				User D	etails:						
Assessor Name: Software Name:	Stroma FS	SAP 201			Strom Softwa Address	are Ver	sion:	v	Versio	n: 1.0.4.14	
Address :			F .	iopenty /	Audress	. Flat 0-t		X			
1. Overall dwelling dim	ensions:										
				Area	a(m²)		Av. Hei	ight(m)		Volume(m ³)	
Basement					• •	(1a) x		.25	(2a) =	169	(3a)
Ground floor						(1b) x	3	.15	(2b) =	129.15	(3b)
Total floor area TFA = (*	1a)+(1b)+(1c)+	-(1d)+(1e)+(1n	ı)	93	(4)			. .		-
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	298.15	(5)
2. Ventilation rate:											-
	main heating		econdar eating	у	other		total			m ³ per hour	
Number of chimneys		_ + ר	0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	 +	0	<u> </u> + [0	- =	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans					- L	3	x ^	10 =	30	(7a)
Number of passive vent	s					Ē	0	x ^	10 =	0	(7b)
Number of flueless gas	fires						0	X 4	40 =	0	(7c)
									Air ch	anges per hou	ır
Infiltration due to chimne							30		÷ (5) =	0.1	(8)
If a pressurisation test has Number of storeys in t			d, proceed	d to (17), d	otherwise of	continue fr	om (9) to ((16)		0	(9)
Additional infiltration	the dw <mark>ennig</mark> (i	3)						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: (0.25 for steel o	or timber f	rame or	0.35 fo	r masoni	ry constr	uction			0	(11)
if both types of wall are			oonding to	the great	er wall are	a (after					J , , ,
deducting areas of open If suspended wooden	- · ·		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ei			,	,	,,					0	(13)
Percentage of window	vs and doors d	raught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)		· · · ·			0	(16)
Air permeability value				•		•	etre of e	nvelope	area	5	(17)
If based on air permeab	•						ia haina w	and		0.35	(18)
Air permeability value appli Number of sides shelter		ion lest has	been don	e or a deg	jree all pe	meability	is being us	seu		0	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			1	(20)
Infiltration rate incorpora	ating shelter fa	ctor			(21) = (18) x (20) =				0.35	(21)
Infiltration rate modified	for monthly wi	nd speed									-
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Tab	le 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 F	Factor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltr	ation rat	e (allowi	ng for sl	nelter an	nd wind s	speed) =	: (21a) x	(22a)m		-			
	0.45	0.44	0.43	0.39	0.38	0.33	0.33	0.32	0.35	0.38	0.39	0.41		
		<i>ctive air</i> al ventila	change .	rate for t	he appli	cable ca	ise				-	 Г		
				andix N (2	23h) - (23a	a) v Emv (d	acuation (N5)) , othe	rwise (23t	(23a)		L	0	(23a)
								n Table 4h		<i>)</i> = (200)		L	0	(23b)
			-	-	-					2h)m + ('23h) v [L 1 – (23c)	0	(23c)
(24a)m=									0			1 - (230)	÷ 100]	(24a)
	balance				without	heat rec		MV) (24t	I	I	23b)			. ,
(24b)m=		0		0	0	0		0	0	0	0	0		(24b)
c) If	whole h	use ex	tract ver	ntilation of	ı or positiv	/e input v	ı ventilatio	on from (Jutside		<u> </u>	1]		
,					•			-c) = (22l		.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,						•		on from 0.5 + [(2		0.5]				
(24d) <mark>m=</mark>	<u> </u>	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.58		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24) or (24	c) or (24	ld) in bo	(25)			<u> </u>		
(25)m=	0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.58		(25)
3 He	at losse	s and he	eat loss	naramet	er.									
	IENT	Gros		Openir		Net Ar	ea	U-val	ue	AXU		k-value		AXk
		area			1 ²	A ,r	m²	W/m2		(W/		kJ/m²∙K	ζ Γ	kJ/K
Doo <mark>rs</mark>						1.8	x	1	=	1.8				(26)
Windo	ws Type	e 1				4.63	х1	/[1/(1.4)+	0.04] =	6.14				(27)
Windo	ws Type	2				7.77	x1	/[1/(1.4)+	0.04] =	10.3				(27)
Windo	ws Type	93				5.67	x1	/[1/(1.4)+	0.04] =	7.52				(27)
Windo	ws Type	94				3.38	x1	/[1/(1.4)+	0.04] =	4.48				(27)
Floor						52	x	0.13	=	6.76				(28)
Walls	Type1	42.2	25	12.4	ţ	29.85	5 X	0.18	=	5.37			7 F	(29)
Walls [·]	Type2	37.	8	9.05	5	28.75	5 X	0.18	=	5.18	= i		ĪĒ	(29)
Walls	Туре3	17.5	55	1.8		15.75	5 X	0.18	=	2.83	= i		- - -	(29)
Walls	Type4	10.	4	0		10.4	x	0.18	=	1.87			- - -	(29)
Total a	area of e	lements	s, m²			160					'			(31)
			ows, use e sides of ir				lated using	g formula 1	1/[(1/U-vali	ıe)+0.04] a	as given in	paragraph	3.2	
			= S (A x					(26)(30) + (32) =			Г	52.2	5 (33)
		Cm = S(•						((28).	(30) + (32	2) + (32a)	(32e) =	15234	

