# **Regulations Compliance Report**

- 1111111111111111111111111111111111111	ber 2020 at 14:53:		na FSAP 2012 program, Version: 1.	0.5.9
Project Information				
Assessed By:	Zahid Ashraf (ST	RO001082)	Building Type: Flat	
Dwelling Details:				
NEW DWELLING	DESIGN STAGE		Total Floor Area: 50.84m <sup>2</sup>	
Site Reference :	Hermitage Lane		Plot Reference: Plot 4	.8
Address :	C C			
Client Details:				
Name:				
Address :				
This report cover	s items included v	vithin the SAP calculations.		
•	te report of regula			
1a TER and DER				
	ng system: Mains g	as (c)		
Fuel factor: 1.00 (r	• • • • • •			
•	xide Emission Rate		23.84 kg/m <sup>2</sup>	01/
1b TFEE and DF	ioxide Emission Ra	te (DER)	15.93 kg/m²	OK
	gy Efficiency (TFE	=)	69.6 kWh/m <sup>2</sup>	
-	ergy Efficiency (DF		52.2 kWh/m <sup>2</sup>	
		/		ОК
2 Fabric U-value	S			
Element		Average	Highest	
External v	vall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor		(no floor)		
Roof		0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)	OK
2a Thermal bridg		rom linear thermal transmitter	and for each junction	
3 Air permeabilit		rom linear thermal transmittar	ices for each junction	
-	ility at 50 pascals		3.00 (design value)	
Maximum	inty at 00 paceale		10.0	ОК
4 Heating efficie	ncv			
Main Heatir		Community heating schem	es - mains gas	
	9 - 9 - 1 - 1 - 1		generation of the second se	
Secondary	neating system:	None		
5 Cylinder insula	ation			
Hot water S		No cylinder		
6 Controls				
Space heat	ng controls	Charging system linked to	use of community heating,	
	-	programmer and at least tw		ОК
Hot water c	ontrols:	No cylinder thermostat		
The water of		No cylinder		

# **Regulations Compliance Report**

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	ОК
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ОК
		UN
Based on:		ÖN
<b>č</b>	Average or unknown	ÖN
Based on:		UK
Based on: Overshading:	Average or unknown	
Based on: Overshading: Windows facing: North East Ventilation rate:	Average or unknown 8.23m <sup>2</sup>	UK
Based on: Overshading: Windows facing: North East Ventilation rate: 10 Key features	Average or unknown 8.23m <sup>2</sup> 4.00	
Based on: Overshading: Windows facing: North East Ventilation rate: 10 Key features Air permeablility	Average or unknown 8.23m <sup>2</sup> 4.00 3.0 m <sup>3</sup> /m <sup>2</sup> h	
Based on: Overshading: Windows facing: North East Ventilation rate: 10 Key features	Average or unknown 8.23m <sup>2</sup> 4.00	

Photovoltaic array

			User D	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20	12		Stroma Softwa					001082 n: 1.0.5.9	
		Pr	operty A	Address:	Plot 48					
Address :										
1. Overall dwelling dime	nsions:									
Ground floor			Area 50		(1a) x	<b></b>	<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup> 127.1	<b>)</b> (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1n)	) 50	0.84	(4)			_		_
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	127.1	(5)
2. Ventilation rate:										
		secondary heating	/	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	i + [_	0	」 1 = 「	0	x	20 =	0	(6b)
Number of intermittent fa	ns					0	x ^	10 =	0	(7a)
Number of passive vents						0	x ·	10 =	0	(7b)
Number of flueless gas fi						0	x 4	40 =	0	(7c)
						0				
								Air ch	anges per ho	our
Infiltration due to chimney If a pressurisation test has b					ontinue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in th							,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0. if both types of wall are pr deducting areas of openir	resent, use the value corre				•	uction			0	(11)
If suspended wooden f		aled) or 0.1	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else enter 0								0	(13)
Percentage of windows	s and doors draught	stripped							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,				•		etre of e	nvelope	area	3	(17)
If based on air permeabil	•								0.15	(18)
Air permeability value applie		as been done	e or a deg	ree air pei	meability i	is being u	sed		_	
Number of sides sheltere Shelter factor	a			(20) = 1 - [	0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate incorporat	ing shelter factor			(21) = (18)		/-			0.03	(21)
Infiltration rate modified for	-	ed		. , . ,	. ,				0.15	
	Mar Apr May		Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7									
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4	· ·								
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	I	_I					ļ	I	I	

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d 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		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N (2	(23a) = (23a	i) x Fmv (e	equation (I	N5)) , othei	rwise (23h	) = (23a)			0.5	=
			0 11		, (	, (		n Table 4h	· · ·	) (200)			0.5	(23b)
			-	-	-			HR) (24a		2b)m + ('	23h) v [·	1 _ (23c)	79.05 · 1001	(23c)
(24a)m=	<b></b>	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25	÷ 100]	(24a)
								MV) (24b				0120		
(24b)m=	<b></b>			0	0	0			0	0	0	0		(24b)
			tract ver	L	l			on from c	l					
,					•			c) = (22b		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	e positiv	/e input	ventilatio	on from l	oft			<u>.</u>		
	if (22b)r	n = 1, th	en (24d)	m = (22	o)m othe	rwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			L	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN	IENT	Gros		Openin	gs	Net Ar		U-valı		AXU		k-value		Xk
_		area	(m²)	m	1 <sup>2</sup>	A ,r	m²	W/m2	:Κ	(W/ł	<)	kJ/m²∙ł	K K	J/K
Doors						2	X	1.4	= [	2.8				(26)
Windo						8.231	ı x1	/[1/( 1.4 )+	0.04] =	10.91				(27)
Walls	Type1	39.2	22	8.23	3	30.99	×	0.15	=	4.65				(29)
Walls	Type2	24.8	37	2		22.87	7 X	0.14	=	3.24				(29)
Roof		50.8	34	0		50.84	1 X	0.1	=	5.08				(30)
Total a	area of e	elements	, m²			114.9	3							(31)
				effective wi nternal wal			lated using	g formula 1,	/[(1/U-valu	ie)+0.04] a	is given in	paragraph	3.2	
		ss, W/K :						(26)(30)	+ (32) =				26.68	(33)
		Cm = S(		,					((28)	.(30) + (32	2) + (32a).	(32e) =	1211.65	(34)
			. ,		- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
For des	ign asses:	sments wh	ere the de	tails of the				recisely the	e indicative	values of	TMP in Ta	able 1f		
		ad of a de				nondiv l	<b>K</b>						15.04	
	-	•		culated ( 1000000000000000000000000000000000000	• •	•	N						15.21	(36)
	abric he		are not kn	- (50)	- 0.00 x (0	")			(33) +	(36) =			41.9	(37)
Ventila	ation hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 × (	25)m x (5)	)		` ´
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	11.21	11.08	10.94	10.28	10.14	9.47	9.47	9.34	9.74	10.14	10.41	10.68		(38)
Heat t	ransfer o	coefficie	nt, W/K		•				(39)m	= (37) + (3				
(39)m=	53.11	52.97	52.84	52.17	52.04	51.37	51.37	51.24	51.64	52.04	52.31	52.57		
	L	•					•	•	•	Average =		12 /12=	52.14	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.04	1.04	1.04	1.03	1.02	1.01	1.01	1.01	1.02	1.02	1.03	1.03		
Numbe	ar of dou		L						,	Average =	Sum(40)1.	12 /12=	1.03	(40)
NUMBE	Jan	Feb	nth (Tab 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)
()	01	20	01						00	01		01		()
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				:[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		71		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.87		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
				ach month I	r			r						
(44)m=	86.76	83.6	80.45	77.29	74.14	70.98	70.98	74.14	77.29	80.45	83.6	86.76	0.40.45	
Energy o	content of	hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		946.45	(44)
(45)m=	128.66	112.53	116.12	101.23	97.14	83.82	77.67	89.13	90.19	105.11	114.74	124.6		
lf instan	taneous w	ater heati	na at point	of use (no	o hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	-	1240.94	(45)
(46)m=	19.3	16.88	17.42	15.19	14.57	12.57	11.65	13.37	13.53	15.77	17.21	18.69		(46)
· · ·	storage		17.42	10.10	14.07	12.01	11.00	10.07	10.00	10.77	17.21	10.00		()
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel	(	0		(47)
	•	-		nk in dw	-			. ,						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage anufact		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
,			m Table				" <b>,</b> )):					0		(49)
•				, kWh/ye	ear			(48) x (49)	) =		1	-		(50)
•••			-	cylinder l		or is not	known:							
		-		om Tabl	le 2 (kW	h/litre/da	ay)				0.	02		(51)
		from Ta	ee secti ble 2a	on 4.3							1	03		(52)
			m Table	2b								.6		(52)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter	(50) or (	(54) in (5	55)	·								03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	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=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3						(	0		(58)
							. ,	65 × (41)						
•	-	1	· · · · · ·	i	i	1	i	ng and a	· ·	1	, 	00.00		(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	h month	(61)m =	(60	D) ÷ 36	65 × (41)	)m							
(61)m=	0	0	0	0	0		0	0	0		0	0	0	0		(61)
Total h	eat req	uired for	water h	neating	calculated	d fo	or eacl	h month	(62)r	n =	0.85 × (	(45)m -	+ (46)m +	(57)m	+ (59)m + (61)m	
(62)m=	183.94	162.45	171.39	154.73	152.41	1:	37.31	132.95	144.	41	143.69	160.39	168.23	179.88	3	(62)
Solar DH	IW input	calculated	using Ap	pendix G	or Appendix	(H)	(negati	ve quantity	/) (ente	er '0'	if no sola	r contrib	ution to wate	er heating	g)	
(add ad	ditiona	l lines if	FGHRS	S and/or	WWHRS	S ap	oplies	, see Ap	pend	ix G	G)					
(63)m=	0	0	0	0	0		0	0	0		0	0	0	0		(63)
Output	from w	ater hea	ter						-							
(64)m=	183.94	162.45	171.39	154.73	152.41	1:	37.31	132.95	144.	41	143.69	160.39	168.23	179.88	;	
E.									. (	Dutp	out from wa	ater heat	er (annual)	112	1891.78	(64)
Heat ga	ains fro	m water	heating	, kWh/r	nonth 0.2	5 ´	[0.85	× (45)m	+ (6	1)m	) + 0.8 x	(46)r	n + (57)m	ı + (59)ı	m ]	
(65)m=	87	77.36	82.83	76.46	76.52	7	70.67	70.05	73.8	6	72.78	79.17	80.95	85.65		(65)
inclu	de (57)	m in calo	ulation	of (65)r	n only if c	vlir	nder i	s in the c	dwelli	ng	or hot w	ater is	from com	munity	 heating	
	. ,	ains (see		. ,	,	,				U					U	
		ns (Table														
Metabl	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ia	Sep	Oct	Nov	Dec		
(66)m=	85.74	85.74	85.74	85.74	85.74	-	35.74	85.74	85.7	<u> </u>	85.74	85.74	85.74	85.74	-	(66)
					L, equat											
(67)m=	13.86	12.31	10.01	7.58	5.67	1	4.78	5.17	6.7	_	9.02	11.45	13.37	14.25	7	(67)
		I											15.57	14.20		(01)
· · r	-	· ·	1		ndix L, eq	<b>1</b>		-	,				400.05	4 40 00		(69)
(68)m=	149.41	150.96	147.06	138.74			18.37	111.78	110.		114.14	122.45	132.95	142.82		(68)
r		<u> </u>		<u>.</u>	k L, equa	-									-	(22)
(69)m=	31.57	31.57	31.57	31.57	31.57	3	81.57	31.57	31.5	7	31.57	31.57	31.57	31.57		(69)
Pumps	and fa	ns gains	(Table	5a)											-	
(70)m=	0	0	0	0	0		0	0	0		0	0	0	0		(70)
Losses	e.g. e\	vaporatio	n (nega	ative val	ues) (Tab	le	5)	-	-					-	_	
(71)m=	-68.59	-68.59	-68.59	-68.59	-68.59	-6	68.59	-68.59	-68.	59	-68.59	-68.59	-68.59	-68.59		(71)
Water I	neating	gains (T	able 5)													
(72)m=	116.94	115.11	111.33	106.19	102.85	9	98.15	94.15	99.2	7	101.09	106.41	112.42	115.12	2	(72)
Total i	nternal	gains =					(66)	m + (67)m	n + (68	)m +	- (69)m + (	(70)m +	(71)m + (72	)m		
(73)m=	328.94	327.11	317.12	301.23	285.48	2	70.02	259.82	264.	94	272.97	289.04	307.47	320.91	7	(73)
6. Sol	ar gain:	s:														
Solar g	ains are o	calculated	using sol	ar flux froi	n Table 6a	and	lassoci	iated equa	tions t	о со	nvert to th	e applic	able orienta	tion.		
Orienta		Access F		Are			Flu				g_		FF		Gains	
	-	Table 6d		m²			Tal	ole 6a		Т	able 6b		Table 6c		(W)	
Northea	st <mark>0.9x</mark>	0.77	>	<u>د</u> ا	.23	x	1	1.28	) × [		0.63	x	0.7	=	28.38	(75)
Northea	st 0.9x	0.77	)	<u>د</u> 8	.23	x	2	2.97	× [		0.63	x	0.7	=	57.77	(75)
Northea	st 0.9x	0.77	)	( 8	.23	x	4	1.38	× [		0.63	×	0.7	=	104.09	(75)
Northea	st 0.9x	0.77	,	<u> </u>	.23	x	6	57.96	×		0.63	×	0.7	=	170.94	(75)
Northea	st 0.9x	0.77		<u>د</u> 8	.23	x	9	1.35	× [		0.63	×	0.7	=	229.78	(75)

