# **Regulations Compliance Report**

Approved Document Printed on 28 Octobe		n, England assessed by Stro	ma FSAP 2012 program, Vei	rsion: 1.0.5.9	
Project Information:					
Assessed By: Z	ahid Ashraf (STI	RO001082)	Building Type:	Flat	
Dwelling Details:					
NEW DWELLING DE	SIGN STAGE		Total Floor Area: 5	i0.9m²	
Site Reference : +	lermitage Lane		Plot Reference:	Plot 46	
Address :					
Client Details:					
Name:					
Address :					
This report covers it It is not a complete		vithin the SAP calculations. tions compliance.			
1a TER and DER					
Fuel for main heating		as (c)			
Fuel factor: 1.00 (mai	• • • • •	/			
Target Carbon Dioxid		. ,	22.29 kg/m <sup>2</sup>		01/
Dwelling Carbon Diox 1b TFEE and DFEE		te (DER)	15.44 kg/m²		OK
Target Fabric Energy		=)	62.4 kWh/m²		
Dwelling Fabric Energy	• •		50.5 kWh/m <sup>2</sup>		
	,,, (	,			ОК
2 Fabric U-values					
Element		Average	Highest		
External wal	l	0.15 (max. 0.30)	0.15 (max. 0.70)		OK
Floor		(no floor)			
Roof		0.10 (max. 0.20)	0.10 (max. 0.35)		OK
Openings	~	1.40 (max. 2.00)	1.40 (max. 3.30)		OK
2a Thermal bridgin		rom linear thermal transmitte	nana far agab junation		
3 Air permeability	iging calculated i	rom linear thermal transmitta	inces for each junction		
	y at 50 pascals		3.00 (design val	ue)	
Maximum	y at oo paooalo		10.0	,	ОК
4 Heating efficiency	V				
Main Heating s		Community heating schem	nes - mains das		
inali i loading c	, yotonii		loo mano gao		
Secondary hea	ating system:	None			
E Cylinder inculatio					
5 Cylinder insulatio		No cylinder			
Hot water Stor	ay <del>c</del> .				
- Controis					
Space heating	controls	Charging system linked to	use of community heating,		
Opace ricating	001111010	programmer and at least t			ОК
Hot water cont	rols:	No cylinder thermostat			
		No cylinder			

# **Regulations Compliance Report**

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ОК
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):	Slight	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	4.27m <sup>2</sup>	
Windows facing: North West	6.1m <sup>2</sup>	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Roofs U-value	0.1 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		U	Jser Deta	ails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 201		S	oftwa	Numl re Ver				001082 n: 1.0.5.9	
		Prop	perty Ad	ldress:	Plot 46					
Address :										
1. Overall dwelling dimen	SIONS:		A	- 2)		A., 11.	ark ((ma)		)/ a la una a (una 2)	
Ground floor			Area(n 50.9	<i>,</i>	1a) x	<b>Av. Hei</b>	<b>gnt(m)</b> 5	(2a) =	Volume(m <sup>3</sup> ) 127.26	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+(1d)+(1e	e)+(1n)	50.9	9 (	4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	127.26	(5)
2. Ventilation rate:	-	_		-						
Number of chimneys Number of open flues		econdary eating 0	•	0 0	] = [	<b>total</b> 0 0		40 = 20 =	m <sup>3</sup> per hour	(6a) (6b)
Number of intermittent fan		0		0		-		0 =	-	
	5					0			0	(7a)
Number of passive vents						0	<b>X</b> 1	0 =	0	(7b)
Number of flueless gas fire	S					0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimneys					ontinue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in the Additional infiltration	e dwelling (ns)						[(9)-	•1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	sent, use the value corres s); if equal user 0.35	ponding to the	e greater v	wall area	(after	uction		İ	0	(11)
If suspended wooden flo		ed) or 0.1 (	(sealed)	, else e	enter 0				0	(12)
If no draught lobby, ente Percentage of windows		rinned							0	(13)
Window infiltration	and doors draught si	npped	0.2	25 - [0.2]	x (14) ÷ 10	= 100			0	(14) (15)
Infiltration rate			(8)	· + (10) +	· (11) + (1)	- 2) + (13) +	- (15) =		0	(16)
Air permeability value, q	50, expressed in cub	oic metres p	per hour	per so	uare me	etre of e	nvelope	area	3	(17)
If based on air permeability	•	•					•		0.15	(18)
Air permeability value applies	if a pressurisation test ha	s been done o	or a degree	e air peri	neability i	s being us	sed			
Number of sides sheltered			(0.0			0.1			2	(19)
Shelter factor					).075 x (1	9)] =			0.85	(20)
Infiltration rate incorporatir	-		(21	1) = (18)	x (20) =				0.13	(21)
Infiltration rate modified for			11	A	I	Oct	Nerr			
	1ar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	- i - i	2.0	20	27		4.0	4 5	4 7		
(22)m= 5.1 5 4	.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)	m ÷ 4									
(22a)m= 1.27 1.25 1.	23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m		-			
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
		al ventila	change i	rate for t	he appli	cable ca	se						0.5	(222)
			using Appe	andix N (2	3h) - (23a	) v Emv (e	auation (N	(15)) othe	rwied (23h	) – (23a)			0.5	(23a)
										) – (238)			0.5	(23b)
			overy: effici	-	-					) h ) has i (1	00h) [	1 (00 a)	79.05	(23c)
a) II (24a)m=	r	0.26	anical ve	0.25	0.24	0.23		1R) (24a	0.23	20)m + (. 0.24	230) × [ 0.25	0.25	÷ 100]	(24a)
												0.25		(244)
,			anical ve				· · · · ·	r Ó	ŕ	, ,	,		l	(246)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,			tract ven (23b), tl		•	•				5 × (23b	)	-		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or whe en (24d)							0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3 Ho	at lossa	e and he	eat loss p	aramat	ar.		•	•			•	•		
ELEN		Gros		Openin		Net Ar	ea	U-valı	IP	AXU		k-value	5 <u>/</u>	A X k
		area		m		A ,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²·l		J/K
Doors						2	x	1.4	=	2.8				(26)
Window	ws Type	1				4.267	· x1,	/[1/( 1.4 )+	0.04] =	5.66				(27)
Window	ws Type	2				6.097	· x1,	/[1/( 1.4 )+	0.04] =	8.08				(27)
Walls <sup>-</sup>	Гуре1	37.8	32	10.3	6	27.45	5 X	0.15	] = [	4.12	ו ד			(29)
Walls -	Гуре2	14.8	38	2		12.88	3 X	0.14		1.82			$\neg$	(29)
Roof		50.9	9	0		50.9	x	0.1		5.09			$\neg$	(30)
Total a	rea of e	lements	, m²			103.6			L		L			(31)
* for win	dows and	roof wind	ows, use e sides of in			alue calcul		formula 1	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	3.2	
			= S (A x		is and part			(26)(30)	+ (32) =				27.57	(33)
		Cm = S(	•	0)				. , . ,		.(30) + (32	(32a)	(32e) =		(34)
			ter (TMF	P – Cm –	- TFA) in	n k. l/m²K				tive Value		(020) -	1022.83 100	(35)
			ere the dea		,			eciselv the				able 1f	100	(55)
	-		tailed calcu					, , , , , , , , , , , , , , , , , , , ,						
Therm	al bridge	es : S (L	x Y) cale	culated	using Ap	pendix ł	<						16	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								
	abric he								(33) +				43.57	(37)
Ventila			alculated	monthl					1	= 0.33 × (		1	I	
(27)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	11.23	11.09	10.96	10.29	10.15	9.49	9.49	9.35	9.75	10.15	10.42	10.69		(38)
Heat tr	ansfer o	oefficier	nt, W/K						(39)m	= (37) + (3	38)m		I	
(39)m=	54.8	54.66	54.53	53.86	53.73	53.06	53.06	52.92	53.33	53.73	53.99	54.26		
									1	Average =	Sum(39)1	12 /12=	53.83	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.08	1.07	1.07	1.06	1.06	1.04	1.04	1.04	1.05	1.06	1.06	1.07		
Numbr	or of dou		nth (Tab					I	,	Average =	Sum(40)1.	12 /12=	1.06	(40)
NULLIDE	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)
(41)	01	20	01	00	01	00			00	01	00	01		()
4. Wa	iter heat	ting enei	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		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.92		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	86.81	83.65	80.5	77.34	74.18	71.03	71.03	74.18	77.34	80.5	83.65	86.81		_
Energy o	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		947.01	(44)
(45)m=	128.74	112.59	116.19	101.29	97.19	83.87	77.72	89.18	90.25	105.18	114.81	124.67		
lf instant	taneous w	ater heatii	ng at point	t of use (no	o hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		1241.68	(45)
(46)m=	19.31	16.89	17.43	15.19	14.58	12.58	11.66	13.38	13.54	15.78	17.22	18.7		(46)
· · ·	storage													
Storag	e volum	e (litres)	includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	-		nk in dw	-			. ,						
	vise it no storage		hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
,			m Table				" <b>,</b> )):					0		(49)
•				, kWh/ye	ear			(48) x (49)	) =			10		(50)
b) If m	anufact	urer's de	eclared of	cylinder	loss fact						i			
		-		om Tabl	le 2 (kW	h/litre/da	ay)				0.	02		(51)
		from Ta	ee secti	on 4.3								00		(52)
			m Table	2b								03 .6		(52) (53)
				, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54)
		(54) in (5	-	,, y	Jul				/ (- / (	,		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)
		s dedicate	l d solar sto	rage, (57)	<b>I</b> m = (56)m			1 60), else (5				m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
							. ,	65 × (41)						
•	-	1	· · · · · ·	· · · · · ·	i	1	i	ng and a	· ·	1	, 			(
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	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	= 0.85 ×	(45)m -	+ (46)m +	(57)m +	(59)m + (61)m	
(62)m=	184.01	162.52	171.40	3	154.79	152.47	1:	37.36	133	144.46	5 143.74	160.45	5 168.3	179.95	]	(62)
Solar DH	-W input	calculated	using A	ppe	ndix G or	Appendix	н (	(negativ	ve quantity	) (enter	'0' if no sola	ar contrib	ution to wate	er heating)	-	
(add a	dditiona	I lines if	FGHR	Sa	and/or V	VWHRS	ap	plies,	, see Ap	pendix	G)					
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter													
(64)m=	184.01	162.52	171.40	3	154.79	152.47	1:	37.36	133	144.46	143.74	160.45	5 168.3	179.95	]	
			•							Οι	itput from w	ater hea	er (annual)	112	1892.52	(64)
Heat g	ains fro	m water	heatin	g,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8	x [(46)r	n + (57)m	+ (59)m	n]	
(65)m=	87.03	77.38	82.85		76.48	76.54	7	0.68	70.06	73.87	72.8	79.19	80.97	85.68	]	(65)
inclu	de (57)	m in calo	ulation	<u>י</u> וס	f (65)m	only if c	ylir	nder is	s in the c	dwellin	g or hot w	vater is	from com	munity h	neating	
5. Int	ernal g	ains (see	e Table	5	and 5a	):					5				Ū	
	Ŭ	ns (Table			,											
Melabo	Jan Jan	Feb	Mai		s Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m=	85.84	85.84	85.84	-	85.84	85.84		5.84	85.84	85.84	85.84	85.84	_	85.84	-	(66)
											e Table 5				J	
(67)m=	9 9anis 13.41	(Calcula 11.91	9.68		7.33	5.48	i —	4.63	19a), a	6.5	8.72	11.07	12.92	13.78	1	(67)
											_I		12.52	10.70	J	(0.)
		<u>,</u>	r —				r –			·	so see Ta		400.4	4 4 2 0 2	1	(69)
(68)m=	149.58	151.13	147.22	_	138.89	128.38		18.5	111.9	110.3		122.59	) 133.1	142.98	J	(68)
		<u> </u>		-i-	·		<u> </u>				see Table		1	1	1	(00)
(69)m=	31.58	31.58	31.58		31.58	31.58	3	1.58	31.58	31.58	31.58	31.58	31.58	31.58	J	(69)
Pumps	and fa	ns gains	(Table	> 5	a)										1	
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	/aporatic	on (neg	jati	ve valu	es) (Tab	le	5)							-	
(71)m=	-68.67	-68.67	-68.67	7	-68.67	-68.67	-6	68.67	-68.67	-68.67	-68.67	-68.67	-68.67	-68.67		(71)
Water	heating	gains (T	able 5	)											_	
(72)m=	116.97	115.15	111.30	3	106.22	102.87	9	8.17	94.17	99.29	101.11	106.44	112.46	115.16		(72)
Total i	nternal	gains =						(66)	m + (67)m	ı + (68)n	n + (69)m +	(70)m +	(71)m + (72	)m		
(73)m=	328.71	326.94	317.02	2	301.19	285.49	2	70.05	259.82	264.89	272.85	288.85	307.23	320.66	]	(73)
6. Sol	ar gain	s:														
Solar g	ains are	calculated	using sc	olar	flux from	Table 6a	and	associ	ated equa	tions to	convert to th	he applic	able orienta	tion.		
Orienta		Access F			Area			Flu					FF		Gains	
		Table 6d			m²			Tat	ole 6a		Table 6b		Table 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	3	6.79		0.63	x	0.7	=	47.98	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	6	2.67		0.63	×	0.7	=	81.73	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	8	5.75		0.63	×	0.7	=	111.83	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	1(	06.25		0.63	x	0.7	=	138.56	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	1	19.01		0.63	×	0.7	=	155.2	(79)

