# **Regulations Compliance Report**

Printed on 28 October 2020 a		Stroma FSAP 2012 program, Version: 1.	0.5.9
Project Information:			
Assessed By: Zahid As	hraf (STRO001082)	Building Type: Flat	
Dwelling Details:			
NEW DWELLING DESIGN S	TAGE	Total Floor Area: 50.86m <sup>2</sup>	
Site Reference : Hermitag		Plot Reference: Plot 1	8
Address :			
Client Details:			
Name:			
Address :			
This report covers items in	cluded within the SAP calculation	ns.	
It is not a complete report o			
1a TER and DER			
Fuel for main heating system:	Mains gas (c)		
Fuel factor: 1.00 (mains gas (	c))		
Target Carbon Dioxide Emiss	. ,	17.34 kg/m²	
Dwelling Carbon Dioxide Emi	ssion Rate (DER)	11.15 kg/m²	OK
1b TFEE and DFEE			
Target Fabric Energy Efficien		35.8 kWh/m <sup>2</sup>	
Dwelling Fabric Energy Efficie	ncy (DFEE)	31.7 kWh/m²	01/
2 Fabric U-values			OK
	A.v.o.z.o.z.o	llisheet	
<b>Element</b> External wall		Highest	ОК
Floor	0.14 (max. 0.30) 0.12 (max. 0.25)	0.15 (max. 0.70) 0.12 (max. 0.70)	OK
Roof	(no roof)	0.12 (max. $0.70$ )	UN
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	ОК
2a Thermal bridging	(maxi 2:00)		
	culated from linear thermal transm	ittances for each junction	
3 Air permeability			
Air permeability at 50 p	bascals	3.00 (design value)	
Maximum		10.0	ОК
4 Heating efficiency			
Main Heating system:	Community heating sch	nemes - mains gas	
Secondary heating sys	tem: None		
5 Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Choose booting controls	Charging system links	to use of community bacting	
Space heating controls		d to use of community heating, st two room thermostats	ОК
Hot water controls:	No cylinder thermostat		UK
	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	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	8.65m <sup>2</sup>	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Floors U-value	0.12 W/m²K	
Community heating, heat from boilers – mains gas		

Photovoltaic array

			User D	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20	)12		Stroma Softwa					001082 on: 1.0.5.9	
		Pi	operty /	Address:	Plot 18					
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor			Area 5	. ,	(1a) x	<b></b>	<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup> 127.15	<b>)</b> (3a)
Total floor area TFA = (1a	n)+(1b)+(1c)+(1d)+(1	1e)+(1n	) 5	0.86	(4)			_		_
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	127.15	(5)
2. Ventilation rate:										
	main heating	secondary heating	у	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0 +	0	+ [	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	i + F	0	i = Г	0	x	20 =	0	(6b)
Number of intermittent far	IS IS					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)
					L	0			0	
								Air ch	anges per ho	ur
Infiltration due to chimney If a pressurisation test has be					ontinue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in th			( )/				,		0	(9)
Additional infiltration							[ <b>(</b> 9)·	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timbe	er frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening		esponding to	the greate	er wall area	a (after					
If suspended wooden fl	- · · ·	aled) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ent			,	,,					0	(13)
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			•		•	etre of e	nvelope	area	3	(17)
If based on air permeabili	•								0.15	(18)
Air permeability value applies Number of sides sheltered		nas been don	e or a deg	ıree air pei	meability	is being u	sed			
Shelter factor				(20) = 1 - [	0.075 x (1	9)] =			3 0.78	(19) (20)
Infiltration rate incorporati	ng shelter factor			(21) = (18)					0.12	(21)
Infiltration rate modified for	-	ed		. , . ,					0.12	
	Mar Apr May	- <u>i</u>	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7	• •						•		
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (00-) (00	) m : 1								I	
Wind Factor (22a)m = (22 (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	l	
(220)III- 1.21 1.20 1	.20 1.1 1.00	0.95	0.90	0.92	I	1.00	1.12	1.10		

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m	-				
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
		c <i>tive air</i> al ventila	•	rate for t	he appli	cable ca	se						0.5	
				ondix N (2	(2b) = (22c)		oquation (I	N5)) , othe	nuico (22h	) = (22a)			0.5	(23a)
										) = (238)			0.5	(23b)
			-	-	-			n Table 4h			· · · •		79.05	(23c)
,	r	i	i	<b>I</b>	i	i	<u> </u>	HR) (24a 1	, <u> </u>	r í		· · · ·	÷ 100]	
(24a)m=	0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)
b) If	balance	ed mecha	anical ve	entilation	without	heat rec	covery (N	MV) (24b	)m = (22	2b)m + (2	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•	•		on from c c) = (22b		5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•			on from l 0.5 + [(2		0.51				
(24d)m=	<u> </u>	0	0	0	0	0	0	0	0	0	0	0		(24d)
		change	rate - er	L hter (24a	L ) or (24h	) or (24	L c) or (24	I ld) in boy	(25)					
(25)m=	0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(25)
		I	I	1	I	I	I	I	I					
3. He	at losse			paramete										
ELEN	/IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·ł		X k J/K
Doors						2	x	1.4	=	2.8				(26)
Windo	WS					8.651	ı x1	/[1/( 1.4 )+	0.04] =	11.47				(27)
Floor						0.785	5 X	0.12	=	0.0942				(28)
Walls	Type1	27.0	)1	8.65	;	18.36	3 X	0.15	=   =	2.75	T T		$\exists$	(29)
Walls	Type2	23.6	69	2		21.69	<b>x</b>	0.14	= [	3.07	i T			(29)
Total a	area of e	lements	, m²			51.48	3	L	I					(31)
* for win	idows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	lated using	g formula 1	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	3.2	
** incluc	le the area	as on both	sides of ir	nternal wal	ls and par	titions								
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30)	+ (32) =				20.19	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	619.51	(34)
Therm	al mass	parame	ter (TM	<sup>-</sup> = Cm ÷	- TFA) ir	∩ kJ/m²K			Indica	tive Value:	Low		100	(35)
	-	sments wh ad of a de			construct	ion are noi	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix l	K						6.18	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			26.36	(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=	10.61	10.49	10.37	9.76	9.64	9.03	9.03	8.91	9.27	9.64	9.88	10.13		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	36.98	36.85	36.73	36.12	36	35.39	35.39	35.27	35.64	36	36.25	36.49		
							-			Average =	Sum(39)1	12 /12=	36.09	(39)

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.73	0.72	0.72	0.71	0.71	0.7	0.7	0.69	0.7	0.71	0.71	0.72		
Numbe	or of day		nth (Tab	le 12)						Average =	Sum(40)1.	12 /12=	0.71	(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)
(,														
4. Wa	ter 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		72		(42)
Reduce	the annua	al average	hot water	ge in litre usage by r day (all w	5% if the a	lwelling is	designed			se target o		.89		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
				ach month	r		r	,					l	
(44)m=	86.78	83.62	80.46	77.31	74.15	71	71	74.15	77.31	80.46	83.62	86.78	046.64	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	0Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		946.64	(44)
(45)m=	128.69	112.55	116.14	101.25	97.16	83.84	77.69	89.15	90.21	105.13	114.76	124.63		
lf instan	aneous w	vater heati	na at point	t of use (no	o hot water	<sup>r</sup> storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		1241.2	(45)
(46)m=	19.3	16.88	17.42	15.19	14.57	12.58	11.65	13.37	13.53	15.77	17.21	18.69		(46)
· · ·	storage	loss:												
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	-		ank in dw er (this ir	-			• •	ore) onto	or 'O' in (	(17)			
	storage		not wate	er (unis ir	iciuues i	nsianiai			ers) erne		47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
			-	e, kWh/ye				(48) x (49)	) =		1	10		(50)
				cylinder l rom Tabl								02		(51)
		-	ee secti			1/1110/00	<b>(y</b> )				0.	02		(31)
		from Ta									1.	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54)
	. ,	(54) in (5	,	(				((50)			1.	03		(55)
	-	r	1	for each	r	1		1	55) × (41) I	<del> </del>	1		l	(==)
(56)m= If cylinde	32.01 er contains	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0). else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01 m Append	ix H	(56)
(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)
							02.01	02.01		02.01		0		(58)
		•		om Table for each		59)m = (	(58) ÷ 36	65 x (41)	m			0		(00)
				le H5 if t			. ,	. ,		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	ch	month (	(61)m =	(60	D) ÷ 36	65 × (41)	m									
(61)m=	0	0	0		0	0		0	0	0		0	0		0	C	)		(61)
Total h	neat req	uired for	water	he	ating ca	alculated	d fo	or each	n month	(62)r	n =	0.85 × (	(45)m	۱+	(46)m +	(57)	m +	(59)m + (61)m	
(62)m=	183.96	162.48	171.42	2	154.75	152.43	1	37.33	132.97	144.	43	143.71	160.	41	168.26	179	9.9		(62)
Solar DI	HW input	calculated	using Ap	ope	ndix G or	· Appendix	(H	(negativ	ve quantity	) (ente	er '0'	if no sola	r contr	ibu	tion to wate	er hea	ating)	•	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	s ap	oplies,	, see Ap	pendi	ix G	S)							
(63)m=	0	0	0		0	0		0	0	0		0	0		0	C	C		(63)
Output	t from w	ater hea	iter																
(64)m=	183.96	162.48	171.42	2	154.75	152.43	1	37.33	132.97	144.	43	143.71	160.	41	168.26	179	9.9		
			•							(	Dutp	out from wa	ater he	eate	er (annual) <sub>1</sub>	12		1892.04	(64)
Heat g	ains fro	m water	heatin	g,	kWh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (6'	1)m	n] + 0.8 x	× [(46	)m	+ (57)m	+ (5	9)m	1]	
(65)m=	87.01	77.36	82.84	Τ	76.46	76.53	7	70.67	70.05	73.8	6	72.79	79.1	8	80.95	85.	.66	1	(65)
inclu	ude (57)	m in cal	ulatior	<u>ו</u> ו ס	f (65)m	only if c	vlir	nder is	s in the c	dwelli	ng	or hot w	ater i	s f	rom com	mun	ity h	eating	
	. ,	ains (see			. ,	-	-				Ū								
		ns (Table				) -													
Metab	Jan	Feb	Mar		Apr	May		Jun	Jul	Au	Ia	Sep	0	ct	Nov	D	ec		
(66)m=	85.77	85.77	85.77	-	85.77	85.77	-	35.77	85.77	85.7	<u> </u>	85.77	85.7		85.77	85.			(66)
		i (calcula				L L equat	ion		l 9a) a	lso se		Table 5						1	
(67)m=	13.74	12.21	9.93		7.51	5.62	1	4.74	5.12	6.6		8.94	11.3	35	13.25	14.	.12	1	(67)
		ains (calc		 in														I	. ,
(68)m=	149.47	151.02	147.11	<b>_</b>	138.79	128.29	r –	18.42	111.82	110.		114.18	122	5	133	1/2	2.87	1	(68)
				_										.0	100	142		l	(00)
	31.58	s (calcula 31.58	31.58	÷	31.58	L, equa	-	1 L 15 31.58	31.58	, aisc 31.5		31.58	31.5		31.58	21	.58	1	(69)
(69)m=			1			31.00		51.50	31.00	31.0	0	31.30	31.0	00	31.56	31.	.50	J	(03)
-		ins gains	r`	) 	,		-				_							1	( <b>70</b> )
(70)m=	0	0	0		0	0		0	0	0		0	0		0	C	J	J	(70)
		vaporatio	<u> </u>	<b>-</b>		- · ·	r –	-			_				1	-		1	(= .)
(71)m=	-68.62	-68.62	-68.62	2	-68.62	-68.62	-(	68.62	-68.62	-68.6	52	-68.62	-68.	62	-68.62	-68	.62	J	(71)
		) gains (1		<u>́</u>		r	_											1	
(72)m=	116.95	115.13	111.34	1	106.2	102.86	9	98.15	94.16	99.2	8	101.1	106.	42	112.44	115	5.13	ļ	(72)
Total i	interna	l gains =	:				_	(66)	m + (67)m	+ (68)	)m +	- (69)m + (	(70)m	+ (7	71)m + (72)	m			
(73)m=	328.89	327.08	317.11		301.24	285.49	2	70.04	259.83	264.	94	272.95	289.	01	307.42	320	).86		(73)
	lar gain																		
	-		Ũ	lar			and			tions to	o co	nvert to th	ie appl	ica	ble orientat	ion.			
Orient		Access F Table 6d			Area m²			Flu	x ole 6a		т	g_ able 6b		т	FF able 6c			Gains	
	-							1 au			-			-	able oc			(W)	_
	ast <mark>0.9x</mark>	0.77		х	8.6	65	x	3	6.79	x		0.63	×	ļ	0.7		=	97.28	(77)
	ast <mark>0.9x</mark>	0.77		x	8.6	65	x	6	2.67	x		0.63	x	Ĺ	0.7		=	165.7	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	8.6	65	x	8	5.75	x		0.63	x		0.7		=	226.72	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	8.6	65	x	1(	06.25	x		0.63	x		0.7		=	280.91	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	8.6	65	x	11	19.01	x		0.63	x		0.7		=	314.65	(77)