	_													_
Northeas	st 0.9x	0.77	×	8.2	23	x	97.38	x	0.63	x	0.7	=	244.97	(75)
Northeas	st 0.9x	0.77	x	8.2	23	x	91.1	x	0.63	x	0.7	=	229.17	(75)
Northeas	st 0.9x	0.77	x	8.2	23	x	72.63	x	0.63	x	0.7	=	182.69	(75)
Northeas	st 0.9x	0.77	x	8.2	23	x	50.42	x 🗌	0.63	x	0.7	=	126.83	(75)
Northeas	st <u>0.9</u> x	0.77	x	8.2	23	x	28.07	x	0.63	x	0.7	=	70.6	(75)
Northeas	st <u>0.9</u> x	0.77	x	8.2	23	x	14.2	x	0.63	×	0.7	=	35.71	(75)
Northeas	st 0.9x	0.77	x	8.2	23	x	9.21	) × [	0.63	_ × [	0.7	=	23.18	(75)
	_									_				
Solar ga	ains in	watts, ca	alculated	for eac	h month	-		(83)m =	Sum(74)m	(82)m				
(83)m=	28.38	57.77	104.09	170.94	229.78	244.97	229.17	182.69	126.83	70.6	35.71	23.18		(83)
Total ga	iins – ii	nternal a	ind solar	(84)m =	= (73)m ·	+ (83)m	, watts							
(84)m=	357.32	384.89	421.21	472.17	515.26	515	488.99	447.63	399.8	359.64	343.18	344.09		(84)
7. Mea	n inter	nal temp	erature	(heating	season	)								
Tempe	rature	during h	eating p	eriods ir	n the livi	ng area	from Tal	ble 9, T	h1 (°C)				21	(85)
Utilisati	ion fac	tor for g	ains for I	iving are	ea, h1,m	(see Ta	able 9a)							
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.95	0.94	0.9	0.83	0.71	0.56	0.43	0.48	0.69	0.87	0.93	0.95		(86)
⊥ Meanii	nterna	l tompor	atura in	living ar		u Mow sta	eps 3 to 7	I 7 in Tah						
(87)m=	19	19.2	19.59	20.13	20.57	20.85	20.95	20.93	20.71	20.15	19.51	18.97		(87)
								I						
· · · · ·	20.05	auring n 20.05	20.05	eriods ir 20.06	20.06	aweiiing 20.07	g from Ta 20.07	20.08	20.07	20.06	20.06	20.06		(88)
(88)m=	20.05	20.05	20.05	20.00	20.00	20.07	20.07	20.00	20.07	20.00	20.00	20.06		(00)
				()		Ì	ee Table	т́	-			r	I	(22)
(89)m=	0.94	0.93	0.89	0.81	0.67	0.5	0.35	0.4	0.64	0.84	0.92	0.95		(89)
Mean i	nterna	l temper	ature in	the rest	of dwelli	ng T2 (	follow ste	eps 3 to	7 in Tab	le 9c)				
(90)m=	17.38	17.67	18.23	18.98	19.59	19.94	20.04	20.02	19.78	19.04	18.11	17.34		(90)
									1	fLA = Livir	ng area ÷ (	4) =	0.45	(91)
Mean i	nterna	l temper	ature (fo	r the wh	ole dwe	lling) = t	fLA × T1	+ (1 – 1	LA) × T2					
_	18.11	18.36	18.84	19.5	20.03	20.35	20.45	20.43	20.2	19.54	18.74	18.07		(92)
Apply a	adjustn	nent to th	he mean	interna	temper	ature fro	om Table	e 4e, wh	ere appro	opriate	Į	•		
(93)m=	18.11	18.36	18.84	19.5	20.03	20.35	20.45	20.43	20.2	19.54	18.74	18.07		(93)
8. Spac	ce hea	ting requ	uirement											
				•		ed at st	tep 11 of	Table 9	9b, so tha	ıt Ti,m=(	76)m an	d re-calc	ulate	
the utili		factor fo					1						l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.93	tor for ga	ains, nm 0.87	: 0.79	0.67	0.52	0.39	0.43	0.65	0.82	0.9	0.93		(94)
		hmGm ,				0.52	0.39	0.43	0.05	0.02	0.9	0.93		(04)
_	330.6	349.47	366.54	374.1	345.71	265.71	188.32	193.47	257.97	296.28	309.27	320.38		(95)
		age exte					100.02	1 100.47			000.27	020.00		()
(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)
									 n— (96)m		I	I	l	
_	733.5	712.97	652.2	552.95	433.53	295.28	197.66	206.53		465.31	608.92	729.26		(97)
	heatin	g require	ement fo	r each n	nonth, k	Nh/mor	1 = 0.02	24 x [(9	7)m – (95	)m] x (4	1)m	<u>.</u>	I	
· · ·	299.76	244.27	212.53	128.78	65.33	0	0	0	0	125.76	215.75	304.21		
							•	•	•	-	•	•		

	Total per year (kWh/y	vear) = Sum(98) <sub>15,912</sub> =	1596.38	(98)
Space heating requirement in kWh/m²/year		[	31.4	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab		nmunity scheme.	0	(301)
Fraction of space heat from community system $1 - (301) =$		ſ	1	(302)
The community scheme may obtain heat from several sources. The procedure allow		our other heat sources; th	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See A Fraction of heat from Community boilers	Appendix C.	[	1	(303a)
Fraction of total space heat from Community boilers		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system	[	1	(305)
Distribution loss factor (Table 12c) for community heating system		[	1.05	(306)
Space heating		-	kWh/year	,
Annual space heating requirement			1596.38	
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	1676.2	(307a)
Efficiency of secondary/supplementary heating system in % (from T	able 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating		-		_
Annual water heating requirement		[	1891.78	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	1986.37	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	36.63	(313)
Cooling System Energy Efficiency Ratio		ſ	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	= [	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outs	side	[	176.38	(330a)
warm air heating system fans		ſ	0	(330b)
pump for solar water heating		Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	176.38	(331)
Energy for lighting (calculated in Appendix L)		ſ	244.85	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		ſ	-518.71	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ty)	[	0	(334)
12b. CO2 Emissions – Community heating scheme		_		
	Energy kWh/year	Emission factor I kg CO2/kWh	Emissions ‹g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	fuels repeat (363) to	(366) for the second fuel	94	(367a)
CO2 associated with heat source 1 [(307b)+(310]	o)] x 100 ÷ (367b) x	0.22 =	841.61	(367)
Electrical energy for heat distribution [(313	i) x	0.52 =	19.01	(372)

Total CO2 associated with community sy	ystems	(363)(366) + (368)(37	2)	=	860.62	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	ion heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =			860.62	(376)
CO2 associated with electricity for pump	os and fans within dwe	lling (331)) x	0.52	=	91.54	(378)
CO2 associated with electricity for lightin	ng	(332))) x	0.52	=	127.08	(379)
Energy saving/generation technologies (	(333) to (334) as appli	cable				_
Item 1			0.52	x 0.01 =	-269.21	(380)
Total CO2, kg/year	sum of (376)(382) =			[	810.03	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			[	15.93	(384)
El rating (section 14)				[	88.67	(385)

# SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 October 2020

Property Details: Plot 48

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling fac Overshading: Overhangs: Thermal mass param Night ventilation: Blinds, curtains, shu Ventilation rate durin	es: neter: tters: ng hot we	ather (a	nch):	Flat England Thames val No 1 South West Average or None Indicative V False 4 ( Window	unknown			
Summer ventilation I Transmission heat Ic	oss coeffi	cient:	ient:	167.77 41.9				(P1)
Summer heat loss co Overhangs:	pefficient:			209.66				(P2)
Ŭ								
Orientation:	Ratio:		Z_overhangs:					
North East (NE)	0		1					
Solar shading:								
Orientation:	Z blind	ls:	Solar access:	Overl	hangs:	Z summer:		
North East (NE)	1		0.9	1	-	0.9		(P8)
Solar gains:								
Orientation		Area	Flux	g_	FF	Shading	Gains	
North East (NE)	0.9 x	8.23	98.85	<b>9</b> 0.63	0.7	0.9	290.62	
· · · ·						Total	290.62	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ration Mean summer externat Thermal mass temperature University of birth in	Il tempera ature incre e	ement		Jur 368 681 3.2! 16 1.3 20.! Slig	8.08 .83 5 55	<b>July</b> 355.21 645.83 3.08 17.9 1.3 22.28 <b>Medium</b>	August 361.89 599.66 2.86 17.8 1.3 21.96 Slight	(P5) (P6) (P7)
Likelihood of high in								

		User E	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	2	Stroma Softwa					001082 n: 1.0.5.9	
			Address:						
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			<b>a(m²)</b> 50.84	1a) x		<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup> ) 127.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	50.84	4)					_
Dwelling volume	, , , , , , , , , , , , , , , , , , , ,				+(3c)+(3d	l)+(3e)+	.(3n) =	127.1	(5)
2. Ventilation rate:									
		condary eating	other		total			m <sup>3</sup> per hour	•
Number of chimneys		0 +	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	i = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins	L		' _	2	x 1	0 =	20	(7a)
Number of passive vents	5				0	x 1	0 =	0	(7b)
Number of flueless gas f	ires			Γ	0	x 4	40 =	0	(7c)
							Air ch	anges per ho	ur
Infiltration due to chimne	vs flues and fans = $(6a)$	)+(6b)+(7a)+(7b)+	(7c) =		20		÷ (5) =	0.16	(8)
	been carried out or is intended			ontinue fro	-		. (0) –	0.10	
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)-	1]x0.1 =	0	(10)
	.25 for steel or timber fr				uction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresp nas): if equal user 0.35	onding to the grea	ter wall area	(after					
	floor, enter 0.2 (unseale	ed) or 0.1 (seale	ed), else e	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of window	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 10	= [00			0	(15)
Infiltration rate			(8) + (10) +	· (11) + (1:	2) + (13) -	+ (15) =		0	(16)
	q50, expressed in cubi	•	•		etre of e	nvelope	area	3	(17)
If based on air permeabi	<b>3</b>							0.31	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has	been done or a de	gree air peri	neability is	s being us	sed		0	(19)
Shelter factor			(20) = 1 - [0	).075 x (19	9)] =			2 0.85	(13)
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.26	(21)
Infiltration rate modified f	for monthly wind speed								
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	beed 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 $(22a)m = (2$	2)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	speed) =	(21a) x	(22a)m					
	0.33	0.33	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31		
		c <i>tive air</i> al ventila	0	rate for t	he appli	cable ca	se							
				ndix N (2	'3h) - (23a	) x Fmv (e	equation (1	N5)) , othei	rwise (23h	) – (23a)			0	(23a)
			0 11		, (	, (	• •	n Table 4h)	,	) = (200)			0	(23b)
			-	-	-			HR) (24a		2b)m + ('	23h) v [*	(23c)	0 · 1001	(23c)
(24a)m=	r			0				0	$0^{111} = (22)^{111}$	0		0	- 100]	(24a)
	-	-		-		-		I VV) (24b	-	-	-	U		(=,
(24b)m=				0				0	0 = (22)	0	230)	0		(24b)
										0	0	0		(210)
,					•	•		on from c c) = (22b		5 × (23b	)			
(24c)m=	, <i>,</i>	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•	•		on from I						
	if (22b)n	n = 1, the	en (24d)	m = (22l	·	· ·	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(24d)
Effe	ctive air		rate - er	· ·	) or (24b	o) or (240	, <u>,</u>	d) in boy	(25)					
(25)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(25)
3. He	at losse	s and he	eat loss p	paramet	er:									
ELEN	/IENT	Gros		Openin	gs	Net Ar	ea	U-valu		ΑXU		k-value		AXk
		area	(m²)	r	1 <sup>2</sup>	A ,r	n²	W/m2	κ.	(W/I	<)	kJ/m²∙ł	<	kJ/K
Doors						2	x	1.4	= [	2.8				(26)
Windo	WS					8.231	x1	/[1/( 1.4 )+	0.04] =	10.91				(27)
Walls	Type1	39.2	22	8.23	3	30.99	) X	0.15	=	4.65				(29)
Walls	Type2	24.8	37	2		22.87	7 X	0.14	= [	3.24				(29)
Roof		50.8	34	0		50.84	<b>x</b>	0.1	=	5.08				(30)
Total a	area of e	lements	, m²			114.9	3							(31)
							ated using	g formula 1,	/[(1/U-valu	ve)+0.04] a	s given in	paragraph	3.2	
					ls and part	titions		(26)(30)	+ (32) -					
			= S (A x	0)				(20)(00)		(20) - (20	) (22a)	(22a)	26.68	(33)
		Cm = S(	. ,			1/100.21				.(30) + (32		(32e) =	1211.65	
			•		+ TFA) ir			raciaaly the		tive Value:		bla 1f	100	(35)
	-		tailed calc		constructi	on are not	l known pi	recisely the	; Indicative	values of				
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix k	<						15.21	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			41.9	(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=	23.3	23.21	23.12	22.7	22.63	22.26	22.26	22.2	22.4	22.63	22.78	22.95		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	65.19	65.1	65.02	64.6	64.52	64.16	64.16	64.09	64.3	64.52	64.68	64.84		
										Average =	Sum(39)1		64.6	(39)