Southwest0.9x	0.77	x	4.2	7	×	118.15	1	0.	.63	x	0.7	=	154.0	7 (79)
Southwest <sub>0.9x</sub>	0.77	×	4.2			113.91	1		.63	ا × ا	0.7	=	148.5	
Southwest <sub>0.9x</sub>	0.77	x	4.2			104.39	1		.63	ا_ x	0.7	=	136.1	
Southwest <sub>0.9x</sub>	0.77	x	4.2			92.85	]		.63		0.7	╡_	121.0	
Southwest <sub>0.9x</sub>	0.77	x	4.2			69.27	]		.63		0.7	╡_	90.33	
Southwest <sub>0.9x</sub>		- ^					]			」^↓ │ × │		=		
	0.77		4.2			44.07	J		.63	= 1	0.7		57.47	
Southwest <sub>0.9x</sub>	0.77	×	4.2	7	×	31.49		0.	.63	×	0.7	=	41.06	(79)
Northwest 0.9x	0.77	x	6.1		x	11.28	x	0.	.63	x	0.7	=	21.02	(81)
Northwest 0.9x	0.77	x	6.1		x	22.97	x	0.	.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	x	6.1		x	41.38	x	0.	.63	×	0.7	=	77.1	(81)
Northwest 0.9x	0.77	x	6.1		x	67.96	x	0.	.63	x	0.7	=	126.6	2 (81)
Northwest 0.9x	0.77	x	6.1		x	91.35	x	0.	.63	×	0.7	=	170.2	1 (81)
Northwest 0.9x	0.77	x	6.1		x	97.38	x	0.	.63	- x	0.7	=	181.4	6 (81)
Northwest 0.9x	0.77	x	6.1		x	91.1	x	0.	.63	- x	0.7	=	169.7	5 (81)
Northwest 0.9x	0.77	x	6.1		x	72.63	x	0.	.63	×	0.7	=	135.3	3 (81)
Northwest 0.9x	0.77	x	6.1		x	50.42	x	0.	.63	- x	0.7	= =	93.95	(81)
Northwest 0.9x	0.77	x	6.1		x	28.07	x	0.	.63	- x	0.7	=	52.3	(81)
Northwest 0.9x	0.77	x	6.1		x	14.2	x	0.	.63	×	0.7	=	26.45	(81)
Northwest 0.9x	0.77	x	6.1		x	9.21	x	0.	.63	_ ×	0.7	= =	17.17	(81)
-							-							
Solar gains in	watts. ca	lculated	for each	n month			(83)m	i = Sumi	(74)m	.(82)m				
(83)m= 69	124.52	188.93	265.18	325.4	335.53	318.29	271		15.03	142.63	83.92	58.23	1	(83)
Total gains – i	nternal ar	nd solar	 (84)m =	(73)m	ı + (83)m	, watts	I	I	I			I	4	

i otai y		itema a	110 30101	(0+)11 -	- (70)11	i (00)iii	, wans							
(84)m=	397.71	451.46	505.94	566.37	610.89	605.58	578.12	536.35	487.88	431.48	391.16	378.89		(84)
7. Me	an inter	nal temp	erature	(heating	season	)								
			eating p	, o			from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(see Ta	ble 9a)		<b>、</b> ,					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.94	0.91	0.87	0.78	0.66	0.51	0.38	0.42	0.62	0.82	0.91	0.95		(86)
Mean	interna	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.05	19.31	19.73	20.24	20.64	20.88	20.96	20.94	20.77	20.26	19.57	19		(87)
Tomp	oraturo	during b	leating p	oriode ir		dwelling	from To						1	
remp	erature		eating p		11651.01	uwennig			12(0)				1	
(88)m=	20.02	20.02	20.02	20.04	20.04	20.05	20.05	20.05	20.04	20.04	20.03	20.03		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, l	h2,m (se	e Table	9a)						
(89)m=	0.93	0.9	0.85	0.75	0.61	0.44	0.31	0.35	0.56	0.79	0.9	0.94		(89)
Mean	internal	l temper	ature in	the rest	of dwelli	na T2 (fa	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
		i				<u> </u>		<u> </u>		, 	40.40	47.00	1	(00)
(90)m=	17.43	17.81	18.4	19.12	19.64	19.94	20.02	20.01	19.82	19.15	18.19	17.36		(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= 18.16 18.49 19 19.62 20.09 20.36 20.44 20.43 20.25 19.65 18.81 18.1	_						 · ·	,		 	_	
	(92)m=		19	19.62	20.09	20.36			19.65	18.1	(92	2)

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

												l	(00)
(93)m= 18.		19	19.62	20.09	20.36	20.44	20.43	20.25	19.65	18.81	18.1		(93)
8. Space I Set Ti to ti				re obtair	ned at st	on 11 of	Table 9	n so tha	t Ti m–(	76)m an	d re-calc	ulate	
the utilisat			•					5, 50 tha	(, , , , , , , , , , , , , , , , , , ,	<i>i</i> 0)111 an		ulate	
Ja	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	factor for g	gains, hr	n:										
(94)m= 0.9	1 0.88	0.83	0.74	0.62	0.46	0.34	0.38	0.58	0.78	0.88	0.92		(94)
Useful gai	1		r Ò	r Ó	1	1	1		i	1		l	( )
(95)m= 361			419.41	375.71	281.1	196.4	203.09	281.73	334.74	343.37	347.88		(95)
Monthly a (96)m= 4.3	<u> </u>	1	nperature	e from Ta		16.6	16.4	14.1	10.6	74	4.2		(96)
(96)m= 4.3 Heat loss		6.5			14.6	16.6	16.4	14.1	10.6	7.1	4.2		(90)
(97)m= 759		681.68	577.63	450.93	305.63	203.85	213.29	- (90)11 327.81	486.2	632.53	754.15		(97)
Space hea											704.10		(0.)
(98)m= 295	- i	194.86	113.92	55.97	0	0	0	0	112.69	208.19	302.27		
. /			I				Tota	l per year	(kWh/yea	l r) = Sum(9	ļ	1515.62	(98)
Space hea	atina requi	ement in	$k M/h/m^2$	2/vear						, , , , , , , , , , , , , , , , , , ,		29.77	(99)
	- ·				1							29.77	
9b. Energy This part is							ting prov	idod by	2 comm	unity col	omo		
Fraction of		•			-		• •	•		unity SCI	leme.	0	(301)
Fraction of	space hea	t from co	mmunity	v system	1 – (30 <sup>-</sup>	1) =						1	(302)
The communi	y scheme m	ay obtain h	eat from se	everal sou	rces. The p	orocedure	allows for	CHP and i	up to four	other heat	sources; ti	he latter	
includes boile	s, heat pump	os, geother	mal and wa	aste heat f									
Fraction of	heat from	Commur	nity boiler	S								1	(303a)
Fraction of	total space	e heat fro	om Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for c	ontrol and	charging	g method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1	(305)
Distribution	loss facto	r (Table <sup>-</sup>	12c) for a	commun	ity heatii	ng syste	m					1.05	(306)
Space hea	ting											kWh/yea	r
Annual spa	ce heating	requirer	nent									1515.62	
Space heat	from Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	1591.4	(307a)
Efficiency of	f seconda	ry/supple	ementary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heat	ing require	ement fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water bee	ina												
Water heat Annual wat	-	requirem	nent									1892.52	
If DHW fror Water heat								(64) x (30	03a) x (30	5) x (306) :	=	1987.15	(310a)
Electricity u	sed for he	at distrib	ution				0.01	× [(307a).	(307e) +	- (310a)…(	[310e)] =	35.79	(313)
Cooling Sy				0								0	(314)
Space cool					n, if not e	enter 0)		= (107) ÷	· (314) =			0	(315)
Electricity f	-					,			-				
							ماريم					470.0	
mechanica	ventilatior	n - balano	cea, extra	act or po	silive in	puliiom	outside					176.6	(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) =		176.6	(331)
Energy for lighting (calculated in Appendix L)				236.74	(332)
Electricity generated by PVs (Appendix M) (neg	gative quantity)			-518.71	(333)
Electricity generated by wind turbine (Appendix	(M) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating sch	eme				
		Emission fac kg CO2/kWh		nissions g CO2/year	
CO2 from other sources of space and water he Efficiency of heat source 1 (%)	eating (not CHP) If there is CHP using two fuels repeat (363) to (3	66) for the secon	id fuel	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	822.31	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	18.57	(372)
	[(010) X	0.02			
Total CO2 associated with community systems			=	840.88	(373)

CO2 associated with space heating (se	condary)	(309) X		)	_	0	(374)
CO2 associated with water from immers	sion heater or instantar	neous heater (312) x	0.2	22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =				840.88	(376)
CO2 associated with electricity for pump	ps and fans within dwe	elling (331)) x	0.5	52	=	91.66	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.5	52	=	122.87	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	cable	0.52	x 0.01 =	-	-269.21	(380)
Total CO2, kg/year	sum of (376)(382) =					786.19	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =					15.44	(384)
El rating (section 14)						89.01	(385)

### SAP 2012 Overheating Assessment

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

Property Details: Plot 46

Dwelling type: Located in: Region: Cross ventilation poss Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass param Night ventilation: Blinds, curtains, shur Ventilation rate durin Overheating Details:	es: eter: tters: g hot wea	coeffic		Yes 1 North I Averag None Indicat False	s valley East je or unknown tive Value Low ndows fully open)			(P1)
Summer heat loss co	efficient:			295.54				(P2)
Overhangs:								
<b>Orientation:</b> South West (SW) North West (NW)	<b>Ratio:</b> 0 0		<b>Z_overhangs:</b> 1 1					
Solar shading:	-							
Ŭ			•			_		
Orientation: South West (SW) North West (NW)	<b>Z blind</b> 1 1	IS:	Solar access: 0.9 0.9	1 1		<b>Z summer:</b> 0.9 0.9		(P8) (P8)
Solar gains:								
<b>Orientation</b> South West (SW) North West (NW)	0.9 x 0.9 x	<b>Area</b> 4.27 6.1	<b>Flux</b> 119.92 98.85	<b>g_</b> 0.63 0.63	<b>FF</b> 0.7 0.7	Shading 0.9 0.9 Total	<b>Gains</b> 182.79 215.28 398.06	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer externa Thermal mass tempera Threshold temperature Likelihood of high internation	l tempera ature incre	ement			June 367.96 792.24 2.68 16 1.3 19.98 Not significant	July 355.04 753.1 2.55 17.9 1.3 21.75 Slight	August 361.59 708.23 2.4 17.8 1.3 21.5 Slight	(P5) (P6) (P7)
Assessment of likelih	nood of h	igh inte	ernal temperatu	re:	<u>Slight</u>			

User Details:		
Assessor Name:Zahid AshrafStroma Number:STRO0Software Name:Stroma FSAP 2012Software Version:Version	01082 h: 1.0.5.9	
Property Address: Plot 46		
Address :		
1. Overall dwelling dimensions:		
Area(m²)         Av. Height(m)           Ground floor         50.9         (1a) x         2.5         (2a) =	Volume(m <sup>3</sup> ) 127.26 (3a)	)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ [4]		
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	127.26 (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 $0 + 0 + 0 = 0 \times 20 = 0$	(6b)	)
Number of intermittent fans $2 \times 10 = 0$	20 (7a)	.)
Number of passive vents $0 \times 10 =$	0 (7b)	)
Number of flueless gas fires $0 \times 40 = 0$	0 (7c)	)
Air cha	inges per hour	
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	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	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 x (14) ÷ 100] =	0 (15)	)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)	)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	3 (17)	)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$	0.31 (18)	)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered	2 (19)	4
Shelter factor $(20) = 1 - [0.075 \times (19)] =$	0.85 (20)	
Infiltration rate incorporating shelter factor (21) = (18) × (20) =	0.26 (21)	
Infiltration rate modified for monthly wind speed		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Monthly average wind speed from Table 7		
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7		
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 infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.33	0.33	0.32	0.29	0.28	0.25	0.25	0.24	0.26	0.28	0.29	0.31		
	<i>late effec</i> echanica		change i	rate for t	he appli	cable ca	se						- 	(00-)
			using Appe	ndiv N (2	(2b) = (22c)	$) \times Emv(c)$	austion (N	(5)) othou	wice (22h	) - (220)			0	(23a)
										) = (23a)			0	(23b)
			overy: effici	-	_						001-)	4 (00-)	0	(23c)
	i		i i		1	i	<u> </u>	1				1 – (23c)	÷ 100] I	(24a)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0		(24a)
,	r		anical ve				· · · · ·	r í í	, ,	<i>,</i> ,	,		1	(0.41)
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
,			tract ven < (23b), t		•	•				5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or wheen (24d)		•					0.5]				
(24d)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(24d)
Effe	ctive air	change	rate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m=	0.56	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55		(25)
3 Ho	atlosso	e and he	eat loss p	aramot	or.		•	•				•		
		Gros		Openin		Net Ar	62	U-valı		AXU		k-value	2	AXk
		area		m		A ,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²·l		kJ/K
Doors						2	x	1.4	] = [	2.8				(26)
Windo	ws Type	1				4.267	y x1,	/[1/( 1.4 )+	0.04] =	5.66				(27)
Windo	ws Type	2				6.097	· x1/	/[1/( 1.4 )+	0.04] =	8.08				(27)
Walls	Type1	37.8	32	10.3	6	27.45	5 X	0.15	=	4.12				(29)
Walls	Type2	14.8	38	2		12.88	3 X	0.14	] = [	1.82				(29)
Roof		50.9	9	0		50.9	x	0.1	= [	5.09	īĒ		$\exists$	(30)
Total a	area of e	lements	, m²			103.6	3							(31)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	e)+0.04] a	s given in	paragraph	1 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				27.57	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	1022.83	
Therm	al mass	parame	ter (TMF	? = Cm -	- TFA) in	n kJ/m²K			Indica	tive Value:	Low		100	(35)
For des	ign assess	ments wh	ere the de tailed calcu	tails of the	,			ecisely the	e indicative	values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cale	culated	using Ap	pendix ł	<						16	(36)
	•	•	are not kn		• •									` ` `
Total f	abric he	at loss							(33) +	(36) =			43.57	(37)
Ventila	ation hea	t loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5	)		—
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	23.32	23.23	23.15	22.73	22.65	22.29	22.29	22.22	22.43	22.65	22.81	22.97		(38)
Heat t	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	66.9	66.81	66.72	66.3	66.22	65.86	65.86	65.79	66	66.22	66.38	66.55		
									/	Average =	Sum(39)1	12 /12=	66.3	(39)