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Indicative Value: Medium

(35)

250

Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						6.78	(36)
		al bridging	are not kn	own (36) =	= 0.15 x (3	1)								_
	abric he									(36) =			59.03	(37)
Ventila		at loss ca							. ,		(25)m x (5)		1	
(20)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	59.03	58.64	58.27	56.51	56.18	54.65	54.65	54.37	55.24	56.18	56.85	57.54		(38)
		coefficier							. ,	= (37) + (·		1	
(39)m=	118.06	117.67	117.3	115.54	115.21	113.68	113.68	113.4	114.27	115.21	115.88	116.57		
Heat lo	oss para	meter (H	ILP), W/	′m²K		-				4verage = = (39)m ÷	: Sum(39)₁. - (4)	12 /12=	115.54	(39)
(40)m=	1.27	1.27	1.26	1.24	1.24	1.22	1.22	1.22	1.23	1.24	1.25	1.25		
Numbe	er of dav	/s in mor	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	1.24	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
											<u> </u>		1	
4. Wa	iter heat	ting ener	gy requi	rement:								kWh/y	ear:	
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)														(40)
				[1 - exp	(-0.0003	49 x (TF	A -13.9)2)] + 0.0)013 x (TF <mark>A -13</mark>		66		(42)
	A £ 13.9													
								(25 x N) to achieve		se target o		.48		(43)
		litres pe <mark>r p</mark>				-	-			Ũ				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach m <mark>onth</mark>	Vd,m = fa	ctor from T	Table 1c x	(43)					'	
(44)m=	107.23	103.33	99.43	95. <mark>5</mark> 3	91.64	87.74	87.74	91.64	95.53	9 <mark>9.43</mark>	103.33	107.23		
_											m(44) ₁₁₂ =		1169.81	(44)
		hot water			onthly $= 4$.						ables 1b, 1 1		1	
(45)m=	159.02	139.08	143.52	125.12	120.06	103.6	96	110.17	111.48	129.92	141.82	154.01		
lf instan	taneous w	ater heatir	ng at point	of use (no	hot water	^r storage),	enter 0 in	boxes (46,		l otal = Su	m(45) ₁₁₂ =	=	1533.81	(45)
(46)m=	23.85	20.86	21.53	18.77	18.01	15.54	14.4	16.52	16.72	19.49	21.27	23.1]	(46)
Water	storage	loss:						I						
Storag	e volum	e (litres)	includir	ig any so	plar or W	/WHRS	storage	within sa	ame ves	sel		150]	(47)
	•	eating a			-			. ,	`	(0) :				
	vise it no storage		hot wate	er (this in	ICIUDES I	nstantar	ieous co	mbi boil	ers) ente	er '0' in ((47)			
	-	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				0.	24	1	(48)
		actor fro				X X	, , , ,					54]	(49)
		m water			ear			(48) x (49)	=			13]	(50)
		urer's de	-			or is not								()
		age loss			e 2 (kW	h/litre/da	ıy)					0]	(51)
		leating s from Tal		on 4.3								0	1	(52)
		actor fro		2b								0 0		(52)
•													1	