Heat lo	oss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.28	1.28	1.28	1.27	1.27	1.26	1.26	1.26	1.26	1.27	1.27	1.28		
Numbe	er of day	/s in mo	nth (Tab	le 1a)			•	•		Average =	Sum(40)1.	12 /12=	1.27	(40)
lunioe	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)
					1			1	1					
4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		: [1 - exp	(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13	1. .9)	71		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.87		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	. <u> </u>					
(44)m=	86.76	83.6	80.45	77.29	74.14	70.98	70.98	74.14	77.29	80.45	83.6	86.76		
_											m(44) <sub>112</sub> =		946.45	(44)
			·		· ·			DTm / 3600			<b></b>		I	
(45)m=	128.66	112.53	116.12	101.23	97.14	83.82	77.67	89.13	90.19	105.11	114.74	124.6		
lf instant	taneous v	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	-	1240.94	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		!	ļ	!	I	Į	1	!	I	!			
Storage	e volum	ne (litres)	) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	-			/elling, e			. ,	ara) ant	or (0' in (	(17)			
	storage		not wate	er (uns n	iciudes i	nstantai	ieous cu	ombi boil	ers) erne		(47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
			-	e, kWh/ye				(48) x (49)	) =			0		(50)
•				•	loss fact								I	
		-	s factor fi		le 2 (kW	n/litre/da	ay)					0		(51)
		from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b							(	0		(53)
Energy	lost fro	om water	r storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter	(50) or	(54) in (ধ	55)									0		(55)
Water	storage	loss cal	culated	for each	month	-	-	((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	[H11)] ÷ (5 -	50), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
								65 × (41)						
· .	-		1		· · · · · ·	1	r	ng and a	· ·	i	r í		I	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	alculated	for ea	ch	month (	(61)m =	(60	)) ÷ 36	65 × (41)	m						
(61)m=	0	0	0		0	0		0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r each	n month	(62)m	= 0.85 ×	(45)m ·	+ (46)m +	(57)m	+ (59)m + (61)m	
(62)m=	109.36	95.65	98.7		86.05	82.57	7	1.25	66.02	75.76	76.67	89.35	97.53	105.9	1	(62)
Solar DH	-IW input	calculated	using A	ppe	ndix G or	Appendix	Η (	(negativ	/e quantity	) (enter	'0' if no sola	ar contrib	ution to wat	er heatin	ıg)	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	ap	oplies,	see Ap	pendix	G)					
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter													
(64)m=	109.36	95.65	98.7		86.05	82.57	7	1.25	66.02	75.76	76.67	89.35	97.53	105.9	1	
			•							O	itput from w	ater hea	ter (annual)	112	1054.8	(64)
Heat g	ains fro	m water	heatin	ıg,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8	x [(46)r	n + (57)m	ı + (59)	m ]	
(65)m=	27.34	23.91	24.67	,	21.51	20.64	1	7.81	16.51	18.94	19.17	22.34	24.38	26.48	;	(65)
inclu	de (57)	m in calo	culation	n o	f (65)m	only if c	ylir	nder is	s in the c	dwellin	g or hot v	vater is	from corr	munity	heating	
5. Int	ernal a	ains (see	e Table	e 5	and 5a	):	-				-			-	-	
		ns (Table														
metab	Jan	Feb	 Ma		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.74	85.74	85.74	-	85.74	85.74	_	5.74	85.74	85.74	85.74	85.74		85.74	_	(66)
Liahtin	n dains	i (calcula	ted in	 Api	pendix	equat	ion	19 or	·19a) a	lso see	Table 5					
(67)m=	13.86	12.31	10.01	<u> </u>	7.58	5.67		4.78	5.17	6.72	9.02	11.45	13.37	14.25	; ]	(67)
		1									so see Ta					
(68)m=	149.41	150.96	147.0	- T	138.74	128.24		18.37	111.78	110.23		122.4	5 132.95	142.82	2	(68)
				_									102.00	142.02		(00)
	31.57	31.57	31.57	-i	31.57	L, equai	_	1 L 15	31.57	, aiso 31.57	see Table	31.57	31.57	31.57		(69)
(69)m=						31.37	3	51.57	31.37	31.37	31.57	51.57	31.57	51.57		(03)
-		ins gains	r i	9 5a	-				-							(70)
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0		(70)
		vaporatic	<u> </u>	- T				· ·			_				-	(
(71)m=	-68.59	-68.59	-68.59	9	-68.59	-68.59	-6	68.59	-68.59	-68.59	-68.59	-68.59	-68.59	-68.59	Э	(71)
Water		gains (T		ŕ											_	
(72)m=	36.75	35.58	33.17	'	29.88	27.74	2	4.74	22.18	25.46	26.62	30.02	33.86	35.59		(72)
Total i	nterna	l gains =	:					(66)	m + (67)m	+ (68)n	n + (69)m +	(70)m +	(71)m + (72	)m	_	
(73)m=	248.75	247.58	238.9	6	224.92	210.37	19	96.62	187.86	191.13	198.5	212.6	5 228.91	241.3	8	(73)
	lar gain															
			Ũ	olar			and			tions to	convert to t	he applic	able orienta	tion.		
Orienta		Access F Table 6d			Area m²			Flu: Tak	x ble 6a		g_ Table 6b		FF Table 6c		Gains (W)	
<b>N</b> 1 (1															. ,	-
Northea		0.77		x	8.2	23	x	1	1.28	×	0.63	×	0.7		= 28.38	(75)
Northea	-	0.77		x	8.2	23	x	2	2.97	×	0.63	X	0.7	=	= 57.77	(75)
Northea	1	0.77		x	8.2	23	x	4	1.38	×	0.63	x	0.7	=	= 104.09	(75)
Northea		0.77		x	8.2	23	x	6	7.96	x	0.63	×	0.7	=	= 170.94	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.2	23	x	9	1.35	x	0.63	x	0.7		229.78	(75)

	Northeast $0.9x$ 0.77 x 8.23 x 97.38 x 0.63 x 0.7 = 244.97 (75)														
Northeast 0.9x	0.77	x	8.2	3	x	97.3	38	×	0.63		×	0.7	=	244.97	(75)
Northeast 0.9x	0.77	x	8.2	3	x	91.	1	x	0.63		x	0.7	=	229.17	(75)
Northeast 0.9x	0.77	x	8.2	3	x	72.6	63	x	0.63		x	0.7	=	182.69	(75)
Northeast 0.9x	0.77	x	8.2	3	x	50.4	42	×	0.63		x	0.7	=	126.83	(75)
Northeast 0.9x	0.77	x	8.2	3	x	28.0	07	×	0.63		x	0.7	=	70.6	(75)
Northeast 0.9x	0.77	x	8.2	3	x	14.	2	×	0.63		x	0.7	=	35.71	(75)
Northeast 0.9x	0.77	x	8.2	3	x	9.2	:1	×	0.63		x	0.7	=	23.18	(75)
								_							
Solar <u>gains in</u>	watts, calc	ulated	for eac	n month				(83)m	= Sum(74)	)m	.(82)m			_	
(83)m= 28.38	57.77 1	104.09	170.94	229.78	24	44.97 2	229.17	182.6	69 126.8	83	70.6	35.71	23.18		(83)
Total gains –	internal and	d solar	(84)m =	= (73)m ·	+ (8	83)m , w	vatts							-	
(84)m= 277.13	305.36	343.05	395.86	440.15	44	41.59 4	17.02	373.8	32 325.3	33	283.25	264.62	264.56	;	(84)
7. Mean inte	rnal tempe	rature (	heating	season	)										
Temperature	e during hea	ating pe	eriods ir	n the livi	ng	area fro	m Tab	ole 9,	Th1 (°C	)				21	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)															
Jan	Feb	Mar	Apr	May		Jun	Jul	Au	g Se	р	Oct	Nov	Dec		
(86)m= 0.97	0.96	0.94	0.9	0.81	(	0.69	0.56	0.62	2 0.8	1	0.93	0.96	0.98		(86)
Mean interna	al temperat	ure in l	iving are	ea T1 (fo	ollo	w steps	3 to 7	' in Ta	able 9c)			•		_	
(87)m= 18.25	<u> </u>	18.92	19.56	20.18	<u> </u>	i	20.84	20.7		9	19.62	18.83	18.2	7	(87)
Tomporatura			oriodo ir	root of	du	uolling fr			Th2 (%						
Temperature	т <u>т</u> т	19.86	19.86	19.87	<b></b>	<u> </u>	0m Ta 19.87	19.8	`	ŕ	19.87	19.86	19.86	7	(88)
. ,									1 10.0	"	15.07	10.00	10.00		(00)
Utilisation fa	T T	r			<u> </u>	<u> </u>	I	,						7	(00)
(89)m= 0.97	0.96	0.94	0.88	0.77		0.61	0.45	0.52	2 0.76	5	0.91	0.96	0.97		(89)
Mean interna	al temperat	ure in t	he rest	of dwelli	ng	T2 (foll	ow ste	ps 3	to 7 in T	able	e 9c)	1		-	
(90)m= 17.35	17.57	18.02	18.65	19.23	1	9.64	19.8	19.7	7 19.4		18.72	17.93	17.31		(90)
										fL	A = Livir	ig area ÷ (4	4) =	0.45	(91)
Mean interna	al temperat	ure (foi	r the wh	ole dwe	llin	g) = fLA	× T1 ·	+ (1 -	- fLA) ×	T2					
(92)m= 17.75	17.97	18.42	19.06	19.66	2	20.09	20.27	20.2	3 19.8	57	19.12	18.34	17.71		(92)
Apply adjust	ment to the	mean	internal	temper	atu	ire from	Table	4e, v	vhere ap	pro	priate			_	
<mark>(93)m=</mark> 17.75	17.97	18.42	19.06	19.66	2	20.09	20.27	20.2	3 19.8	7	19.12	18.34	17.71		(93)
8. Space hea															
Set Ti to the			•		ned	at step	11 of	Table	e 9b, so	that	Ti,m=(	76)m an	d re-ca	Iculate	
the utilisation	Feb	<u> </u>			<u> </u>	lun	Jul	۸.,			Oct	Nov	Dee		
Utilisation fa		Mar Mar	Apr	May		Jun	Jui	Au	g Se	p [	OCI	Nov	Dec		
(94)m= 0.96	<u> </u>	0.92	0.86	0.76		0.63	0.49	0.55	5 0.76	3	0.89	0.95	0.96	7	(94)
Useful gains							-								
(95)m= 265.57	<u> </u>	315.39	340.95	336.03	2	77.11 2	206.39	206.	6 246.	13	253.38	250.1	254.59	-	(95)
Monthly ave			perature		abl		I		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)													(96)		
Heat loss rat	Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]														
(97)m= 877.16	851.05 7	775.13	656.29	513.56	3	52.15 2	235.38	245.4	48 371.	19	550.01	726.82	876.01		(97)
Space heatir	ng requirem	nent for	each m	nonth, k	Nh	/month	= 0.02	4 x [(	97)m – (	(95)	m] x (4	1)m		_	
(98)m= 455.02	377.75 3	342.05	227.05	132.09		0	0	0	0		220.69	343.24	462.33	;	

								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	2560.22	(98)	
Space	e heatin	g require	ement in	kWh/m²	²/year								50.36	(99)	
8c. Sp	bace co	oling req	luiremer	nt											
Calcu	lated fo	r June, J	July and	August.	See Tal	ole 10b	-	-	-						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Heat I	oss rate	e Lm (ca	lculated	using 28	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)			
(100)m=	0	0	0	0	0	603.09	474.78	487.1	0	0	0	0		(100)	
Utilisa	ation fac	tor for lo	oss hm												
(101)m=	0	0	0	0	0	0.7	0.76	0.72	0	0	0	0		(101)	
Usefu	l loss, h	mLm (V	/atts) = (	(100)m x	(101)m										
(102)m=	(102)m=0000421.08362.01351.7300000(1Gains (solar gains calculated for applicable weather region, see Table 10)														
Gains	(solar g	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)						
$(103)m = \begin{array}{c c c c c c c c c c c c c c c c c c c $														(103)	
						lwelling,	continue	ous ( kW	h) = 0.02	24 x [(10	)3)m – (	102)m];	x (41)m		
set (1	04)m to	zero if (	104)m <	: 3 × (98	)m										
(104)m=	0	0	0	0	0	115.14	140.68	111.51	0	0	0	0		_	
										= Sum(	,	=	367.34	(104)	
	I fractior								f C =	cooled	area ÷ (4	1) =	1	(105)	
		actor (Ta	I	Í	r	r	r		r				I		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_	
_		_							Total	I = Sum(	104)	=	0	(106)	
•		· ·	1	month =	r`´´	, <u>,</u>	·						I		
(107)m=	0	0	0	0	0	28.79	35.17	27.88	0	0	0	0		_	
									Total	= Sum(	107)	=	91.83	(107)	
Space	cooling	requirer	ment in k	(Wh/m²/y	/ear				(107)	) ÷ (4) =			1.81	(108)	
8f. Fab	ric Ener	gy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)					
Fabric	Energy	/ Efficier	тсу						(99) ·	+ (108) =	=		52.17	(109)	

# SAP Input

Property Details: Plo	ot 48							
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:	08 July 28 Oct New dy New dy Unknov No rela Indicat	s valley 2020 ober 2020 welling design stag welling	ge				
Property description	ו:							
Dwelling type:		Flat						
Detachment: Year Completed:		2020						
Floor Location:		Floor	area:					
Floor 0		50.839	m <sup>2</sup>		Storey height 2.5 m	:		
Living area:			m <sup>2</sup> (fraction 0.4	51)	2.5 111			
Front of dwelling fa	aces:	South		<i>.</i>				
Opening types:								
Name: sw	Source: Manufacturer		ype: blid	Glazing:		Argon:	Fram	e:
NE	Manufacturer		/indows	double-glaz	ed	Yes		
Name:	Gap:		Frame Facto	or: g-value:	U-value:	Area:	No. o	f Openings:
SW NE	mm 16mm c	r more	0 0.7	0 0.63	1.4 1.4	2 8.231	1 1	
					1.4			
Name: sw	Type-Nam		ocation: prridor Wall	Orient: South West		Width: 0	Heigl 0	nt:
NE			kternal Wall	North East		0	0	
Overshading:		Averad	e or unknown					
Opaque Elements:		, wordg						
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall	Kappa:
External Elements							wan.	
External Wall Corridor Wall	39.225 24.87	8.23 2	30.99 22.87	0.15 0.15	0 0.4	False False		N/A N/A
Flat Roof	50.839	0	50.84	0.1	0	1 0.00		N/A
Internal Elements Party Elements								
Thermal bridges:								
Thermal bridges:			efined (individual		ue = 0.1324			
		<b>Lengt</b> 4.795	h Psi-valu 0.289		r lintels (including o	other steel lintel	ls)	
		12.459		E4 Jam	D			
		9.385	0.057	E7 Party	/ floor between dwe	ellings (in blocks	s of flats)	

# **SAP Input**

	5.3	0.08	E16	Corner (normal)
	5.3	0.055	E18	Party wall between dwellings
	14.802	0.12	E24	Eaves (insulation at ceiling level - inverted)
	14.802	0.56	E15	Flat roof with parapet
[Approved]	1.135	0.04	E3	Sill
	9.385	0.062	E14	Flat roof
	5.417	0	P3	Intermediate floor between dwellings (in blocks of flats)
	5.417	0.24	P4	Roof (insulation at ceiling level)

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 2 3
Main heating system:	
Main heating system:	Community heating schemes Heat source: Community boilers heat from boilers – mains gas, heat fraction 1, efficiency 94 Piping>=1991, pre-insulated, low temp, variable flow Central heating pump : 2013 or later Design flow temperature: Unknown Boiler interlock: Yes
Main heating Control:	
Main heating Control:	Charging system linked to use of community heating, programmer and at least two room thermostats Control code: 2312
Secondary heating system:	
Secondary heating system:	None
Water heating:	
Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False
Others:	
Electricity tariff: 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: 0.63 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West
Assess Zero Carbon Home:	No