Heat Ic	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.31	1.31	1.31	1.3	1.3	1.29	1.29	1.29	1.3	1.3	1.3	1.31		
Numbe	er of day	/s in mo	nth (Tab	le 1a)			•	•		Average =	Sum(40)1.	12 /12=	1.3	(40)
- turno e	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)
l														
4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		: [1 - exp	(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		72		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.92		(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=	86.81	83.65	80.5	77.34	74.18	71.03	71.03	74.18	77.34	80.5	83.65	86.81		
Francis	optopt of	bot water	used of	la vlatad m	anthly 1	100 v Vd v		DTm / 2600			m(44) <sub>112</sub> =		947.01	(44)
			·					DTm / 3600		· ·			I	
(45)m=	128.74	112.59	116.19	101.29	97.19	83.87	77.72	89.18	90.25	105.18	114.81	124.67	40.44.00	
lf instant	taneous v	vater heati	ng at point	t of use (no	o hot wate	<sup>r</sup> storage),	enter 0 in	boxes (46		1 otal = Su	m(45) <sub>112</sub> =		1241.68	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		!	ļ	!	I	!	1	!	Į	!			
Storag	e volum	ne (litres)	) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	-			/elling, e			. ,	ara) ant	or (0' in (	47)			
	storage		not wate	er (uns n	iciuues i	nstantai	ieous cu	ombi boil	ers) erne		47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
0,			•	e, kWh/ye				(48) x (49)	) =			0		(50)
				•	loss fact								I	
		-	s lactor li see secti		le 2 (kW	n/iitre/da	iy)					0		(51)
	•	from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	lost fro	om water	r storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
	. ,	(54) in (5	•									0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	50), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
								65 × (41)						
	-		1		· · · · · ·	1	· · · · · ·	ng and a	<u> </u>		, 	<u> </u>	l	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Total heat required for water heating calculated for each month ( $62$ )m = $0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ (62)m=       109.43       95.7       98.76       86.1       82.61       71.29       66.06       75.81       76.71       89.4       97.59       105.97         Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)       (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)       (63)m=       0       0       0       0       0       0       0       0         (64)m=       109.43       95.7       98.76       86.1       82.61       71.29       66.06       75.81       76.71       89.4       97.59       105.97         (63)m=       0       0       0       0       0       0       0       0       0       0         (64)m=       109.43       95.7       98.76       86.1       82.61       71.29       66.06       75.81       76.71       89.4       97.59       105.97         Output from water heater         (64)m=       109.43       95.7       98.76       86.1       82.61       71.29       66.06       75.81       76.71       89.4       97.59       105.97	
$ \begin{array}{c} (62)m= & 109.43 & 95.7 & 98.76 & 86.1 & 82.61 & 71.29 & 66.06 & 75.81 & 76.71 & 89.4 & 97.59 & 105.97 \\ Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) \\ (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) \\ (63)m= & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & $	(61)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$	(62)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
Output from water heater $(64)m =$ 109.43       95.7       98.76       86.1       82.61       71.29       66.06       75.81       76.71       89.4       97.59       105.97         Output from water heater (annual)         Utput from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]         (65)m =         27.36       23.93       24.69       21.52       20.65       17.82       16.52       18.95       19.18       22.35       24.4       26.49         include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(63)
Output from water heater (annual)       1055.43         Heat gains from water heating, kWh/month $0.25 \ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$ (65)m= 27.36 23.93 24.69 21.52 20.65 17.82 16.52 18.95 19.18 22.35 24.4 26.49         include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
Heat gains from water heating, kWh/month $0.25 \ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$ (65)m= 27.36 23.93 24.69 21.52 20.65 17.82 16.52 18.95 19.18 22.35 24.4 26.49 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
(65)m=         27.36         23.93         24.69         21.52         20.65         17.82         16.52         18.95         19.18         22.35         24.4         26.49           include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	(64)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
	(65)
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
	(69)
Pumps and fans gains (Table 5a)	
	(70)
Losses e.g. evaporation (negative values) (Table 5)	
	(71)
	()
Water heating gains (Table 5)         (72)m=       36.77       35.6       33.18       29.9       27.76       24.75       22.2       25.47       26.64       30.04       33.88       35.61	(72)
	(12)
	(73)
	(13)
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 6d $m^2$ Table 6aTable 6bTable 6c(W)	
Southwest <sub>0.9x</sub> 0.77 x 4.27 x 36.79 0.63 x 0.7 = 47.98	(79)
	(79)
	(79)
	(79)
Southwesto.gx         0.77         x         4.27         x         119.01         0.63         x         0.7         =         155.2	· · · · /

Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	×	11	8.15		0.6	3	x	0.7		=	154.07	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	×	11	3.91		0.6	3	x	0.7		=	148.54	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	×	10	4.39		0.6	3	×	0.7		=	136.13	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	×	92	2.85		0.6	3	×	0.7		=	121.08	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	×	69	9.27		0.6	3	×	0.7		=	90.33	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	×	44	4.07		0.6	3	x	0.7		=	57.47	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	×	3′	1.49		0.6	3	×	0.7		=	41.06	(79)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	11	1.28	x	0.6	3	x	0.7		=	21.02	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	22	2.97	x	0.6	3	x	0.7		=	42.79	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	41	1.38	x	0.6	3	×	0.7		=	77.1	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	67	7.96	x	0.6	3	x	0.7		=	126.62	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	9′	1.35	x	0.6	3	×	0.7		=	170.21	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	97	7.38	x	0.6	3	×	0.7		=	181.46	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	9	1.1	x	0.6	3	x	0.7		=	169.75	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	72	2.63	x	0.6	3	×	0.7		=	135.33	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	50	0.42	x	0.6	3	×	0.7		=	93.95	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	28	8.07	x	0.6	3	×	0.7		=	52.3	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	×	1	4.2	x	0.6	3	×	0.7		=	26.45	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	<b>x</b> [	9	.21	x	0.6	3	×	0.7		=	17.17	(81)
Solar g	ains in	watts, ca	alculated	for eac	h month	۱ <u> </u>			(83)m	i = Sum(7	4)m	.(82)m					
(83)m=	69	124.52	188.93	265.18	325.4		5.53	318.29	271	.46 215	5.03	142.63	8 83.92	58	.23		(83)
Total g	ains – ii	nternal a	ind solar	(84)m =	= (73)m	+ (8	3)m ,	watts					_				
(84)m=	317.51	371.92	427.77	490.05	535.78	53	2.17	506.14	462	.53 41	3.4	355.08	312.58	299	9.35		(84)

													l l	
7. Me	an inter	nal temp	erature	(heating	season	)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	living are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.95	0.92	0.86	0.76	0.62	0.5	0.55	0.74	0.89	0.95	0.97		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)				I	
(87)m=	18.31	18.6	19.09	19.72	20.3	20.7	20.87	20.84	20.5	19.76	18.92	18.24		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	n2 (°C)				-	
(88)m=	19.83	19.83	19.83	19.84	19.84	19.85	19.85	19.85	19.84	19.84	19.84	19.84		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)					•	
(89)m=	0.96	0.94	0.9	0.83	0.71	0.55	0.39	0.44	0.68	0.87	0.94	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.39	17.68	18.16	18.78	19.31	19.66	19.79	19.77	19.51	18.83	18	17.33		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.45	(91)

#### Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

(92)m=	17.8	18.09	18.58	19.2	19.75	20.13	20.28	20.25	19.96	19.25	18.41	17.74	(92)
										-			