Southeast 0.9x	0.77	X	8.6	5	× 1	18.15	x	0.63	x	0.7	=	312.37	(77)
Southeast 0.9x	0.77	x	8.6	5	<b>x</b> 1	13.91	x	0.63	×	0.7	=	301.16	(77)
Southeast 0.9x	0.77	x	8.6	5	x 1	04.39	x	0.63	x	0.7	=	275.99	(77)
Southeast 0.9x	0.77	x	8.6	5	x	92.85	x	0.63	x	0.7	=	245.49	(77)
Southeast 0.9x	0.77	x	8.6	5	x	69.27	x	0.63	x	0.7	=	183.13	(77)
Southeast 0.9x	0.77	x	8.6	5	x	44.07	x	0.63	x	0.7	=	116.52	(77)
Southeast 0.9x	0.77	x	8.6	5	x;	31.49	x	0.63	x	0.7	=	83.25	(77)
Solar gains in	watts, ca	lculated	for eac	n month			(83)m = \$	Sum(74)m	(82)m				
(83)m= 97.28	165.7	226.72	280.91	314.65	312.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains – i	<del></del>		(84)m =	. ,	+ (83)m	, watts						1	
(84)m= 426.17	492.78	543.83	582.15	600.14	582.42	560.99	540.94	518.44	472.14	423.94	404.11		(84)
7. Mean inte	rnal tempe	erature	(heating	season	)								
Temperature	during he	eating p	eriods ir	n the livii	ng area	from Tal	ole 9, Tl	ո1 (°C)				21	(85)
Utilisation fac	ctor for ga	ins for I	iving are	a, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.9	0.85	0.77	0.66	0.53	0.38	0.28	0.3	0.46	0.69	0.84	0.91		(86)
Mean interna	al tempera	iture in l	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Tab	le 9c)	-	-			
(87)m= 20.03	20.27	20.54	20.78	20.92	20.98	21	20.99	20.96	20.79	20.4	19.99		(87)
Temperature			oriode ir	rost of	dwalling	I from To							
(88)m= 20.32	20.32	20.32	20.33	20.33	20.34	20.34	20.35	20.34	20.33	20.33	20.33		(88)
	II												
Utilisation fac	T T				Ì	1	г <sup>′</sup>		0.00	0.00		l	(90)
(89)m= 0.89	0.83	0.75	0.63	0.49	0.34	0.24	0.26	0.42	0.66	0.83	0.9		(89)
Mean interna	<u> </u>	ture in t			<u>,                                     </u>	1	eps 3 to	7 in Tab	<u> </u>	r	1	1	
(90)m= 19.03	19.37	19.73	20.07	20.25	20.33	20.34	20.34	20.3	20.08	19.55	18.97		(90)
								1	fLA = Livin	g area ÷ (4	4) =	0.45	(91)
Mean interna	al tempera	ture (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – f	LA) × T2					
(92)m= 19.48	19.78	20.1	20.39	20.55	20.62	20.64	20.64	20.6	20.4	19.93	19.43		(92)
Apply adjust	ment to th	e mean	internal	temper	1	om Table	e 4e, wh	ere appro	opriate	r			
(93)m= 19.48	19.78	20.1	20.39	20.55	20.62	20.64	20.64	20.6	20.4	19.93	19.43		(93)
8. Space hea													
Set Ti to the the utilisatior			•		ied at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	I I			way	Jun		Aug				Dee		
(94)m= 0.87	0.82	0.75	0.64	0.5	0.36	0.25	0.27	0.43	0.66	0.82	0.89		(94)
Useful gains	, hmGm ,	W = (94	1)m x (84	4)m	ļ		I		ļ				
(95)m= 372.12	404.15	405.96	370.54	302.65	209.76	142.2	148.51	224.76	310.84	346.49	358.22		(95)
Monthly aver	age exter	nal tem	perature	from Ta	able 8	•	•	•	•	•	•		
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for mea	n intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)n	n– (96)m	]			L	
(97)m= 561.44	548.31	499.4	415.07	318.66	213.2	142.92	149.47	231.74	352.94	465.18	555.71		(97)
Space heatir	r r	1				1	r	1	<u> </u>	r		I	
(98)m= 140.85	96.88	69.52	32.06	11.91	0	0	0	0	31.32	85.45	146.94		

	Total per year (kWh/y	$vear) = Sum(98)_{15,912} =$	614.93	(98)
Space heating requirement in kWh/m²/year			12.09	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heatin Fraction of space heat from secondary/supplementary heating (Ta		nmunity scheme.	0	(301)
Fraction of space heat from community system $1 - (301) =$			1	(302)
The community scheme may obtain heat from several sources. The procedure all		our other heat sources; t	he latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. Se Fraction of heat from Community boilers	e 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 commun	ity heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system			1.05	(306)
Space heating			kWh/year	
Annual space heating requirement			614.93	
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	645.68	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary system	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating				
Annual water heating requirement			1892.04	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	1986.64	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	26.32	(313)
Cooling System Energy Efficiency Ratio			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 o	utside		176.46	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	176.46	(331)
Energy for lighting (calculated in Appendix L)			242.69	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-518.71	(333)
Electricity generated by wind turbine (Appendix M) (negative quart	ntity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	wo fuels repeat (363) to	(366) for the second fue	94	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.22 =	604.87	(367)
Electrical energy for heat distribution [(3	313) x	0.52 =	13.66	(372)

Total CO2 associated with community s	ystems	(363)(366) + (368)(37	2)	=	618.53	(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) =			618.53	(376)
CO2 associated with electricity for pump	os and fans within dwe	lling (331)) x	0.52	=	91.58	(378)
CO2 associated with electricity for lightin	ng	(332))) x	0.52	=	125.95	(379)
Energy saving/generation technologies	(333) to (334) as appli		0.52 × 0.0	)1 =	-269.21	(380)
Total CO2, kg/year	sum of (376)(382) =				566.86	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.15	(384)
El rating (section 14)					92.08	(385)

# SAP 2012 Overheating Assessment

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

Property Details: Plot 18

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shut Ventilation rate during Overheating Details:	es: eter: ters: g hot we			None Indicative False	-			(P1)
Transmission heat los Summer heat loss co	ss coeffi	cient:		26.4 194.2				(P2)
Overhangs:	enneient.			194.2				(1 2)
Orientation:	Ratio:		Z_overhangs:					
South East (SE)	0		1					
Solar shading:	U		•					
			<b>.</b> .	_	_	_		
Orientation:	Z blind	IS:	Solar access:		rhangs:	Z summer:		(D0)
South East (SE)	1		0.9	1		0.9		(P8)
Solar gains:								
Orientation		Area	Flux	<b>g_</b>	FF	Shading	Gains	
South East (SE)	0.9 x	8.65	119.92	0.63	0.7	0.9	370.59	
						Total	370.59	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass tempera Threshold temperature Likelihood of high internation	tempera ture incre	ement		36 75 3. 16 1. 21	)	<b>July</b> 355.18 725.77 3.74 17.9 1.3 22.94 <b>Medium</b>	August 361.83 707.54 3.64 17.8 1.3 22.74 Mediun	(P5) (P6) (P7)
Assessment of likelih		-			<u>edium</u>			

User Details:	
Assessor Name:Zahid AshrafStroma Number:STRO0Software Name:Stroma FSAP 2012Software Version:Version	001082 n: 1.0.5.9
Property Address: Plot 18	
Address :	
1. Overall dwelling dimensions:	
Area(m²)         Av. Height(m)           Ground floor         50.86         (1a) x         2.5         (2a) =	Volume(m <sup>3</sup> ) 127.15 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 50.86 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	127.15 (5)
2. Ventilation rate:	
main secondary other total heating heating	m <sup>3</sup> per hour
Number of chimneys $0 + 0 + 0 = 0 \times 40 =$	0 (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	0 (6b)
Number of intermittent fans $2 \times 10 = 10$	20 (7a)
Number of passive vents $0 \times 10 = 0$	0 (7b)
Number of flueless gas fires $0 \times 40 = 0$	0 (7c)
	anges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $\div$ (5) =	0.16 (8)
Number of storeys in the dwelling (ns)	0 (9)
Additional infiltration [(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	0 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)
If no draught lobby, enter 0.05, else enter 0	0 (13)
Percentage of windows and doors draught stripped	0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$	0 (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$	3 (17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.31 (18)
Number of sides sheltered	3 (19)
Shelter factor $(20) = 1 - [0.075 \times (19)] =$	0.78 (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$	0.24 (21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m=         5.1         5         4.9         4.4         4.3         3.8         3.8         3.7         4         4.3         4.5         4.7	
Wind Factor (22a)m = (22)m $\div$ 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 (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
	0.3	0.3	0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28	]	
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	√5)) , othe	rwise (23b	) = (23a)			0	(23b)
		• •	0 11	iency in %	, (	, ,	• •	,, .	,	, ( ,			0	(23c)
			-	entilation	-					2b)m + (	23b) x [′	I – (23c)	-	(200)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If	balance	d mech	anical ve	entilation	without	heat rec	covery (N	и ЛV) (24b	)m = (22	1 2b)m + (2	23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If	whole h	ouse ex	tract ver	ntilation o	or positiv	ve input v	ventilatio	n from o	outside					
	if (22b)r	n < 0.5 >	(23b), t	hen (24	c) = (23b	); other	wise (24	c) = (22k	o) m + 0.	.5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (221	•					0.5]				
(24d)m=	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54	]	(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in box	(25)					
(25)m=	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54	]	(25)
3 Ho	at losse	s and he	at loss	paramete	⊃r∙	•	•	•	•		•			
	/IENT	Gros		Openin		Net Ar	ea	U-valı	ue	AXU		k-value	<del>)</del>	AXk
		area		'n	•	A ,r		W/m2		(W/	<b>&lt;</b> )	kJ/m²·l		kJ/K
Doors						2	x	1.4	=	2.8				(26)
Windo	WS					8.651	x1.	/[1/( 1.4 )+	0.04] =	11.47				(27)
Floor						0.785	5 X	0.12	=	0.0942				(28)
Walls	Type1	27.0	)1	8.65	;	18.36	3 X	0.15	=	2.75				(29)
Walls	Type2	23.6	69	2		21.69	) x	0.14	=	3.07				(29)
Total a	area of e	elements	, m²			51.48	3							(31)
				effective wi nternal wal			ated using	ı formula 1	/[(1/U-valı	ıe)+0.04] a	ns given in	paragraph	n 3.2	
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30)	) + (32) =				20.19	(33)
Heat c	apacity	Cm = S	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	619.51	(34)
Therm	al mass	parame	eter (TMI	- = Cm -	- TFA) ir	n kJ/m²K			Indica	itive Value	: Low		100	(35)
	0	sments wh ad of a de		tails of the ulation.	construct	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
				culated	using Ap	pendix l	<						6.18	(36)
if details	s of therma	al bridging	, are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			26.36	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	/		-	-	(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
(38)m=	22.91	22.84	22.77	22.42	22.36	22.05	22.05	22	22.17	22.36	22.49	22.62	J	(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	49.28	49.2	49.13	48.78	48.72	48.42	48.42	48.36	48.53	48.72	48.85	48.99		
										Average =	Sum(39)1.	12 /12=	48.78	(39)