# **SAP Input**

		ι	User Det	ails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20	12	-		a Numi re Ver				001082 n: 1.0.5.9	
		Pro	operty Ad	dress:	Plot 48					
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor			Area(n 50.8	-	(1a) x	<b>Av. He</b>	<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup> ) 127.1	) (3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1	e)+(1n)	50.8	34	(4)					
Dwelling volume			L		(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	127.1	(5)
2. Ventilation rate:										
		econdary heating	ot	ther		total			m <sup>3</sup> per hou	r
Number of chimneys		0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fan	is				Ĺ	2	x	0 =	20	(7a)
Number of passive vents					Γ	0	× ′	0 =	0	(7b)
Number of flueless gas fire	es				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans = $($	6a)+(6b)+(7a)	)+(7b)+(7c)	) =	Г	20	<u> </u>	÷ (5) =	0.16	(8)
If a pressurisation test has be					ontinue fro					
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	esent, use the value corre			-		uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	aled) or 0.1	(sealed)	), else e	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	stripped							0	(14)
Window infiltration					x (14) ÷ 1	1	(		0	(15)
Infiltration rate					- (11) + (1				0	(16)
Air permeability value, o			•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabilit Air permeability value applies	-					s haina us	bod		0.41	(18)
Number of sides sheltered			or a dogro	e un pen	noability i	o boing a	500		2	(19)
Shelter factor			(20	0) = 1 - [0	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor		(21	1) = (18)	x (20) =				0.35	(21)
Infiltration rate modified fo	r monthly wind spee	d								_
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7						-			
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m	-				
~ / /	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41		
		<i>ctive air</i> al ventila	•	rate for t	ne appli	cable ca	ISE						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othei	wise (23b	) = (23a)			0	(23b)
lf bala	anced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =	, , ,			0	(23c)
			-	-	-			HR) (24a		2b)m + (;	23b) x [*	1 – (23c)	-	(200)
(24a)m=	<b></b>	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	ı anical ve	ntilation	without	heat rec	L Coverv (N	u MV) (24b	)m = (22	2b)m + (2	23b)			
(24b)m=	r	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	tract ver	tilation of	or positiv	e input v	ventilatio	on from c	outside					
,					•	•		c) = (22b		5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,								on from I						
	<u> </u>		<u>, , ,</u>	<u>`</u>	<i>.</i>	<u>`</u>	<u>,</u>	0.5 + [(2	,	<u> </u>			I	
(24d)m=		0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
		<u> </u>	i	· · ·		<u> </u>	r i	d) in boy	. ,			1	I	(07)
(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
3. He	at losse	s and he	eat loss p	paramete	er:									
ELEN	IENT	Gros area		Openin m	•	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²⋅I		A X k kJ/K
Doors						2	x	1	=	2				(26)
Windo	WS					8.231	x1	/[1/( 1.4 )+	0.04] =	10.91				(27)
Walls <sup>-</sup>	Type1	39.2	22	8.23	;	30.99		0.18	] = [	5.58	ו ד			(29)
Walls <sup>-</sup>	Type2	24.8	37	2		22.87	7 X	0.18		4.12	i F		$\exists$	(29)
Roof		50.8	34	0		50.84	1 X	0.13		6.61	i F		$\dashv$	(30)
Total a	area of e	lements	, m²	L		114.9	3	L	เ		L			(31)
* for win	ndows and	roof wind	ows, use e	effective wi	ndow U-va			g formula 1,	/[(1/U-valu	ie)+0.04] a	is given in	paragraph	3.2	× ,
** incluc	le the area	as on both	sides of ir	nternal wal	ls and par	titions								
		ss, W/K :		U)				(26)(30)	+ (32) =				29.22	(33)
		Cm = S(	. ,							.(30) + (32		(32e) =	1211.6	is (34)
		parame			,					tive Value:			250	(35)
	0	sments wh ad of a de			construct	ion are noi	t known pr	recisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix l	K						15.61	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			44.83	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y		1	1	(38)m	= 0.33 × (	25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	25.06	24.9	24.74	24.01	23.88	23.24	23.24	23.12	23.49	23.88	24.15	24.44		(38)
Heat ti	ransfer o	coefficier	nt, W/K				-		(39)m	= (37) + (3	38)m	-		
(39)m=	69.89	69.73	69.57	68.84	68.71	68.07	68.07	67.95	68.32	68.71	68.98	69.27		
									1	Average =	Sum(39)1	12 /12=	68.84	(39)

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.37	1.37	1.37	1.35	1.35	1.34	1.34	1.34	1.34	1.35	1.36	1.36		
Numbe	ar of day	rs in mo	nth (Tab	le 12)			1			Average =	Sum(40)1.	12 /12=	1.35	(40)
Numbe	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	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		(1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		71		(42)
Reduce	the annua	al average	hot water		5% if the a	welling is	designed	(25 x N) to achieve		se target o		.93		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for e	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-	-				
(44)m=	82.42	79.42	76.43	73.43	70.43	67.43	67.43	70.43	73.43	76.43	79.42	82.42		_
Energy	content of	bot water	used - ca	loulated m	onthly — 1	100 v Vd r	n v nm v l	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			m(44) <sub>112</sub> =		899.12	(44)
	122.23	106.9	110.31	96.17	92.28	79.63	73.79	84.67	85.68	99.86	109	118.37		
(45)m=	122.23	100.9	110.31	90.17	92.20	79.03	73.79	04.07			m(45) <sub>112</sub> =		1178.89	(45)
lf instant	taneous v	vater heati	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		10101 - 00			1170.00	
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage													
-		. ,					-	within sa	ame ves	sel		150		(47)
	•	-		ank in dw er (this ir	-			n (47) ombi boil	ers) ente	ər '0' in (	47)			
	storage								,		,			
a) If m	anufact	turer's de	eclared l	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
			-	e, kWh/y₀				(48) x (49)	) =			0		(50)
				cylinder rom Tab								0		(51)
		•	see secti			.,	-J)					0		(0.)
		from Ta										0		(52)
Tempe	erature f	actor fro	m Table	e 2b								0		(53)
0.			•	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
	. ,	(54) in (8		(				((50)				0		(55)
			<b></b>	for each				((56)m = (		1				(50)
(56)m=	0	0 s dodicato	0 d color sto	0	0 = (56)m	0	0	0 50), else (5	0		0	0 m Appond	iv Ll	(56)
-								1 .						
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•			om Table		50)		~				0		(58)
	•						. ,	65 × (41) ng and a		r tharma	stat)			
(1100 (59)m=												0		(59)
( <b>/</b>												-		

Combi	loss ca	lculated	for eac	h n	nonth (	(61)m =	(60	)) ÷ 36	65 × (41)	m									
(61)m=	0	0	0		0	0		0	0	0		0	0		0	C	)		(61)
Total h	eat req	uired for	water	hea	ating ca	alculated	l fo	r eacl	n month	(62)r	n =	0.85 × (	(45)m	+	(46)m +	(57)	m +	(59)m + (61)m	
(62)m=	103.89	90.86	93.76		81.75	78.44	6	67.69	62.72	71.9	97	72.83	84.8	8	92.65	100	.61		(62)
Solar DH	W input	calculated	using Ap	per	ndix G or	Appendix	Η (	(negativ	ve quantity	) (ente	er '0'	' if no sola	r contril	buti	ion to wate	er hea	ting)	-	
(add a	dditiona	l lines if	FGHR	Sa	nd/or V	WWHRS	ap	plies,	, see Ap	pend	ix G	G)			-			_	
(63)m=	0	0	0		0	0		0	0	0		0	0		0	C	)		(63)
Output	from w	ater hea	ter																
(64)m=	103.89	90.86	93.76		81.75	78.44	6	67.69	62.72	71.9	97	72.83	84.8	8	92.65	100	.61		_
										(	Outp	out from wa	ater hea	ate	r (annual)₁	12		1002.06	(64)
Heat g	ains fro	m water	heating	g, k	wh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	< [(46)	m	+ (57)m	+ (5	9)m	]	
(65)m=	25.97	22.72	23.44	Τ	20.44	19.61	1	6.92	15.68	17.9	99	18.21	21.2	2	23.16	25.	15		(65)
inclu	de (57)	m in calo	ulatior	n of	(65)m	only if c	ylir	nder is	s in the c	dwelli	ng	or hot w	ater is	s fr	om com	mun	ity ł	neating	
5. Int	ernal g	ains (see	e Table	5 a	and 5a	):													
Metabo	olic gair	ns (Table	5) Wa	atts	;														
motab	Jan	Feb	Mar		Apr	May		Jun	Jul	Αι	ıg	Sep	Oc	t	Nov	D	ес	]	
(66)m=	85.74	85.74	85.74	╈	85.74	85.74	8	5.74	85.74	85.7	-	85.74	85.74	4	85.74	85.	74		(66)
Lightin	g gains	(calcula	ted in A	- App	endix	L, equat	ion	L9 01	r L9a), a	lso se	ee T	Table 5						1	
(67)m=	13.86	12.31	10.01	Ť	7.58	5.67		4.78	5.17	6.7		9.02	11.4	5	13.37	14.	25	]	(67)
Applia	nces da	ins (calc	ulated	in /	Append	l dix L. ea	uat	tion L	13 or L1	3a), a	also	see Tal	l ble 5					1	
(68)m=	149.41	150.96	147.06	-	138.74	128.24		18.37	111.78	110.		114.14	122.4	15	132.95	142	.82	1	(68)
		(calcula															-	1	
(69)m=	31.57	31.57	31.57	<u> </u>	31.57	2, Equal	_	1.57	31.57	31.5		31.57	31.5	7	31.57	31.	57	1	(69)
		ns gains				0.1101			0.1101	0.110		0.1107	0.110		0.1101	•	0.	J	()
(70)m=					a) 0	0		0	0	0		0	0		0	C	)	1	(70)
									Ū	0		0			Ū		,	J	(10)
	-68.59	aporatic	-68.59	_	-68.59	-68.59		5) 68.59	-68.59	-68.	50	-68.59	-68.5	0	-68.59	-68	50	1	(71)
(71)m=					-00.59	-00.39	-0	56.59	-00.59	-00.	59	-00.59	-00.5	9	-00.59	-00	.59	J	(1)
		gains (T	· · · · ·	<u> </u>	00.00	00.00		20.5	21.08	044		05.00	28.5		00.47	00	04	1	(72)
(72)m=	34.91	33.8	31.51		28.38	26.36	4	23.5		24.1		25.29			32.17	33.	01	J	(72)
		gains =	i		000.40	000.00			. ,			. ,	r –	-	1)m + (72)			1	(72)
(73)m=	246.91	245.8	237.3		223.43	208.99	1	95.38	186.75	189.	85	197.17	211.1	5	227.21	239	9.6		(73)
	ar gains	s: calculated		lar f	lux from	Table 6a	and	25500	iated equa	tions t	0.00	nvert to th	o annli	cah	le orientat	ion			
-		Access F	-		Area		and	Flu			0.00			uar	FF	.011.		Gains	
Onenta		Table 6d			m <sup>2</sup>				^ ole 6a		Т	g_ able 6b		Т	able 6c			(W)	
Northea	ast o ov [	0.77		×Г	8.2	2	x	1	1.28	×		0.63	x	Г	0.7	_	=	28.38	(75)
Northea	L			F									=				_		](75)
Northea	Ļ	0.77		× [ √ Γ	8.2		x x		2.97	×		0.63			0.7	$\dashv$		57.77	(75)
Northea	Ļ	0.77		× [ [	8.2				1.38	X		0.63			0.7	$\dashv$	_	104.09	
	L	0.77		× [ Г	8.2		x		7.96	×		0.63			0.7	$\dashv$	=	170.94	(75)
Northea	αοι <u>0.9x</u>	0.77		×	8.2	23	x	9	1.35	X		0.63	x	L	0.7		=	229.78	(75)

-											_				_
Northeast 0.9x	0.77	x	8.2	3	x	97	7.38	×	0.63		×	0.7	=	244.97	(75)
Northeast 0.9x	0.77	x	8.2	3	x	9	1.1	×	0.63		×	0.7	=	229.17	(75)
Northeast 0.9x	0.77	x	8.2	3	x	72	2.63	x	0.63		x	0.7	=	182.69	(75)
Northeast 0.9x	0.77	x	8.2	3	x	50	).42	x	0.63		x	0.7	=	126.83	(75)
Northeast 0.9x	0.77	x	8.2	3	x	28	3.07	x	0.63		x	0.7	=	70.6	(75)
Northeast 0.9x	0.77	x	8.2	3	x	1	4.2	x	0.63		x	0.7	=	35.71	(75)
Northeast 0.9x	0.77	x	8.2	3	x	9	.21	x	0.63		x	0.7	=	23.18	(75)
Solar <u>g</u> ains in	watts, calc	ulated	for each	n month				(83)m	= Sum(74)n	n(82	) <b>m</b>			_	
(83)m= 28.38		04.09	170.94	229.78		44.97	229.17	182.0	69 126.83	3 70	).6	35.71	23.18		(83)
Total gains – i		l solar	(84)m =	- (73)m	+ (8	33)m,	watts							-	
(84)m= 275.29	303.58 3	41.39	394.37	438.77	44	40.35	415.91	372.	55 324	28′	1.75	262.92	262.78		(84)
7. Mean inter	nal temper	ature (	heating	season	)										
Temperature	during hea	ating pe	eriods ir	n the livi	ng	area fi	rom Tab	ole 9,	Th1 (°C)					21	(85)
Utilisation fac	ctor for gain	ns for li	ving are	a, h1,m	ı (s	ee Tab	ole 9a)								
Jan	Feb	Mar	Apr	May	Ĺ	Jun	Jul	Au	g Sep		Oct	Nov	Dec	7	
(86)m= 1	1	0.99	0.98	0.93	(	0.81	0.66	0.74			99	1	1		(86)
Mean interna	l temperati	ire in li	iving are	a T1 (f	 مالد	w ster	os 3 to 7	in T	able 9c)	-					
(87)m= 19.42	<u> </u>	19.81	20.2	20.59	<b></b>	0.86	20.96	20.9		20	.22	19.76	19.4	7	(87)
	II						(								
		T	eriods in 19.8	19.8	1	9.81	19.81				9.8	19.8	10.70	7	(88)
(88)m= 19.78	19.79	9.79	19.6	19.6	<u> </u>	9.01	19.01	19.8	1 19.81		9.0	19.8	19.79		(00)
Utilisation fac	<u>т</u> т				r	<u> </u>		, ,					-	7	()
(89)m= 1	1	0.99	0.97	0.9	(	0.72	0.51	0.59	0.88	0.	98	1	1		(89)
Mean interna	l temperatu	ure in t	he rest	of dwell	ing	T2 (fo	llow ste	ps 3	to 7 in Ta	ble 90	c)	_		_	
(90)m= 18.35	18.48 1	18.75	19.14	19.51	1	9.74	19.8	19.7	9 19.62	19	.17	18.7	18.34		(90)
										fLA =	Livin	g area ÷ (4	4) =	0.45	(91)
Mean interna	l temperatu	ure (for	r the wh	ole dwe	llin	g) = fL	.A × T1	+ (1 -	- fLA) × T	2					
(92)m= 18.83	<u> </u>	19.23	19.62	20	-	0.25	20.32	20.3		1	.64	19.18	18.82	7	(92)
Apply adjustr	nent to the	mean	internal	temper	atu	re fror	n Table	4e, v	vhere app	propria	ate			-	
(93)m= 18.83	18.96 1	19.23	19.62	20	2	0.25	20.32	20.3	1 20.11	19	.64	19.18	18.82	]	(93)
8. Space hea	ting require	ement													
Set Ti to the			•		ned	at ste	p 11 of	Table	e 9b, so th	nat Ti,	m=(7	76)m an	d re-ca	lculate	
the utilisation					-	.							_	-	
Jan		Mar	Apr	May		Jun	Jul	Au	g Sep		Oct	Nov	Dec		
Utilisation fac	r T	is, nm: 0.99	0.97	0.9		0.76	0.58	0.66	6 0.9		98	1	1	7	(94)
Useful gains,						5.70	0.56	0.00	0.9	0.	90	I	1		(34)
(95)m= 274.62	1 1	7 = (94 38.15	382.46	396.93	3	33.48	241.7	245.	5 291.04	1 27	7.04	261.81	262.26	7	(95)
Monthly aver							241.7	240.	2011.0-	- 211	.04	201.01	202.20		()
(96)m= 4.3	<u> </u>	6.5	8.9	11.7	-	14.6	16.6	16.4	1 14.1	10	).6	7.1	4.2	7	(96)
Heat loss rate															
(97)m= 1015.53	I I I	85.42	738.17	570.07	-	34.36	253.34	265.4	<u> </u>	- ī	1.38	833.3	1012.43	3	(97)
Space heatin	g requirem	ent for	each m	honth, k	Wh	/montl	h = 0.02	24 x [(	97)m – (9			1)m		<b>_</b>	
(98)m= 551.23	r i r	07.17	256.11	128.82		0	0	0	0		š.19	, 411.47	558.12	7	
L	· · · · ·				-			L		-				<b>_</b>	