•••		om water (54) in (5	-	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			. ,
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
	er contain	s dedicate	l d solar sto	rage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5 ⁻	7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
		i	·	·	· · · · · ·	· · · · · ·	ter heatir	-	· ·	i	<u>,</u>	1	I	(70)
(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 each	month	(61)m =	(60) ÷ 30	65 × (41))m		-	-			
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	186.28	163.7	170.78	151.51	147.32	129.98	123.26	137.43	137.86	157.18	168.2	181.27		(62)
							ve quantity			r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)	r	r		I	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea											I	
(64)m=	186.28	163.7	170.78	151.51	147.32	129.98	123.26	137.43	137.86	157.18	168.2	181.27		
									out from wa				1854.77	(64)
Heat g	ains fro	m water	heating	kWh/m	onth 0.2	5 [0.85	× (45)m	+ (61)m	1] + 0.8 x	(<mark>(46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	74.68	65.94	69.53	62.71	61.73	55.55	53.73	58.44	58.17	65.01	68.26	73.01		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	is (Table		ts	-					i	- 			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		()
		133.23			133.23			133.23		133.23	133.23	133.23		(66)
0	<u> </u>	È	· · · ·	·	· ·	· · · · · · · · · · · · · · · · · · ·	r L9a), a			i	i		I	()
(67)m=	21.8	19.36	15.74	11.92	8.91	7.52	8.13	10.56	14.18	18	21.01	22.4		(67)
••		r È	r	· · ·	· · ·	r	13 or L1	, .	-	1		1	I	()
(68)m=	244.49	247.03	240.63	227.02	209.84	193.69	182.91	180.37	186.76	200.37	217.55	233.7		(68)
Cookir	<u> </u>	<u>`</u>	· · · · · ·	· ·	· · ·	· · · · · ·	or L15a)						1	
(69)m=	36.32	36.32	36.32	36.32	36.32	36.32	36.32	36.32	36.32	36.32	36.32	36.32		(69)
Pumps	and fa	ns gains	(Table	5a)	i	i								
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatic	on (nega	tive valu	es) (Tab	ole 5)	-					-	L	
(71)m=	-106.58	-106.58	-106.58	-106.58	-106.58	-106.58	-106.58	-106.58	-106.58	-106.58	-106.58	-106.58		(71)
Water		gains (T	able 5)											
(72)m=	100.38	98.13	93.45	87.1	82.97	77.16	72.22	78.55	80.79	87.37	94.8	98.14		(72)
Total i	nternal	gains =				(66)	m + (67)m	1 + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	432.64	430.48	415.8	392.01	367.69	344.34	329.22	335.45	347.71	371.72	399.34	420.21		(73)
6. So	lar gains	S:												