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

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(93)m=	17.8	18.09	18.58	19.2	19.75	20.13	20.28	20.25	19.96	19.25	18.41	17.74		(93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilization factor for gains using Table 9a       Image: Content of Content o					I	10.70	20.10	20.20	20.20	10.00	10.20	10.41	11.14		(00)
the utilisation factor for gains using Table 9a Uan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)= 0.35 0.32 0.88 0.81 0.71 0.57 0.43 0.48 0.88 0.85 0.33 0.95 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 50.43 4.57 378.5 5 98.8 378.41 301.32 219.41 223.03 282.86 302.45 285.08 (95) Monthly average external temperature from Table 8 (96)m= 64.3 4.9 6.5 8.9 11.7 14.8 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm, W = ((39)m × ((95)m) × (41)m (97)m 60.32 881.28 80.57 6 83.08 53.38 264.09 24.2 253.43 38.82 572.54 750.92 901.23 (97)m 60.32 881.28 80.57 6 83.06 53.38 364.09 24.21 253.43 38.82 572.54 750.92 901.23 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 448.54 361.34 317.84 204.67 115.28 0 0 0 0 20.094 332.18 458.41 Total per year (Wh/year) = Sum(98), v = 2439.21 (98) Space heating requirement in KWh/m <sup>2</sup> /year 60. Space cooling requirement Calculated for June, July and August. See Table 10b Utilisation factor for loss hm (101) (100)m 0 0 0 0 0 0 6 619.09 447.37 500.03 0 0 0 0 0 (100) Utilisation factor for loss hm (101)m 0 0 0 0 0 0 6 480.8 382.01 382.01 0 0 0 0 0 0 (100) Utilisation factor for loss hm (102)m 0 0 0 0 0 0 688.72 665.1 605.06 0 0 0 0 0 0 (100) Utilisation factor for loss hm (102)m 0 0 0 0 0 0 688.72 665.1 605.06 0 0 0 0 0 0 (100) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m (103)m 0 0 0 0 0 0 0 888.72 665.1 605.06 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m (104)m 0 0 0 0 0 0 0 868.72 665.1 605.06 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m (104)m 0 0 0 0 0 0 0 0 888.72 665.1 605.06 0 0 0 0 0 (103) Space cooling requirement for month = (104)m x (105) x (106)m (105) Total = Sum(104) = 0 (106) Total = Sum(104) = (106) Total						re obtair	ned at ste	ep 11 of	Table 9	o so tha	t Ti m=('	76)m an	d re-calo	ulate	
Utilisation factor for gains, hm:         (4)me       0.85       0.82       0.81       0.71       0.57       0.43       0.48       0.85								op e.		,					
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm, W = (94)m x (84)m       (95)         (95)m = 300.44       343.57       378.55       398.8       378.41       301.32       219.41       223.03       282.86       302.45       289.55       285.08       (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 × ((93)m - (95)m) × ((11)m       (96)m = $445.54$ 381.34       317.84       204.77       152.80       0       0       200.94       321.18       458.41         (97)m = 903.32       881.28       305.76       63.06       533.35       364.09       242.3       253.38       386.62       572.54       750.92       901.23       (97)         Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m) × (14)m       Total per year (W/hyear) = Sum(98), wo =       2439.21       (98)         Space cooling requirement in kWh/m?/year       47.32       (99)       47.32       (99)         Scace cooling requirement in kWh/m?/year       ad.77       0       0       0       (100)         Utopm       0       0       0       <	Utilisa	ation fac	tor for g	ains, hm	1:										
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	(94)m=	0.95	0.92	0.88	0.81	0.71	0.57	0.43	0.48	0.68	0.85	0.93	0.95		(94)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Usefu	ıl gains,	hmGm	W = (94	4)m x (8	4)m								1	
	(95)m=	300.44	343.57	378.55	398.8	378.41	301.32	219.41	223.03	282.86	302.45	289.55	285.08		(95)
Heat loss rate for mean internal temperature, Lm , W = [(39)m × [(93)m - (96)m]         (97)         Space heating requirement for each month, kWh/month = 0.024 × [(97)m - (95)m] × (41)m         (98)         Vertice in the internal temperature, Lm , W = [(39)m × [(93)m - (96)m] × (41)m         (97)         Space heating requirement for each month, kWh/month = 0.024 × [(97)m - (95)m] × (41)m         (98)         Vertice in the internal temperature in the internal temperature internal temperature internal temperature internal temperature internal temperature internation internatintemperature internation internation internati	Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
	(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m=       448.54       361.34       317.84       204.67       115.28       0       0       0       200.94       332.18       458.41         Total per year (kWh/year) = Sum(98)s. =       2439.21       (98)         Space heating requirement in kWh/m²/year       47.92       (99)         Scale cooling requirement in kWh/m²/year       47.92       (99)         Calculated for June, July and August. See Table 10b         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)         (100)m         (101)m         (102)m         Gains (solar gains calculated for applicable weather region, see Table 10)         (102)m         Gooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ (102)         Geoing requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ Total = Sum(10A)       =	Heat	loss rate			al temp	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
													901.23		(97)
$\begin{tabular}{ c c c c c c } \hline Total per year (kWh/year) = Sum(98)_{a.s.v.} = $2439.21$ (98) \\ \hline Space heating requirement in kWh/m²/year $(98) \\ \hline Space cooling requirement in kWh/m²/year $(98) \\ \hline Space cooling requirement in kWh/m²/year $(98) \\ \hline Space cooling requirement in kWh/m²/year $(100) \\ \hline Space cooling requirement in kWh/m²/year $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement in kWh/m²/year $(107) + (4) = $(100) \\ \hline Space cooling requirement in kWh/m²/year $(107) + (4) = $(100) \\ \hline Space cooling requirement in kWh/m²/year $(107) + (4) = $(100) \\ \hline Space cooling requirement in kWh/m²/year $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement for month = (104)m × (105) × (106)m $(107) + (4) = $(100) \\ \hline Space cooling requirement in kWh/m²/year $(107) + (4) = $(100) $$	Space			1	1	i	Wh/mont	th = 0.02	24 x [(97)	)m – (95	i	r		1	
Space heating requirement in kWh/m²/year $47.92$ (99)         Sc. Space cooling requirement         Calculated for June, July and August. See Table 10b         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (101)       (101)       (101)       (101)       (102)       (103)       (101)       (102)       (103)       (102)       (103)       (102)       (103)       (102)       (103)       (102)       (103)       (104)       (102)       (103)       (104)       (102)       (103)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (105)       (104)       (105)       (104)       (105)       (104)       (105)       (104)       (105)       (	(98)m=	448.54	361.34	317.84	204.67	115.28	0	0	0	0	200.94	332.18	458.41		_
Sc. Space cooling requirement         Calculated for June, July and August. See Table 10b         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (100)       (101)       (101)       (101)       (101)       (101)       (101)       (101)       (102)       (102)       (102)       (102)       (102)       (102)       (103)       (102)       (103)       (102)       (103)       (102)       (103)       (102)       (103)       (102)       (103)       (103)       (103)       (103)       (103)       (104)       (103)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (104)       (105)       (104)       (105)       (104)       (105)       (104)       (105)       (104)       (105)       (104)       (105)       (104)       (105)       (104)       (105)<									Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	2439.21	(98)
Calculated for June, July and August. See Table 10b         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)       0 <td>Space</td> <td>e heatin</td> <td>g require</td> <td>ement in</td> <td>kWh/m²</td> <td>/year</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>47.92</td> <td>(99)</td>	Space	e heatin	g require	ement in	kWh/m²	/year								47.92	(99)
Calculated for June, July and August. See Table 10b         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)       0 <td>8c. S</td> <td>pace co</td> <td>oling rec</td> <td>Juiremer</td> <td>nt</td> <td></td>	8c. S	pace co	oling rec	Juiremer	nt										
JanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)000			Ŭ			See Tal	ble 10b								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$								Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for loss hm       (101)m=0000000000000000000000000000000000	Heat	loss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	Derature	and exte	ernal ten	nperatur	e from T	able 10)		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(100)m=	0	0	0	0	0	619.09	487.37	500.03	0	0	0	0		(100)
Useful loss, hmLm (Watts) = (100)m x (101)m       (102)m         (102)m=       0       0       0       460.8       392.01       386.38       0       0       0       0       0       (102)         Gains (solar gains calculated for applicable weather region, see Table 10)       (103)m=       0       0       0       0       686.72       655.1       605.06       0       0       0       0       (103)         Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m       set (104)m to zero if (104)m < 3 x (98)m	Utilisa	ation fac	tor for lo	ss hm											
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(101)m=	0	0	0	0	0	0.74	0.8	0.77	0	0	0	0		(101)
Gains (solar gains calculated for applicable weather region, see Table 10)       (103)m=       0       0       0       686.72       655.1       605.06       0       0       0       0       (103)         Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m < 3 × (98)m	Usefu	ıl loss, h	mLm (V	/atts) = (	(100)m >	(101)m									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(102)m=	0	0	0	0	0	460.8	392.01	386.38	0	0	0	0		(102)
Space cooling requirement for month, whole dwelling, continuous ( kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m < $3 \times (98)m$ (104)m       0       0       0       162.67       195.74       162.7       0       0       0         Total = Sum(10.4) =       521.1       (104)m       1       (105)         Cooled fraction       f C = cooled area ÷ (4) =       1       (105)         Intermittency factor (Table 10b) $Total = Sum(10.4) =$ 0       0       0         (106)m       0       0       0       0.25       0.25       0       0       0         Space cooling requirement for month = (104)m × (105) × (106)m       Total = Sum(10.4)       =       0       (106)         Space cooling requirement in kWh/m²/year       (107) ÷ (4) =       130.27       (107)         Space cooling requirement in kWh/m²/year       (107) ÷ (4) =       2.56       (108)	Gains	s (solar g	gains ca	culated	for appli	cable w	eather re	egion, se	e Table	10)					
Set (104)m to zero if (104)m < $3 \times (98)m$ (104)m to zero if (104)m < $3 \times (98)m$ Total = Sum(104) =         Total = Sum(104) =         Cooled fraction         Total = Sum(104) =         Total = Sum(104) =         1         Total = Sum(104) =         0         Total = Sum(104)         Space cooling requirement for month = (104)m × (105) × (106)m         Total = Sum(107) =         130.27         Space cooling requirement in kWh/m²/year         (107) ÷ (4) =         2.56         Space cooling requirement in kWh/m²/year         (107) ÷ (4) =         2.56         Space cooling requirement in kWh/m²/year         (107) ÷ (4) =         2.56         Space cool															(103)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		•					dwelling,	continue	ous ( kW	(h) = 0.0	24 x [(10	03)m – (	102)m]:	x (41)m	
Total = Sum(1.04) =Cooled fractionf C = cooled area $\div$ (4) =1Intermittency factor (Table 10b)(106)m=0000.250.25000(106)m=0000.250.2500000Total = Sum(1.0.4) =0(106)Space cooling requirement for month = (104)m × (105) × (106)m(107)m=00040.6748.9340.67000Total = Sum(1.0.7) =130.27(107)Space cooling requirement in kWh/m²/year(107) $\div$ (4) =2.56(108)8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)	•	<u> </u>		,	i È	í	162 67	195 74	162.7	0	0	0	0		
Cooled fractionf C = cooled area $\div (4) =$ 1(105)Intermittency factor (Table 10b)(106)m=0000.250.25000(106)m=0000.250.250.250000Total = Sum(104) =0(106)Space cooling requirement for month = (104)m × (105) × (106)m(107)m=00040.6748.9340.67000Total = Sum(107) =130.27(107)Space cooling requirement in kWh/m²/year(107) $\div$ (4) =2.56(108)8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)	(101)	Ŭ	Ŭ		Ů	Ů	102.07	100.11	102.1			-		521.1	$\Box_{(104)}$
Intermittency factor (Table 10b) $(106)m = 0$ 0       0       0       0.25       0.25       0       0       0       0         Total = Sum(10.4)       =       0       (106)         Space cooling requirement for month = (104)m × (105) × (106)m $(107)m = 0$ 0       0       0       0       0       0       0         Total = Sum(10.7)       =       130.27       (107)         Space cooling requirement in kWh/m²/year       (107) ÷ (4) =       2.56       (108)         8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)	Cooled	d fractior	า												
$Total = Sum(1Q4) = 0  (106)$ Space cooling requirement for month = $(104)m \times (105) \times (106)m$ $(107)m = 0  0  0  0  40.67  48.93  40.67  0  0  0  0$ $Total = Sum(1Q7) = 130.27  (107)$ Space cooling requirement in kWh/m²/year $(107) \div (4) = 2.56  (108)$ 8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)				able 10b	)					-			,	-	
Space cooling requirement for month = $(104)m \times (105) \times (106)m$ (107)m = 0 0 0 0 0 40.67 48.93 40.67 0 0 0 0 Total = Sum(107) = 130.27 (107) Space cooling requirement in kWh/m <sup>2</sup> /year (107) ÷ (4) = 2.56 (108) 8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)	(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(107)m = 0 0 0 0 0 40.67 48.93 40.67 0 0 0 0 0 $Total = Sum(1.0.7) = 130.27 (107)$ Space cooling requirement in kWh/m <sup>2</sup> /year (107) ÷ (4) = 2.56 (108) 8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)										Tota	l = Sum(	(104)	=	0	(106)
Total = Sum(1,0,7) =130.27(107)Space cooling requirement in kWh/m²/year $(107) \div (4) =$ $2.56$ $(108)$ 8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11) $(107) \div (4) =$ $(107) \div (4) =$	Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n		-	-			
Space cooling requirement in kWh/m²/year       (107) ÷ (4) =       2.56       (108)         8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)       100       100	(107)m=	0	0	0	0	0	40.67	48.93	40.67	0	0	0	0		
8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)										Tota	= Sum(	107)	=	130.27	(107)
	Space	cooling	requirer	nent in k	(Wh/m²/	/ear				(107)	) ÷ (4) =			2.56	(108)
	8f. Fab	oric Ener	rgy <u>Effic</u> i	ency (ca	alcul <u>atec</u>	l onl <u>y un</u>	der <u>spec</u>	cial cond	lition <u>s, s</u> e	ee s <u>ectio</u>	on 11) _				
												=		50.48	(109)

## SAP Input

Property Details: Pl	ot 46						
Address: Located in: Region: UPRN: Date of assessm Date of certifica Assessment type Transaction type Tenure type: Related party di Thermal Mass Pa Water use <= 1 PCDF Version:	te: e: e: sclosure: arameter:	New dw New dw Unknov No rela Indicati	s valley 2020 ober 2020 velling design sta velling	ge			
Property description	n:						
Dwelling type: Detachment: Year Completed: Floor Location: Floor 0 Living area:		Flat 2020 Floor 50.903 22.892 North E	m <sup>2</sup> m <sup>2</sup> (fraction 0.4		Storey height 2.5 m	:	
Front of dwelling f Opening types:	aces:	NOITHE	ası				
Name: NE SW NW	Source: Manufacturer Manufacturer Manufacturer	So Wi	/pe: lid ndows ndows	Glazing: double-glaze double-glaze		Argon: Yes Yes	Frame:
<b>Name:</b> NE SW NW	<b>Gap:</b> mm 16mm or n 16mm or n		<b>Frame Facto</b> 0 0.7 0.7	<b>or: g-value:</b> 0 0.63 0.63	<b>U-value:</b> 1.4 1.4 1.4	<b>Area:</b> 2 4.267 6.097	No. of Openings: 1 1 1
Name: NE SW NW	Type-Name:	Co Ex	ocation: rridor Wall ternal Wall ternal Wall	Orient: North East South West North West		Width: 0 0 0	Height: 0 0 0
Overshading: Opaque Elements:		Average	e or unknown				
	Gross area: (	Openings:	Net area:	U-value:	Ru value:	Curtain	wall: Kappa:
External Wall Corridor Wall Flat Roof <u>Internal Elements</u> <u>Party Elements</u>	37.818 14.882 50.903	10.36 2 0	27.45 12.88 50.9	0.15 0.15 0.1	0 0.4 0	False False	N/A N/A N/A
Thermal bridges: Thermal bridges:		User-de <b>Lengti</b> 5.93			ue = 0.1544 r lintels (including o	other steel lintel	s)

### **SAP Input**

	16.219	0.048	E4	Jamb
	14.665	0.065	E7	Party floor between dwellings (in blocks of flats)
	5.3	0.08	E16	Corner (normal)
	7.95	0.104	E25	Staggered party wall between dwellings
[Approved]	2.65	0.06	E18	Party wall between dwellings
	5.21	0.12	E24	Eaves (insulation at ceiling level - inverted)
	14.271	0.56	E15	Flat roof with parapet
[Approved]	2.27	0.04	E3	Sill
	5.616	0.062	E14	Flat roof
	8.655	0	P3	Intermediate floor between dwellings (in blocks of flats)
	8.655	0.24	P4	Roof (insulation at ceiling level)

Ventilation:	
Pressure test: Ventilation: Number of chimneys: Number of open flues:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True 0
Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 2 3
Main heating system:	
Main heating system:	Community heating schemes Heat source: Community boilers heat from boilers – mains gas, heat fraction 1, efficiency 94 Piping>=1991, pre-insulated, low temp, variable flow Central heating pump : 2013 or later Design flow temperature: Unknown Boiler interlock: Yes
Main heating Control:	
Main heating Control:	Charging system linked to use of community heating, programmer and at least two room thermostats Control code: 2312
Secondary heating system:	
Secondary heating system: Water heating:	None
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°

### **SAP Input**

Overshading: None or very little Collector Orientation: South West No

Assess Zero Carbon Home:

		User	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 201	12	Stroma Softwar		-			001082 n: 1.0.5.9	
		Property	/ Address: F	Plot 46					
Address :									
1. Overall dwelling dimer	nsions:	_	<i>(</i> )			• • • •			
Ground floor		Ar	ea(m²) 50.9 (1	A  a) x	v. Heig 2.5	. ,	(2a) =	Volume(m <sup>3</sup> ) 127.26	(3a)
Total floor area TFA = (1a	u)+(1b)+(1c)+(1d)+(1e	e)+(1n)	50.9 (4	<b>!</b> )					
Dwelling volume			(	3a)+(3b)+(	(3c)+(3d)+	·(3e)+	.(3n) =	127.26	(5)
2. Ventilation rate:									
	heating I	econdary heating	other		total			m <sup>3</sup> per hour	-
Number of chimneys	0 +	0 +	0		0		0 =	0	(6a)
Number of open flues	0 +	0 +	0		0		20 =	0	(6b)
Number of intermittent far	IS				2		0 =	20	(7a)
Number of passive vents					0		0 =	0	(7b)
Number of flueless gas fir	es				0	x 4	0 =	0	(7c)
							Air ch	anges per hou	Jr
Infiltration due to chimney	s, flues and fans = $(6)$	∂a)+(6b)+(7a)+(7b)·	+(7c) =		20		÷ (5) =	0.16	(8)
If a pressurisation test has be		ed, proceed to (17)	, otherwise co	ntinue from	n (9) to (16	6)	- r		-
Number of storeys in th Additional infiltration	e dwelling (ns)					[(0)]	1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2	25 for steel or timber	frame or 0.35 f	or masonry	construc	tion	[(9)-	1JXU. 1 =	0	(10)
if both types of wall are pre deducting areas of opening	esent, use the value corres		•				l	0	]()
If suspended wooden fl		led) or 0.1 (sea	led), else e	nter 0			[	0	(12)
If no draught lobby, ente								0	(13)
Percentage of windows	and doors draught s	tripped	0.05 10.0 %	(14) + 100	1			0	(14)
Window infiltration			0.25 - [0.2 x (8) + (10) +			(15) -		0	(15)
Infiltration rate Air permeability value, o	750 expressed in cut	nic matras nar k					araa	0	(16) (17)
If based on air permeabilit		•	• •			velope	aica	5 0.41	(17)
Air permeability value applies	-				being use	d	l	0.41	
Number of sides sheltered	b							2	(19)
Shelter factor			(20) = 1 - [0.	.075 x (19)]	] =			0.85	(20)
Infiltration rate incorporati	ng shelter factor		(21) = (18) x	(20) =				0.35	(21)
Infiltration rate modified for	or monthly wind speed	d							
Jan Feb I	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7	i		•					
(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	e)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 infiltra	ation rat	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41		
	ate effec echanica		change i	rate for t	he appli	cable ca	se				-		- 	
			using Appe	ondix N (2	(2b) = (22c)	) v Emv (c	austion (N	(5)) othou	nuico (22h	) = (22a)			0	(23a)
										) = (23a)			0	(23b)
			overy: effici	-	_					<b>)</b>	006)	4 (00-)	0	(23c)
			i		i		<u> </u>	1	1	1	i	1 – (23c)	÷ 100] I	(24a)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0		(24a)
,			anical ve				· · · · ·	r í í	í .	, ,	, I		1	(0.45)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,			tract ven < (23b), t		•	•				5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or wh en (24d)		•	•				0.5]				
(24d)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
Effe	ctive air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				1	
(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	]	(25)
2 40	at loans	o ond he		oromot	ori							•	1	
		Gros	eat loss p			Net Ar	00	U-valı	10	AXU		k-value	<u>`</u>	AXk
ELEN	/IENT	area		Openin rr		A,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²·l		kJ/K
Doors						2	x	1	= [	2				(26)
Windo	ws Type	e 1				4.267	y x1/	/[1/( 1.4 )+	0.04] =	5.66				(27)
Windo	ws Type	2				6.097	y x1,	/[1/( 1.4 )+	0.04] =	8.08				(27)
Walls <sup>-</sup>	Type1	37.8	32	10.3	6	27.45	5 x	0.18	=	4.94				(29)
Walls <sup>-</sup>	Type2	14.8	38	2		12.88	3 X	0.18	=	2.32				(29)
Roof		50.	9	0		50.9	x	0.13	=	6.62			$\neg \square$	(30)
Total a	area of e	lements	, m²			103.6	3		·					(31)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	n 3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				29.62	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	1022.83	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	∩ kJ/m²K			Indica	tive Value:	: Medium		250	(35)
	-		ere the de tailed calcu		construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						14.09	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			43.71	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y		-	-	(38)m	= 0.33 × (	25)m x (5	)		
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	25.09	24.93	24.77	24.04	23.9	23.27	23.27	23.15	23.51	23.9	24.18	24.47		(38)
Heat ti	ransfer c	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	68.79	68.64	68.48	67.75	67.61	66.98	66.98	66.86	67.22	67.61	67.89	68.18		
										Average =	Sum(39)	12 /12=	67.75	(39)

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.35	1.35	1.35	1.33	1.33	1.32	1.32	1.31	1.32	1.33	1.33	1.34		
Numb	er of day	r vs in mo	nth (Tab	le 1a)						Average =	Sum(40) <sub>1</sub>	12 /12=	1.33	(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	o(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		72		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.97		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for e	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	82.47	79.47	76.47	73.47	70.47	67.47	67.47	70.47	73.47	76.47	79.47	82.47		
_											m(44) <sub>112</sub> =		899.66	(44)
Energy	content of	<sup>f</sup> hot water	used - ca	lculated m	onthly = 4.	190 x Vd,ı	m x nm x L	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	122.3	106.96	110.38	96.23	92.33	79.68	73.83	84.72	85.74	99.92	109.07	118.44		<b>-</b>
lf instan	taneous v	vater heati	ng at poin	t of use (no	o hot wate	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	-	1179.6	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
· · ·	storage	-	Ů	Ů	0	Ů	Ů	Ů	Ů	Ū	Ŭ	0		()
Storag	je volum	ne (litres)	) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	•			velling, e ncludes i			ı (47) ombi boil	ers) ente	er '0' in (	47)			
	storage				! I		- /-/)-							(10)
					or is kno	wn (kvvi	n/day):					0		(48)
			m Table					(10) (10)				0		(49)
υ.	•		•	e, kWh/ye cylinder	ear loss fact	or is not	known <sup>.</sup>	(48) x (49)	) =			0		(50)
,				•	le 2 (kW							0		(51)
	-	-	see secti	on 4.3										
		from Ta		0								0		(52)
•			m Table									0		(53)
•		m wateı (54) in (5	-	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
	. ,	. , .		for each	month			((56)m = (	55) 🗸 (41)	m		0		(55)
		r	<b></b>	<b></b>				1				0		(56)
(56)m=	0 er contain	0 s dedicate	0 d solar sto	0 prage (57)	0 = (56)m	$0 \times [(50) - ($	0 (H11)] $\div$ (5)	0 50), else (5	0 = (56)	0 m where (	0 H11) is fro	0 m Append	ix H	(56)
-								1 .	· · ·					(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•			om Table			(=0) -					0		(58)
	•						. ,	65 × (41) ng and a		r thermo	etat)			
(mo (59)m=								ng and a				0		(59)
(00)11-												0		(30)

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	wate	r he	ating ca	alculated	l fo	r eacl	n month	(62)m	= 0.85 ×	(45)m -	- (46)m +	(57)m ·	+ (59)m + (61)m	
(62)m=	103.95	90.92	93.8	2	81.79	78.48	6	57.73	62.76	72.02	72.88	84.93	92.71	100.67	7	(62)
Solar DH	-IW input	calculated	using /	Appe	endix G or	Appendix	Н	(negativ	ve quantity	) (enter	'0' if no sola	ar contrib	ution to wate	er heating	3)	
(add a	dditiona	al lines if	FGHF	RS a	and/or V	WWHRS	ap	plies,	, 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=	103.95	90.92	93.8	2	81.79	78.48	6	57.73	62.76	72.02	72.88	84.93	92.71	100.67	7	
										Οι	tput from w	ater heat	er (annual)	112	1002.66	(64)
Heat g	ains fro	m water	heati	ng,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8 :	x [(46)n	n + (57)m	+ (59)r	n ]	
(65)m=	25.99	22.73	23.4	6	20.45	19.62	1	6.93	15.69	18	18.22	21.23	23.18	25.17	7	(65)
inclu	de (57)	m in calo	culatio	n o	f (65)m	only if c	ylir	nder is	s in the c	dwelling	g or hot w	/ater is	from com	munity	_ heating	
5. Int	ernal a	ains (see	e Tabl	e 5	and 5a	):	-				-			•	-	
		ns (Table														
metab	Jan	Feb	50), V Ma		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	7	
(66)m=	85.84	85.84	85.8	-	85.84	85.84	_	5.84	85.84	85.84	85.84	85.84	85.84	85.84	-	(66)
Liahtin	u dains	(calcula	L ted in	Ap	pendix	equat	ion	1 9 or	(19a) a	lso see	Table 5					
(67)m=	13.41	11.91	9.68	<u> </u>	7.33	5.48		4.63	5	6.5	8.72	11.07	12.92	13.78	7	(67)
											so see Ta					
(68)m=	149.58	151.13	147.2		138.89	128.38		18.5	111.9	110.35		122.59	133.1	142.98	7	(68)
													100.1	142.00		(00)
	31.58	31.58	31.5		31.58	L, equai	_	1 L 15 1.58	31.58	, also : 31.58	see Table 31.58	31.58	31.58	31.58	7	(69)
(69)m=						31.00	3	01.00	31.00	31.30	31.56	31.56	31.56	31.00		(03)
		ns gains	1												-	( <b>70</b> )
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0		(70)
		vaporatic	<u> </u>	-			-			-		1	- <u>_</u>	r	-	
(71)m=	-68.67	-68.67	-68.6	67	-68.67	-68.67	-6	68.67	-68.67	-68.67	-68.67	-68.67	-68.67	-68.67		(71)
Water		gains (T		<u> </u>										,	-	
(72)m=	34.93	33.82	31.5	3	28.4	26.37	2	3.52	21.09	24.2	25.3	28.54	32.19	33.83		(72)
Total i	nterna	gains =	:					(66)	m + (67)m	+ (68)m	+ (69)m +	(70)m +	(71)m + (72		-	
(73)m=	246.67	245.61	237.′	18	223.38	208.98	1	95.4	186.74	189.8	197.04	210.95	226.97	239.34		(73)
	lar gain															
-			•				and			tions to	convert to th	ne applica	able orienta	tion.		
Orienta		Access F Table 6d			Area m <sup>2</sup>			Flu	x ole 6a		g_ Table 6b		FF Table 6c		Gains (W)	
•															(**)	-
Southw		0.77		x	4.2	27	x	3	6.79		0.63	×	0.7	=	47.98	(79)
Southw	l	0.77		X	4.2	27	x	6	2.67		0.63	×	0.7	=	81.73	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	8	5.75		0.63	×	0.7	=	111.83	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	1(	06.25		0.63	×	0.7	=	138.56	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	1'	19.01		0.63	x	0.7	=	155.2	(79)

Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	x	118.15	]	0	.63	×	0.7	=	154.07	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	x	113.91	1	0	.63	×	0.7	=	148.54	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	x	104.39	]	0	.63	×	0.7	=	136.13	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	x	92.85	]	0	.63	×	0.7	=	121.08	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	x	69.27		0	.63	×	0.7	=	90.33	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	!7	x	44.07		0	.63	×	0.7	=	57.47	(79)
Southwe	est <mark>0.9x</mark>	0.77	x	4.2	27	x	31.49	]	0	.63	×	0.7	=	41.06	(79)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	11.28	x	0	.63	×	0.7	=	21.02	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	22.97	x	0	.63	×	0.7	=	42.79	(81)
Northwe	st <mark>0.9x</mark>	0.77	x	6.	1	x	41.38	x	0	.63	×	0.7	=	77.1	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	67.96	x	0	.63	×	0.7	=	126.62	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	91.35	x	0	.63	×	0.7	=	170.21	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	97.38	x	0	.63	×	0.7	=	181.46	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	91.1	x	0	.63	×	0.7	=	169.75	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	72.63	x	0	.63	×	0.7	=	135.33	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	50.42	x	0	.63	×	0.7	=	93.95	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	28.07	x	0	.63	×	0.7	=	52.3	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	14.2	x	0	.63	×	0.7	=	26.45	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	9.21	x	0	.63	×	0.7	=	17.17	(81)
													—		-
Solar g	ains in	watts, ca	alculated	for eac	n month			(83)m	n = Sum	(74)m	.(82)m			_	
(83)m=	69	124.52	188.93	265.18	325.4	335.	.53 318.29	271	.46 2	15.03	142.6	3 83.92	58.23	]	(83)

(83)m=	69	124.52	188.93	265.18	325.4	335.53	318.29	271.46	215.03	142.63	83.92	58.23		(83)
Total g	ains – ir	nternal a	ind solar	(84)m =	- (73)m -	+ (83)m	, watts							
(84)m=	315.67	370.14	426.11	488.56	534.39	530.93	505.03	461.26	412.07	353.58	310.89	297.57		(84)
7. Me	an inter	nal temp	erature	(heating	season	)							-	
Temp	erature	during h	leating p	eriods ir	n the livir	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)	-						
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.99	0.96	0.88	0.72	0.56	0.63	0.86	0.98	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.52	19.69	19.98	20.37	20.71	20.92	20.98	20.97	20.81	20.36	19.87	19.49		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	n2 (°C)				-	
(88)m=	19.8	19.8	19.81	19.82	19.82	19.83	19.83	19.83	19.82	19.82	19.81	19.81		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, I	h2,m (se	e Table	9a)					-	
(89)m=	1	0.99	0.98	0.94	0.83	0.62	0.42	0.49	0.79	0.96	0.99	1	]	(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.46	18.64	18.93	19.32	19.63	19.79	19.82	19.82	19.72	19.31	18.82	18.44		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.45	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	ling) = fl	_A × T1	+ (1 – fL	A) × T2					
1		· ·	· ·					<u>`</u>	· ·				1	

						. 0/			, ,				_
(92)m=	18.94	19.11	19.4	19.79	20.12	20.3	20.34	20.34	20.21	19.78	19.29	18.91	(92)
					-								•

