a pressurisation test has be					continue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in th			· · · · · · · · · · · · · · · · · · ·				-7		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or	timber fram	e or 0.35 fo	r masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening			ng to the grea	ter wall are	a (after					
If suspended wooden fl			or 0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ente			,	, -					0	(13)
Percentage of windows	and doors dr	aught strippe	ed						0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o				•	•	etre of e	nvelope	area	3	(17)
If based on air permeabilit	-								0.15	(18)
Air permeability value applies	•	on test has beer	n done or a de	gree air pe	rmeability	is being us	sed			٦
Number of sides sheltered Shelter factor	1			(20) = 1 -	[0.075 x (1	9)] =			3	(19) (20)
Infiltration rate incorporati	na shelter fac	tor		(21) = (18)		-/1			0.78	(20)
Infiltration rate modified for	•			(()	, (==)				0.12	(21)
	Mar Apr		ın Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe							. · ·		I	
	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
		I	<u>     I                               </u>	1			I	1	I	
Wind Factor (22a)m = (22 (22a)m = 1.27 1.25 1	)m ÷ 4 .23 1.1	1.08 0.9	0.95	0.92	1	1.08	1.12	1.18		
	I		I	I				I	I	

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
<b>~</b> /	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
	l <del>ate effec</del> echanica		•	rate for t	ne appli	cable ca	se						0.5	(23a)
	naust air he			endix N. (2	<sup>2</sup> 3b) = (23a	a) x Fmv (e	equation (N	(15)), othe	wise (23b	) = (23a)			0.5	(23b)
	anced with									, (,			0.5	(23c)
	balance		-	-	-					2h)m + (	23h) x [1	I – (23c)		(200)
(24a)m=		0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25	]	(24a)
	balance	d mech:	l anical ve	I	without	L heat rec	L coverv (N	L /\\/) (24b	l = (22)	l 2b)m + ('	1 23b)		1	
(24b)m=		0		0	0	0		0	0	0	0	0	]	(24b)
	whole h	ouse ex	tract ver	I Intilation of	r positiv	L ve input v	L ventilatio	n from c	outside				1	
,	if (22b)m					•				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 I	oft	-		•		
	if (22b)m		en (24d)	m = (22l	b)m othe	erwise (2	4d)m = 0	0.5 + [(2	2b)m² x	0.5]	1	r	1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
	ctive air		i	· · · ·	í .	r i	<u>, ,</u>	· · · · · ·	· ,				1	
(25)m=	0.26	0.26	0.26	0.24	0.24	0.22	0.22	0.22	0.23	0.24	0.24	0.25		(25)
3. He	at losses	s and he	eat loss	paramet	er:									
ELEN	MENT	Gros		Openin		Net Ar		U-valu		AXU		k-value		Xk
D		area	(m²)	m	) <sup>2</sup>	A ,r		W/m2	—	(W/	K)	kJ/m²∙l	K K.	J/K
Doors						2.44		1	=	2.44				(26)
	ws Type _					1.98		/[1/( 1.4 )+		2.62				(27)
	ws Type	2				13.42	2 x1,	/[1/( 1.4 )+	0.04] =	17.79				(27)
Floor						67.87	<b>x</b>	0.11	= [	7.4657				(28)
Walls	Type1	50.5	52	15.4	L .	35.12	<u>x</u>	0.15	=	5.27				(29)
Walls	Type2	18.6	6	0		18.66	3 X	0.14	=	2.59				(29)
Walls	Туре3	23.	3	0		23.3	x	0.17	=	3.89				(29)
Total a	area of e	lements	, m²			162.7	9							(31)
Party	ceiling					67.87	7				[			(32b)
Interna	al wall **					64.21					[			(32c)
	ndows and de the area						ated using	formula 1.	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	ז 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				42.07	(33)
Heat o	capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	19947.1	(34)