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

Orientation:	Access Factor Table 6d	·	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	4.63	x	11.28	×	0.63	x	0.7	=	15.97	(75)
Northeast 0.9x	0.77	x	3.38	x	11.28	x	0.63	x	0.7	=	11.65	(75)
Northeast 0.9x	0.77	x	4.63	x	22.97	×	0.63	x	0.7	=	32.5	(75)
Northeast 0.9x	0.77	x	3.38	x	22.97	x	0.63	x	0.7	=	23.72	(75)
Northeast 0.9x	0.77	x	4.63	x	41.38	x	0.63	x	0.7	=	58.55	(75)
Northeast 0.9x	0.77	x	3.38	x	41.38	×	0.63	x	0.7	=	42.74	(75)
Northeast 0.9x	0.77	x	4.63	x	67.96	x	0.63	x	0.7	=	96.16	(75)
Northeast 0.9x	0.77	x	3.38	x	67.96	×	0.63	x	0.7	=	70.2	(75)
Northeast 0.9x	0.77	x	4.63	x	91.35	x	0.63	x	0.7	=	129.25	(75)
Northeast 0.9x	0.77	x	3.38	x	91.35	x	0.63	x	0.7	=	94.36	(75)
Northeast 0.9x	0.77	x	4.63	x	97.38	x	0.63	x	0.7	=	137.8	(75)
Northeast 0.9x	0.77	x	3.38	x	97.38	×	0.63	x	0.7	=	100.6	(75)
Northeast 0.9x	0.77	x	4.63	x	91.1	x	0.63	x	0.7	=	128.91	(75)
Northeast 0.9x	0.77	x	3.38	x	91.1	×	0.63	x	0.7	=	94.1	(75)
Northeast 0.9x	0.77	x	4.63	x	72.63	×	0.63	x	0.7	=	102.77	(75)
Northeast 0.9x	0.77	x	3.38	×	72.63	x	0.63	х	0.7	=	75.02	(75)
Northeast 0.9x	0.77	x	4.63	x	50.42	x	0.63	x	0.7	-	71.34	(75)
Northeast 0.9x	0.77	x	3.38	х	50.42	×	0.63	x	0.7	=	52.08	(75)
Northeast 0.9x	0.77	x	4.63	x	28.07	x	0.63	x	0.7	=	39.71	(75)
Northeast 0.9x	0.77	x	3.38	x	28.07	x	0.63	x	0.7	=	28.99	(75)
Northeast 0.9x	0.77	x	4.63	x	14.2	×	0.63	x	0.7	=	20.09	(75)
Northeast 0.9x	0.77	x	3.38	x	14.2	x	0.63	x	0.7	=	14.66	(75)
Northeast 0.9x	0.77	x	4.63	x	9.21	×	0.63	x	0.7	=	13.04	(75)
Northeast 0.9x	0.77	x	3.38	x	9.21	×	0.63	x	0.7	=	9.52	(75)
Northwest 0.9x	••••	x	7.77	x	11.28	×	0.63	x	0.7	=	26.79	(81)
Northwest 0.9x	0.77	x	5.67	x	11.28	×	0.63	x	0.7	=	19.55	(81)
Northwest 0.9x	0.77	x	7.77	x	22.97	x	0.63	x	0.7	=	54.54	(81)
Northwest 0.9x		x	5.67	x	22.97	×	0.63	x	0.7	=	39.8	(81)
Northwest 0.9x	0.77	x	7.77	x	41.38	×	0.63	x	0.7	=	98.26	(81)
Northwest 0.9x	0.77	x	5.67	x	41.38	×	0.63	x	0.7	=	71.7	(81)
Northwest 0.9x		x	7.77	x	67.96	×	0.63	x	0.7	=	161.37	(81)
Northwest 0.9x	0.77	x	5.67	x	67.96	×	0.63	x	0.7	=	117.76	(81)
Northwest 0.9x	_	x	7.77	x	91.35	x	0.63	x	0.7	=	216.91	(81)
Northwest 0.9x	0.77	x	5.67	x	91.35	×	0.63	x	0.7	=	158.29	(81)
Northwest 0.9x	0.77	x	7.77	x	97.38	x	0.63	x	0.7	=	231.25	(81)
Northwest 0.9x	••••	x	5.67	x	97.38	x	0.63	x	0.7	=	168.75	(81)
Northwest 0.9x		x	7.77	x	91.1	×	0.63	x	0.7	=	216.33	(81)
Northwest 0.9x		x	5.67	x	91.1	×	0.63	x	0.7	=	157.86	(81)
Northwest 0.9x	0.77	x	7.77	x	72.63	x	0.63	x	0.7	=	172.46	(81)