Heat Ic	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.97	0.97	0.97	0.96	0.96	0.95	0.95	0.95	0.95	0.96	0.96	0.96		
Numbe	er of dav	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	.12 /12=	0.96	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			1	1										
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.	1. <sup>-</sup> .9)	72		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.89		(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=	86.78	83.62	80.46	77.31	74.15	71	71	74.15	77.31	80.46	83.62	86.78		
Enorm	oontont of	botwator	upod og	loulotod m	onthly - 1	100 v Vd r		)Tm / 2600			$m(44)_{112} =$		946.64	(44)
			. <u> </u>	. <u> </u>	· ·					·	ables 1b, 1	-		
(45)m=	128.69	112.55	116.14	101.25	97.16	83.84	77.69	89.15	90.21	105.13	114.76 m(45) <sub>112</sub> =	124.63	1241.2	(45)
lf instant	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		10tal = Su	III(43) <sub>112</sub> =		1241.2	(+0)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage										··			
-		. ,		• •			•	within sa	ame ves	sel	(	0		(47)
	•	-			velling, e			(47) ombi boil	ore) onto	ər '()' in <i>(</i>	(17)			
	storage		not wate	51 (1113 11	iciuues i	nstantai					<i><b>H</b>()</i>			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):				(	0		(48)
Tempe	erature f	actor fro	m Table	2b							(	)		(49)
•••			-	e, kWh/ye				(48) x (49)	) =		(	0		(50)
				•	loss fact le 2 (kW									(54)
		•	ee secti			n/nne/ua	iy)				(	)		(51)
		from Ta									(	)		(52)
Tempe	erature f	actor fro	m Table	2b							(	C		(53)
Energy	/ lost fro	m water	<sup>-</sup> storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	(	)		(54)
	. ,	(54) in (5									(	0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3						(	)		(58)
	•				,		• •	65 × (41)						
	-	1		I	· · · · ·	· · · · · ·	· · · · · ·	ng and a	· ·	· · · · · ·	, 	6	l	(50)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for ea	ach	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	r he	ating ca	alculated	l fo	r each	h month	(62)m	= 0.85 ×	(45)m +	- (46)m +	(57)m +	· (59)m + (61)m	
(62)m=	109.38	95.67	98.7	2	86.07	82.58	7	'1.26	66.04	75.78	76.68	89.36	97.55	105.93	]	(62)
Solar DH	-IW input	calculated	using A	Appe	ndix G or	Appendix	: H (	(negativ	ve quantity	) (enter	'0' if no sola	ar contrib	ution to wate	er heating)	-	
(add a	dditiona	al lines if	FGHF	RSa	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	iter													
(64)m=	109.38	95.67	98.7	2	86.07	82.58	7	'1.26	66.04	75.78	76.68	89.36	97.55	105.93		_
										Οι	tput from w	ater heat	er (annual)	112	1055.02	(64)
Heat g	ains fro	m water	heatii	ng,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8 :	x [(46)n	n + (57)m	+ (59)m	ו ]	
(65)m=	27.35	23.92	24.6	8	21.52	20.65	1	7.82	16.51	18.94	19.17	22.34	24.39	26.48	]	(65)
inclu	de (57)	m in calo	culatio	on o	f (65)m	only if c	ylir:	nder is	s in the c	dwelling	g or hot w	, vater is	from com	munity l	neating	
5. Int	ernal g	ains (see	e Tabl	e 5	and 5a	):										
		ns (Table														
metab	Jan	Feb	Ma		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m=	85.77	85.77	85.7	-	85.77	85.77	-	35.77	85.77	85.77	85.77	85.77	85.77	85.77		(66)
Liahtin	a aains	(calcula	ted in	Ap	pendix	L. equat	ion	L9 or	r L9a). a	lso see	Table 5	1			1	
(67)m=	13.74	12.21	9.93	<u> </u>	7.51	5.62	<u> </u>	4.74	5.12	6.66	8.94	11.35	13.25	14.12	1	(67)
		ins (calc			Annend		L uat	tion L	13 or I 1:	( 3a) als	so see Ta	uble 5		ļ	J	
(68)m=	149.47	151.02	147.1		138.79	128.29	r –	18.42	111.82	110.27		122.5	133	142.87	1	(68)
											see Table				]	
(69)m=	31.58	31.58	31.5		31.58	2, equal 31.58	-	1L15 81.58	31.58	31.58	31.58	31.58	31.58	31.58	1	(69)
						01.00		1.50	01.00	01.00	01.00	01.00	01.00	01.00	]	(00)
-		ns gains	r`		,	0	<u> </u>	0	0	0					1	(70)
(70)m=		0	0		0	0	Ļ	0	0	0	0	0	0	0	]	(70)
		vaporatio	<u> </u>	-			r –	-							1	(74)
(71)m=			-68.6		-68.62	-68.62	-6	68.62	-68.62	-68.62	-68.62	-68.62	-68.62	-68.62		(71)
		gains (T		<u> </u>			_				-1			. <u> </u>	7	()
(72)m=	36.75	35.59	33.1	7	29.88	27.75	2	24.74	22.19	25.46	26.63	30.03	33.87	35.6		(72)
		gains =	i				_		m + (67)m	+ (68)m		(70)m +	(71)m + (72)	1	7	
(73)m=	248.7	247.55	238.9	94	224.92	210.39	19	96.63	187.87	191.13	198.48	212.61	228.86	241.33		(73)
	lar gain															
-			•				and			tions to		ne applica	able orienta	tion.		
Orienta		Access F Table 6d			Area m <sup>2</sup>			Flu: Tak	x ole 6a		g_ Table 6b		FF Table 6c		Gains (W)	
0 11															. ,	-
Southe		0.77		x	8.6	65	x	3	6.79	×	0.63	×	0.7	=	97.28	(77)
Southe	l	0.77		x	8.6	65	x	6	2.67	x	0.63	×	0.7	=	165.7	(77)
Southe		0.77		x	8.6	65	x	8	5.75	×	0.63	×	0.7	=	226.72	(77)
Southe	Ļ	0.77		x	8.6	65	x	10	06.25	x	0.63	×	0.7	=	280.91	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	8.6	55	x	11	19.01	x	0.63	x	0.7	=	314.65	(77)

Southeast 0.9x	0.77	x	8.6	65	<b>x</b> 1	18.15	x	0.63	x	0.7	=	312.37	(77)
Southeast 0.9x	0.77	x	8.6	65	<b>x</b> 1	13.91	x	0.63	x	0.7	=	301.16	(77)
Southeast 0.9x	0.77	x	8.6	65	<b>X</b> 1	04.39	x	0.63	x	0.7	=	275.99	(77)
Southeast 0.9x	0.77	x	8.6	65	x	92.85	x	0.63	x	0.7	=	245.49	(77)
Southeast 0.9x	0.77	x	8.6	65	x	69.27	x	0.63	x	0.7	=	183.13	(77)
Southeast 0.9x	0.77	x	8.6	65	x	44.07	x	0.63	x	0.7	=	116.52	(77)
Southeast 0.9x	0.77	x	8.6	65	x	31.49	x 🗌	0.63	x	0.7	=	83.25	(77)
													_
Solar <u>g</u> ains ir	n watts, ca	alculated	for eac	h month	-		(83)m = \$	Sum(74)m .	(82)m				
(83)m= 97.28		226.72	280.91	314.65	312.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains –	1	1	· ,	· ,	· ,	1						1	
(84)m= 345.98	413.25	465.66	505.84	525.03	509.01	489.03	467.12	443.96	395.75	345.37	324.58		(84)
7. Mean inte	ernal temp	perature	(heating	season	)								
Temperatur	e during h	eating p	eriods ir	n the livi	ng area	from Tal	ole 9, Tl	ո1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for l	iving are	ea, h1,m	(see Ta	able 9a)			_				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.95	0.92	0.88	0.8	0.69	0.54	0.41	0.45	0.63	0.83	0.93	0.96		(86)
Mean intern	al temper	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Tab	le 9c)					
(87)m= 19.15		19.86	20.3	20.66	20.88	20.96	20.95	20.8	20.33	19.65	19.08		(87)
Temperatur	e durina h	eating p	eriods ir	n rest of	dwelling	n from Ta	able 9 1	- - h2 (°C)					
(88)m= 20.11	20.11	20.11	20.12	20.12	20.12	20.12	20.12	20.12	20.12	20.12	20.11		(88)
		l .	root of d		L		(						
Utilisation fa	0.91	0.86	0.77	0.65	0.48		9a) 0.37	0.58	0.8	0.92	0.95		(89)
										0.52	0.00		(00)
Mean intern				1	<u> </u>	1	r –	1	r - '			l	(00)
(90)m= 18.42	18.72	19.11	19.53	19.86	20.05	20.1	20.1	19.99	19.57	18.92	18.35	0.45	(90)
								1		ig area ÷ (·	+) =	0.45	(91)
Mean intern		ature (fo	r the wh	i	lling) = f	$LA \times T1$	+ (1 – f	LA) × T2				1	
(92)m= 18.75		19.45	19.88	20.22	20.42	20.49	20.48	20.35	19.91	19.25	18.68		(92)
Apply adjust	-	i		i	1	1	i		r			l	(02)
(93)m= 18.75	1	19.45	19.88	20.22	20.42	20.49	20.48	20.35	19.91	19.25	18.68		(93)
8. Space he							Table (		4 <b>T</b> : (	70)	-l		
Set Ti to the the utilisatio			•		ied at st	ep 11 of	i able s	ød, so tha	it 11,m=(	76)m an	d re-cald	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm	•	,									
(94)m= 0.93	0.9	0.85	0.77	0.65	0.51	0.37	0.4	0.59	0.79	0.9	0.94		(94)
Useful gains	s, hmGm	, W = (94	4)m x (84	4)m									
(95)m= 322.85	371.06	394.44	387.76	342.7	257.46	181.3	188.17	263.11	314.32	311.78	305.78		(95)
Monthly ave	rage exte	rnal tem	perature	e from Ta	able 8	_							
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra		i	· · ·	i	i	1 /	1 · · · ·	1 <u> </u>	ř.		I	I	
(97)m= 711.98		636.08	535.69	414.98	281.9	188.44	197.5	303.53	453.68	593.45	709.28		(97)
Space heati		r				1	r	1	<u> </u>	<u> </u>	200.0	l	
(98)m= 289.52	2 218.62	179.79	106.51	53.78	0	0	0	0	103.68	202.8	300.2		