Therm	al mass	parame	ter (TMI	- = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	ign assess used instea				constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	<						9.88	(36)
	s of therma		are not kr	nown (36) =	= 0.15 x (3	1)				(00)				
	abric hea		ملماريما	ا بالدين من ال						(36) =	05)		51.95	(37)
ventila	ation hea		i	i		1	11	۸		1	25)m x (5)	i	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

(39)m = (37) + (38)m         (39)m = (37, + (38)m         Average = Sum(39)112 /12=         Average = Sum(39)112 /12=         (40)m = (39)m ÷ (4)         Average = Sum(39)112 /12=         Average = Sum(40)112 /12=         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       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31 <t< th=""><th>(39) (40) (41) (42) (43)</th></t<>	(39) (40) (41) (42) (43)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(40) (41) (42)
(40)m = (39)m ÷ (4)         (40)m = (39)m ÷ (4)         (40)m =       1       1       0.99       0.98       0.96       0.96       0.97       0.98       0.98       0.99         Average = Sum(40)112 /12 =       0.98         Number of days in month (Table 1a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec	(40) (41) (42)
(40)m=       1       1       0.99       0.98       0.96       0.96       0.96       0.97       0.98       0.98       0.99         Average = Sum(40)112 /12=         Number of days in month (Table 1a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec	(41) (42)
Average = Sum(40)112 /12=     0.98       Number of days in month (Table 1a)     Jan       Jan     Feb     Mar       Apr     May       Jun     Jul       Aug     Sep       Oct     Nov	(41) (42)
Number of days in month (Table 1a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec	(41) (42)
	(42)
(41)m= 31 28 31 30 31 30 31 31 30 31 30 31 30 31	(42)
4. Water heating energy requirement: kWh/year:	
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1	(43)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)	
(44)m= 94.92 91.47 88.02 84.57 81.11 77.66 77.66 81.11 84.57 88.02 91.47 94.92	
$Total = Sum(44)_{112} = 1035.5$	(44)
Energy content of hot water used - calculated monthly = $4.190 \times Vd$ , $m \times nm \times DTm / 3600 kWh/month$ (see Tables 1b, 1c, 1d)	
(45)m=       140.76       123.11       127.04       110.76       106.28       91.71       84.98       97.52       98.68       115       125.53       136.32         Total = Sum(45)112 = 1357.7	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) $1337.7$	
(46)m= 21.11 18.47 19.06 16.61 15.94 13.76 12.75 14.63 14.8 17.25 18.83 20.45	(46)
Water storage loss:	
Storage volume (litres) including any solar or WWHRS storage within same vessel 180	(47)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss:	
a) If manufacturer's declared loss factor is known (kWh/day):	(48)
Temperature factor from Table 2b	(49)
Energy lost from water storage, kWh/year (48) x (49) = 0	(50)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0	(51)
If community heating see section 4.3	
Volume factor from Table 2a 0	(52)
Temperature factor from Table 2b     0	(53)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ Enter (50) or (54) in (55)       0	(54) (55)
Water storage loss calculated for each month $((56)m = (55) \times (41)m$	(00)
(56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(56)