N I a with the set					г			1 I							
Northwest 0.9x		×	5.6	67	×L	72	2.63	X		0.63		0.7	=	125.85	(81)
Northwest 0.9x		x	7.7	77	×L	50	0.42	X		0.63		0.7	=	119.73	(81)
Northwest 0.9x	•	×	5.6	67	×	50	0.42	x		0.63	_ × _	0.7	=	87.37	(81)
Northwest 0.9x		×	7.7	77	×	28	8.07	x		0.63	×	0.7	=	66.65	(81)
Northwest 0.9x	0.77	×	5.6	67	×	28	8.07	x		0.63	×	0.7	=	48.64	(81)
Northwest 0.9x	0.77	×	7.7	77	×	1	4.2	x		0.63	×	0.7	=	33.71	(81)
Northwest 0.9x	0.77	×	5.6	67	×	1	4.2	x		0.63	x	0.7	=	24.6	(81)
Northwest 0.9x	0.77	′ ×	7.7	77	×	9).21	x		0.63	x	0.7	=	21.88	(81)
Northwest 0.9x	0.77	×	5.6	67	×	9).21	x		0.63	x	0.7	=	15.97	(81)
Solar gains i	n watts, c	alculated	for eac	h month	-			(83)m	i = Sui	m(74)m .	(82)m			•	
(83)m= 73.96	150.56	271.25	445.48	598.81	63	8.39	597.2	476	5.1	330.53	183.99	93.07	60.4		(83)
Total gains –	internal a	and solai	r (84)m =	= (73)m	+ (8	33)m ,	watts	i						•	
(84)m= 506.6	581.04	687.05	837.48	966.5	98	32.74	926.43	811.	.55	678.23	555.71	492.41	480.61		(84)
7. Mean inte	ernal tem	perature	(heating	season)										
Temperatur	e during l	heating p	eriods in	n the livi	ng a	area f	rom Tab	ole 9,	Th1	(°C)				21	(85)
Utilisation fa	actor for g	ains for	living are	ea, h1,m	ı (se	e Tal	ble 9a)								
Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.96	0.87	0	.69	0.53	0.6	51	0.88	0.99	1	1		(86)
Me <mark>an int</mark> ern	al tempe	rature in	living ar	ea T1 (fo	ollov	w ster	as 3 to 7	, 7 in T	able	9c)					
(87)m= 19.55		19.99	20.41	20.77	1	0.95	20. <mark>9</mark> 9	20.9	<u> </u>	20.81	20.35	19.89	1 <mark>9.53</mark>		(87)
Temperatur		hooting r	L orioda ir	root of	duv		from To	hla (1	
(88)m= 19.86		19.87	19.89	19.89	1	9.9	19.9	19.		19.9	19.89	19.88	19.88	1	(88)
			L		<u> </u>					10.0	10.00	10.00	10.00	1	(00)
Utilisation fa		1	i	<u> </u>	1	<u> </u>		r Ó						1	(00)
(89)m= 1	1	0.99	0.95	0.82	0	.59	0.4	0.4	8	0.82	0.98	1	1	J	(89)
Mean intern	al tempe	rature in	the rest	of dwell	ing ⁻	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c)			•	
(90)m= 17.94	18.16	18.58	19.19	19.66	19	9.87	19.9	19.8	89	19.74	19.12	18.44	17.92		(90)
										f	LA = Livi	ng area ÷ (4) =	0.35	(91)
Mean intern	al tempe	rature (fo	or the wh	ole dwe	lling	g) = fL	.A × T1	+ (1 ·	– fLA	A) × T2					
(92)m= 18.51	18.7	19.08	19.63	20.05	20	0.25	20.28	20.2	28	20.12	19.56	18.96	18.49		(92)
Apply adjus	tment to t	the mear	interna	l temper	atur	re froi	m Table	4e, v	wher	e appro	priate			_	
<mark>(93)</mark> m= 18.51	18.7	19.08	19.63	20.05	20	0.25	20.28	20.2	28	20.12	19.56	18.96	18.49		(93)
8. Space he	ating req	uirement													
Set Ti to the			•		ned	at ste	ep 11 of	Tabl	e 9b,	, so tha	t Ti,m=	(76)m an	d re-calo	culate	
the utilisatio		T	<u> </u>	1	1	. 1		<u> </u>	- 1		Q (1		1	
Jan		Mar Mar	Apr	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	J	
Utilisation fa	0.99	1		0.82		62	0.45	0.5	2	0.92	0.07	0.00	1	1	(94)
(94)m= 1 Useful gains		0.98	0.94	0.82		.62	0.45	0.5		0.83	0.97	0.99	1	1	(-+)
(95)m= 505.24		, VV = (94	789.84	796.4	61	0.55	413.68	428.	.82	564.55	541.66	489.9	479.61	1	(95)
Monthly ave								L		301.00	011.00	1.00.0		1	()
(96)m= 4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.	.4	14.1	10.6	7.1	4.2]	(96)
Heat loss ra		I										<u>I</u>	<u> </u>	1	
	5 1624.25	1	1239.33	962.56	1	2.31	418.86	439	ŕ	687.84	1032.22	1373.87	1666.27]	(97)
		I	I	I	<u>ا</u>			I				1	I	1	