								Tota	l per year	(kWh/year	<sup>.</sup> ) = Sum(9	8)15,912 =	1454.91	(98)	
Space	e heatin	g require	ement in	kWh/m²	²/year								28.61	(99)	
8c. Sp	bace co	oling req	quiremer	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 2	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)			
(100)m=	0	0	0	0	0	455.11	358.28	367.54	0	0	0	0		(100)	
Utilisa	ation fac	tor for lo	oss hm												
(101)m=	0	0	0	0	0	0.86	0.91	0.9	0	0	0	0		(101)	
Usefu	l loss, h	mLm (V	vatts) = (	(100)m x	(101)m										
(102)m=	0	0		(102)											
(102)m=         0         0         0         393.62         325.99         329.67         0         0         0         0         0         (102)           Gains (solar gains calculated for applicable weather region, see Table 10)         Table 10         (102)         (102															
(103)m=	0	0		(103)											
	Space cooling requirement for month, whole dwelling, continuous ( kWh) = 0.024 x [(103)m – (102)m ]														
set (1	04)m to	zero if (	(104)m <	: 3 × (98	)m										
(104)m=	0	0	0	0	0	191.63	230.07	209.02	0	0	0	0			
										= Sum(	,	=	630.71	(104)	
	I fraction								f C =	cooled a	area ÷ (4	4) =	1	(105)	
	ttency f	actor (Ta	able 10b	)									1		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_	
									Total	I = Sum(	(104)	=	0	(106)	
· ·		-	r	month =	r`	, <i>,</i>	r <u> </u>	I			1		l		
(107)m=	0	0	0	0	0	47.91	57.52	52.25	0	0	0	0		_	
									Total	= Sum(	107)	=	157.68	(107)	
Space	cooling	requirer	ment in k	kWh/m²/y	year				(107)	) ÷ (4) =			3.1	(108)	
8f. Fab	ric Enei	gy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)					
Fabrio	Energy	/ Efficier	псу						(99) ·	+ (108) =	=		31.71	(109)	

# SAP Input

Property Details: Pl	ot 18							
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 d New d Unkno No rela Indica	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		50.861	m <sup>2</sup>		Storey height 2.5 m	:		
Living area:			m <sup>2</sup> (fraction 0.4	54)	2.5 11			
Front of dwelling fa	aces:	North	West					
Opening types:								
Name: NW	Source: Manufacturer		ype: olid	Glazing:		Argon:	Fram	ie:
SE	Manufacturer		/indows	double-glaze	ed	Yes		
<b>Name:</b> NW SE	<b>Gap:</b> mm 16mm o	r more	<b>Frame Facto</b> 0 0.7	or: g-value: 0 0.63	<b>U-value:</b> 1.4 1.4	<b>Area:</b> 2 8.651	<b>No. c</b> 1 1	f Openings:
Name: NW SE	Type-Nam	С	ocation: orridor Wall xternal Wall	Orient: North West South East		Width: 0 0	Heig 0 0	ht:
Overshading:		Averac	je or unknown					
Opaque Elements:								
Type: ( <u>External Elements</u>	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall:	Карра:
External Wall Corridor Wall Exposed Floor Internal Elements Party Elements	27.01 23.686 0.785	8.65 2	18.36 21.69	0.15 0.15 0.12	0 0.4	False False		N/A N/A N/A
Thermal bridges:								
Thermal bridges:		User-d <b>Leng</b> 4.795 13.2 35.726	<b>h Psi-valu</b> 0.289 0.047	E2 Othe E4 Jamb	r lintels (including o			

# SAP Input

10.9	0.109	E25	Staggered party wall between dwellings
13.625	0.08	E16	Corner (normal)
8.175	-0.072	E17	Corner (inverted internal area greater than external area)
1.482	0.131	E21	Exposed floor (inverted)
22.574	0	P3	Intermediate floor between dwellings (in blocks of flats)

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

			User De	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 207		Ś	Softwa	a Numi ire Ver				001082 n: 1.0.5.9	
		Pro	operty A	ddress:	Plot 18					
Address :										
1. Overall dwelling dimen	isions:		_	( ))						
Ground floor			<b>Area</b>	· ·	(1a) x		<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup> ) 127.15	) (3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e	e)+(1n)	50	.86	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	127.15	(5)
2. Ventilation rate:										
		econdary heating	· ·	other		total			m <sup>3</sup> per houi	r
Number of chimneys		0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+ [	0	] = [	0	×	20 =	0	(6b)
Number of intermittent fan	s				Γ	2	x ′	10 =	20	(7a)
Number of passive vents					Γ	0	x ′	10 =	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 = $(6)$	6a)+(6b)+(7a	)+(7b)+(7	c) =	Г	20	<u> </u>	÷ (5) =	0.16	(8)
If a pressurisation test has be					ontinue fro			. (0)	0.10	
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	sent, use the value corres				•	uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	led) or 0.1	(sealed	d), else (	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration					x (14) ÷ 1	- C			0	(15)
Infiltration rate		h:			+ (11) + (1				0	(16)
Air permeability value, c If based on air permeabilit			•	•	•	etre of e	nvelope	area	5	(17)
Air permeability value applies	-					s heina u	sed		0.41	(18)
Number of sides sheltered			or a dogr		inousinty i	o boing a	Jou		3	(19)
Shelter factor			(	20) = 1 - [	0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor		(:	21) = (18)	x (20) =				0.32	(21)
Infiltration rate modified fo	r monthly wind spee	d								_
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7		-				-	-		
(22)m= 5.1 5 4	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 (allow	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m			_		
	0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se							(220)
				andix N (2	(23a) – (23a	) × Emv (e	acuation (I	N5)) , othe	rwise (23h	) – (23a)			0	(23a)
			0 11		, (	, (	• •	n Table 4h		) = (200)			0	(23b)
			-	-	-					) b)m i ('	00h) v [/	1 (220)	0	(23c)
(24a)m=	<b></b>							HR) (24a	a) = (22)	20)11 + ( <i>1</i>	23D) X [	0	÷ 100]	(24a)
		-		-		-		-	-	-	÷	0		(210)
(24b)m=								MV) (24b 0	0 = (22)	20)m + (2 0	230)	0		(24b)
	-								_	0	0	0		(240)
,					•	-		on from $c$ c) = (22b)		5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•			on from I 0.5 + [(2		0.5]				
(24d)m=	<u> </u>	0.58	0.57	0.56	0.56	0.54	0.54	0.54	, 0.55	0.56	0.56	0.57		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in boy	(25)					
(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
							1	•						
				Daramete		Not An		11						
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<b>&lt;</b> )	k-value kJ/m²∙ł		A X k kJ/K
Doors						2	x	1	=	2				(26)
Windo	WS					8.651	ı x1	/[1/( 1.4 )+	0.04] =	11.47				(27)
Floor						0.785	5 x	0.13	=	0.10205	5			(28)
Walls <sup>-</sup>	Type1	27.0	)1	8.65	;	18.36	3 X	0.18	=	3.3			$\neg$	(29)
Walls <sup>-</sup>	Type2	23.6	69	2		21.69	) X	0.18		3.9	ז ר		$\exists$	(29)
Total a	area of e	elements	, m²			51.48	3							(31)
* for win	ndows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	lated using	g formula 1	/[(1/U-valu	e)+0.04] a	s given in	paragraph	3.2	
				nternal wal	ls and part	titions								
		ss, W/K :	•	U)				(26)(30)	) + (32) =				20.78	(33)
		Cm = S(	. ,						((28)	.(30) + (32	2) + (32a).	(32e) =	619.51	(34)
		•	· ·	<sup>-</sup> = Cm ÷	,					tive Value:			250	(35)
	-	sments wh ad of a de			construct	ion are noi	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
				culated (	using Ap	pendix I	K						5.02	(36)
	•	•	,	own (36) =	• •	•							0.02	
Total f	abric he	at loss							(33) +	(36) =			25.8	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	24.38	24.25	24.12	23.51	23.4	22.87	22.87	22.77	23.07	23.4	23.63	23.87		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	50.18	50.04	49.92	49.31	49.19	48.67	48.67	48.57	48.87	49.19	49.42	49.66		
										Average =	Sum(39)1	12 /12=	49.31	(39)

Heat le	oss para	ımeter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.99	0.98	0.98	0.97	0.97	0.96	0.96	0.95	0.96	0.97	0.97	0.98		
Numer								Į	,	Average =	Sum(40)1	12 /12=	0.97	(40)
NUMD	-	/s in mo	<u> </u>	r í	Mov	lun	1.1	Aug	Son	Oct	Nov	Dee		
(41)m=	Jan 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
(41)11-	51	20	51	50	51	- 50	51	51	50	51	- 50	51		()
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	o(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		72		(42)
Reduce	the annua	al average	hot water		5% if the c	welling is	designed	(25 x N) to achieve		se target o		.94		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	82.44	79.44	76.44	73.44	70.45	67.45	67.45	70.45	73.44	76.44	79.44	82.44		_
Enorm	contont of	bot wator	upod op	loulotod m	onthly - 1	100 v Vd		7Tm / 2600			m(44) <sub>112</sub> =		899.31	(44)
				·	-		·	DTm / 3600		-				
(45)m=	122.25	106.92	110.33	96.19	92.3	79.65	73.8	84.69	85.7	99.88	109.02	118.39	4470.44	(45)
lf instan	taneous w	vater heati	ng at poin	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		i otal = Su	m(45) <sub>112</sub> =		1179.14	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:				ļ		1		ļ				
Storag	je volum	e (litres)	) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	-	-		ank in dw	-						( <b>—</b> )			
	vise if no storage		hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	•		eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
,		actor fro				,	,					0		(49)
				e, kWh/y	ear			(48) x (49)	) =			0		(50)
b) If n	nanufact	urer's de	eclared	cylinder	loss fact							-		
		•		rom Tab	le 2 (kW	h/litre/da	ay)				(	0		(51)
	-	eating s from Ta		on 4.3										(52)
		actor fro		2b								0 0		(52) (53)
				e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
-		(54) in (5	-	, <b>,</b>						,		0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylind	er contains	s dedicate	d solar sto	nage, (57)	m = (56)m	x [(50) – (	(5 [H11)] ÷ (5	50), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Prima	v circuit	loss (ar	nnual) fro	om Table	e 3						(	0		(58)
	•					59)m =	(58) ÷ 30	65 × (41)	m		·			
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wa	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for 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 eacl	n month	(62)m	1 =	0.85 × (	(45)m	+	(46)m +	(57)	m +	(59)m + (61)m	
(62)m=	103.91	90.88	93.78	3	81.76	78.45	(	67.7	62.73	71.9	Э	72.85	84.	9	92.67	100	.63		(62)
Solar DH	- W input	calculated	using A	ppe	endix G or	· Appendix	H	(negativ	ve quantity	) (ente	r '0'	if no sola	r contr	ibu	tion to wate	er hea	ting)	•	
(add a	dditiona	al lines if	FGHR	S a	and/or \	WWHRS	ap	oplies,	, see Ap	pendi	x G	6)							
(63)m=	0	0	0		0	0		0	0	0		0	0		0	0	)		(63)
Output	from w	ater hea	ter																
(64)m=	103.91	90.88	93.78	3	81.76	78.45	(	67.7	62.73	71.9	9	72.85	84.	9	92.67	100	.63		
		•								С	utp	ut from wa	ater he	ate	r (annual)₁	12		1002.27	(64)
Heat g	ains fro	m water	heatir	ıg,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61	)m	] + 0.8 ×	< [(46	)m	+ (57)m	+ (5	9)m	1]	
(65)m=	25.98	22.72	23.45	5	20.44	19.61	1	6.92	15.68	18		18.21	21.2	22	23.17	25.	16		(65)
inclu	de (57)	m in calo	culatio	n o	f (65)m	only if c	ylir	nder is	s in the c	dwellir	ng d	or hot w	ater i	s f	rom com	mun	ity h	eating	
5. Int	ernal g	ains (see	e Table	e 5	and 5a	):	-				-						-	-	
	Ŭ	ns (Table																	
metab	Jan	Feb	Ma		Apr	May		Jun	Jul	Au	a	Sep	00	ct	Nov	D	ес	1	
(66)m=	85.77	85.77	85.77	-	85.77	85.77		35.77	85.77	85.7	<u> </u>	85.77	85.7		85.77	85.			(66)
Liahtin	u a aains	(calcula	ı ted in	Ap	pendix	L. equat	ion	L9 0I	r L9a), al	lso se	e T	Table 5	I		1			1	
(67)m=	13.74	12.21	9.93	<u> </u>	7.51	5.62	—	4.74	5.12	6.66	- 1	8.94	11.3	35	13.25	14.	12	1	(67)
		ins (calc	ulated				L		13 or 1 1'	3a) a	ا معا	see Ta						1	
(68)m=	149.47	151.02	147.1	-	138.79	128.29	r	18.42	111.82	110.2	- 1	114.18	122	5	133	142	87	1	(68)
														.0	100	142	.07	l	()
(69)m=	31.58	(calcula 31.58	31.58	-i	31.58	2, equa	_	1L15 31.58	31.58	, also 31.5	-	31.58	31.5	:0	31.58	31.	58	1	(69)
						51.50		1.50	51.50	51.5	5	51.50	51.0		51.50	51.	50	J	(00)
•		ns gains	r`	9 58 T			_	0	0	0	_	0						1	( <b>70</b> )
(70)m=	0	0	0		0	0	<u> </u>	0	0	0		0	0		0	0	)	J	(70)
		/aporatio	<u> </u>	- T		, ,	r –								L			1	(74)
(71)m=	-68.62	-68.62	-68.6		-68.62	-68.62	-6	68.62	-68.62	-68.6	2	-68.62	-68.0	52	-68.62	-68	.62	J	(71)
		gains (T		ŕ			_						-					1	
(72)m=	34.92	33.81	31.51		28.39	26.36	2	23.51	21.08	24.1		25.29	28.5	-	32.18	33.	82	l	(72)
Total i	nterna	gains =	:					(66)	m + (67)m	+ (68)	m +	(69)m + (	(70)m ·	+ (7	71)m + (72)	m		•	
(73)m=	246.86	245.77	237.2	8	223.43	209	1	95.4	186.76	189.8	5	197.15	211.	11	227.16	239	.55		(73)
	lar gain																		
-			-	olar			and			tions to	COI	nvert to th	e appl	ical	ble orientat	ion.			
Orientation:     Access Factor     Area     Flux     g_     FF     Gains       Table 6d     m <sup>2</sup> Table 6a     Table 6b     Table 6c     (W)																			
•	_				····								_	_				(**)	-
Southe	L	0.77		x	8.6	65	x	3	6.79	×		0.63	×	Ļ	0.7		=	97.28	(77)
Southe	Ļ	0.77		x	8.6	65	x	6	2.67	×		0.63	×	F	0.7		=	165.7	(77)
Southe	Ļ	0.77		x	8.6	65	x	8	5.75	×		0.63	×	L	0.7		=	226.72	(77)
Southe	L	0.77		x	8.6	65	x	1(	06.25	x		0.63	x	Ĺ	0.7		=	280.91	(77)
Southe	ast <mark>0.9</mark> x	0.77		x	8.6	65	x	1	19.01	×		0.63	x		0.7		=	314.65	(77)