								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	3024.74	(98)
Space	e heatir	ng require	ement in	kWh/m²	²/year								59.5	(99)
8c. Sr	bace co	oling req	luiremer	nt										
		or June, J			See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rat	e Lm (ca	lculated	using 2	5°C inter	nal temp	berature			nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	639.87	503.73	516.44	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.77	0.85	0.8	0	0	0	0		(101)
Usefu	l loss, l	nmLm (V	/atts) = (	(100)m x	(101)m		•	•				•		
(102)m=	0	0	0	0	0	495.49	428.54	415.12	0	0	0	0		(102)
Gains	(solar	gains cal	culated	for appli	cable w	eather re	egion, se	e Table	10)			•		
(103)m=	0	0	0	0	0	579.77	549.99	500.34	0	0	0	0		(103)
		g <i>require</i> zero if (				lwelling,	continu	ous ( kW	/h) = 0.0	24 x [(10	)3)m – (	102)m]:	x (41)m	
(104)m=	04)11110		0		0	60.68	90.36	63.41	0	0	0	0		
(	•	Ů		Ŭ,					-	= Sum(		=	214.44	(104)
Cooled	l fractio	n								cooled	,		1	(105)
Intermi	ttency f	actor (Ta	able 10b	)							,	,		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
		<u>.</u>							Total	= Sum(	104)	=	0	(106)
Space	cooling	requirer	nent for	month =	= (104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	15.17	22.59	15.85	0	0	0	0		
		-			-		-		Total	= Sum(	107)	=	53.61	(107)
Space	cooling	requirer	nent in k	(Wh/m²/y	year				(107)	÷ (4) =			1.05	(108)
8f. Fab	ric Ene	rgy Effici	ency (ca	alculated	l only un	der spec	cial conc	litions, se	ee sectio	on 11)				
		y Efficier								+ (108) =	=		60.55	(109)
		c Energ	-	ency (TF	EE)				、 /	. ,			69.63	(109)
			,		,								00.00	()

			User D	etails:						
Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 2	012		Softwa	re Ver	sion:		Versio	n: 1.0.5.9	
		Pi	roperty A	Address:	Plot 48					
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor	rare Name:       Stoma FSAP 2012       Software Version:       Version: 1.0.5.9         Property Address: Plot 48         Reservation:         Adversion:         Area(m <sup>2</sup> )       Av. Height(m)       Version: 1.0.5.9         Stoma FSAP 2012       Property Address: Plot 48         Stoma FSAP 2012       Property Address: Plot 48         Stoma FSAP 2012       Area(m <sup>2</sup> )       Av. Height(m)       Volume(m <sup>2</sup> )         Stoma FSAP 2012       Area(m <sup>2</sup> )       Volume(m <sup>2</sup> )         grade (1a) + (1b) + (1c) + (1d) + (1e) + (1n)       Stoma FSAP 2012       Volume(m <sup>2</sup> )         area for hour       (30) + (30)									
	),(1b),(1a),(1d),(	10) (10				2	2.5	(2d) =	127.1	(3a)
	i)+(1b)+(1c)+(1d)+(	1e)+(1h	) 5	0.84		(2-) (2-		(2)		_
Dwelling volume					(3a)+(3b)	+(3C)+(3C	1)+(3e)+	.(3n) =	127.1	(5)
2. Ventilation rate:	main	secondar	w.	other		total			m <sup>3</sup> per hou	r
			у — —	Uner		lotai				
Number of chimneys	0 +	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	] = [	0	× 2	20 =	0	(6b)
Number of intermittent far	าร					0	X ′	10 =	0	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fir	es					0	X 4	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimney	s flues and fans =	(6a)+(6b)+(7	a)+(7b)+(7	7c) =	Г	0		÷ (5) –	0	<b>–</b> (8)
					ontinue fro			. (0) –	0	
Number of storeys in th	e dwelling (ns)								0	(9)
Additional infiltration							[ <b>(</b> 9)·	-1]x0.1 =	0	(10)
					•	uction			0	(11)
		responding to	the greate	er wall area	a (after					
		ealed) or 0.	1 (seale	d), else	enter 0				0	(12)
-			,	,.						=
Percentage of windows	and doors draught	stripped							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	q50, expressed in c	ubic metre	s per ho	ur per so	quare m	etre of e	envelope	area	3	(17)
•									0.15	(18)
	•	has been don	e or a deg	iree air pei	meability i	is being u	sed			-
Shelter factor				(20) = 1 - [	0.075 x (1	9)] =				_
	ng shelter factor									=
	0	ed		. , . ,					0.13	
i		- I I	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7						-	-		
	- i i	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	$2$ )m $\div 4$	. I								
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	· · · · · ·						I		I	

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	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		
		c <i>tive air</i> al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N. (2	3b) = (23a	ı) × Fmv (e	equation (	N5)) , othei	rwise (23b	) = (23a)			0.5	(23b)
								n Table 4h		, (,			79.05	(230) (23c)
			-	-	-			HR) (24a		2h)m + ('	23h) 🗙 ['	1 – (23c)		(200)
(24a)m=	r	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25	. 100]	(24a)
		l d mech:	I anical ve	Intilation	without	heat rec	L coverv (N	I //V) (24b	1 = (22)	L 2b)m + (;	L 23b)			
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
		use ex	ract ver	tilation o	or positiv	re input v	ı ventilatio	n from c	utside					
,					•	•		c) = (22b		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	e positiv	/e input	ventilatio	on from l	oft					
	if (22b)n	n = 1, th	en (24d)	m = (22l	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			I	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	r	<u> </u>	rate - er	· · ·		, <u>,</u>	c) or (24	d) in boy	(25)				I	
(25)m=	0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN	/IENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/ł	$\langle \rangle$	k-value kJ/m²·ł		X k J/K
Doors		arca	(11)		I	2		1.4	= [	2.8	$\neg$	N0/111 -1	X K	(26)
Windo	ws					8.231	= .	/[1/( 1.4 )+	י	10.91				(27)
Walls		20.0		0.00					= [		╡╷			(29)
Walls		39.2		8.23	<u> </u>	30.99		0.15		4.65	╡╏			
Roof	туреz	24.8		2		22.87		0.14		3.24	╡╏		╡┝━	(29)
	roo of a	50.8		0		50.84		0.1	= [	5.08				(30)
		elements		footivowi	ndowlly	114.9		formula 1	/[/1/		o aivon in	naraaranh		(31)
				nternal wal			aleu using	formula 1,	/[(1/0-valu	e)+0.04j a	s given in	parayrapri	13.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				26.68	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	1211.65	(34)
Therm	al mass	parame	ter (TMF		- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
	-	sments wh ad of a de			construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
				culated (	using Ap	pendix ł	<						15.21	(36)
	•		,	own (36) =	• •	•							10.21	
Total f	abric he	at loss							(33) +	(36) =			41.9	(37)
Ventila	ation hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	11.21	11.08	10.94	10.28	10.14	9.47	9.47	9.34	9.74	10.14	10.41	10.68		(38)
Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	53.11	52.97	52.84	52.17	52.04	51.37	51.37	51.24	51.64	52.04	52.31	52.57		
										Average =	Sum(39)1	12 /12=	52.14	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.04	1.04	1.04	1.03	1.02	1.01	1.01	1.01	1.02	1.02	1.03	1.03		
Numb			nth (Tab					<b>I</b>	,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.03	(40)
Numb	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)
()												0.		~ /
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	ned occu A > 13.9 A £ 13.9	9, N = 1		: [1 - exp	0(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		71		(42)
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.87		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage il	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	86.76	83.6	80.45	77.29	74.14	70.98	70.98	74.14	77.29	80.45	83.6	86.76		<b>—</b>
Energy	content of	hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		946.45	(44)
(45)m=	128.66	112.53	116.12	101.23	97.14	83.82	77.67	89.13	90.19	105.11	114.74	124.6		
lf inoton	tonoouou	votor hooti	ng of point	t of upp /m		, otorogo)	ontor 0 in	hoven (46		Total = Su	m(45) <sub>112</sub> =		1240.94	(45)
			· ·		1			boxes (46)	1	45 77	17.01	19.60		(46)
(46)m= Water	19.3 storage	16.88 IOSS:	17.42	15.19	14.57	12.57	11.65	13.37	13.53	15.77	17.21	18.69		(40)
Storag	je volum	e (litres)	) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	-	-			velling, e									
	vise if no storage		hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
			m Table			,	,					0		(49)
Energ	y lost fro	m water	<sup>-</sup> storage	e, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
				•	loss fact									(= 1)
		-	ee secti		le 2 (kW	n/litre/da	ay)				0.	02		(51)
	e factor	-									1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energ	y lost fro	m water	<sup>-</sup> storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
	(50) or (	. , .									1.	03		(55)
Water	storage	loss cal	culated t	for each	month	-	-	((56)m = (	55) × (41)ı	m	-			
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylind	er contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	i0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
		•	nnual) fro									0		(58)
	•				,	,	• •	65 × (41)		r tharma	ctot)			
(mo (59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	ng and a 23.26	22.51	r thermo 23.26	stat) 22.51	23.26		(59)
(00)11=	20.20	21.01	20.20	22.01	20.20	22.01	20.20	20.20	22.01	20.20	22.01	20.20		(00)

Combi	loss ca	alculated	for eac	h month	(61)m =	(60	) ÷ 365	5 × (41)	m						
(61)m=	0	0	0	0	0		0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	neating c	alculated	d foi	r each	month	(62)m =	= 0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	183.94	162.45	171.39	154.73	152.41	13	37.31	132.95	144.41	143.69	160.39	168.23	179.88	]	(62)
Solar DI	-IW input	calculated	using Ap	pendix G c	r Appendix	(H (	negative	e quantity	) (enter '(	)' if no sola	r contribu	tion to wate	er heating)	-	
(add a	dditiona	al lines if	FGHRS	S and/or	WWHRS	s ap	plies,	see Ap	pendix	G)				_	
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter												
(64)m=	183.94	162.45	171.39	154.73	152.41	13	37.31	132.95	144.41	143.69	160.39	168.23	179.88		
		-		-			-		Out	put from w	ater heate	er (annual)	12	1891.78	(64)
Heat g	ains fro	om water	heating	, kWh/m	onth 0.2	5 ´	[0.85 ×	<b>‹</b> (45)m	+ (61)r	n] + 0.8 >	x [(46)m	n + (57)m	+ (59)m	]	
(65)m=	87	77.36	82.83	76.46	76.52	7	0.67	70.05	73.86	72.78	79.17	80.95	85.65		(65)
inclu	de (57)	)m in cal	ulation	of (65)m	n only if c	ylin	nder is	in the c	welling	or hot w	vater is f	rom com	munity ł	neating	
5. In	ternal g	ains (see	Table	5 and 5a	ı):										
		ns (Table			,										
motab	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m=	102.89	102.89	102.89	102.89	102.89	10	)2.89	102.89	102.89	102.89	102.89	102.89	102.89		(66)
Lightin	g gains	; (calcula	ted in A	ppendix	L, equat	ion	L9 or	L9a), a	lso see	Table 5				1	
(67)m=	34.66	30.79	25.04	18.95	14.17	1	1.96	12.93	16.8	22.55	28.63	33.42	35.62	]	(67)
Applia	nces da	ains (calc	ulated i	n Appen	u dix L. ea	uati	ion L1:	3 or L1:	3a), als	i o see Ta	l ble 5	1		1	
(68)m=	223	225.32	219.49	207.07	191.4	r —		166.83	164.52	170.35	182.77	198.44	213.16	]	(68)
		s (calcula									1 5.5			1	
(69)m=	47	47	47	47	47	-	47	47	47	47	47	47	47	1	(69)
	s and fa	I Ins gains	I (Table	<u> </u>	1					1		1		1	
(70)m=					0		0	0	0	0	0	0	0	1	(70)
		vaporatio						-				1 -		J	
(71)m=		1	-68.59	-68.59	-68.59	r –	5) 58.59	-68.59	-68.59	-68.59	-68.59	-68.59	-68.59	1	(71)
					00.00	Ľ	,0.00	00.00	00.00	00.00	00.00	00.00	00.00	J	(***)
(72)m=	116.94	gains (1 115.11	111.33	-	102.85		8.15	94.15	99.27	101.09	106.41	112.42	115.12	1	(72)
				100.13	102.05	3						71)m + (72)		J	(12)
	455.9	l gains = 452.52	437.15	413.51	389.72	26		355.21	361.89	375.29	399.11	425.58	445.21	1	(73)
(73)m=	lar gain	1	437.13	415.51	309.72	30	0.00	355.21	301.09	375.29	399.11	423.30	445.21		(10)
	Ŭ		usina soli	ar flux from	Table 6a	and	associa	ted equa	tions to c	onvert to th	ne applica	ble orientat	tion.		
		Access F	•	Area		ana	Flux			g_		FF		Gains	
onona		Table 6d		m²	•			e 6a	-	able 6b	٦	able 6c		(W)	
Northe	ast <u>0.9</u> x	0.77	>	8	23	x [	11	.28	x	0.63	ר × ר	0.7		28.38	(75)
	ast <mark>0.9x</mark>	0.77	,		23	x [		.97	x	0.63		0.7		57.77	(75)
	ast 0.9x	0.77			23	× [		.38	x	0.63		0.7		104.09	(75)
	ast <u>0.9x</u>	0.77			23	∧ L × [		.96	x	0.63		0.7	=	170.94	](75)
	ast 0.9x	0.77	,		23	^ L × [		.35	x	0.63		0.7		229.78	(75)
	0.07	0.77	^	`O.	2J	<u>^</u>	91	.55		0.05	^ L	0.7		229.10	