						En	ergy			Emiss	ion fac	tor	Emissions	5
12a. (CO2 em	issions ·	– Individ	lual heat	ing syste	ems inclu	uding mi	cro-CHP						
Electric	ity for li	ighting											384.93	(232)
Total e	lectricity	y for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
boiler	with a f	an-assis	sted flue									45		(230e)
		ig pump										30		(230c)
		•		electric	keep-ho	t								
	-	fuel use											2178.68	
-	•			system	1								4814.46	_
	l totals									k\	Wh/year	r	kWh/yea	-
-								Tota	I = Sum(2	19a) ₁₁₂ =			2178.68	(219)
	= (64)	m x 100 185.47			174.65	162.89	154.47	172.21	172.76	180.69	191.06	204.87		
(217)m=		88.26 heating,	87.87	86.79	84.35	79.8	79.8	79.8	79.8	86.99	88.03	88.48		(217)
r		ater hea	ı — — — — — — — — — — — — — — — — — — —										79.8	(216)
	186.28		170.78	151.51	147.32	129.98	123.26	137.43	137.86	15 <mark>7.18</mark>	168.2	181.27		_
	heating from w	ater hea		ulated a										
(213)11-	0					0				ar) =Sum(2	-		0	(215)
		g fuel (s 01)] } x 1 0		ry), kWh/ 08) 0	/month	0	0	0	0	0	0	0		
				1		I		Tota	l I (kWh/yea	l ar) =Sum(2		=	4814.46	(211)
(211)m	= {[(90 932.83)III X (20 752.01	635.96	100 ÷ (20 346.13	132.22	0	0	0	0	390.35	680.71	944.25	1	(211)
(211)m						0	0	0	0	304.90	030.40	002.07		(011)
Space	e heatin 872.2	g require 703.13	ement (0 594.63	calculate 323.64	d above 123.62) 0	0	0	0	364.98	636.46	882.87	l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g systen	n, %						0	(208)
Efficie	ency of r	main spa	ace heat	ting syste	em 1								93.5	(206)
Fraction	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Fracti	on of sp	ace hea	at from n	nain syst	tem(s)			(202) = 1 -	- (201) =				1	(202)
Space	e heatir	ng:		econdar		-	Ĩ						0	(201)
9a. Ene	erav rec	uiremer	nts – Ind	lividual h	eating s	vstems i	ncluding	micro-C	CHP)]
Space	e heatin	g require	ement in	n kWh/m²	²/year								48.4	 (99)
(50)11-	072.2	700.10	004.00	020.04	120.02	0	0		-	(kWh/year			4501.52	(98)
Space (98)m=	872.2	g require 703.13	594.63	323.64	123.62		n = 0.02	$\frac{24 \times [(97)]}{0}$)m – (95 0	364.98	636.46	882.87	1	

Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m

kWh/year

Emission factor kg CO2/kWh Emissions kg CO2/year

(211) x	0.216	=	1039.92	(261)
(215) x	0.519	=	0	(263)
(219) x	0.216	=	470.6	(264)
(261) + (262) + (263) + (264) =			1510.52	(265)
(231) x	0.519	=	38.93	(267)
(232) x	0.519	=	199.78	(268)
sum	of (265)(271) =		1749.22	(272)
	(215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	$\begin{array}{c} (215) \times \\ (219) \times \\ (261) + (262) + (263) + (264) = \\ (231) \times \\ (202) \times \\ (202) \times \\ \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

TER =

18.81 (273)