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

(93)m=	18.94	19.11	19.4	19.79	20.12	20.3	20.34	20.34	20.21	19.78	19.29	18.91		(93)
8. Spa	ace hea	ting requ	uirement	t										
				mperatu using Ta		ed at ste	ep 11 of	Table 9I	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	<u>ו ייי</u> ווי										
(94)m=	1	0.99	0.98	0.94	0.84	0.66	0.49	0.55	0.82	0.96	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (84	4)m									
(95)m=	314.39	366.99	417.29	459.47	450.2	352.88	245.28	253.85	336.61	340.82	308.44	296.64		(95)
Month	ly aver	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	nal tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	1				
(97)m=	1006.91	i	883.44	737.86	569.1	381.69	250.73	263.2	410.56	621.01	827.83	1003.01		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Nh/mont	h = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	515.23	408.76	346.82	200.44	88.46	0	0	0	0	208.46	, 373.96	525.54		
I				1	1			Tota	l per year	(kWh/yeai	) = Sum(9	8)15,912 =	2667.67	(98)
Space	e heatin	g require	ement in	n kWh/m²	²/year								52.41	(99)
8c Sr		oling rec	wiremer	ht										
				August.	See Tal	alo 10b								
Calcu	Jan	Feb	Mar	August. Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
l Heat l				using 2					· ·					
(100)m=	0		0			629.57	495.62	508.12		0	0			(100)
` ´	tion fac	tor for lo	l <u> </u>	, in the second se	Ĵ	020101			Ŭ	Ŭ	Ŭ	Ŭ		(/
(101)m=	0		0	0	0	0.85	0.91	0.88	0	0	0	0		(101)
	-	-		<u> </u>	_		0.01	0.00	Ŭ	Ŭ	Ŭ	Ŭ		
(102)m=	0	0				536.27	451.86	448.09	0	0	0	0		(102)
· · I				for appli						Ű	Ů	Ŭ		
(103)m=	0 0					685.48	653.99	603.78	0	0	0	0		(103)
												 102)m]:	(A1)m	(100)
•				< 3 × (98		iwenny,	continue	JUS ( NI	(11) = 0.0.	24 X [[ 10	,	102)111]2	(41)	
(104)m=	0	0	0	0	0	107.43	150.38	115.84	0	0	0	0		
l		1	Į	1	ļ			1	Total	= Sum(	104)	=	373.65	(104)
Cooled	fractio	า									area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b	)							· ·	,		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	l = Sum(	(104)	=	0	(106)
Space	cooling	requirer	ment for	month =	= (104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	26.86	37.6	28.96	0	0	0	0		
•									Total	= Sum(	107)	=	93.41	(107)
Space	cooling	requirer	ment in l	kWh/m²/y	year				(107)	) ÷ (4) =			1.84	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				-
Fabric	Energ	y Efficier	псу						(99) -	+ (108) =	=		54.24	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								62.38	(109)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Stroma	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 2	012		Softwa				Versio	n: 1.0.5.9	
		Р	roperty <i>i</i>	Address:	Plot 46					
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor				<b>a(m²)</b> 50.9	(1a) x	<b>Av. He</b> i	i <b>ght(m)</b> 5	(2a) =	Volume(m <sup>3</sup> ) 127.26	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+	(1e)+(1r	n)	50.9	(4)			-		_
Dwelling volume			L		(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	127.26	(5)
2. Ventilation rate:	-									
	main heating	secondar heating	У	other		total			m <sup>3</sup> per hour	•
Number of chimneys	0 +	0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	- + -	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	IS				- _	0	x 1	0 =	0	(7a)
Number of passive vents						0	<b>x</b> 1	0 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
					L					
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans =	(6a)+(6b)+(7	′a)+(7b)+(7	7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be		nded, procee	d to (17), c	otherwise c	continue fro	om (9) to (	16)			-
Number of storeys in the Additional infiltration	e dwelling (ns)						[(0)	41-0-4	0	(9)
Structural infiltration: 0.2	25 for steel or timb	er frame or	0 35 for	masonr	v constr	uction	[(9)-	1]x0.1 =	0	(10) (11)
if both types of wall are pre deducting areas of opening	esent, use the value co								0	](,,)
If suspended wooden fle	oor, enter 0.2 (uns	ealed) or 0	.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows	and doors draugh	t stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value, of If based on air permeabilit			•	•	•	etre of e	nvelope	area	3	(17)
Air permeability value applies	-					is heina us	sed		0.15	(18)
Number of sides sheltered				, ee an per	incusinty i	o bonng uc			2	(19)
Shelter factor				(20) = 1 - [	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	) x (20) =				0.13	(21)
Infiltration rate modified for	r monthly wind spe	ed								_
Jan Feb I	Mar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 4									
	.23 1.1 1.08	3 0.95	0.95	0.92	1	1.08	1.12	1.18		
	I	•							I	

Adjust	ed infiltr	ation rat	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m				_		
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15			
	<i>ate effec</i> echanica		change i	rate for t	he appli	cable ca	se								
			using Appe	andix N (2	(23a) – (23a	a) × Emv (e	austion (1	N5)) other	nwise (23b	) – (23a)			0.		(23a)
			overy: effici							) – (200)			0.		(23b)
					U				,	) b) m i (	226) [	1 (22a)		.05	(23c)
a) II (24a)m=		0.26	anical ve	0.25	0.24	0.23	0.23	0.22	0.23	20)m + (. 0.24	23D) × [ 0.25	0.25	) ÷ 100] ]		(24a)
												0.25	J		(2-14)
	balance		anical ve	ntilation		· · · · · ·	r	r Ó	m = (22)	2) + m(d 0	, 		1		(24b)
(24b)m=		0	0	-	-	0	0	0	-	0	0	0			(240)
,			tract ven < (23b), t		•	•				5 × (23b	)	-	_		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,			on or when (24d)							0.5]					
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	]		(24d)
Effe	ctive air	change	rate - en	iter (24a	) or (24t	o) or (24	c) or (24	d) in boy	(25)			-	-		
(25)m=	0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25	]		(25)
3 He	at losse	s and he	eat loss p	aramet	≏r.								-		
ELEN		Gros		Openin		Net Ar	ea	U-valı	le	AXU		k-value	-	АX	(k
		area		m		A ,r		W/m2		(W/I	K)	kJ/m²•		kJ/	
Doors						2	x	1.4	=	2.8					(26)
Windo	ws Type	e 1				4.267	, x1	/[1/( 1.4 )+	0.04] =	5.66					(27)
Windo	ws Type	2				6.097	, x1	/[1/( 1.4 )+	0.04] =	8.08	=				(27)
Walls -	Type1	37.8	32	10.3	6	27.45	5 X	0.15	] = [	4.12	= r				(29)
Walls	Type2	14.8	38	2		12.88	3 X	0.14		1.82					(29)
Roof		50.5	9	0		50.9	x	0.1		5.09					(30)
Total a	area of e	lements	. m²	L		103.6		L	I		L		L		(31)
* for win	ndows and	roof wind	ows, use e			alue calcul		g formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragrapl	n 3.2		
			sides of in = S (A x		is and pari	titions		(26)(30)	) + (32) -						
	apacity			0)				(20)(00)		.(30) + (32	2) + (225)	(220) -	27.		(33)
			eter (TMF	) _ (m		k l/m2k				tive Value		(326) =		2.83	(34)
		•	ere the dea					racisaly the				ahla 1f	10	0	(35)
	•		tailed calcu		construct	ion ale noi	. KHOWH PI	cosciy und	, muicative	values of					
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						1	6	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
Total f	abric he	at loss							(33) +	(36) =			43.	.57	(37)
Ventila			alculated	monthl					<b>I</b>	= 0.33 × (	25)m x (5	)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	•		
(38)m=	11.23	11.09	10.96	10.29	10.15	9.49	9.49	9.35	9.75	10.15	10.42	10.69	J		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m		-		
(39)m=	54.8	54.66	54.53	53.86	53.73	53.06	53.06	52.92	53.33	53.73	53.99	54.26			_
									/	Average =	Sum(39)1	12 /12=	53.	.83	(39)

Heat lo	oss para	meter (H	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.08	1.07	1.07	1.06	1.06	1.04	1.04	1.04	1.05	1.06	1.06	1.07		
Numb			nth (Tab					I	,	Average =	Sum(40)1.	12 /12=	1.06	(40)
Numb	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,												0.		
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				[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	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.92		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)						
(44)m=	86.81	83.65	80.5	77.34	74.18	71.03	71.03	74.18	77.34	80.5	83.65	86.81		
Energy	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x L	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		947.01	(44)
(45)m=	128.74	112.59	116.19	101.29	97.19	83.87	77.72	89.18	90.25	105.18	114.81	124.67		
					· · · ·	· · · ·				Total = Su	m(45) <sub>112</sub> =	-	1241.68	(45)
			· ·	· · ·				boxes (46)	, , , 					(40)
(46)m= Water	19.31 storage	16.89 IOSS:	17.43	15.19	14.58	12.58	11.66	13.38	13.54	15.78	17.22	18.7		(46)
	-		includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	ind no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
			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				"aay).					0		(49)
			· storage		ear			(48) x (49)	) =			10		(50)
				•	loss fact							-		
		-	factor fr		le 2 (kW	h/litre/da	ay)				0.	02		(51)
	•	from Ta		011 4.0							1.	03		(52)
Tempe	erature f	actor fro	m Table	2b								.6		(53)
Energ	y lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter	(50) or (	(54) in (5	55)								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 contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Prima	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	•				,	,	• •	65 × (41)						
		1	· · · · · ·	1	i	1	i	ng and a	· ·	1	, 	00.00		
(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 I	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	h month	(62)m	= 0.85 ×	(45)m +	· (46)m +	(57)m +	- (59)m + (61)m	
(62)m=	184.01	162.52	171.4	3	154.79	152.47	1:	37.36	133	144.46	143.74	160.45	168.3	179.95	]	(62)
Solar DH	W input	calculated	using A	ope	ndix G or	· Appendix	с Н (	negati	ve quantity	/) (enter	'0' if no sola	ar contribu	ition to wate	er heating	)	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	ap	plies	, see Ap	pendix	G)				_	
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter			-					-			-		
(64)m=	184.01	162.52	171.4	3	154.79	152.47	1:	37.36	133	144.46	143.74	160.45	168.3	179.95	]	
										O	Itput from w	ater heat	er (annual)	112	1892.52	(64)
Heat g	ains fro	m water	heatin	g, I	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8 :	x [(46)n	n + (57)m	+ (59)n	ן ו	
(65)m=	87.03	77.38	82.85	Τ	76.48	76.54	7	0.68	70.06	73.87	72.8	79.19	80.97	85.68	]	(65)
inclu	de (57)	m in calo	ulatio	י ר ר	f (65)m	only if c	ylir:	nder i	s in the c	dwellin	g or hot w	/ater is i	from com	Imunity l	neating	
5. Int	ernal g	ains (see	Table	5	and 5a	):										
	Ŭ	ns (Table														
motab	Jan	Feb	Ma		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m=	103	103	103	╈	103	103		103	103	103	103	103	103	103	1	(66)
Lightin	g gains	(calcula	ted in <i>i</i>	Ap	pendix	L, equat	ion	L9 oi	r L9a), a	lso see	Table 5	1			1	
(67)m=	33.51	29.77	24.21	<u> </u>	18.33	13.7	r	1.57	12.5	16.24	21.8	27.68	32.31	34.44	1	(67)
Applia	nces aa	ins (calc	ulated	in	Append	u dix L. ea	uat	ion L	13 or L1	3a), al	so see Ta	ble 5		I	1	
(68)m=	223.25	1	219.7	<b>_</b>	207.3	191.61	r –	76.87	167.02	164.7	170.54	182.97	198.66	213.4	1	(68)
			i Ited in	 An	pendix	L equat	tion	115	or I 15a)	also	see Table	1 9.5			1	
(69)m=	47.02	47.02	47.02	-i-	47.02	47.02	-	7.02	47.02	47.02	47.02	47.02	47.02	47.02	1	(69)
	and fa	I Ins gains	(Table	 גריי	a)		L					1			]	
(70)m=				) 	0	0		0	0	0	0	0	0	0	1	(70)
		vaporatio		 inter						-		-	1 -		]	
(71)m=		T	-68.67		-68.67	-68.67	r –	5) 58.67	-68.67	-68.67	-68.67	-68.67	-68.67	-68.67	1	(71)
		gains (T			00.07	00.07		0.01	00.07	00.07	00.07	00.07	00.07	00.07	]	(***)
(72)m=	116.97	115.15	111.3	ŕт	106.22	102.87	0	8.17	94.17	99.29	101.11	106.44	112.46	115.16	1	(72)
		1		<u></u>	100.22	102.07					1 + (69)m +				]	(, _)
(73)m=	455.09	<b>gains =</b> 451.83	436.6	5	413.2	389.54	30	(00) 67.96	355.04	361.59		398.45	-	444.35	1	(73)
. ,	ar gain		430.0	<u>'</u>	415.2	309.94	5	57.50	333.04	501.5	374.01	330.43	424.70	444.55	J	(10)
			usina sa	lar	flux from	Table 6a	and	associ	iated equa	tions to	convert to th	ne applica	ble orienta	tion.		
•		Access F	•		Area			Flu			g_		FF		Gains	
		Table 6d			m²				ole 6a		Table 6b	-	Table 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77		x	4.2	27	x	3	6.79		0.63	×	0.7	=	47.98	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2		x		2.67		0.63		0.7		81.73	](79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2		x		5.75		0.63		0.7		111.83	(79)
Southw	1	0.77		x	4.2		x		06.25		0.63		0.7		138.56	(79)
Southw	est <mark>0.9x</mark>	0.77		x	4.2		x		19.01		0.63		0.7		155.2	(79)