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , else $(57)m = (56)m$ where (H11) is from Appendix H	
(57)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(57)

Primary circuit loss (annual) fro		59)m = (58) ÷ 36	5 x (41)m		0	(58)	
(modified by factor from Tab	•		. ,	r thermostat)			
(59)m= 0 0 0	0 0	0 0	0 0	0 0	0	(59)	
Combi loss calculated for each	n month (61)m = (	60) ÷ 365 × (41)	)m				
(61)m= 21.95 19.82 21.95	21.24 21.95	21.24 21.95	21.95 21.24	21.95 21.24	21.95	(61)	
Total heat required for water h	eating calculated	for each month	(62)m = 0.85 ×	(45)m + (46)m +	(57)m +	(59)m + (61)m	
(62)m= 162.71 142.94 148.99	132 128.22	112.95 106.93	119.46 119.92	136.95 146.77	158.27	(62)	
Solar DHW input calculated using App	endix G or Appendix	H (negative quantity	/) (enter '0' if no sola	r contribution to wat	er heating)		
(add additional lines if FGHRS	and/or WWHRS	applies, see Ap	pendix G)				
(63)m= 0 0 0	0 0	0 0	0 0	0 0	0	(63)	
FHRS 31.94 25.98 21.79	14.16 11.37	9.39 8.71	9.96 10.07	15.47 25.27	32.2	(63) (6	G2)
Output from water heater							
(64)m= 130.77 116.96 127.2	117.84 116.85	103.56 98.21	109.51 109.85	121.47 121.5	126.07		
· · · ·			Output from w	ater heater (annual)	112	1399.78 <mark>(64)</mark>	
Heat gains from water heating	, kWh/month 0.25	5 ´ [0.85 × (45)m	+ (61)m] + 0.8 x	x [(46)m + (57)m	ı + (59)m	]	
(65)m= 52.29 45.89 47.73	42.14 40.82	35.8 33.74	37.91 38.12	43.73 47.05	50.81	(65)	
include (57)m in calculation	of (65)m only if cy	/linder is in the o	dwelling or hot w	ater is from com	nmunity h	eating	
5. Internal gains (see Table s	5 and 5a):						
Metabolic gains (Table 5), Wat	tts						_
Jan Feb Mar	Apr May	Jun Jul	Aug Sep	Oct Nov	Dec		
(66)m= 131.6 131.6 131.6	131.6 131.6	131.6 131.6	131.6 131.6	131.6 131.6	131.6	(66)	
Lighting gains (calculated in A	ppendix L, equation	on L9 or L9a), a	lso see Table 5	• •	1		
(67)m= 42.85 38.05 30.95	23.43 17.51	14.79 15.98	20.77 27.87	35.39 41.31	44.04	(67)	
Appliances gains (calculated in	n Appendix L, equ	uation L13 or L1	3a), also see Ta	ble 5			
(68)m= 286.98 289.96 282.45	266.48 246.31	227.36 214.69	211.72 219.22	235.2 255.36	274.32	(68)	
Cooking gains (calculated in A	ppendix L, equati	ion L15 or L15a)	, also see Table	9 5			
(69)m= 50.35 50.35 50.35	50.35 50.35	50.35 50.35	50.35 50.35	50.35 50.35	50.35	(69)	
Pumps and fans gains (Table	5a)	•	I	• •			
(70)m= 3 3 3	3 3	3 3	3 3	3 3	3	(70)	
Losses e.g. evaporation (nega	tive values) (Tabl	le 5)	<b>I</b>	• •	•		
(71)m= -87.73 -87.73 -87.73	-87.73 -87.73	-87.73 -87.73	-87.73 -87.73	-87.73 -87.73	-87.73	(71)	
Water heating gains (Table 5)		•	L I	• •			
(72)m= 70.28 68.29 64.15	58.52 54.87	49.73 45.35	50.96 52.95	58.77 65.35	68.3	(72)	
Total internal gains =		(66)m + (67)m	u + (68)m + (69)m +	(70)m + (71)m + (72	)m		
(73)m= 497.33 493.52 474.77	445.65 415.91	389.09 373.24	380.66 397.26	426.58 459.24	483.87	(73)	
6. Solar gains:	· · ·			• • • • • • • • • • • • • • • • • • •	•		
Solar gains are calculated using sola	ar flux from Table 6a a	ind associated equa	tions to convert to th	ne applicable orienta	tion.		
Orientation: Access Factor Table 6d	Area m²	Flux Table 6a	g_ Table 6b	FF Table 6c		Gains (W)	

Chemaner	Table 6dm²		Table 6a	Table 6b	Table 6c	(W)
East 0	.9x 1	x 13.42	x 19.64	x 0.63	<b>x</b> 0.7	= 80.55 (76)