Northeast 0.9x												
	0.77	× 8.	23	x	97.38	×	0.63	x	0.7	=	244.97	(75)
Northeast 0.9x	0.77	x 8.	23	x	91.1	x	0.63	x	0.7	=	229.17	(75)
Northeast 0.9x	0.77	x 8.	23	x	72.63	x	0.63	x	0.7	=	182.69	(75)
Northeast 0.9x	0.77	× 8.	23	x	50.42	x	0.63	x	0.7	=	126.83	(75)
Northeast 0.9x	0.77	× 8.	23	x	28.07	x	0.63	x	0.7	=	70.6	(75)
Northeast 0.9x	0.77	<b>x</b> 8	23	x	14.2	x	0.63	x	0.7	=	35.71	(75)
Northeast 0.9x	0.77	x 8.	23	x	9.21	x	0.63	x	0.7	=	23.18	(75)
Solar gains in wa	atts, calculat	ed for eac	ch month			(83)m = S	um(74)m .	(82)m				
	57.77 104.0		229.78	244.97		182.69	126.83	70.6	35.71	23.18		(83)
Total gains – inte			1	· ,	1						I	
(84)m= 484.28 5	510.29 541.2	4 584.46	619.5	613.05	584.37	544.58	502.12	469.71	461.29	468.39		(84)
7. Mean interna	al temperatur	e (heatin	g season	)								
Temperature du	uring heating	periods	in the livi	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisation facto	r for gains fo	r living ar	ea, h1,m	(see T	able 9a)							
Jan	Feb Ma	· Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.91	0.89 0.85	0.76	0.64	0.49	0.37	0.41	0.6	0.79	0.88	0.91		(86)
Mean internal to	emperature i	n living a	rea T1 (fo	ollow st	eps 3 to 7	7 in Tabl	e 9c)					
(87)m= 19.36	19.54 19.88	20.32	20.68	20.89	20.96	20.95	20.8	20.37	19.81	19.33		(87)
Temperature du	uring heating	periods	n rest of	dwellin	a from Ta	hle 9 T	• h2 (°ር)					
· · · · ·	20.05 20.05	· .	20.06	20.07	20.07	20.08	20.07	20.06	20.06	20.06		(88)
			l	L (		0>						
Utilisation facto	0.87 0.83	0.74		n2,m (s		9a) 0.33	0.54	0.75	0.86	0.9		(89)
(03) $(03)$ $(0.03)$	0.07 0.05	0.74										
							0.54		0.00	0.0		()
Mean internal to	· · ·	1	of dwelli	ing T2 (	(follow ste	eps 3 to	7 in Tabl	e 9c)				
r r	emperature i 18.14 18.62	1					7 in Tabl 19.88	e 9c) 19.32	18.55	17.85		(90)
	· · ·	1	of dwelli	ing T2 (	(follow ste	eps 3 to	7 in Tabl 19.88	e 9c) 19.32		17.85	0.45	
(90)m= 17.89 Mean internal to	18.14 18.62 emperature	19.24 for the w	t of dwelli 19.71	Ing T2 ( 19.98	(follow ste 20.05	20.04	7 in Tabl 19.88	e 9c) 19.32 LA = Livir	18.55 g area ÷ (4	17.85	0.45	(90) (91)
(90)m= 17.89 Mean internal to (92)m= 18.56	18.14 18.62 emperature ( 18.77 19.18	19.24 for the w 19.73	of dwelli 19.71 hole dwe 20.15	Ing T2 ( 19.98 Iling) = 20.39	(follow ste 20.05 fLA × T1 20.46	eps 3 to 20.04 + (1 - fL 20.45	7 in Tabl 19.88 f -A) × T2 20.29	e 9c) 19.32 LA = Livir 19.79	18.55	17.85	0.45	(90)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme	18.14         18.62           emperature         18.77           18.77         19.18           ent to the me         14.12	19.24 for the w 19.73 an interna	of dwelli 19.71 hole dwe 20.15 al temper	Ing T2 ( 19.98 Iling) = 20.39 ature fr	follow ste 20.05 fLA × T1 20.46 com Table	eps 3 to 20.04 + (1 – fL 20.45 4e, whe	7 in Tabl 19.88 f A) × T2 20.29 ere appro	e 9c) 19.32 LA = Livir 19.79 opriate	18.55 g area ÷ (4 19.12	17.85 4) = 18.52	0.45	(90) (91) (92)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56	18.14         18.62           emperature         18.77           18.77         19.18           ent to the me         18.77           18.77         19.18	19.24 for the w 19.73 an interna 19.73	of dwelli 19.71 hole dwe 20.15	Ing T2 ( 19.98 Iling) = 20.39	(follow ste 20.05 fLA × T1 20.46	eps 3 to 20.04 + (1 - fL 20.45	7 in Tabl 19.88 f -A) × T2 20.29	e 9c) 19.32 LA = Livir 19.79	18.55 g area ÷ (4	17.85 4) =	0.45	(90) (91)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56 8. Space heatin	18.14     18.62       emperature     18.77       18.77     19.18       ent to the me       18.77     19.18       18.77     19.18       18.77     19.18       18.77     19.18	19.24 for the w 19.73 an interna 19.73 nt	tof dwelli 19.71 hole dwe 20.15 al temper 20.15	Iling) = 20.39 20.39 20.39	(follow ste 20.05 fLA × T1 20.46 com Table 20.46	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45	7 in Tabl 19.88 f A) × T2 20.29 ere appro 20.29	e 9c) 19.32 LA = Livir 19.79 opriate 19.79	18.55 g area ÷ (4 19.12 19.12	17.85 4) = 18.52 18.52		(90) (91) (92)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56 8. Space heatin Set Ti to the me	18.1418.62emperature18.7719.18ent to the me18.7719.1818.7719.1819.7719.18ng requiremeean internal to	for the wind 19.24	tof dwelli 19.71 hole dwe 20.15 al temper 20.15 ure obtain	Iling) = 20.39 20.39 20.39	(follow ste 20.05 fLA × T1 20.46 com Table 20.46	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45	7 in Tabl 19.88 f A) × T2 20.29 ere appro 20.29	e 9c) 19.32 LA = Livir 19.79 opriate 19.79	18.55 g area ÷ (4 19.12 19.12	17.85 4) = 18.52 18.52		(90) (91) (92)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56 8. Space heating Set Ti to the me the utilisation fa	18.1418.62emperature18.7719.18ent to the me18.7719.1818.7719.1819.7719.18ng requiremeean internal to	for the w 19.24 for the w 19.73 an interna 19.73 nt emperatu s using T	<ul> <li>of dwelli</li> <li>19.71</li> <li>hole dwe</li> <li>20.15</li> <li>al temper</li> <li>20.15</li> <li>ure obtain</li> <li>able 9a</li> </ul>	Ing T2 ( 19.98 20.39 ature fr 20.39	(follow ster 20.05 fLA × T1 20.46 com Table 20.46	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45 Table 9	7 in Tabl 19.88 f -A) × T2 20.29 ere appro 20.29 b, so tha	e 9c) 19.32 LA = Livir 19.79 opriate 19.79	18.55 g area ÷ (4 19.12 19.12	17.85 4) = 18.52 18.52 d re-calc		(90) (91) (92)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56 8. Space heatin Set Ti to the me	18.1418.62emperature18.7718.7719.18ent to the me18.7719.1818.7719.18ng requiremeean internal factor for gainFebMa	for the wind 19.24	tof dwelli 19.71 hole dwe 20.15 al temper 20.15 ure obtain	Iling) = 20.39 20.39 20.39	(follow ste 20.05 fLA × T1 20.46 com Table 20.46	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45	7 in Tabl 19.88 f A) × T2 20.29 ere appro 20.29	e 9c) 19.32 LA = Livir 19.79 opriate 19.79 t Ti,m=(	18.55 g area ÷ (4 19.12 19.12 76)m an	17.85 4) = 18.52 18.52		(90) (91) (92)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56 8. Space heatin Set Ti to the me the utilisation fa	18.1418.62emperature18.7718.7719.18ent to the me18.7719.1818.7719.18ng requiremeean internal factor for gainFebMa	for the wind 19.24	<ul> <li>of dwelli</li> <li>19.71</li> <li>hole dwe</li> <li>20.15</li> <li>al temper</li> <li>20.15</li> <li>ure obtain</li> <li>able 9a</li> </ul>	Ing T2 ( 19.98 20.39 ature fr 20.39	(follow ster 20.05 fLA × T1 20.46 com Table 20.46	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45 Table 9	7 in Tabl 19.88 f -A) × T2 20.29 ere appro 20.29 b, so tha	e 9c) 19.32 LA = Livir 19.79 opriate 19.79 t Ti,m=(	18.55 g area ÷ (4 19.12 19.12 76)m an	17.85 4) = 18.52 18.52 d re-calc		(90) (91) (92)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56 8. Space heatin Set Ti to the me the utilisation fa Jan Utilisation facto	18.1418.62emperature18.7718.7719.18ent to the me18.7719.1818.7719.18ng requiremeean internal tactor for gainFebMar for gains, h0.850.81	for the wind 19.24 for the wind 19.73 an international 19.73 nt emperatures using The second	i of dwelli 19.71 hole dwe 20.15 al temper 20.15 ure obtain able 9a May 0.6	Ing T2 ( 19.98 20.39 ature fr 20.39 ature fr 20.39	(follow sterman) 20.05 fLA × T1 20.46 com Table 20.46 tep 11 of Jul	eps 3 to 20.04 + (1 – fL 20.45 e 4e, whe 20.45 Table 9 Aug	7 in Tabl 19.88 f -A) × T2 20.29 ere appro 20.29 b, so tha Sep	e 9c) 19.32 LA = Livir 19.79 opriate 19.79 t Ti,m=( Oct	18.55 g area ÷ (4 19.12 19.12 76)m an Nov	17.85 4) = 18.52 18.52 d re-calc Dec		(90) (91) (92) (93)
(90)m= 17.89 Mean internal to $(92)m= 18.56$ Apply adjustme $(93)m= 18.56$ 8. Space heatin Set Ti to the me the utilisation facto $(94)m= 0.87$ Useful gains, hi	18.1418.62emperature18.7718.7719.18ent to the me18.7719.1818.7719.18ng requiremeean internal tactor for gainFebMar for gains, h0.850.81	19.24         for the w         19.73         an interna         19.73         an interna         19.73         nt         emperatus         s using T         Apr         m:         0.72         94)m x (8	i of dwelli 19.71 hole dwe 20.15 al temper 20.15 ure obtain able 9a May 0.6	Ing T2 ( 19.98 20.39 ature fr 20.39 ature fr 20.39	(follow ste 20.05 fLA × T1 20.46 com Table 20.46 tep 11 of Jul 0.33	eps 3 to 20.04 + (1 – fL 20.45 e 4e, whe 20.45 Table 9 Aug	7 in Tabl 19.88 f -A) × T2 20.29 ere appro 20.29 b, so tha Sep	e 9c) 19.32 LA = Livir 19.79 opriate 19.79 t Ti,m=( Oct	18.55 g area ÷ (4 19.12 19.12 76)m an Nov	17.85 4) = 18.52 18.52 d re-calc Dec		(90) (91) (92) (93)
(90)m= $17.89$ Mean internal to (92)m= $18.56$ Apply adjustme (93)m= $18.56$ 8. Space heatin Set Ti to the me the utilisation facto (94)m= $0.87$ Useful gains, hi (95)m= $422.23$ 4 Monthly average	18.14       18.62         emperature       18.77         18.77       19.18         ent to the me         18.77       19.18         ng requireme         ean internal tactor for gain         Feb       Ma         r for gains, h         0.85       0.81         mGm, W = 0         434.55       437.5         ge external ternal tag	19.24         for the will         19.73         an interna         19.73         an interna         19.73         an interna         19.73         nt         emperatu         s using T         Apr         m:         0.72         94)m x (8         3         423.47         mperatur	i of dwelli 19.71 hole dwe 20.15 al temper 20.15 ire obtain able 9a May 0.6 34)m 372.89	Iling) = 20.39 ature fr 20.39 ature fr 20.39 ned at s Jun 0.45	(follow ste 20.05 fLA × T1 20.46 com Table 20.46 tep 11 of Jul 0.33	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45 Table 9 Aug 0.37	7 in Tabl 19.88 f A) × T2 20.29 ere appro 20.29 b, so tha Sep 0.56	e 9c) 19.32 LA = Livir 19.79 opriate 19.79 t Ti,m=( Oct 0.74	18.55 g area ÷ (4 19.12 19.12 76)m an Nov 0.84	17.85 4) = 18.52 18.52 d re-calc Dec 0.88		(90) (91) (92) (93) (93) (94) (95)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56 8. Space heating Set Ti to the mean the utilisation factor (94)m= 0.87 Useful gains, his (95)m= 422.23 Monthly average (96)m= 4.3	18.14       18.62         emperature       18.77         18.77       19.18         ent to the me         18.77       19.18         ing requireme         ean internal factor for gains, h         actor for gains, h         0.85       0.81         mGm , W = 0         434.55       437.5         je external te         4.9       6.5	19.24         for the will         19.73         an international internation international internationa internatinternational internatinternatinternatina inte	i of dwelli 19.71 hole dwe 20.15 al temper 20.15 ure obtain able 9a May 0.6 34)m 372.89 e from Ta 11.7	Iling) = 20.39 ature fr 20.39 ature fr 20.39 ature fr 20.39 ature fr 20.45 20.45 20.45 20.45 20.45	(follow ster 20.05 fLA × T1 20.46 om Table 20.46 tep 11 of Jul 0.33	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45 Table 9 Aug 0.37 199.11	7 in Tabl 19.88 f A) × T2 20.29 ere appro 20.29 b, so tha Sep 0.56 280.31 14.1	e 9c) 19.32 LA = Livir 19.79 opriate 19.79 t Ti,m=( Oct 0.74 349.56 10.6	18.55 g area ÷ (4 19.12 19.12 76)m an Nov 0.84	17.85 4) = 18.52 18.52 d re-calc Dec 0.88		(90) (91) (92) (93) (93)
(90)m= 17.89 Mean internal to (92)m= 18.56 Apply adjustme (93)m= 18.56 8. Space heating Set Ti to the mean the utilisation factor (94)m= 0.87 Useful gains, his (95)m= 422.23 Monthly average (96)m= 4.3 Heat loss rate f	18.14         18.62           emperature         18.77           18.77         19.18           ent to the me           18.77         19.18           ng requireme           ean internal to           actor for gains, h           0.85         0.81           mGm , W = 0           134.55         437.5           ie external te           4.9         6.5           or mean inte	19.24         for the will         19.73         an interna         19.73         an interna         19.73         an interna         19.73         mt         emperatu         susing T         Apr         m:         0.72         94)m x (8         3         423.47         mperatur         8.9         rnal temp	<ul> <li>of dwelli</li> <li>19.71</li> <li>hole dwe</li> <li>20.15</li> <li>al temper</li> <li>20.15</li> <li>al temper</li> <li>20.15</li> <li>al temper</li> <li>al temper</li> <li>372.89</li> <li>e from Ta</li> <li>11.7</li> <li>perature,</li> </ul>	Iling) = 20.39 ature fr 20.39 ature fr 20.45 ature	(follow ster 20.05 fLA × T1 20.46 com Table 20.46 tep 11 of Jul 0.33 192.17 16.6 f =[(39)m	eps 3 to 20.04 + (1 – fL 20.45 • 4e, whe 20.45 Table 9 Aug 0.37 199.11 16.4 x [(93)m	7 in Tabl 19.88 f A) × T2 20.29 ere appro 20.29 b, so tha Sep 0.56 280.31 14.1 - (96)m	e 9c) 19.32 LA = Livir 19.79 ppriate 19.79 t Ti,m=( Oct 0.74 349.56 10.6 ]	18.55 g area ÷ (4 19.12 19.12 76)m an Nov 0.84 386.63 7.1	17.85 4) = 18.52 18.52 d re-calc Dec 0.88 411.96 4.2		(90) (91) (92) (93) (93) (93) (93) (95) (96)
(90)m= $17.89$ Mean internal to (92)m= $18.56$ Apply adjustme (93)m= $18.56$ 8. Space heatin Set Ti to the me the utilisation facto (94)m= $0.87$ Useful gains, hi (95)m= $422.23$ Monthly averag (96)m= $4.3$ Heat loss rate f (97)m= $757.07$	18.14       18.62         emperature       18.77         18.77       19.18         ent to the me         18.77       19.18         int to the me         18.77       19.18         ing requireme         ean internal tactor for gains, h         0.85       0.81         mGm , W = 0         434.55       437.5         je external te         4.9       6.5         or mean inte         734.81       670.2	19.24         for the will         19.73         an interna         94)m x (8         3         423.47         mperatur         8.9         rnal temp         7       565	<ul> <li>of dwelli</li> <li>19.71</li> <li>hole dwe</li> <li>20.15</li> <li>al temperative obtain able 9a</li> <li>May</li> <li>0.6</li> <li>0.6</li> <li>0.6</li> <li>0.6</li> <li>0.6</li> <li>0.72.89</li> <li>e from Tature,</li> <li>439.71</li> </ul>	Iling) = 20.39 ature fr 20.39 ature fr 20.39 ature fr 20.39 ature fr 20.45 20.45 20.45 276.43 able 8 14.6 Lm , W 297.5	(follow ster 20.05 fLA × T1 20.46 om Table 20.46 itep 11 of Jul 0.33 i 192.17 16.6 = [(39)m 198.42	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45 Table 9 Aug 0.37 199.11 16.4 x [(93)m 207.65	7 in Tabl 19.88 f A) × T2 20.29 ere appro 20.29 b, so tha Sep 0.56 280.31 14.1 - (96)m 319.87	e 9c) 19.32 LA = Livir 19.79 opriate 19.79 t Ti,m=( Oct 0.74 349.56 10.6 ] 478.42	18.55 g area ÷ (4 19.12 19.12 76)m an Nov 0.84 386.63 7.1 628.57	17.85 4) = 18.52 18.52 d re-calc Dec 0.88 411.96		(90) (91) (92) (93) (93) (94) (95)
(90)m= $17.89$ Mean internal to (92)m= $18.56$ Apply adjustme (93)m= $18.56$ 8. Space heatin Set Ti to the me the utilisation facto (94)m= $0.87$ Useful gains, hi (95)m= $422.23$ Monthly averag (96)m= $4.3$ Heat loss rate f (97)m= $757.07$ Space heating	18.14       18.62         emperature       18.77         18.77       19.18         ent to the me         18.77       19.18         int to the me         18.77       19.18         ing requireme         ean internal tactor for gains, h         0.85       0.81         mGm , W = 0         434.55       437.5         je external te         4.9       6.5         or mean inte         734.81       670.2	19.24         for the will         19.73         an interna         19.73         an interna         19.73         an interna         19.73         an interna         19.73         nt         emperatu         s using T         -         Apr         m:         0.72         94)m x (8         3         423.47         mperatur         8.9         rnal temp         7         565         for each	<ul> <li>of dwelli</li> <li>19.71</li> <li>hole dwe</li> <li>20.15</li> <li>al temperative obtain able 9a</li> <li>May</li> <li>0.6</li> <li>0.6</li> <li>0.6</li> <li>0.6</li> <li>0.6</li> <li>0.72.89</li> <li>e from Tature,</li> <li>439.71</li> </ul>	Iling) = 20.39 ature fr 20.39 ature fr 20.39 ature fr 20.39 ature fr 20.45 20.45 20.45 276.43 able 8 14.6 Lm , W 297.5	(follow ster 20.05 fLA × T1 20.46 om Table 20.46 itep 11 of Jul 0.33 i 192.17 16.6 = [(39)m 198.42	eps 3 to 20.04 + (1 – fL 20.45 4e, whe 20.45 Table 9 Aug 0.37 199.11 16.4 x [(93)m 207.65	7 in Tabl 19.88 f A) × T2 20.29 ere appro 20.29 b, so tha Sep 0.56 280.31 14.1 - (96)m 319.87	e 9c) 19.32 LA = Livir 19.79 opriate 19.79 t Ti,m=( Oct 0.74 349.56 10.6 ] 478.42	18.55 g area ÷ (4 19.12 19.12 76)m an Nov 0.84 386.63 7.1 628.57	17.85 4) = 18.52 18.52 d re-calc Dec 0.88 411.96 4.2		(90) (91) (92) (93) (93) (93) (93) (95) (96)