Southwest <sub>0.9x</sub>	0.77	×	4.27	x	118.15	]	0.63	x	0.7	=	154.07	(79)
Southwest <sub>0.9x</sub>	0.77	×	4.27	x	113.91		0.63	x	0.7	=	148.54	(79)
Southwest <sub>0.9x</sub>	0.77	x	4.27	x	104.39		0.63	x	0.7	=	136.13	(79)
Southwest <sub>0.9x</sub>	0.77	x	4.27	x	92.85		0.63	x	0.7	=	121.08	(79)
Southwest <sub>0.9x</sub>	0.77	x	4.27	x	69.27		0.63	×	0.7	=	90.33	(79)
Southwest <sub>0.9x</sub>	0.77	x	4.27	x	44.07		0.63	x	0.7	=	57.47	(79)
Southwest0.9x	0.77	_ x [	4.27	x	31.49	]	0.63	x	0.7	=	41.06	(79)
Northwest 0.9x	0.77	x	6.1	x	11.28	x	0.63	×	0.7	=	21.02	(81)
Northwest 0.9x	0.77	×	6.1	x	22.97	x	0.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	x [	6.1	x	41.38	x	0.63	x	0.7	=	77.1	(81)
Northwest 0.9x	0.77	×	6.1	x	67.96	x	0.63	x	0.7	=	126.62	(81)
Northwest 0.9x	0.77	×	6.1	x	91.35	x	0.63	×	0.7	=	170.21	(81)
Northwest 0.9x	0.77	×	6.1	x	97.38	x	0.63	×	0.7	=	181.46	(81)
Northwest 0.9x	0.77	×	6.1	x	91.1	x	0.63	×	0.7	=	169.75	(81)
Northwest 0.9x	0.77	×	6.1	x	72.63	x	0.63	×	0.7	=	135.33	(81)
Northwest 0.9x	0.77	x [	6.1	x	50.42	x	0.63	x	0.7	=	93.95	(81)
Northwest 0.9x	0.77	×	6.1	x	28.07	x	0.63	x	0.7	=	52.3	(81)
Northwest 0.9x	0.77	<b>x</b>	6.1	x	14.2	x	0.63	x	0.7	=	26.45	(81)
Northwest 0.9x	0.77	×	6.1	x	9.21	x	0.63	×	0.7	=	17.17	(81)
Solar gains in	watts, calcu	ulated	for each mont	th	i	(83)m	n = Sum(74)m	.(82)m			1	
(83)m= 69			265.18 325.4	-	35.53 318.29	271	.46 215.03	142.63	3 83.92	58.23		(83)
Total gains – ir	nternal and	solar (	(84)m = (73)n	ו + (מ	33)m, watts							
(84)m= 524.09	576.36 62	25.58	678.38 714.94	4 7	03.49 673.33	633	.05 589.84	541.07	7 508.7	502.58		(84)
7. Mean inter	nal temp <u>era</u>	ature (I	heating seaso	on) _								
Tomporatura	during boo	ting no	riodo in the li	ling	araa from Tak		Th1 (%C)				01	(95)

Temperature during heating periods in the living area from Table 9, Th1 (°C)													21	(85)
Utilisa	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=	(86)m=         0.89         0.86         0.81         0.72         0.59         0.45         0.33         0.37         0.55         0.75         0.86         0.9													(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)														
(87)m=	19.39	19.62	19.98	20.4	20.72	20.91	20.97	20.96	20.84	20.44	19.86	19.34		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m= 20.02 20.02 20.02 20.04 20.04 20.04 20.05 20.05 20.05 20.04 20.04 20.03 20.03														(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)												-		

•						, (00		00)					_
(89)m=	0.88	0.85	0.79	0.69	0.55	0.39	0.27	0.3	0.49	0.71	0.84	0.89	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													-
(90)m=	17.91	18.23	18.73	19.32	19.74	19.97	20.03	20.02	19.89	19.38	18.59	17.85	(90)

(90)m=	17.91	18.23	18.73	19.32	19.74	19.97	20.03	20.02	19.89	19.38	18.59	17.85		(90)
									1	fLA = Livin	g area ÷ (4	4) =	0.45	(91)
														-

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$													_
(92)m=	18.57	18.86	19.29	19.81	20.18	20.39	20.45	20.45	20.31	19.86	19.16	18.52	(92)

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

	-												
(93)m=         18.57         18.86         19.29         19.81         20.18         20.39         20.45         20.31         19.86         19.16         18.52		(93)											
8. Space heating requirement	ouloto												
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-cal the utilisation factor for gains using Table 9a	culate												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	]												
Utilisation factor for gains, hm:	-												
(94)m= 0.86 0.82 0.77 0.68 0.56 0.41 0.3 0.33 0.51 0.7 0.82 0.87	]	(94)											
Useful gains, hmGm , W = (94)m x (84)m	-												
(95)m= 448.97 475.07 481.91 460.44 397.16 289.14 199.13 207.01 298.17 379.83 415.04 435.57		(95)											
Monthly average external temperature from Table 8	-												
(96)m=         4.3         4.9         6.5         8.9         11.7         14.6         16.6         16.4         14.1         10.6         7.1         4.2		(96)											
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m ]	7												
(97)m= 782.19 762.96 697.63 587.62 455.78 307.29 204.39 214.08 331.4 497.31 651.05 777.03		(97)											
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$	7												
(98)m= 247.92 193.46 160.5 91.57 43.62 0 0 0 0 87.4 169.93 254.04													
Total per year (kWh/year) = Sum(98) <sub>15.912</sub> =	1248.43	(98)											
Space heating requirement in kWh/m²/year	24.53	(99)											
9b. Energy requirements – Community heating scheme													
This part is used for space heating, space cooling or water heating provided by a community scheme.													
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)											
Fraction of space heat from community system $1 - (301) =$	1	(302)											
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources;	the latter												
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers		(303a)											
	1												
Fraction of total space heat from Community boilers (302) × (303a) =	1	(304a)											
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)											
Distribution loss factor (Table 12c) for community heating system	1.05	(306)											
Space heating	kWh/year	,											
Annual space heating requirement	1248.43	]											
Space heat from Community boilers (98) x (304a) x (305) x (306) =	1310.85	(307a)											
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308											
Space heating requirement from secondary/supplementary system $(98) \times (301) \times 100 \div (308) =$	0	 (309)											
	0												
Water heating Annual water heating requirement	4000 50	7											
	1892.52												
If DHW from community scheme: Water heat from Community boilers (64) x (303a) x (305) x (306) =	1987.15	(310a)											
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] =	32.98	(313)											
Cooling System Energy Efficiency Ratio		(314)											
	0	-											
Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$	0	(315)											
Electricity for pumps and fans within dwelling (Table 4f):	470.0	(3300)											
mechanical ventilation - balanced, extract or positive input from outside	176.6	(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) =	176.6	(331)
Energy for lighting (calculated in Ap	ppendix L)			236.74	(332)
Electricity generated by PVs (Appen	ndix M) (negative quantity)			-518.71	(333)
Electricity generated by wind turbin	e (Appendix M) (negative quantity)	)		0	(334)
10b. Fuel costs – Community heat	ting scheme				-
	<b>Fuel</b> kWh/year	<b>Fuel I</b> (Table		<b>Fuel Cost</b> £/year	
Space heating from CHP	(307a) x	4.	24 x 0.01 =	55.58	(340a)
Water heating from CHP	(310a) x	4.	24 x 0.01 =	84.26	(342a)
		Fuel F	Price		_
Pumps and fans	(331)	13	.19 x 0.01 =	23.29	(349)
Energy for lighting	(332)	13	.19 x 0.01 =	31.23	(350)
Additional standing charges (Table	12)			120	(351)
Energy saving/generation technolog Total energy cost	= (340a)(342e) + (345)(354) =			314.36	(355)
11b. SAP rating - Community heat	ting scheme				
Energy cost deflator (Table 12)				0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =			1.38	(357)
SAP rating (section12)				80.8	(358)
12b. CO2 Emissions – Community		nergy E	Emission factor	Emissions	
				kg CO2/year	
CO2 from other sources of space a Efficiency of heat source 1 (%)	nd water heating (not CHP) If there is CHP using two fu	els repeat (363) to (36	6) for the second fue	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x	0.22	757.84	(367)
Electrical energy for heat distributio	n [(313) >	( [	0.52	17.12	(372)
Total CO2 associated with commun	nity systems (363)	(366) + (368)(372)	=	774.95	(373)
CO2 associated with space heating	(309) x (309) x	[	0 =	= 0	(374)
CO2 associated with water from im	mersion heater or instantaneous h	eater (312) x	0.22	= 0	(375)
Total CO2 associated with space a	nd water heating (373) +	(374) + (375) =		774.95	(376)
CO2 associated with electricity for p	oumps and fans within dwelling (3	331)) x	0.52	91.66	(378)
CO2 associated with electricity for I	ighting (332)))	x	0.52	122.87	(379)
Energy saving/generation technolog	gies (333) to (334) as applicable	0.	52 × 0.01 =	-269.21	(380)
Total CO2, kg/year	sum of (376)(382) =			720.27	(383)

Dwelling CO2 Emission Rate (383) ÷ (4) =				14.15	(384)
El rating (section 14)				89.94	(385)
13b. Primary Energy – Community heating scheme					
	Energy kWh/year	Primary factor		Energy Nh/year	
Energy from other sources of space and water heating ( Efficiency of heat source 1 (%)	not CHP) CHP using two fuels repeat (363) to	(366) for the second	fuel	94	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	1.22	=	4280.38	(367)
Electrical energy for heat distribution	[(313) x		=	101.25	(372)
Total Energy associated with community systems	(363)(366) + (368)(372	2)	=	4381.63	(373)
if it is negative set (373) to zero (unless specified othe	erwise, see C7 in Appendix C	;)		4381.63	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from immersion heater or	instantaneous heater(312) x	1.22	=	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =			4381.63	(376)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Energy associated with electricity for pumps and fans with	ithin dwelling (331)) x	3.07	=	542.17	(378)
Energy associated with electricity for lighting	(332))) x	3.07	=	726.8	(379)
Energy saving/generation technologies Item 1		3.07 × 0.01	=	-1592.44	(380)
Total Primary Energy, kWh/year sum	of (376)(382) =			4058.16	(383)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP	2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.9	
		P	roperty <i>i</i>	Address	: Plot 46					
Address :										
1. Overall dwelling dimer	isions:									
				a(m²)			ight(m)	1	Volume(m <sup>3</sup> )	
Ground floor				50.9	(1a) x	2	2.5	(2a) =	127.26	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)	+(1e)+(1r	n) <u></u>	50.9	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	l)+(3e)+	.(3n) =	127.26	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m <sup>3</sup> per hou	r
Number of chimneys		+ 0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0	+ 0	_ + _	0	-   -	0	x	20 =	0	(6b)
Number of intermittent fan	s	L			- L	2	x .	10 =	20	(7a)
Number of passive vents						0	x ·	10 =	0	(7b)
Number of flueless gas fire	es					0	x.	40 =	0	(7c)
i tambér ér naciece gao int						0			0	
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans	= (6a)+(6b)+(7	'a)+(7b)+(	7c) =	Γ	20		÷ (5) =	0.16	(8)
If a pressurisation test has be		tended, procee	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration Structural infiltration: 0.2	25 for stool or tim	har frama ar	0.25 for	macan	av constr	uction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are pre deducting areas of opening	esent, use the value c	orresponding to			•	uction			0	(11)
If suspended wooden flo			1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else ente	r 0							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)					0	(16)
Air permeability value, o			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabilit	-						1		0.41	(18)
Air permeability value applies Number of sides sheltered		st has been dor	ie or a deg	gree air pei	rmeability	is being u	sed		2	(19)
Shelter factor	4			(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19)
Infiltration rate incorporati	ng shelter factor			(21) = (18)	) x (20) =				0.35	(21)
Infiltration rate modified fo	r monthly wind sp	beed								
Jan Feb I	Vlar Apr M	1ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	4.9 4.4 4	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 1									
		08 0.95	0.95	0.92	1	1.08	1.12	1.18		
	I	I		I			I	<b></b>	I	

Adjust	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41			
	ate effec echanica		change i	rate for t	he appli	cable ca	se	-		-	-		-		
				ondix N (2	(26) = (22)	$) \times Emv(c)$	oquation (I	N5)) , othe	nuico (22h	) - (220)			(		(23a)
		• •	0 11		, ,	, ,	• •	,, -		) = (23a)			(	-	(23b)
			-	-	-			n Table 4h				<b>1</b> (00 -)	(	)	(23c)
			i		i	i	1	1	<u> </u>	<u> </u>	23b) × [	1 – (23c)	) ÷ 100] ]		(24a)
(24a)m=		0	0	0	0	0	0	0	0	0	Ů	0	J		(24a)
					1	· · · · · ·	<b></b>	MV) (24b	ŕ	r í	, I	<u> </u>	1		(0.41)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
,					•	•		on from c c) = (22t		5 × (23b	)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,						•		on from l 0.5 + [(2		0.5]					
(24d)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58			(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in boy	x (25)		-		-		
(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58			(25)
3 Ho	at losse	e and he	eat loss p	aramet	or:			-				-	-		
	/IENT	Gros		Openin		Net Ar	ea	U-valı	Ie	AXU		k-value	2	АХ	(k
		area		m		A ,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²·l		kJ/l	
Doors						2	x	1	=	2					(26)
Windo	ws Type	1				4.267	7 x1	/[1/( 1.4 )+	0.04] =	5.66					(27)
Windo	ws Type	2				6.097	7 x1	/[1/( 1.4 )+	0.04] =	8.08	=				(27)
Walls <sup>-</sup>	Type1	37.8	32	10.3	6	27.45	5 X	0.18		4.94	ו ד				(29)
Walls <sup>-</sup>		14.8		2	<u> </u>	12.88		0.18		2.32			$\dashv$		(29)
Roof		50.9		0		50.9		0.13		6.62			$\dashv$		(30)
	area of e			0				0.13	[	0.02	[				
				ffective wi	ndow I I-ve	103.6		n formula 1	/[/1/   _vəlu	ر (م)	ns aiven in	paragraph	132		(31)
			sides of in				aica asing	g lonnaia n	/[( // O - Valu	0)+0.04j 0	is given in	palagiapi	10.2		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	) + (32) =				29.	62	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	102	2.83	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		25		(35)
	-		ere the de tailed calcu		construct	ion are noi	t known pr	recisely the	e indicative	values of	TMP in T	able 1f			_
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						14.	.09	(36)
if details	s of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	1)									
Total f	abric he	at loss							(33) +	(36) =			43.	71	(37)
Ventila	ation hea	t loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5	)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	25.09	24.93	24.77	24.04	23.9	23.27	23.27	23.15	23.51	23.9	24.18	24.47	]		(38)
Heat ti	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	68.79	68.64	68.48	67.75	67.61	66.98	66.98	66.86	67.22	67.61	67.89	68.18			
							_			Average =	Sum(39)	12 /12=	67.	75	(39)