Southeast $0.9x$ 0.77 x 8.65 x 118.15 x 0.63 x 0.7 = 312.37 (77)															
Southeast 0.9x	0.77	x	8.6	5	x	118	8.15	x		0.63	x	0.7	=	312.37	(77)
Southeast 0.9x	0.77	x	8.6	5	x	113	3.91	x		0.63	x	0.7	=	301.16	(77)
Southeast 0.9x	0.77	x	8.6	5	x	104	4.39	x		0.63	×	0.7	=	275.99	(77)
Southeast 0.9x	0.77	x	8.6	5	x	92	.85	x		0.63	×	0.7	=	245.49	(77)
Southeast 0.9x	0.77	x	8.6	5	x	69	).27	x		0.63	×	0.7	=	183.13	(77)
Southeast 0.9x	0.77	x	8.6	5	x	44	.07	x		0.63	×	0.7	=	116.52	(77)
Southeast 0.9x	0.77	x	8.6	5	x	31	.49	x		0.63	×	0.7	=	83.25	(77)
Solar gains in	watts, calc	culated	for eac	n month				(83)m	i = Sui	m(74)m	(82)m			-	
(83)m= 97.28		226.72	280.91	314.65			301.16	275.	.99	245.49	183.13	3 116.52	83.25		(83)
Total gains –	· · · · ·	d solar	· ,	· ,	<u>`</u>									-	
(84)m= 344.14	411.47	464	504.34	523.65	50	07.77	487.92	465.	.85	442.63	394.24	343.68	322.8		(84)
7. Mean inte	rnal tempe	rature (	heating	season	)										
Temperature	e during hea	ating pe	eriods ir	n the livi	ng	area fr	om Tab	ole 9,	Th1	(°C)				21	(85)
Utilisation fa	ctor for gain	ns for li	ving are	ea, h1,m	ı (s	ee Tab	ole 9a)							_	
Jan	Feb	Mar	Apr	May		Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.97	0.91	0.79		0.6	0.44	0.4	8	0.72	0.94	0.99	1		(86)
Mean interna	al temperat	ure in li	iving are	ea T1 (fe	ollo	w step	s 3 to 7	' in T	able	9c)					
(87)m= 20.06	<u> </u>	20.48	20.74	20.92	<b>—</b>	0.99	21	21		20.96	20.73	20.34	20.02	]	(87)
Temperature	during he	ating pr	eriods ir	rest of	dw	ellina f	from Ta	ble C	) Th	2 (°C)		•		-	
(88)m= 20.09	20.1	20.1	20.11	20.11	<b>—</b>	20.12	20.12	20.		20.12	20.11	20.11	20.1	]	(88)
				valliaa	ـــــــــــــــــــــــــــــــــــــ		Tabla	()						J	
Utilisation fa	0.99	0.96	0.89	0.74	T -	.m (see	0.35	9a) 0.3	10	0.64	0.91	0.99	1	1	(89)
	<u> </u>				I							0.00			(00)
Mean interna	<u>т і</u> т	r		(	Ť	<u> </u>		Ċ.				(0.70)		7	(00)
(90)m= 19.24	19.42	19.66	19.91	20.06	2	0.11	20.12	20.1	12	20.1	19.91	19.53	19.21		(90)
										11	LA = LIV	ing area ÷ (4	•) =	0.45	(91)
Mean interna	al temperat	ure (for		ole dwe	llin	g) = fL/	A × T1	+ (1	– fLA	A) × T2				-	
(92)m= 19.61		20.03	20.29	20.45		0.51	20.52	20.		20.49	20.28	19.9	19.58		(92)
Apply adjust	<u>г г</u>	i		· ·	<b>1</b>				- T	<u> </u>	•			7	(00)
(93)m= 19.61	I	20.03	20.29	20.45	2	0.51	20.52	20.	52	20.49	20.28	19.9	19.58	]	(93)
8. Space he			norotu	o obtoir		ot oto	n 11 of	Tabl	0 Ob	an that	Tim	(76) m and	d ro ool	ouloto	
Set Ti to the the utilisation			•		iea	at step	рттог	Tabl	e 90,	, so that	[ ] ],m=	=(76)m and	a re-cai	culate	
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec	]	
Utilisation fa	ctor for gain	ns, hm:				I				· .		1		1	
(94)m= 0.99	0.98	0.96	0.89	0.76	(	0.56	0.39	0.4	3	0.68	0.92	0.99	1	]	(94)
Useful gains	, hmGm , V	N = (94	)m x (84	4)m										_	
(95)m= 342.16	405.13 4	445.53	450.89	396.84	28	82.97	190.18	199.	.18	298.95	362.75	5 338.93	321.46		(95)
Monthly ave	rage extern	nal temp	perature	e from T	abl	e 8								-	
(96)m= 4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.		14.1	10.6	7.1	4.2	J	(96)
Heat loss rat					-		- ,	- `	<u> </u>	<u> </u>	-			7	(07)
(97)m= 768.2		675.3	561.44	430.29			190.66	20		312.27	476.18		763.79	J	(97)
Space heatin	<u> </u>				vvh T				T T	- i		-	220.00	1	
(98)m= 316.97	228.6 1	170.95	79.6	24.89		0	0	0		0	84.39	211.3	329.09	J	