		Total per year (kWh/year) = Sum(98) <sub>15,912</sub>	= 1299.17	(98)
Space heating requirement in kWh/m²/year			25.55	(99)
9b. Energy requirements – Community heatin	g scheme			
This part is used for space heating, space coor Fraction of space heat from secondary/supple	<b>e e i</b>			(301)
			0	(302)
Fraction of space heat from community system The community scheme may obtain heat from several so	. ,	o for CHP and up to four other hast source	1	(302)
includes boilers, heat pumps, geothermal and waste heat Fraction of heat from Community boilers			s, the latter	(303a)
Fraction of total space heat from Community b	poilers	(302) x (303a) =	1	 (304a)
Factor for control and charging method (Table	e 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for commu	nity heating system		1.05	(306)
Space heating			kWh/year	
Annual space heating requirement			1299.17	]
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	1364.13	(307a)
Efficiency of secondary/supplementary heatin	g system in % (from Ta	able 4a or Appendix E)	0	(308
Space heating requirement from secondary/su	upplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1891.78	7
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	1986.37	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307e) + (310a)(310e)]	= 33.51	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling syste	m, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling mechanical ventilation - balanced, extract or p	. ,	side	176.38	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	176.38	(331)
Energy for lighting (calculated in Appendix L)			244.85	(332)
Electricity generated by PVs (Appendix M) (ne	egative quantity)		-518.71	(333)
Electricity generated by wind turbine (Append	ix M) (negative quantit	y)	0	(334)
10b. Fuel costs – Community heating schem	e			_
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)	<b>Fuel Cost</b> £/year	
Space heating from CHP	(307a) x	4.24 × 0.01	= 57.84	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01	= 84.22	(342a)

			Fuel Price			
Pumps and fans	(331)		13.19 ×	0.01 =	23.26	(349)
Energy for lighting	(332)		13.19	0.01 =	32.3	(350)
Additional standing charges (Table 12)					120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (34	45)(354) =		Γ	317.62	(355)
11b. SAP rating - Community heating	scheme					
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) +	45.0] =		Г	1.39	(357)
SAP rating (section12)				Ē	80.58	(358)
12b. CO2 Emissions – Community heat	ing scheme					_
		Energy kWh/year	Emission kg CO2/k\		missions g CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		HP) <sup>P</sup> using two fuels repeat (3	363) to (366) for the se	econd fuel	94	(367a)
CO2 associated with heat source 1	[(3	07b)+(310b)] x 100 ÷ (367	7b) x 0.22	=	769.9	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	17.39	(372)
Total CO2 associated with community s	systems	(363)(366) + (368	)(372)	=	787.29	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instar	ntaneous heater (31	2) x 0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375	5) =		787.29	(376)
CO2 associated with electricity for pum	ps and fans within c	lwelling (331)) x	0.52	=	91.54	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	127.08	(379)
Energy saving/generation technologies Item 1	(333) to (334) as ap	oplicable	0.52	0.01 =	-269.21	(380)
Total CO2, kg/year	sum of (376)(382) =			Г	736.7	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			Γ	14.49	(384)
El rating (section 14)					89.7	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		.Energy Wh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		t CHP) P using two fuels repeat (3	363) to (366) for the se	econd fuel	94	(367a)
Energy associated with heat source 1	[(3	07b)+(310b)] x 100 ÷ (367	7b) x 1.22	=	4348.52	(367)
Electrical energy for heat distribution		[(313) x		=	102.86	(372)
Total Energy associated with communit	y systems	(363)(366) + (368	)(372)	=	4451.38	(373)
if it is negative set (373) to zero (unle	ss specified otherw	ise, see C7 in Apper	ndix C)		4451.38	(373)
Energy associated with space heating (	secondary)	(309) x	0	=	0	(374)

Total Primary Energy, kWh/year sum	of (376)(382) =				4152.13	(383)
Energy saving/generation technologies Item 1			3.07 × 0	.01 =	-1592.44	(380)
Energy associated with electricity for lighting	(332))) x		3.07	] =	751.7	(379)
Energy associated with electricity for pumps and fans w	ithin dwelling	(331)) x	3.07	=	541.49	(378)
Energy associated with space cooling	(315) x		3.07	=	0	(377)
Total Energy associated with space and water heating	(373) + (374)	+ (375) =			4451.38	(376)
Energy associated with water from immersion heater or	instantaneous hea	ater(312) x	1.22	=	0	(375)

			User De	etails:						
Assessor Name:	Zahid Ashraf	Stroma	a Num	ber:		STRO	001082			
Software Name:	Stroma FSAP 201	2		Softwa				Versic	on: 1.0.5.9	
		Pro	operty A	ddress:	Plot 48					
Address :										
1. Overall dwelling dimen	sions:									
			Area	. ,		Av. He	ight(m)	-	Volume(m <sup>3</sup> )	_
Ground floor			50	).84	(1a) x	2	2.5	(2a) =	127.1	(3a)
Total floor area TFA = (1a)	)+(1b)+(1c)+(1d)+(1e	e)+(1n)	) 50	).84	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	127.1	(5)
2. Ventilation rate:										
		econdary neating	/ (	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	i + 🗖	0	] = [	0	x2	20 =	0	(6b)
Number of intermittent fan	s				, r	2	x	10 =	20	(7a)
Number of passive vents						0	× ^	10 =	0	(7b)
Number of flueless gas fire	es					0	x 4	40 =	0	(7c)
								Air ch	anges per ho	_ ur
Infiltration due to chimney	$r_{\rm c}$ flues and fans $-$ (6)	a)+(6b)+(7a	a)+(7h)+(7	(c) -	Г					_
If a pressurisation test has be					ontinue fro	20 0 <i>m (</i> 9) to (		÷ (5) =	0.16	(8)
Number of storeys in the							-/		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber	frame or (	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre		ponding to	the greate	er wall area	a (after					
deducting areas of opening If suspended wooden flo		ed) or 0.1	l (sealed	d). else	enter 0				0	(12)
If no draught lobby, ente		,	(	.,,					0	(13)
Percentage of windows		ripped							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, q	50, expressed in cub	oic metres	s per hou	ur per so	uare m	etre of e	nvelope	area	5	(17)
If based on air permeabilit									0.41	(18)
Air permeability value applies		s been done	e or a degi	ree air per	meability i	is being u	sed			٦
Number of sides sheltered Shelter factor			(	(20) = 1 - [	0.075 x (1	9)] =			2	(19)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)		-/1			0.85	(20) (21)
Infiltration rate modified fo	-	4		() ()					0.35	
i i i	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		II	I		·		1			
	.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	I I	I I	I				1	1	I	
Wind Factor $(22a)m = (22)$	- I I	0.05	0.05	0.00	4	1.00	4.40	1 4 0		
(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	speed) =	(21a) x	(22a)m				_	
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41		
		c <i>tive air (</i> al ventila	change i	rate for t	he appli	cable ca	se							(220)
				endix N (2	3h) - (23a	a) x Fmv (e	equation (I	N5)) , othe	rwise (23h	) – (23a)			0	(23a)
								n Table 4h		) = (200)			0	(23b)
			-	-	-			HR) (24a		2b)m + ('	23h) v [ <sup>,</sup>	1 _ (23c)	0	(23c)
(24a)m=	<b></b>			0	0					0	0	1 - (230)	- 100j	(24a)
		-		-		-		I MV) (24b	-	-	-	Ů	l	
(24b)m=				0	0			0	0	0	0	0		(24b)
			-					n from c	_	•	•	Ů	l	
,					•			c) = (22b		5 × (23b	))			
(24c)m=	· ,	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	n or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft				1	
,	if (22b)n	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
3. He	at losse	s and he	eat loss p	paramete	ər:									
	<b>IENT</b>	Gros		Openin		Net Ar	ea	U-valı	ue	AXU		k-value	Э	AXk
		area	(m²)	m	2	A ,r	m²	W/m2	:Κ	(W/I	<)	kJ/m²∙l	K	kJ/K
Doors						2	X	1	=	2				(26)
Windo	WS					8.231	ı x1	/[1/( 1.4 )+	0.04] =	10.91				(27)
Walls	Type1	39.2	22	8.23	;	30.99	) X	0.18	=	5.58				(29)
Walls	Type2	24.8	37	2		22.87	7 X	0.18	=	4.12				(29)
Roof		50.8	34	0		50.84	1 X	0.13	=	6.61				(30)
Total a	area of e	lements	, m²			114.9	3							(31)
							lated using	g formula 1	/[(1/U-valu	e)+0.04] a	s given in	paragraph	n 3.2	
			sides of in		ls and part	titions		(26)(30)	1 + (32) -					
			= S (A x	0)				(20)(30)		(20) - (20	) (22a)	(220)	29.22	
		Cm = S(	. ,	2 _ Cm ·		k l/m 2k				.(30) + (32		(320) =	1211.6	
		•	eter (TMF					recisely the		tive Value:		oblo 1f	250	(35)
	-		tailed calc		constructi	ion ale noi	t known pi	ecisely life	, muicative	values of				
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	K						15.61	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			44.83	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y		i	<u>.</u>	(38)m	= 0.33 × (	25)m x (5)	)	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	25.06	24.9	24.74	24.01	23.88	23.24	23.24	23.12	23.49	23.88	24.15	24.44		(38)
Heat ti	ransfer o	coefficier	nt, W/K					-	(39)m	= (37) + (3	38)m			
(39)m=	69.89	69.73	69.57	68.84	68.71	68.07	68.07	67.95	68.32	68.71	68.98	69.27		
										Average =	Sum(39)1	12 /12=	68.84	(39)