	-									-			_					_
East	0.9x	1		x	13.4	12	x	3	8.42	x		0.63	x	0.7		=	157.58	(76)
East	0.9x	1		x	13.4	12	x	6	3.27	x		0.63	x	0.7		=	259.5	(76)
East	0.9x	1		x	13.4	42	x	g	2.28	x		0.63	x	0.7		=	378.47	(76)
East	0.9x	1		x	13.4	12	x	1	13.09	x		0.63	×	0.7		=	463.83	(76)
East	0.9x	1		x	13.4	12	x	1	15.77	x		0.63	×	0.7		=	474.81	(76)
East	0.9x	1		x	13.4	42	x	1	10.22	x		0.63	×	0.7		=	452.04	(76)
East	0.9x	1		x	13.4	42	x	g	4.68	x		0.63	×	0.7		=	388.3	(76)
East	0.9x	1		x	13.4	12	x	7	3.59	x		0.63	×	0.7		=	301.81	(76)
East	0.9x	1		x	13.4	12	x	4	5.59	x		0.63	×	0.7		=	186.98	(76)
East	0.9x	1		x	13.4	12	x	2	4.49	×		0.63	×	0.7		=	100.44	(76)
East	0.9x	1		x	13.4	12	x	1	6.15	x		0.63	×	0.7		=	66.24	(76)
South	0.9x	0.77		x	1.9	8	x	4	6.75	x		0.63	×	0.7		=	28.29	(78)
South	0.9x	0.77		x	1.9	8	x	7	6.57	x		0.63	x	0.7		=	46.33	(78)
South	0.9x	0.77		x	1.9	8	x	g	7.53	x		0.63	×	0.7		=	59.02	(78)
South	0.9x	0.77		x	1.9	8	x	1	10.23	×		0.63	x	0.7		=	66.7	(78)
South	0.9x	0.77		x	1.9	8	x	1	14.87	x		0.63	x	0.7		=	69.51	(78)
South	0.9x	0.77		x	1.9	8	x	1	10.55	x		0.63	x	0.7		=	66.89	(78)
South	0.9x	0.77		x	1.9	8	x	1	08.01	x		0.63	x	0.7		=	65.36	(78)
South	0.9x	0.77		x	1.9	8	x	1	04.89	x		0.63	×	0.7		=	63.47	(78)
South	0.9x	0.77		x	1.9	8	x	1	01.89	x		0.63	x	0.7		=	61.65	(78)
South	0.9x	0.77		x	1.9	8	x	8	2.59	x		0.63	x	0.7		=	49.97	(78)
South	0.9x	0.77		x	1.9	8	x	5	5.42	x		0.63	x	0.7		=	33.53	(78)
South	0.9x	0.77		x	1.9	8	x		40.4	x		0.63	x	0.7		=	24.45	(78)
Solar g	ains in	watts, ca	alculat	ed	for eac	n mont	h			(83)m	า = Sเ	um(74)m	.(82)m					
(83)m=	108.84	203.91	318.5		445.18	533.34		541.71	517.4	451	.77	363.47	236.9	5 133.97	90.	69		(83)
-		nternal a		_	. ,	. ,	-										I	()
(84)m=	606.17	697.43	793.2	Э	890.82	949.25	5 9	930.79	890.64	832	.43	760.73	663.5	3 593.21	574	.56		(84)
7. Me	an intei	rnal temp	eratur	e (	heating	seaso	n)											
Temp	erature	during h	eating	pe	eriods ir	the liv	/ing	area	from Tab	ole 9	, Th′	1 (°C)					21	(85)
Utilisa	ation fac	ctor for g	ains fo	r li	ving are	a, h1,ı	m (s	see Ta	ble 9a)	·							L	
	Jan	Feb	Ма	r	Apr	Мау	/	Jun	Jul	A	ug	Sep	Oc	t Nov	D	ec		
(86)m=	0.99	0.97	0.92		0.8	0.63		0.45	0.32	0.3	36	0.58	0.87	0.97	0.9	99		(86)
Mean	interna	l temper	ature i	n li	iving are	ea T1 (	follo	ow ste	ps 3 to 7	7 in T	able	e 9c)						
(87)m=	20.24	20.41	20.65		20.87	20.97		21	21	2	1	20.99	20.84	20.5	20	.2		(87)
Temp	erature	during h	eating	pe	eriods ir	rest o	of dv	velling	from Ta	able 9	9, Th	n2 (°C)						
(88)m=	20.08	20.09	20.09		20.1	20.1		20.11	20.11	20.	11	20.11	20.1	20.1	20.	09		(88)
Utilies	ation fac	ctor for g	ains fo	r re	est of d	vellina	. h2	.m (se	e Tahle	9a)							I	
(89)m=	0.98	0.96	0.9		0.77	0.58	_	0.39	0.26	0.2	29	0.51	0.83	0.96	0.9	99		(89)
		I tempera												1			I	
(90)m=	19.41	19.58	19.81	-	20.01	20.09		20.11	20.11	20.		20.1	9C) 19.99	9 19.67	19.	38		(90)
(00)11-			10.01		_0.01	_0.00			L_0.11	L _ 0.				ving area ÷ (4			0.42	(91)
														0.000	·		0.42	

				مام ماريما	(l:) fl	A T4	. / 4 . 41						
Mean interna (92)m= 19.76	19.93	20.16	r the wn 20.37	20.46	11ng) = fl 20.48	_A × 11 20.48	+ (1 — ĭ∟ 20.49	A) × 12 20.47	20.34	20.02	19.73		(92)
Apply adjustr										20.02	19.75		(32)
(93)m= 19.61	19.78	20.01	20.22	20.31	20.33	20.33	20.34	20.32	20.19	19.87	19.58	l	(93)
8. Space hea	I			20.01	20.00	20.00	20.01	20.02	20.10	10.01	10.00		()