								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	1445.79	(98)
Space	e heatir	ng require	ement in	kWh/m²	²/year								28.43	(99)
8c. Sp	bace co	oling rec	uiremer	nt										
Calcu	lated fo	or June, J	July and	August.	See Tal	ble 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	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	457.45	360.12	369.11	0	0	0	0		(100)
Utilisa	ation fac	ctor for lo	ss hm											
(101)m=	0	0	0	0	0	0.96	0.98	0.98	0	0	0	0		(101)
Usefu	l loss, l	nmLm (V	/atts) = (	(100)m x	(101)m									
(102)m=	0	0	0	0	0	439.31	354.28	361.09	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	658.53	634.11	609.33	0	0	0	0		(103)
		og <i>require</i> zero if (				dwelling,	continu	ous ( kW	(h) = 0.0	24 x [(10	)3)m – (	102)m]:	x (41)m	
(104)m=	0	0	0	0	0	157.84	208.19	184.69	0	0	0	0		
		1							Total	= Sum(	104)	=	550.72	(104)
Cooled	l fractio	n							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency	factor (Ta	able 10b	)	_	_	_	_				_		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	' = Sum(	104)	=	0	(106)
Space	cooling	requirer	nent for	month =	: (104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	39.46	52.05	46.17	0	0	0	0		_
									Total	= Sum(	107)	=	137.68	(107)
Space	cooling	requirer	nent in k	kWh/m²/y	year				(107)	÷ (4) =			2.71	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only un	der spec	cial conc	litions, se	ee sectio	on 11)				
Fabric	: Energ	y Efficier	псу						(99) ·	+ (108) =	=		31.13	(109)
Targe	et Fabri	ic Energ	y Efficie	ency (TF	EE)								35.8	(109)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP	2012		Softwa	are Ver	sion:		Versio	n: 1.0.5.9	
		Р	roperty /	Address:	Plot 18					
Address :										
1. Overall dwelling dimer	isions:									
Ground floor				a <b>(m²)</b> 0.86	(1a) x		<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup> )	) (3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)	+(1e)+(1r			(4)		-	]```		
Dwelling volume	, , , , , , , ,		,			+(3c)+(3c	l)+(3e)+	.(3n) =	127.15	(5)
2. Ventilation rate:										]
	main	secondar	у	other		total			m <sup>3</sup> per hou	r
Number of chimneys	heating	+ 0	] + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	+ 0	] + [	0	] = [	0	x	20 =	0	(6b)
Number of intermittent fan	s				- - -	0	x /	10 =	0	(7a)
Number of passive vents					Г	0	<b>x</b> 7	10 =	0	(7b)
Number of flueless gas fire	es				Г	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	e flues and fans	-(6a)+(6b)+(7)	′a)+(7h)+( <sup>-</sup>	7c) -	Г			1		_
If a pressurisation test has be					continue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in the			( )						0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or tim	ber frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening			the greate	er wall area	a (after					
If suspended wooden flo			1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente			(	-,,					0	(13)
Percentage of windows	and doors draug	ht 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, c	50, expressed ir	n cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	3	(17)
If based on air permeabilit	y value, then (18)	$= [(17) \div 20] + (8)$	3), otherwi	se (18) = (	16)				0.15	(18)
Air permeability value applies		est has been dor	ne or a deg	ree air pei	rmeability i	is being u	sed			_
Number of sides sheltered Shelter factor				(20) = 1 - [	[0 075 x (1	9)] =			3	(19)
Infiltration rate incorporati	a shelter factor			(21) = (18)		0)] –			0.78	(20)
Infiltration rate modified fo	0	need		(21) = (10)	) x (20) -				0.12	(21)
		May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	·		Uui	7 tug	OCP	000	1107	000		
Monthly average wind spectrum (22)m= 5.1 5 4		.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
			0.0	5.7	· ·			I	l	
Wind Factor $(22a)m = (22)$					. I				l	
(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					
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
		c <i>tive air</i> al ventila	•	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) , othe	rwise (23h	) = (23a)			0.5	
			• • •		, ,	, ,	• •	n Table 4h		) = (200)			0.5	(23b)
			-	-	-			HR) (24a		2b)m i (ʻ	22P) ^ [v	l (22a)	79.05	(23c)
(24a)m=	r	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	÷ 100]	(24a)
								I				0.24		(210)
(24b)m=	r							VV) (24b	0 = (22)	2D)m + (2 0	230)	0		(24b)
										0	0	0		(246)
					-	-		on from c c) = (22b		5 × (23b	)	-		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
								on from I 0.5 + [(2		0.5]				
(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=	0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(25)
2.116	otlogge				o #1		•	•						
				Daramete		Net Ar	~~	U-valı	10	AXU		kyoluo	ς Λ	Xk
ELEN	/IEN I	Gros area		Openin m		A,r		W/m2		(W/ł	<b>&lt;</b> )	k-value kJ/m²⋅ł		J/K
Doors						2	x	1.4	=	2.8				(26)
Windo	ws					8.651	x1	/[1/( 1.4 )+	0.04] =	11.47				(27)
Floor						0.785	5 X	0.12	=	0.0942				(28)
Walls -	Type1	27.0	)1	8.65	;	18.36	3 X	0.15		2.75	i F		╡ ──	(29)
Walls -	Type2	23.6	69	2		21.69	) x	0.14	=	3.07	i F		<b>╡                                    </b>	(29)
Total a	area of e	lements	, m²			51.48	3							(31)
				effective wi nternal wal			ated using	g formula 1	/[(1/U-valu	ie)+0.04] a	is given in	paragraph	3.2	
		s, W/K						(26)(30)	+ (32) =				20.19	(33)
		Cm = S(		,					((28)	.(30) + (32	2) + (32a).	(32e) =	619.51	(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 noi	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
				culated u	using Ap	pendix l	<						6.18	(36)
	-		,	own (36) =	• •									
Total fa	abric he	at loss							(33) +	(36) =			26.36	(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=	10.61	10.49	10.37	9.76	9.64	9.03	9.03	8.91	9.27	9.64	9.88	10.13		(38)
Heat tr	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	36.98	36.85	36.73	36.12	36	35.39	35.39	35.27	35.64	36	36.25	36.49		
										Average =	Sum(39)1.	12 /12=	36.09	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.73	0.72	0.72	0.71	0.71	0.7	0.7	0.69	0.7	0.71	0.71	0.72		
Numb	er of day	u vs in mo	nth (Tab	le 12)				<b>!</b>	,	Average =	Sum(40)1.	12 /12=	0.71	(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)
()														
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	0(-0.0003	349 x (TI	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		72		(42)
Reduce	the annua	al average		usage by	5% if the c	welling is	designed	(25 x N) to achieve		se target o		.89		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i		r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	86.78	83.62	80.46	77.31	74.15	71	71	74.15	77.31	80.46	83.62	86.78		
Energy	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,ı	m x nm x [	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		946.64	(44)
(45)m=	128.69	112.55	116.14	101.25	97.16	83.84	77.69	89.15	90.21	105.13	114.76	124.63		
lf incton	tanoous w	ator hoati	ng at paint	t of use /n	- bot wato	r storago)	ontor 0 in	hoves (46		Total = Su	m(45) <sub>112</sub> =	-	1241.2	(45)
	r		· ·		1	i	1	boxes (46)	i	45 77	47.04	40.00		(46)
(46)m= Water	19.3 storage	16.88 IOSS:	17.42	15.19	14.57	12.58	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)
	•	-	and no ta		-			. ,						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage nanufact		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
			m Table				" <b>,</b> ) / ·					0		(49)
			<sup>.</sup> storage		ear			(48) x (49)	) =		1	10		(50)
,			eclared											
		-	factor fr		le 2 (kW	h/litre/da	ay)				0.	02		(51)
		from Ta		011 4.5							1.	03		(52)
			m Table	2b								.6		(53)
Energ	y lost fro	m watei	<sup>.</sup> storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter	(50) or	(54) in ( <del>5</del>	55)								1.	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 cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	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)
Prima	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	•					,	. ,	65 × (41)						
		1	r	r	r	· · · · · · · · · · · · · · · · · · ·		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)

(61)m=       0 </th <th>(61) (62) (63)</th>	(61) (62) (63)
(62)m= 183.96 162.48 171.42 154.75 152.43 137.33 132.97 144.43 143.71 160.41 168.26 179.9	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	(63)
	(63)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	(63)
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Output from water heater	
(64)m= 183.96 162.48 171.42 154.75 152.43 137.33 132.97 144.43 143.71 160.41 168.26 179.9	
Output from water heater (annual) <sub>112</sub> 1892.04	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]	
(65)m= 87.01 77.36 82.84 76.46 76.53 70.67 70.05 73.86 72.79 79.18 80.95 85.66	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 102.93 102.93 102.93 102.93 102.93 102.93 102.93 102.93 102.93 102.93 102.93 102.93 102.93	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 34.35 30.51 24.82 18.79 14.04 11.86 12.81 16.65 22.35 28.38 33.12 35.31	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 223.09 225.4 219.57 207.15 191.47 176.74 166.9 164.58 170.42 182.84 198.51 213.25	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 47.01 47.01 47.01 47.01 47.01 47.01 47.01 47.01 47.01 47.01 47.01 47.01 47.01 47.01 47.01	(69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	
$ (71)m = \begin{array}{c c c c c c c c c c c c c c c c c c c $	(71)
Water heating gains (Table 5)	
(72)m= 116.95 115.13 111.34 106.2 102.86 98.15 94.16 99.28 101.1 106.42 112.44 115.13	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	(/
(73)m=       455.71       452.36       437.05       413.45       389.69       368.07       355.18       361.83       375.18       398.95       425.39       445.01	(73)
6. Solar gains:	(
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6dm²Table 6aTable 6bTable 6c(W)	
Southeast 0.9x 0.77 x 8.65 x 36.79 x 0.63 x 0.7 = 97.28	(77)
Southeast 0.9x 0.77 x 8.65 x 62.67 x 0.63 x 0.7 = 165.7	(77)
Southeast 0.9x 0.77 x 8.65 x 85.75 x 0.63 x 0.7 = 226.72	(77)
Southeast 0.9x 0.77 x 8.65 x 106.25 x 0.63 x 0.7 = 280.91	](77)
Southeast 0.9x 0.77 x 8.65 x 119.01 x 0.63 x 0.7 = 314.65	(77)

Southeast 0.9x 0.77 x 8.65 x 118.15 x 0.63 x 0.7 = 312.37 (77)													
Southeast 0.9x	0.77	x	8.6	5	x	118.15	×	0.63	x	0.7	=	312.37	(77)
Southeast 0.9x	0.77	x	8.6	5	x	113.91	] × [	0.63	x	0.7	=	301.16	(77)
Southeast 0.9x	0.77	x	8.6	5	x	104.39	<b>x</b>	0.63	x	0.7	=	275.99	(77)
Southeast 0.9x	0.77	x	8.6	5	x	92.85	] × [	0.63	×	0.7	=	245.49	(77)
Southeast 0.9x	0.77	x	8.6	5	x	69.27	) × [	0.63	x	0.7	=	183.13	(77)
Southeast 0.9x	0.77	x	8.6	5	x	44.07	) × [	0.63	x	0.7	=	116.52	(77)
Southeast 0.9x	0.77	x	8.6	5	x	31.49	] × [	0.63	x	0.7	=	83.25	(77)
Solar <u>gains in</u>	watts, calc	ulated	for each	n month			(83)m	= Sum(74)m .	(82)m				
(83)m= 97.28	165.7 2	26.72	280.91	314.65	3	12.37 301.16	275.	99 245.49	183.13	116.52	83.25		(83)
Total gains –	internal and	l solar	(84)m =	: (73)m	+ (8	33)m, watts							
(84)m= 552.99	618.06 6	63.76	694.37	704.34	6	30.44 656.34	637.	620.67	582.09	541.9	528.26		(84)
7. Mean inte	rnal temper	ature (	heating	season	)								
Temperature	during hea	ating pe	eriods ir	the livi	ng	area from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fa	ctor for gain	ns for li	ving are	a, h1,m	ı (s	ee Table 9a)							
Jan	Feb	Mar	Apr	May		Jun Jul	Au	ig Sep	Oct	Nov	Dec		
(86)m= 0.82	0.76	0.69	0.58	0.46	(	0.33 0.24	0.2	5 0.39	0.59	0.75	0.84		(86)
Mean interna	i temperati	ure in li	iving are	ea T1 (fo	ollo	w steps 3 to 7	7 in Ta	able 9c)		•			
(87)m= 20.33	<u> </u>	20.69	20.86	20.95	<b></b>	0.99 21	21		20.87	20.6	20.29		(87)
Tomporature		ting of	ariode in	rost of	dw.	elling from Ta		Th2 (°C)					
(88)m= 20.32	T T	20.32	20.33	20.33	<b></b>	0.34 20.34	20.3		20.33	20.33	20.33		(88)
									_0.00		20.00		
	T T				r –	m (see Table	T Ó		0.50	0.70	0.00	l	(89)
(89)m= 0.81	0.75	0.67	0.55	0.43		0.3 0.2	0.22	2 0.35	0.56	0.73	0.82		(89)
Mean interna	al temperatu	ure in t	he rest	of dwell	ing	T2 (follow ste	eps 3	to 7 in Tab	le 9c)			1	
(90)m= 19.43	19.67 1	9.93	20.16	20.28	2	0.33 20.34	20.3		20.18	19.83	19.39		(90)
								1	fLA = Livi	ng area ÷ (4	4) =	0.45	(91)
Mean interna	al temperatu	ure (for	the wh	ole dwe	llin	g) = $fLA \times T1$	+ (1 -	- fLA) × T2					
(92)m= 19.84	20.05 2	20.27	20.48	20.58	2	0.63 20.64	20.6	4 20.62	20.5	20.18	19.8		(92)
Apply adjust	ment to the	mean	internal	temper	atu	re from Table	e 4e, v	vhere appro	opriate				
(93)m= 19.84	20.05 2	20.27	20.48	20.58	2	0.63 20.64	20.6	4 20.62	20.5	20.18	19.8		(93)
8. Space hea													
			•		ned	at step 11 of	Table	e 9b, so tha	t Ti,m=	(76)m an	d re-calc	culate	
the utilisation		Mar	Apr	May		Jun Jul	Au	ig Sep	Oct	Nov	Dec		
Utilisation fa	I			iviay				ig j Sep			Dec		
(94)m= 0.79		0.67	0.56	0.44		0.31 0.22	0.2	3 0.37	0.57	0.73	0.81		(94)
Useful gains	, hmGm , W	/ = (94	)m x (84	1)m	<u> </u>		1			1			
(95)m= 439.5	<u> </u>	41.58	388.61	, 309.46	2	11.34 142.55	148.	99 228.19	330.13	394.24	427.85		(95)
Monthly ave	age externa	al temp	perature	from T	abl	e 8	•		•	•	·		
(96)m= 4.3	4.9	6.5	8.9	11.7	•	14.6 16.6	16.4	4 14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for mean	interna	al tempe	erature,	Lm	, W =[(39)m	x [(93	)m– (96)m	]				
<mark>(97)m=</mark> 574.58	558.34 5	05.91	418.17	319.77	2	13.45 142.97	149.	55 232.29	356.26	474.1	569.22		(97)
· ·	т і т	r			Wh	/month = 0.02	24 x [(	97)m – (95	ŕ	T T		1	
(98)m= 100.5	68.17 4	47.86	21.28	7.67		0 0	0	0	19.44	57.49	105.18		