Heat lo	oss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.37	1.37	1.37	1.35	1.35	1.34	1.34	1.34	1.34	1.35	1.36	1.36		
Numbe	er of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	.12 /12=	1.35	(40)
- turno	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 heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				(1 - exp	0(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.	1. 9)	71		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.93		(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=	82.42	79.42	76.43	73.43	70.43	67.43	67.43	70.43	73.43	76.43	79.42	82.42		
Energy	content of	hot water	used - ca	lculated m	onthly $= 4$ .	190 x Vd,r	m x nm x L	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			m(44) <sub>112</sub> = ables 1b, 1		899.12	(44)
(45)m=	122.23	106.9	110.31	96.17	92.28	79.63	73.79	84.67	85.68	99.86	109	118.37		
		I	1	1	1	1	1		-	Total = Su	m(45) <sub>112</sub> =		1178.89	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46	) to (61)					
(46)m=	18.33 storage	16.03	16.55	14.43	13.84	11.94	11.07	12.7	12.85	14.98	16.35	17.76		(46)
	-		) includir	na anv s	olar or W	/WHRS	storage	within sa	ame ves	sel	· ·	150		(47)
-		. ,			velling, e		-					100		(,
		-			-			ombi boil	ers) ente	er '0' in (	47)			
	storage													
					or is kno	wn (kWł	n/day):				1.	39		(48)
			m Table								0.	54		(49)
0.			•	e, kWh/ye	ear loss fact	or is not	known:	(48) x (49)	) =		0.	75		(50)
'				•	le 2 (kW						(	C		(51)
	•	-	ee secti	on 4.3										
		from Ta		0h								)		(52)
			m Table						(			)		(53)
		m water (54) in (5	-	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		) 75		(54) (55)
	. ,	. , .	,	for each	month			((56)m = (	55) x (41)ı	m	0.	75		(00)
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
· · ·								i0), else (5					ix H	(00)
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
												 C		(58)
				om Table for each		59)m = (	(58) ÷ 36	65 × (41)	m		L'	~		(00)
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h montł	n (61)m =	(60	D) ÷ 36	65 × (41)	)m							
(61)m=	0	0	0	0	0		0	0	0	0	0	)	0	0		(61)
Total h	neat req	uired for	water h	neating	calculate	d fo	r each	n month	(62)m	= 0.85 ×	(45)r	n +	(46)m +	(57)m +	· (59)m + (61)m	
(62)m=	168.82	148.99	156.91	141.20	3 138.87	1	24.72	120.38	131.2	7 130.78	146	6.45	154.09	164.96	]	(62)
Solar D	- HW input	calculated	using Ap	pendix G	or Appendi	хH	(negativ	ve quantity	/) (enter	'0' if no so	ar cont	ribut	ion to wate	er heating	-	
(add a	dditiona	al lines if	FGHR	S and/o	WWHR	S ap	oplies,	, see Ap	pendi>	(G)						
(63)m=	0	0	0	0	0		0	0	0	0	0	)	0	0		(63)
Outpu	t from w	ater hea	ter													
(64)m=	168.82	148.99	156.91	141.20	6 138.87	1:	24.72	120.38	131.2	7 130.78	146	.45	154.09	164.96	]	
				•					0	utput from	water h	eate	r (annual)₁	12	1727.51	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m ]																
(65)m=	77.92	69.21	73.95	68.05	67.96	6	62.55	61.81	65.43	64.56	70.	48	72.32	76.63	]	(65)
inclu	ude (57)	m in calo	ulation	of (65)	m only if o	cylir	nder is	s in the c	dwellin	g or hot	water	is fi	rom com	munity l	neating	
	. ,	ains (see		. ,	-										-	
		ns (Table														
wictab	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	g Sep		oct	Nov	Dec	]	
(66)m=	85.74	85.74	85.74	85.74		-	35.74	85.74	85.74		85.		85.74	85.74	4	(66)
Liahtir		(calcula	ı ted in A		x L, equa	tion	19 or	19a) a	lso se	a Table 5	;		I		1	
(67)m=	13.86	12.31	10.01	7.58	5.67	-	4.78	5.17	6.72		11.	45	13.37	14.25	1	(67)
		1			ndix L, ec										]	. ,
(68)m=	149.41	150.96	147.06		- T	T	18.37	111.78	110.2		-		132.95	142.82	1	(68)
						_					_		102.00	142.02	1	(00)
	31.57	31.57	31.57	31.57	x L, equa	-	1 L 15 81.57	31.57	, also 31.57		9 5 31.	57	31.57	31.57	1	(69)
(69)m=					31.57	<b>_</b> 3	51.57	31.37	51.57	31.57	31.	57	31.57	31.37	]	(03)
-		ins gains	r`	<u> </u>		1									1	( <b>70</b> )
(70)m=	3	3	3	3	3		3	3	3	3		3	3	3		(70)
		1	<u> </u>	<b>1</b>	lues) (Tal	-	-								1	(= .)
(71)m=	-68.59	-68.59	-68.59	-68.59	-68.59	-6	68.59	-68.59	-68.5	-68.59	-68	.59	-68.59	-68.59		(71)
Water		gains (T	· · · · · ·	-		-									7	
(72)m=	104.73	103	99.4	94.51	91.34	8	86.88	83.08	87.94	89.67	94.	73	100.44	103		(72)
Total	interna	l gains =		_			(66)	m + (67)m	ı + (68)r	n + (69)m +	- (70)m	+ (7	'1)m + (72)	m	-	
(73)m=	319.73	318	308.19	292.5	6 276.97	2	61.75	251.75	256.6	1 264.55	280	.36	298.48	311.79		(73)
6. So	lar gain	s:														
	-		Ũ		m Table 6a	and		•	tions to	convert to	the app	olicat		ion.		
Orient		Access F Table 6d		Are m			Flu	x ble 6a		g_ Table 6t		т	FF able 6c		Gains	
							- 1 au		. –	Table of	, 	, 			(W)	-
	ast <mark>0.9x</mark>	0.77	;	( 8	3.23	x	1	1.28	x	0.63	)	٢Ľ	0.7	=	28.38	(75)
	ast <mark>0.9x</mark>	0.77	;	<u>د</u> ۽	8.23		22.97		×	0.63	,	٢Ľ	0.7	=	57.77	(75)
	ast <mark>0.9x</mark>	0.77	;	<u>د</u> ۽	3.23	x	4	1.38	x	0.63	)	< [	0.7	=	104.09	(75)
Northe	ast <mark>0.9x</mark>	0.77	2	<u>د</u> ۽	3.23	x	6	7.96	x	0.63	)	< [	0.7	=	170.94	(75)
Northe	ast <mark>0.9x</mark>	0.77	;	( 8	3.23	x	9	1.35	x	0.63	)	< [	0.7	=	229.78	(75)

															_
Northeast 0.9x	0.77	X	8.2	23	x	9	7.38	×	0	.63	×	0.7	=	244.97	(75)
Northeast 0.9x	0.77	X	8.2	23	x	ę	91.1	x	0	.63	x	0.7	=	229.17	(75)
Northeast 0.9x	0.77	x	8.2	23	x	7	2.63	×	0	.63	x	0.7	=	182.69	(75)
Northeast 0.9x	0.77	x	8.2	23	x	5	0.42	×	0	.63	×	0.7	=	126.83	(75)
Northeast 0.9x	0.77	x	8.2	23	x	2	8.07	x	0	.63	×	0.7	=	70.6	(75)
Northeast 0.9x	0.77	x	8.2	23	x	1	14.2	×	0	.63	x	0.7	=	35.71	(75)
Northeast 0.9x	0.77	x	8.2	23	x	ç	9.21	x	0	.63	x	0.7	=	23.18	(75)
Solar <u>gains in</u>	watts, ca	lculated	for eacl	h month				(83)m	= Sum	(74)m	.(82)m		-	_	
(83)m= 28.38	57.77	104.09	170.94	229.78		44.97	229.17	182.	69 1	26.83	70.6	35.71	23.18		(83)
Total gains –	<del></del>	nd solar	(84)m =	· ,	<u>`</u>		, watts							-	
(84)m= 348.11	375.77	412.28	463.5	506.75	50	06.72	480.91	439.	31 3	91.38	350.96	334.19	334.97		(84)
7. Mean inte	rnal temp	erature	(heating	season	)										
Temperature	e during he	eating p	eriods ir	n the livi	ng	area f	rom Tab	ole 9,	Th1 (	(°C)				21	(85)
Utilisation fa	ctor for ga	ains for I	iving are	ea, h1,m	(s	ee Ta	ble 9a)							<b></b>	
Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	g	Sep	Oct	Nov	Dec	]	
(86)m= 1	0.99	0.99	0.97	0.9	(	0.75	0.59	0.6	6	0.88	0.98	0.99	1	1	(86)
Mean interna	al tempera	ature in l	iving are	ea T1 (fo	ollo	w ste	os 3 to 7	in T	able 9	) )		-	-	-	
(87)m= 19.54	19.67	19.93	20.31	20.67	r –	20.9	20.97	20.9		20.78	20.34	19.88	19.52	]	(87)
Temperature		eating n	oriode ir	rest of	L dw	السلام	from To			(°C)				1	
(88)m= 19.78	19.79	19.79	19.8	19.8	<b></b>	9.81	19.81	19.8		19.81	19.8	19.8	19.79	1	(88)
	<u> </u>													J	
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)									1	(89)					
(89)m= 1	0.99	0.98	0.95	0.85		0.65	0.45	0.5		0.81	0.97	0.99	1		(03)
Mean interna	<u> </u>	ature in f		of dwelli	ng	T2 (fo	ollow ste	eps 3			e 9c)	r		7	
(90)m= 17.87	18.06	18.44	18.99	19.47	1	9.74	19.8	19.	8 1	19.62	19.04	18.38	17.85		(90)
										fL	A = Livir	ng area ÷ (4	4) =	0.45	(91)
Mean interna	al tempera	ature (fo	r the wh	ole dwe	llin	g) = fL	_A x T1	+ (1 -	– fLA)	<b>x</b> T2		-	-	_	
(92)m= 18.62	18.78	19.11	19.59	20.01	2	0.27	20.33	20.3	32 2	20.14	19.62	19.06	18.6		(92)
Apply adjust	1 1	1			<b>I</b>					1	priate			-	
(93)m= 18.62	18.78	19.11	19.59	20.01	2	0.27	20.33	20.3	32 2	20.14	19.62	19.06	18.6		(93)
8. Space hea												>		• -	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a															
Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	IU	Sep	Oct	Nov	Dec	1	
Utilisation fa				may					-9	000		1.07	200	1	
(94)m= 0.99	0.99	0.98	0.95	0.86		0.69	0.51	0.5	8	0.84	0.96	0.99	0.99	]	(94)
Useful gains	,hmGm,	W = (94	l)m x (84	4)m					I	I		Į		4	
(95)m= 345.85	372.09	404.16	439.26	436.29	3	50.43	246.69	254.	31 3	27.72	338.09	330.47	333.14	]	(95)
Monthly ave	rage exter	rnal tem	perature	from Ta	abl	e 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 rat		in intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93	3)m– (	[96)m ]				-	
	968.07	877.37	735.72	571.2		85.65	253.86	266.		12.73	619.9	824.76	997.74		(97)
Space heatin	<u> </u>				Nh				<u> </u>			r i		1	
(98)m= 487.54	400.5	352.07	213.45	100.37		0	0	0		0	209.67	355.88	494.47	J	

								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	2613.95	(98)
Space	heatin	g require	ement ir	n kWh/m²	²/year								51.42	(99)
9a. Ener	rgy rec	luiremer	nts – Ind	lividual h	eating s	ystems i	ncluding	micro-C	HP)					
Space		-										1		-
Fraction of space heat from secondary/supplementary system													0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$ $(202) = 1 - (201) =$ $(202) = 1 - (202) =$													1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$												1	(204)	
Efficiency of main space heating system 1												93.5	(206)	
Efficiency of secondary/supplementary heating system, %													0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
· –		· ·	i È	calculate	í – – – – – – – – – – – – – – – – – – –		1			1			I	
4	487.54	400.5	352.07	213.45	100.37	0	0	0	0	209.67	355.88	494.47		
) í r			1	100 ÷ (20	r		1						I	(211)
Ę	521.43	428.34	376.54	228.29	107.35	0	0	0	0	224.24	380.62	528.84		
								Tota	i (kwn/yea	ar) =Sum(2	211) <sub>15,1012</sub>	-	2795.67	(211)
Space = {[(98)n				ry), kWh/ אר	month									
= {[(90)   (215)m=	0	0	00 ÷ (20	0	0	0	0	0	0	0	0	0		
	-								-	ar) =Sum(2	215) <sub>15,1012</sub>		0	(215)
Water h	eating													
	-		ter (calc	culated a	bove)									
•	168.82	148.99	156.91	141.26	138.87	124.72	120.38	131.27	130.78	146.45	154.09	164.96		
Efficienc	cy of w	ater hea	iter			-							79.8	(216)
(217)m=	87.48	87.33	86.91	85.91	83.96	79.8	79.8	79.8	79.8	85.77	86.98	87.56		(217)
Fuel for (219)m =		-												
(219)m=		170.61	180.54	164.43	165.4	156.29	150.86	164.5	163.88	170.75	177.17	188.4		
								Tota	l = Sum(2	19a) <sub>112</sub> =			2045.79	(219)
Annual	totals									k	Wh/year	,	kWh/year	
Space h	eating	fuel use	ed, main	n system	1						-		2795.67	
Water heating fuel used										2045.79	7			
Electricit	ty for p	oumps, f	ans and	l electric	keep-ho	t								
central	heatin	g pump	:									30		(230c)
boiler with a fan-assisted flue 45									45		(230e)			
Total electricity for the above, kWh/year sum of (230a)(230g) =										75	(231)			
Electricity for lighting										244.85	(232)			
	-		– Indivic	lua <u>l heat</u>	in <u>g syste</u>	em <u>ş inclı</u>	udi <u>ng mi</u>	cro <u>-CHP</u>						
12a. CO2 emissions – Individual heating systems including micro-CHP         Energy       Emission factor         kWh/year       kg CO2/kWh											Emissions			
Space h	eating	(main s	ystem 1	)		(21	1) x			0.2	16	=	603.86	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	441.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1045.75	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	127.08	(268)
Total CO2, kg/year	sum	of (265)(271) =		1211.76	(272)

TER =

23.84 (273)