Set Ti to the				e obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti.m=()	76)m an	d re-calc	ulate	
the utilisation			•			·p · · · •		,	, (	c) a			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
Utilisation fac	tor for g	ains, hm	:									1	
(94)m= 0.98	0.96	0.9	0.77	0.59	0.4	0.27	0.31	0.53	0.83	0.96	0.98	I	(94)
Useful gains,	1	r Ì	, <u>,</u>	, 								l	
(95)m= 593.62	667.79	715.43	687.43	558.41	374.21	244.43	256.81	404.26	552.93	568.19	565.22		(95)
Monthly aver	<u>r</u>											l	(00)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea	i i	al tempe 753.33	571.18		=[(39)m > 244.53	x [(93)m- 257.01			851.83	1021 15	l	(97)
. ,					375.37			409.65	636.58		1031.15		(97)
Space heatin (98)m= 330.11	227.05	145.3	47.45	9.5	0	n = 0.02	4 X [(97)	0	62.24	204.23	346.66	l	
(50)11- 550.11	227.00	140.0	-1.15	0.0	0			l per year				1372.53	(98)
							TOId	i pei yeai	(KWII/yeai	) = Sum(9	<b>5)</b> 15,912 -		
Space heatin	g require	ement in	kWh/m <sup>2</sup>	/year								20.22	(99)
9a. Energy rec	quiremer	its – Indi	vidual h	eating sy	/stems ii	hcluding	micro-C	HP)					
Space heatin	-			1							г		
Fraction of sp			-		mentary	-	(000)	(004)				0	(201)
Fraction of sp	bace hea	it from m	ain syst	em(s)			(202) = 1 -					1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (20	02) × [1 – (	(203)] =			1	(204)
Efficiency of	main spa	ace heati	ng syste	em 1								92.9	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g system	ı, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin	g require	ement (c	alculated	d above)									
330.11	227.05	145.3	47.45	9.5	0	0	0	0	62.24	204.23	346.66		
(211)m = {[(98	)m x (20	4)] + (21	0)m } x	$100 \cdot (2)$									
355.34			<u>ojiii j x</u>	100 ÷ (2	06)								(211)
555.54	244.4	156.41	51.07	100 ÷ (2 10.23	06) 0	0	0	0	67	219.83	373.15		(211)
333.34	244.4	156.41	<u>, ,</u>	,	, 	0		0 I (kWh/yea				1477.43	(211)
Space heatin	ng fuel (s	econdar	51.07 y), kWh/	10.23	, 	0						1477.43	_
Space heatin = {[(98)m x (20	ng fuel (s 01)] + (2 <sup>-</sup>	econdary 14) m } x	51.07 y), kWh/ 100 ÷ (2	10.23 month 208)	0		Tota	l (kWh/yea	ır) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	=	1477.43	_
Space heatin	ng fuel (s	econdar	51.07 y), kWh/	10.23	, 	0	Tota 0	l (kWh/yea	ar) =Sum(2 0	211) <sub>15,1012</sub>	- 0		(211)
Space heatin = {[(98)m x (20 (215)m=0	ug fuel (s 01)] + (2 <sup>-1</sup> 0	econdary 14) m } x	51.07 y), kWh/ 100 ÷ (2	10.23 month 208)	0		Tota 0	l (kWh/yea	ar) =Sum(2 0	211) <sub>15,1012</sub>	- 0	0	_
Space heatin = $\{[(98)m \times (20)(215)m = 0\}$ Water heating	ng fuel (s 01)] + (2 <sup>-1</sup> 0	econdary 14) m } x 0	y), kWh/ 100 ÷ (2 0	10.23 month 208) 0	0		Tota 0	l (kWh/yea	ar) =Sum(2 0	211) <sub>15,1012</sub>	- 0		(211)
Space heatin = $\{[(98)m \times (20)(215)m=0\}$ Water heating Output from w	g fuel (s 01)] + (2 0 g gater hea	econdar 14) m } x 0	y), kWh/ 100 ÷ (2 0	10.23 month 208) 0	0	0	Tota 0 Tota	I (kWh/yea 0 I (kWh/yea	ar) =Sum(2 0 ar) =Sum(2	0 211) <sub>15,1012</sub> 0	= 0 =		(211)
Space heatin = $\{[(98)m \times (20)(215)m = 0 \}$ Water heating Output from w 130.77	g fuel (s 01)] + (2 0 g ater hea 116.96	econdary 14) m } x 0 ter (calco 127.2	y), kWh/ 100 ÷ (2 0	10.23 month 208) 0	0		Tota 0	l (kWh/yea	ar) =Sum(2 0	211) <sub>15,1012</sub>	- 0	0	(211)