	Тс	tal per year (kWh/year) = Sum(98) <sub>15,912</sub> =	427.59	(98)
Space heating requirement in kWh/m²/year			8.41	(99)
9b. Energy requirements – Community heating sc	heme			
This part is used for space heating, space cooling Fraction of space heat from secondary/supplement			0	(301)
Fraction of space heat from community system 1 -			1	(302)
The community scheme may obtain heat from several sources		ا or CHP and up to four other heat sources; ti	he latter	
includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community boilers	power stations. See App	pendix C.	1	(303a)
Fraction of total space heat from Community boile	rs	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(	3)) for community he	eating system	1	(305)
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)
Space heating			kWh/yea	r r
Annual space heating requirement			427.59	
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	448.97	(307a)
Efficiency of secondary/supplementary heating system	stem in % (from Tab	le 4a or Appendix E)	0	(308
Space heating requirement from secondary/supple	ementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			4000.04	-
If DHW from community scheme:			1892.04	
Water heat from Community boilers		(64) x (303a) x (305) x (306) =	1986.64	(310a)
Electricity used for heat distribution	0.	01 × [(307a)(307e) + (310a)(310e)] =	24.36	(313)
Cooling System Energy Efficiency Ratio			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 (Tab mechanical ventilation - balanced, extract or positi	,	e	176.46	(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) =	176.46	(331)
Energy for lighting (calculated in Appendix L)			242.69	(332)
Electricity generated by PVs (Appendix M) (negati	ve quantity)		-518.71	(333)
Electricity generated by wind turbine (Appendix M	) (negative quantity)		0	(334)
10b. Fuel costs – Community heating scheme				
	<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 =	19.04	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	84.23	(342a)

		F	Fuel Price			
Pumps and fans	(331)	[	13.19 × 0.	01 =	23.27	(349)
Energy for lighting	(332)	[	13.19 × 0.	01 =	32.01	(350)
Additional standing charges (Table 12)					120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (34	5)(354) =			278.55	(355)
11b. SAP rating - Community heating	scheme					
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 4	45.0] =			1.22	(357)
SAP rating (section12)					82.97	(358)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emission fac kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		HP) using two fuels repeat (363	3) to (366) for the seco	nd fuel	94	(367a)
CO2 associated with heat source 1	[(30	)7b)+(310b)] x 100 ÷ (367b)	x 0.22	] =	559.67	(367)
Electrical energy for heat distribution		[(313) x	0.52	] =	12.64	(372)
Total CO2 associated with community s	systems	(363)(366) + (368)	.(372)	=	572.31	(373)
CO2 associated with space heating (se	condary)	(309) x	0	] =	0	(374)
CO2 associated with water from immers	sion heater or instan	taneous heater (312)	x 0.22	] =	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =	=		572.31	(376)
CO2 associated with electricity for pum	ps and fans within d	welling (331)) x	0.52	] =	91.58	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	] =	125.95	(379)
Energy saving/generation technologies Item 1	(333) to (334) as ap	plicable	0.52 × 0.	01 =	-269.21	(380)
Total CO2, kg/year	sum of (376)(382) =	L			520.64	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				10.24	(384)
El rating (section 14)					92.72	(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 (%)		CHP) using two fuels repeat (363	3) to (366) for the seco	nd fuel	94	(367a)
Energy associated with heat source 1	[(30	)7b)+(310b)] x 100 ÷ (367b)	x 1.22	] =	3161.11	(367)
Electrical energy for heat distribution		[(313) x		] =	74.77	(372)
Total Energy associated with communit	y systems	(363)(366) + (368)	.(372)	=	3235.88	(373)
if it is negative set (373) to zero (unle	ss specified otherwi	se, see C7 in Appendi	ix C)		3235.88	(373)
Energy associated with space heating (	secondary)	(309) x	0	] =	0	(374)

Total Primary Energy, kWh/year sum of (370	6)(382) =				2930.21	(383)
Energy saving/generation technologies Item 1		3.07	× 0	0.01 =	-1592.44	(380)
Energy associated with electricity for lighting	(332))) x		3.07	=	745.05	(379)
Energy associated with electricity for pumps and fans within o	dwelling (33	31)) x	3.07	=	541.72	(378)
Energy associated with space cooling	(315) x		3.07	=	0	(377)
Total Energy associated with space and water heating	(373) + (374) + (375	5) =			3235.88	(376)
Energy associated with water from immersion heater or insta	ntaneous heater(31	12) x	1.22	=	0	(375)

			User D	etails:						
Property Address: Plot 18Address :1. Overall dwelling dimensions:Area(m <sup>2</sup> )Av. Height(m)Volume(m <sup>2</sup> )Struct 18Struct 18Volume(m <sup>2</sup> )127.15(sa)Othertotal floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)Struct 18Othertotalmain m settingNumber of chimneysNumber of chimneysSecondary heatingtotalm <sup>3</sup> per hourNumber of open flues $0$ $+$ $0$ $+$ $0$ $+$ $0$ $(6b)$ Number of flueless gas fires $0$ $+$ $0$ $+$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ Number of flueless gas fires $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$										
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.9	
		Р	roperty a	Address:	Plot 18					
Address :										
1. Overall dwelling dimen	sions:		_	( A)						
Ground floor			<b></b>		(1a) x			(2a) =		_
Total floor area TFA = (1a)	)+(1b)+(1c)+(	1d)+(1e)+(1r	ר) <u>5</u>	0.86	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	l)+(3e)+	.(3n) =	127.15	(5)
2. Ventilation rate:									<u> </u>	
			У	other		total			m <sup>3</sup> per hour	•
Number of chimneys		¬	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0	+ 0	+	0	] = [	0	x	20 =	0	(6b)
Number of intermittent fan	s				- Ē	2	x	10 =	20	(7a)
Number of passive vents						0	<b>x</b> '	10 =	0	(7b)
Number of flueless gas fire	es					0	x	40 =	0	 ](7c)
					L	-				
								Air ch	anges per ho	ur
•						-		÷ (5) =	0.16	(8)
			d to (17), o	otherwise o	continue fr	om (9) to (	(16)			٦
	e aweiling (ns	5)					[(9)]	-1]x0 1 –		
	5 for steel or	timber frame or	0.35 foi	r masonr	v constr	uction	[(0)	1]x0.1 =		
if both types of wall are pre	sent, use the val	lue corresponding to								
•		,	.1 (seale	ed), else	enter 0				0	
0									0	
Ū	and doors dra	aught stripped		0 25 - [0 2	$x(14) \pm 1$	001 -				
				-		-	+ (15) =			
	50 expresse	d in cubic metre						area		=
			•	•	•					=
						is being u	sed			
Number of sides sheltered				(00)		0.1			3	
		1				9)] =				4
	-			(21) = (18)	) x (20) =				0.32	(21)
	<u> </u>		11	A	Can	Oat	Nev	Dee	1	
			Jui	Aug	Sep	Oct	INOV	Dec		
			2.0	27	4	4.2	15	47	1	
(22)m= 5.1 5 4	4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	l	
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 sł	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se	-	-	-	-			(23a)
				endix N. (2	3b) = (23a	a) × Fmv (e	equation (	N5)) . othe	rwise (23b	) = (23a)			0	(23a) (23b)
		• •	0 11		, (	or in-use f	• •	,, .	``	) (200)			0	(230) (23c)
			-	-	-					2h)m + (	23h) <b>x</b> [ <sup>,</sup>	1 – (23c)	-	(230)
(24a)m=				0	0	0						0	. 100]	(24a)
		d mech	I anical ve	Intilation	without	heat rec	coverv (N	I /I\/) (24h	1 = (2)	2b)m + (	23b)	-		
(24b)m=	r	0		0	0	0	0	0	0	0	0	0		(24b)
		use ex	I tract ver	tilation o	or positiv	ı e input v	l ventilatio	n from o	utside					
,					•	o); other				5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
						ve input erwise (2				0.51	•			
(24d)m=	, <i>,</i>	0.58	0.57	0.56	0.56	0.54	0.54	0.5 + [(2	0.55	0.5	0.56	0.57		(24d)
						o) or (24				0.00	0.00	0.07		· · · ·
(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
			1											
				paramet										
ELEN	IENT	Gros area		Openin m	•	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²·ł		A X k kJ/K
Doors			<b>、</b>			2	x	1	=	2	, 			(26)
Windo	ws					8.651	x1.	L/[1/( 1.4 )+	0.04] =	11.47				(27)
Floor						0.785		0.13		0.1020	 [			(28)
Walls	Tvpe1	27.0	)1	8.65		18.36		0.18		3.3			$\dashv$	(29)
Walls		23.6		2		21.69		0.18		3.9	╡╏		$\dashv$	(29)
		lements		2		51.48		0.10		0.0	L			(20)
				effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ie)+0.041 a	as aiven in	paragraph	32	(31)
				nternal wal			atou aonig	, crinicia i	, (( <i>ii</i> e <sup>-</sup> taile	. <i></i>	ie gronni	paragraph	0.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	) + (32) =				20.78	(33)
Heat c	apacity	Cm = S(	(A x k )						((28).	(30) + (32	2) + (32a).	(32e) =	619.51	(34)
Therm	al mass	parame	eter (TMF	<sup>-</sup> = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	•		ere the de tailed calc		construct	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						5.02	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			25.8	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5)		I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	24.38	24.25	24.12	23.51	23.4	22.87	22.87	22.77	23.07	23.4	23.63	23.87		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	50.18	50.04	49.92	49.31	49.19	48.67	48.67	48.57	48.87	49.19	49.42	49.66		
										Average =	Sum(39)1	12 /12=	49.31	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	0.99	0.98	0.98	0.97	0.97	0.96	0.96	0.95	0.96	0.97	0.97	0.98		
Numb	ar of day	us in mo	nth (Tab	le 12)			1		,	Average =	Sum(40)1.	12 /12=	0.97	(40)
1 units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,														~ /
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	ΓFA -13.		72		(42)
Reduce	the annua	al average	hot water	usage by	5% if the c		designed	(25 x N) to achieve		se target o		.94		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate		n litres pei I	r day for ea T	ach month 1	1	ctor from 1		· ·	1		· · · · ·			
(44)m=	82.44	79.44	76.44	73.44	70.45	67.45	67.45	70.45	73.44	76.44	79.44	82.44		<b>-</b> ]
Energy	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x [	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		899.31	(44)
(45)m=	122.25	106.92	110.33	96.19	92.3	79.65	73.8	84.69	85.7	99.88	109.02	118.39		
lf instan	taneous w	ater heati	na at noini	of use (no	hot wate	r storage)	enter () in	boxes (46		Fotal = Su	m(45) <sub>112</sub> =		1179.14	(45)
(46)m=	18.34	16.04	16.55	14.43	13.84	11.95	11.07	12.7	12.86	14.98	16.35	17.76		(46)
· · ·	storage		10.00	11.10	10.01	11.00	11.07		12.00	11.00	10.00			( - /
Storag	e volum	e (litres)	) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	-			-	nter 110		. ,						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage nanufact		eclared I	oss facto	or is kno	wn (kWł	n/dav):				1	39		(48)
			m Table				" <b>,</b> )):					54		(49)
-				, kWh/ye	ear			(48) x (49)	) =			75		(50)
			-	-		or is not	known:							()
		-			le 2 (kW	h/litre/da	ay)					0		(51)
	•	leating s	ee secti	on 4.3										(50)
			m Table	2b								0 0		(52) (53)
				_~ , kWh/ye	aar			(47) x (51)	) x (52) x ( <sup>j</sup>	53) -				(54)
0.		(54) in (5	•	,, y				(11) x (01)	) x (0 <u>2</u> ) x (		<u> </u>	0 75		(55)
	. ,	. , .		for each	month			((56)m = (	55) × (41)ı	m				. ,
(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	()
(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)
Primar	v circuit	loss (ar	nual) fr	n Dm Table	• <u> </u>			•				0		(58)
	-		,			59)m = (	(58) ÷ 36	65 × (41)	m		L			
(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 eacl	h month	(61)m =	(60)	) ÷ 36	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	l for	r each	month	(62)m	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	168.85	149.01	156.93	141.28	138.89	12	.4.74	120.4	131.29	) 130.79	146.47	154.12	164.99		(62)
Solar DI	-IW input	calculated	using Ap	pendix G o	r Appendix	: H (I	negative	e quantity	) (enter	'0' if no sola	r contribu	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	S and/or V	WWHRS	ар	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=	168.85	149.01	156.93	141.28	138.89	12	.4.74	120.4	131.29	) 130.79	146.47	154.12	164.99		
	Output from water heater $(annual)_{112}$ 1727.75 (64)												(64)		
Heat g	ains fro	m water	heating	j, kWh/m	onth 0.2	5´[	[0.85 >	<b>×</b> (45)m	+ (61)	m] + 0.8 x	x [(46)m	n + (57)m	+ (59)m	]	
(65)m=	77.92	69.22	73.96	68.06	67.97	62	2.56	61.82	65.44	64.57	70.49	72.32	76.64		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylin	der is	in the c	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Int	ternal g	ains (see	Table	5 and 5a	):										
		ns (Table			,										
motab	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.77	85.77	85.77	85.77	85.77	85	5.77	85.77	85.77	-	85.77	85.77	85.77		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion	L9 or	L9a), a	lso see	e Table 5				1	
(67)m=	13.74	12.21	9.93	7.51	5.62	i —	.74	5.12	6.66	8.94	11.35	13.25	14.12		(67)
Applia	nces da	uins (calc	ulated i	n Appen	u dix L. ea	uati	ion L1	3 or L1:	3a), al	so see Ta	ble 5	1	1	1	
(68)m=	149.47	<u> </u>	147.11	138.79	128.29	r –	8.42	111.82	110.27		122.5	133	142.87		(68)
										see Table				l	
(69)m=	31.58	31.58	31.58	31.58	31.58	-	1.58	31.58	31.58		31.58	31.58	31.58		(69)
		I Ins gains	I (Table	1 5a)			I							1	
(70)m=	3	3	3	3	3		3	3	3	3	3	3	3	]	(70)
		vaporatic								-				I	
(71)m=	<u> </u>	<u> </u>	-68.62	T	-68.62	r —	8.62	-68.62	-68.62	-68.62	-68.62	-68.62	-68.62	]	(71)
		gains (1		00.02	00.02	Ľ	0.02	00.02	00.02	00.02	00.02	00.02	00.02	I	( )
(72)m=	104.74	<u>,                                    </u>	99.41	94.52	91.35	86	6.88	83.09	87.95	89.68	94.74	100.45	103.01	1	(72)
				04.02	01.00					n + (69)m +				l	()
(73)m=	319.68	<b>gains =</b> 317.96	308.18	292.56	276.99	26	(00)II 61.77	251.76	256.6		280.32	1	311.74	1	(73)
. ,	lar gain	1	300.10	292.50	270.99	20	,	231.70	230.0	204.33	200.32	290.43	511.74		(10)
			usina soli	ar flux from	Table 6a	and	associa	nted equa	tions to	convert to th	ne applica	ble orientat	tion.		
		Access F	•	Area			Flux			g_		FF		Gains	
•		Table 6d		m²				le 6a		Table 6b	٦	able 6c		(W)	
Southe	ast <mark>0.9x</mark>	0.77	×	8.0	35	×「	36	6.79	×	0.63	ר × ר	0.7		97.28	(77)
	ast 0.9x				8.65		62.67			0.63		0.7		165.7	](77)
	ast 0.9x				8.65		85.75			0.63		0.7		226.72	](** <i>)</i> ](77)
Southeast 0.9x		0.77	^			× [ × [		6.25		0.63		0.7		280.91	](77)
	ast 0.9x	0.77	^ ^			× [		9.01		0.63		0.7		314.65	]( <i>TT</i> )
0.00		5.77	^	0.0		L	115	0.01		0.00	^ L	0.1		0.7.00	