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.35	1.35	1.35	1.33	1.33	1.32	1.32	1.31	1.32	1.33	1.33	1.34		
Numb	er of day	ys in mo	nth (Tab	le 1a)				!	,	Average =	Sum(40)1	<sub>12</sub> /12=	1.33	(40)
Turno	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		(1 - exp	0(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		72		(42)
Reduce	the annua		hot water	usage by	5% if the c	welling is	designed	(25 x N) to achieve		se target o		.97		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	in litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					I	
(44)m=	82.47	79.47	76.47	73.47	70.47	67.47	67.47	70.47	73.47	76.47	79.47	82.47		<b>—</b>
Energy	content of	f hot water	used - cal	lculated m	onthly $= 4$ .	190 x Vd,r	m x nm x L	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		899.66	(44)
(45)m=	122.3	106.96	110.38	96.23	92.33	79.68	73.83	84.72	85.74	99.92	109.07	118.44		
lf instan	taneous v	vater heati	ng at point	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	-	1179.6	(45)
(46)m=	18.34	16.04	16.56	14.43	13.85	11.95	11.07	12.71	12.86	14.99	16.36	17.77		(46)
Water	storage	loss:	I	I	I	I	I	<u> </u>						
Storag	e volum	ne (litres)	) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	-	neating a			-			ı (47) ombi boil	ore) onto	or 'O' in (	47)			
	storage		not wate	51 (1115 11		nsianiai					47)			
a) If m	nanufact	turer's de	eclared I	oss fact	or is kno	wn (kWł	n/day):				1.	39		(48)
Tempe	erature f	actor fro	m Table	2b							0.	54		(49)
		om water	-	•				(48) x (49)	) =		0.	75		(50)
		turer's de age loss		•										(54)
		neating s				1/1110/02	ay)					0		(51)
		from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energ	/ lost fro	om water	<sup>-</sup> storage	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter	(50) or	(54) in ( <del>5</del>	55)								0.	75		(55)
Water	storage	loss cal	culated	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)
If cylind	er contain	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	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)
Primai	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
							. ,	65 × (41)						
		1		1		r		ng and a	-	1	1	1	I	<i>i</i> =
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	h month	(61)m =	(60) ÷	365 × (41	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	l for ea	ich month	(62)m =	= 0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	168.89	149.05	156.97	141.32	138.93	124.7	7 120.43	131.32	130.83	146.51	154.16	165.04		(62)
Solar DH	IW input	calculated	using Ap	pendix G o	r Appendix	H (neg	ative quantity	y) (enter 'C	)' if no sola	r contribut	ion to wate	er heating)		
(add ad	dditiona	l lines if	FGHR	S and/or	WWHRS	applie	es, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter						-					
(64)m=	168.89	149.05	156.97	141.32	138.93	124.7	7 120.43	131.32	130.83	146.51	154.16	165.04		
I				•	•		-	Out	put from w	ater heate	r (annual)₁	12	1728.22	(64)
Heat g	ains fro	m water	heating	g, kWh/m	onth 0.2	5 ´ [0.8	85 × (45)m	ı + (61)n	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m=	77.94	69.23	73.98	68.07	67.98	62.57	61.83	65.45	64.58	70.5	72.34	76.66		(65)
inclu	de (57)	n in calo	culation	of (65)m	n only if c	vlinde	is in the	dwellina	or hot w	ater is f	rom com	n munitv h	neating	
	. ,			5 and 5a		,		J					3	
Melabo	Jan	ns (Table Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.84	85.84	85.84	85.84	85.84	85.84		85.84	85.84	85.84	85.84	85.84		(66)
							or L9a), a				00.01	00.01	l	()
(67)m=	9 yans 13.41	(Calcula 11.91	9.68	7.33	5.48	4.63	5 5	6.5	8.72	11.07	12.92	13.78	1	(67)
		I									12.92	13.78	J	(07)
		, T	r —	<u> </u>	· · ·		L13 or L1	r <sup>′</sup>	1	r	1 400 4		1	(69)
(68)m=	149.58	151.13	147.22		128.38	118.5		110.35	114.26	122.59	133.1	142.98		(68)
1		<u> </u>		<u>.</u>	· · ·		5 or L15a	. <u> </u>		1	r		1	
(69)m=	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58	31.58		(69)
Pumps	and fa	ns gains	(Table	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. e\	/aporatio	on (nega	ative valu	ies) (Tab	le 5)		-						
(71)m=	-68.67	-68.67	-68.67	-68.67	-68.67	-68.6	-68.67	-68.67	-68.67	-68.67	-68.67	-68.67		(71)
Water	heating	gains (T	able 5)	1										
(72)m=	104.76	103.03	99.43	94.54	91.37	86.9	83.1	87.97	89.7	94.76	100.47	103.03		(72)
Total i	nternal	gains =				(6	6)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)	m		
(73)m=	319.49	317.82	308.08	292.52	276.98	261.7	3 251.75	256.56	264.43	280.17	298.25	311.54		(73)
6. Sol	ar gain:	s:						-	•					
Solar g	ains are o	calculated	using sol	ar flux from	Table 6a	and ass	ociated equa	ations to co	onvert to th	ne applicat	ole orientat	ion.		
Orienta		Access F		Area	ı		lux		g_		FF		Gains	
	-	Table 6d		m²		Т	able 6a	T	able 6b	Т	able 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77	;	<b>4</b> .	27	x	36.79		0.63	x	0.7	=	47.98	(79)
Southw	est <mark>0.9x</mark>	0.77	;	4.	27	x	62.67		0.63	x	0.7	=	81.73	(79)
Southw	est <mark>0.9x</mark>	0.77	;	4.	27	x	85.75		0.63	× [	0.7	=	111.83	(79)
Southw	est <mark>0.9x</mark>	0.77	;	4.	27	×	106.25		0.63		0.7	=	138.56	(79)
Southw	est <mark>0.9x</mark>	0.77	;	4.	27	×	119.01	j	0.63	× [	0.7	=	155.2	(79)

Southw	est <mark>0.9x</mark>	0.77	x	4.2	27	x	1'	18.15	]		0.63	x	0.7		=	154.07	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.2	27	x	1.	13.91	Ì		0.63	x	0.7		=	148.54	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.2	27	x	1(	04.39			0.63	x	0.7		=	136.13	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.2	27	x	9	2.85			0.63	x	0.7		=	121.08	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.2	27	x	6	9.27	]		0.63	x	0.7		=	90.33	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.2	27	x	4	4.07	]		0.63	x	0.7		=	57.47	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.2	27	x	3	31.49			0.63	×	0.7		=	41.06	(79)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	1	1.28	×		0.63	×	0.7		=	21.02	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	2	2.97	×		0.63	×	0.7		=	42.79	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	4	1.38	×		0.63	×	0.7		=	77.1	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	6	67.96	x		0.63	×	0.7		=	126.62	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	9	1.35	×		0.63	×	0.7		=	170.21	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	9	7.38	×		0.63	x	0.7		=	181.46	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	ę	91.1	×		0.63	×	0.7		=	169.75	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	7	2.63	×		0.63	×	0.7		=	135.33	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	5	60.42	×		0.63	×	0.7		=	93.95	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	2	8.07	×		0.63	×	0.7		=	52.3	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x		14.2	×		0.63	×	0.7		=	26.45	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	6.	1	x	ę	9.21	×		0.63	x	0.7		=	17.17	(81)
Solar g	ains in	watts, ca	alculated	for eac	h month	<u>۱</u>			(83)m	ו = Su	ım(74)m .	<mark>(82)</mark> m	_				
(83)m=	69	124.52	188.93	265.18	325.4		35.53	318.29	271	.46	215.03	142.6	3 83.92	58.2	23		(83)
Total g	ains – i	nternal a	ind solai	<sup>-</sup> (84)m =	= (73)m	+ (8	83)m	, watts									
(84)m=	388.5	442.34	497.01	557.7	602.38	5	97.31	570.05	528	.02	479.46	422.8	382.17	369.	77		(84)

7. Me	an inter	nal temp	erature	(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	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.98	0.94	0.83	0.66	0.5	0.56	0.8	0.96	0.99	1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)														
(87)m=	19.64	19.81	20.1	20.47	20.77	20.94	20.99	20.98	20.86	20.47	19.99	19.61		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.8	19.8	19.81	19.82	19.82	19.83	19.83	19.83	19.82	19.82	19.81	19.81		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)														
(89)m=	0.99	0.99	0.97	0.91	0.78	0.56	0.38	0.43	0.72	0.94	0.99	0.99		(89)
										• •	•	-		

# Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.03 18.27 18.68 19.21 19.70 19.82 19.82 19.72 19.22 18.54 17.99

		1	LA = Livin	g area ÷ (4	4) =	0.45	(91)

#### Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

									,				
(92)m=	18.75	18.96	19.32	19.78	20.13	20.31	20.35	20.34	20.23	19.78	19.19	18.72	(92)
			-		-								

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

(90)

(02)	40.75	40.00	40.00	40.70	00.40	00.04	00.05	00.04	00.00	40.70	40.40	40.70	l	(93)
(93)m=	18.75	18.96	19.32 uiromont	19.78	20.13	20.31	20.35	20.34	20.23	19.78	19.19	18.72		(93)
			uirement ernal ter		ro obtoir	od at at	on 11 of		o oo tho	+ Ti m_(	76)m on	d ro oolo	vulata	
			or gains	•			эрттог		0, 50 ina	t 11,111=(	70)111 an		ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	:										
(94)m=	0.99	0.98	0.96	0.91	0.79	0.61	0.43	0.49	0.75	0.94	0.98	0.99		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	384.78	434.7	478.96	507.94	478.62	362.36	247.47	257.77	360.42	395.39	375.38	366.88		(95)
Month	ly avera	age exte	ernal tem	perature	e from Ta	able 8					-	-		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m=	994.31	965.36	877.81	736.88	570.18	382.41	250.95	263.59	412.23	620.83	821.01	989.98		(97)
Space	e heating	g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
(98)m=	453.5	356.61	296.74	164.83	68.12	0	0	0	0	167.73	320.86	463.58		
L								Tota	l per year	(kWh/yeai	.) = Sum(9	8)15,912 =	2291.96	(98)
Snace	hoatin	a require	ement in	$kM/h/m^2$	2/voar								45.03	(99)
					•							l	45.05	
			nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
-	e heatir	-			, .									<b>-</b>
Fractio	on of sp	ace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$									1	(202)				
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$											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	ear
Space	heating	g require	ement (c	alculate	d above)	)								
[	453.5	356.61	296.74	164.83	68.12	0	0	0	0	167.73	320.86	463.58		
(211)m	= {[(98]	)m x (20	(4)]}x1	00 ÷ (20	)6)									(211)
]	485.02	381.4	317.37	176.29	72.85	0	0	0	0	179.39	343.16	495.81		
L								Tota	l (kWh/yea	ar) =Sum(2	L 211), 510 13	=	2451.3	(211)
Secon	haatin	a fuel (e	aaaadam		month					, , , , , , , , , , , , , , , , , , ,	/10,1012		2401.0	
•			econdar <u>)</u> 00 ÷ (20		monun									
(215)m=	0		00 ÷ (20	0)	0	0	0	0	0	0	0	0		
(210)	U	Ū	Ŭ	Ũ	Ű	Ŭ	Ŭ		l (kWh/yea	-	-		0	(215)
								1014		) –Cum(1			0	(213)
Water	-	•	tor (oolo	م امدم ما										
	168.89	ater nea 149.05	ter (calc 156.97	141.32	138.93	124.77	120.43	131.32	130.83	146.51	154.16	165.04		
Efficien		ater hea		141.52	100.00	124.77	120.40	101.02	100.00	140.01	104.10	100.04	70.0	(216)
г	-			05.00		70.0	70.0	70.0	70.0	05.40	00.70	07.40	79.8	
(217)m=	87.32	87.06	86.49	85.23	83.03	79.8	79.8	79.8	79.8	85.18	86.73	87.42		(217)
		•	kWh/mo											
(219)m (219)m=		171.2	) ÷ (217) 181.5	165.82	167.32	156.35	150.91	164.56	163.94	172.01	177.75	188.78		
()													2053.58	(219)
$Total = Sum(219a)_{112} =$														
Annual totals kWh/year Space heating fuel used, main system 1										<b>kWh/yea</b> 2451.3	<u>'</u>			
			,	.,									2101.0	

Water heating fuel used				2053.58	]
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue		(230e)			
Total electricity for the above, kWh/year		75	(231)		
Electricity for lighting		236.74	(232)		
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	ctor	<b>Emissions</b> kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	529.48	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	443.57	(264)
Space and water heating	(261) + (262) + (263) + (264) =			973.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	122.87	(268)
Total CO2, kg/year	sum	of (265)(271) =		1134.85	(272)

TER =

(273)

22.29