Space heatin = $\{[(98)m \times (20)(215)m=0]$ Water heating Output from w 130.77 Efficiency of w	g fuel (s 01)] + (2 0 g ater hea 116.96 vater hea	econdary 14) m } x 0 ter (calco 127.2 ater	y), kWh/ 100 ÷ (i 0 ulated at 117.84	10.23 month 208) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 98.21	Tota 0 Tota 109.51	0 I (kWh/yea I (kWh/yea 109.85	ar) =Sum(2 0 ar) =Sum(2 121.47	0 215) <sub>15,1012</sub> 121.5	= 0 = 126.07		(211) (215) (216)
Space heating = $\{[(98)m \times (20)(215)m = 0$ Water heating Output from w 130.77 Efficiency of w (217)m = 89.15	ng fuel (s 01)] + (2 0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	econdary 14) m } x 0 ter (calco 127.2 ater 88.67	y), kWh/ 100 ÷ (2 0 ulated at 117.84 88.03	10.23 month 208) 0	0	0	Tota 0 Tota	I (kWh/yea 0 I (kWh/yea	ar) =Sum(2 0 ar) =Sum(2	0 211) <sub>15,1012</sub> 0	= 0 =	0	(211)
Space heating = $\{[(98)m \times (20)(215)m = 0$ Water heating Output from w 130.77 Efficiency of w (217)m = 89.15 Fuel for water	g fuel (s 01)] + (2 0 g ater hea 116.96 vater hea 89 heating,	econdary 14) m } x 0 ter (calco 127.2 ater 88.67 kWh/mc	y), kWh/ 100 ÷ (2 0 ulated at 117.84 88.03 onth	10.23 month 208) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 98.21	Tota 0 Tota 109.51	0 I (kWh/yea I (kWh/yea 109.85	ar) =Sum(2 0 ar) =Sum(2 121.47	0 215) <sub>15,1012</sub> 121.5	= 0 = 126.07	0	(211) (215) (216)
Space heating = $\{[(98)m \times (20)(215)m = 0$ Water heating Output from w 130.77 Efficiency of w (217)m = 89.15	g fuel (s 01)] + (2 0 g ater hea 116.96 vater hea 89 heating,	econdary 14) m } x 0 ter (calco 127.2 ater 88.67 kWh/mc	y), kWh/ 100 ÷ (2 0 ulated at 117.84 88.03 onth	10.23 month 208) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 98.21	Tota 0 Tota 109.51	0 I (kWh/yea I (kWh/yea 109.85	ar) =Sum(2 0 ar) =Sum(2 121.47	0 215) <sub>15,1012</sub> 121.5	= 0 = 126.07	0	(211) (215) (216)
Space heatin = $\{[(98)m \times (20)(215)m = 0 \\$ Water heating Output from w 130.77 Efficiency of w (217)m = 89.15 Fuel for water (219)m = (64)	g fuel (s 01)] + (2 0 g ater hea 116.96 vater hea vater hea s9 heating, 0m x 100	econdary 14) m } x 0 ter (calco 127.2 ater 88.67 kWh/mc 0 ÷ (217)	y), kWh/ 100 ÷ (2 0 ulated al 117.84 88.03 onth m	10.23 month 208) 0 200ve) 116.85 87.49	0 103.56 87.3	0 98.21 87.3	Tota 0 Tota 109.51 87.3	0 1 (kWh/yea 1 (kWh/yea 109.85 87.3	0 ar) =Sum(2 121.47 88.16 137.78	0 211) <sub>15,1012</sub> 215) <sub>15,1012</sub> 121.5 88.91	0 = 126.07 89.19	0	(211) (215) (216)

Annual totals Space heating fuel used, main system 1		kWh/year	<b>kWh/year</b> 1477.43
Water heating fuel used			1587.15
Electricity for pumps, fans and electric keep	-hot		
mechanical ventilation - balanced, extract of	or positive input from outside	117	.37 (230a)
central heating pump:		30	0 (230c)
boiler with a fan-assisted flue		4	5 (230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	192.37 (231)
Electricity for lighting			302.66 (232)
Electricity generated by PVs			-532.34 (233)
10a. Fuel costs - individual heating system	S:		
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 × 0.0	1 = 51.4145595102571 (240)
Space heating - main system 2	(213) x	0 × 0.0	1 = 0 (241)
Space heating - secondary	(215) x	13.19 × 0.0	1 = 0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.0	1 = 55.23 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.0	1 = 25.37 (249)