Southeast $0.9x$ $0.77$ x $8.65$ x $118.15$ x $0.63$ x $0.7$ = $312.3$ Southeast $0.9x$ $0.77$ x $8.65$ x $113.91$ x $0.63$ x $0.7$ = $301.1$ Southeast $0.9x$ $0.77$ x $8.65$ x $104.39$ x $0.63$ x $0.7$ = $275.9$ Southeast $0.9x$ $0.77$ x $8.65$ x $92.85$ x $0.63$ x $0.7$ = $245.4$											
Southeast $0.9x$ $0.77$ $x$ $8.65$ $x$ $104.39$ $x$ $0.63$ $x$ $0.77$ $=$ $275.9$ Southeast $0.9x$ $0.77$ $x$ $8.65$ $x$ $104.39$ $x$ $0.63$ $x$ $0.77$ $=$ $275.9$ Southeast $0.9x$ $0.77$ $x$ $8.65$ $x$ $92.85$ $x$ $0.63$ $x$ $0.77$ $=$ $245.4$	6 (77)										
Southeast $0.9x$ 0.77       x       8.65       x       92.85       x       0.63       x       0.77       =       245.4											
	9 (77)										
	.9 (77)										
Southeast 0.9x 0.77 x 8.65 x 69.27 x 0.63 x 0.7 = 183.1	3 (77)										
Southeast 0.9x 0.77 x 8.65 x 44.07 x 0.63 x 0.7 = 116.5	2 (77)										
Southeast 0.9x 0.77 x 8.65 x 31.49 x 0.63 x 0.7 = 83.29	5 (77)										
Solar gains in watts, calculated for each month $(83)m = Sum(74)m(82)m$											
(83)m= 97.28 165.7 226.72 280.91 314.65 312.37 301.16 275.99 245.49 183.13 116.52 83.25	(83)										
Total gains – internal and solar (84)m = (73)m + (83)m , watts											
(84)m=         416.96         483.66         534.9         573.48         591.64         574.15         552.92         532.61         510.02         463.46         414.95         394.99	(84)										
7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21	(85)										
Utilisation factor for gains for living area, h1,m (see Table 9a)											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec											
(86)m= 0.99 0.98 0.95 0.87 0.73 0.54 0.39 0.42 0.64 0.89 0.98 0.99	(86)										
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)											
(87)m= 20.19 20.37 20.59 20.81 20.95 20.99 21 21 20.98 20.81 20.46 20.16	(87)										
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)											
(88)m=         20.09         20.1         20.11         20.11         20.12         20.12         20.12         20.11         20.11         20.1	(88)										
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	(89)										
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)											
(90)m= 19.03 19.29 19.6 19.9 20.06 20.11 20.12 20.12 20.1 19.91 19.44 18.99	(90)										
$fLA = Living area \div (4) = 0.45$	(91)										
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$											
(92)m= 19.56 19.78 20.04 20.32 20.46 20.51 20.52 20.52 20.5 20.32 19.9 19.52	(92)										
Apply adjustment to the mean internal temperature from Table 4e, where appropriate											
(93)m=         19.56         19.78         20.04         20.32         20.46         20.51         20.52         20.52         20.32         19.9         19.52	(93)										
8. Space heating requirement											
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec											
Utilisation factor for gains, hm:											
(94)m= 0.99 0.97 0.93 0.84 0.69 0.5 0.34 0.37 0.6 0.87 0.97 0.99	(94)										
Useful gains, hmGm , W = (94)m x (84)m											
(95)m= 410.88 468.34 497.98 484.22 409.89 285.18 190.43 199.63 305.45 401.19 401.63 390.53	(95)										
Monthly average external temperature from Table 8											
(96)m=         4.3         4.9         6.5         8.9         11.7         14.6         16.6         16.4         14.1         10.6         7.1         4.2	(96)										
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m ]											
(97)m= 765.62 744.45 676.1 562.9 431.1 287.74 190.68 200.03 312.74 478.19 632.7 760.82	(97)										
Space heating requirement for each month, kWh/month = $0.024 \text{ x} [(97)\text{m} - (95)\text{m}] \text{ x} (41)\text{m}$ (98)m= 263.93 185.54 132.53 56.65 15.78 0 0 0 0 57.29 166.37 275.5											

								Tota	l per year	(kWh/yeai	<sup>-</sup> ) = Sum(9	8)15,912 =	1153.58	(98)
Spac	e heating	g require	ement in	ı kWh/m²	²/year								22.68	(99)
9a. En	ergy req	uiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	HP)					
•	e heatin	-			, .									<b>-</b>
Fraction of space heat from secondary/supplementary system										0	(201)			
				nain syst	. ,			(202) = 1 -		/			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
Spac	i		i È	alculate	1	i	-						I	
	263.93	185.54	132.53	56.65	15.78	0	0	0	0	57.29	166.37	275.5		
(211)n			<u> </u>	100 ÷ (20			1						I	(211)
	282.27	198.44	141.74	60.59	16.87	0	0	0	0	61.27	177.94	294.65		
-								Tota	г (күүп/уеа	ar) =Sum(2	211) <sub>15,1012</sub>	=	1233.77	(211)
•				y), kWh/	month									
= {[(90 (215)m=	)m x (20	0	00 ÷ (20	0	0	0	0	0	0	0	0	0		
(2.0)		•	, °	Ů	Ů	ů	Ů	-	-	•	215) <sub>15,1012</sub>	-	0	(215)
Water	heating	I									· 1		Ŭ	
	-		ter (calc	ulated a	bove)									
•	168.85	149.01	156.93	141.28	138.89	124.74	120.4	131.29	130.79	146.47	154.12	164.99		
Efficie	ncy of w	ater hea	iter		-	-				-	-		79.8	(216)
(217)m=	86	85.4	84.37	82.59	80.77	79.8	79.8	79.8	79.8	82.54	85.02	86.17		(217)
	or water	0,												
(219)II (219)m=	1 = (64) 196.33	<u>174.48</u>	186.01	171.06	171.95	156.31	150.88	164.52	163.9	177.45	181.28	191.46		
								Tota	I = Sum(2				2085.63	(219)
Annua	I totals									k	Wh/year	•	kWh/yea	
Space heating fuel used, main system 1									1233.77					
Water heating fuel used									2085.63	Ī				
Electri	city for p	umps, fa	ans and	electric	keep-ho	t								_
centra	al heatin	g pump	:									30		(230c)
boiler with a fan-assisted flue 45									(230e)					
Total electricity for the above, kWh/year sum of (230a)(230g) =								75	(231)					
Electricity for lighting								242.69	(232)					
12a. (	CO2 em	issions -	– Individ	ual heat	ina svste	ems inclu	udina mi	cro-CHP	)					]
							<b>ergy</b> /h/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/ye	
Space	heating	(main s	ystem 1	)		(21	1) x			0.2	16	=	266.49	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	450.5	(264)
Space and water heating	(261) + (262) + (263) + (264) =			716.99	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	125.95	(268)
Total CO2, kg/year	sum	of (265)(271) =		881.87	(272)

TER =

17.34 (273)