(if off-peak tariff, list each of (230a) to (230g Energy for lighting	) separately as applicable and app (232)	bly fuel price according	
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 × 0.0	1 = 0 (252)
Appendix Q items: repeat lines (253) and (2 Total energy cost (245	54) as needed 5)(247) + (250)(254) =		291.94 (255)
11a. SAP rating - individual heating system	IS		
	5) x (256)] ÷ [(4) + 45.0] =		0.42 (256) 1.09 (257)
SAP rating (Section 12)			84.85 (258)
12a. CO2 emissions – Individual heating sy	stems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	319.12 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	342.82 (264)
Space and water heating	(261) + (262) + (263) + (264) =		661.95 (265)
Electricity for pumps, fans and electric keep	-hot (231) x	0.519 =	99.84 (267)

Electricity for lighting	(232) x	0.519	- [	157.08	(268)
Energy saving/generation technologies Item 1		0.519	- [	-276.29	(269)
Total CO2, kg/year		sum of (265)(271) =		642.59	(272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	[	9.47	(273)
El rating (section 14)			[	92	(274)
13a. Primary Energy					
	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	- [	1802.46	(261)
Space heating (secondary)	(215) x	3.07	- [	0	(263)
Energy for water heating	(219) x	1.22	- [	1936.32	(264)
Space and water heating	(261) + (262) + (263) + (2	64) =	[	3738.79	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	- [	590.58	(267)
Electricity for lighting	(232) x	0	- [	929.18	(268)
Energy saving/generation technologies Item 1		3.07	- [	-1634.3	(269)
'Total Primary Energy		sum of (265)(271) =	[	3624.25	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =	[	53.4	(273)

# SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 November 2014

Property Details: Unit G 02

Dwelling type: Located in: Region: Cross ventilation possible: Number of storeys: Front of dwelling faces: Overshading: Overhangs: Thermal mass parameter: Night ventilation: Blinds, curtains, shutters: Ventilation rate during hot weather (ach): Overheating Details:					Flat England Thames valley Yes 1 West Average or unknown None Indicative Value Medium False Light-coloured curtain or roller blind 3 ( Windows open half the time)						
Summer ventilation heat los Transmission heat los Summer heat loss coo	ss coeffi	cient:	ent:	181.42 52 233.37				(P1) (P2)			
Overhangs:											
Orientation:	Ratio:		Z_overhangs:								
South (south window) East (East Window)	0 0		1 1								
Solar shading:											
<b>- - - - - - - - - -</b>			•	-		_					
Orientation:	Z blind	IS:	Solar access:		)verhangs:	Z summer:					
South (south window) East (East Window)	0.6 0.6		0.9 0.9	1 1		0.54 0.54		(P8) (P8)			
Solar gains:											
Orientation		Area	Flux	g_	FF	Shading	Gains				
South (south window)	0.9 x	1.98	112.21	0.63	0.7	0.54	47.62				
East (East Window)	0.9 x	13.42	117.51	0.63	0.7	0.54	337.98				
						Total	385.6	(P3/P4)			
Internal gains:											
Internal gains Total summer gains Summer gain/loss ratio		+uro /Th			<b>June</b> 386.09 794.22 3.4	<b>July</b> 370.24 755.84 3.24 17.9	<b>Augus</b> 377.66 721.98 3.09				
Mean summer external Thermal mass tempera Threshold temperature Likelihood of high inter	ture incre	ement	-		16 0.25 19.65 <b>Not significant</b>	0.25 21.39	17.8 0.25 21.14 <b>Slight</b>	(P7)			
Assessment of likelih		-		re:	<u>Slight</u>						