			User D	etails:										
Assessor Name: Software Name:	Stroma FS	-		Strom Softwa	are Ver	sion:		Versio	n: 1.0.4.14					
		F	Property A	Address:	Flat 3-0)1								
Address :														
1. Overall dwelling dim	iensions:		-	(0)										
Ground floor			Area	a(m²)	(1 -)		ight(m)		Volume(m ³)	-				
					(1a) x	3	.15	(2a) =	160.65	(3a)				
Total floor area TFA = (1a)+(1b)+(1c)+	(1d)+(1e)+(1	n)	51	(4)					_				
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	160.65	(5)				
2. Ventilation rate:	-	-												
	main heating	seconda heating	ry	other		total			m ³ per hour					
Number of chimneys	0	+ 0	+	0] = [0	X 4	40 =	0	(6a)				
Number of open flues	0	+ 0	+	0] = [0	x	20 =	0	(6b)				
Number of intermittent	fans				- F	2	×	10 =	20	(7a)				
Number of passive vent	ts					0	x '	10 =	0	(7b)				
Number of flueless gas	fires				Ē	0	X	40 =	0	(7c)				
								÷ (5) =	0.12	(8)				
Number of storeys in			.u to (11), c			0111 (0) 10 (10)		0	(9)				
Additional infiltration							[(9)	-1]x0.1 =	0	(10)				
Structural infiltration:	0.25 for steel o	timber frame o	r 0.35 for	r masonr	y constr	uction			0	(11)				
if both types of wall are deducting areas of oper			o the great	er wall are	a (after									
If suspended wooder			.1 (seale	ed), else	enter 0				0	(12)				
lf no draught lobby, e	nter 0.05, else	enter 0							0	(13)				
Percentage of window	ws and doors dr	aught stripped							0	(14)				
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)				
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)				
Air permeability value			•	•	•	etre of e	envelope	area	5	(17)				
If based on air permeat	-								0.37	(18)				
Air permeability value app		on test has been do	ne or a deg	gree air pei	rmeability	is being u	sed							
Number of sides shelter Shelter factor	reu			(20) = 1 -	[0.075 x (1	9)] =			0	(19) (20)				
Infiltration rate incorpora	ating shelter fac	tor		(21) = (18)					0.37	(20)				
Infiltration rate modified	-								0.07					
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind s	speed from Tabl	e 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						
		I						ļ	I					

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				_		
<i>.</i>	0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.37	0.4	0.42	0.44			
		<i>ctive air</i> al ventila	•	rate for t	he appli	cable ca	se								(220)
				endix N (2	3b) = (23a	a) × Fmv (e	equation (N	(5)) other	wise (23h) = (23a)			0		(23a)
						or in-use fa) (200)			0		(23b)
			-	-	-					2h)m i (22h) v [1 (22a)	0		(23c)
a) II (24a)m=								אר) (24a	$0^{m} = (22)^{m}$	$\frac{20}{10} + \frac{10}{10}$	230) × [1 – (23c) 0] - 100j		(24a)
		_	÷	÷	-		-	÷	-	÷	ů	0	J		(244)
	· · · · · · · · · · · · · · · · · · ·					heat rec		0 (240	0 m = (22)	20)m + (2 0	, I		1		(24b)
(24b)m=				-	-			-	-	0	0	0	J		(240)
,					•	ve input v o); otherv				5 v (23h					
(24c)m=	· ,		0) = (20L 0		0	0 = (220)	0		,, 0	0	1		(24c)
				-	-		-	-	-	0	0	Ů	J		()
,					•	ve input v erwise (2				0.5]					
(24d)m=	<u> </u>	0.61	0.61	0.58	, 0.58	0.56	0.56	0.56	, 0.57	0.58	0.59	0.6]		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t) or (240	c) or (24	d) in box	(25)			1	1		
(25)m=	0.61	0.61	0.61	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(25)
												-	1		
				paramete											
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²·l		A X I kJ/K	
Doo <mark>rs</mark>						1.8	x	1	=	1.8					(26)
Win <mark>do</mark> v	ws Type	e 1				5.21	x1/	/[1/(1.4)+	0.04] =	6.91					(27)
Windo	ws Type	e 2				2.8	x1/	/[1/(1.4)+	0.04] =	3.71	Fi i				(27)
Windo	ws Type	e 3				2.94	 	/[1/(1.4)+	0.04] =	3.9	5				(27)
Walls ⁻	Type1	52.9	9	10.9	5	41.95	5 X	0.18		7.55					(29)
Walls ⁻		4.7		1.8		2.93		0.18		0.53			4 2		(29)
Roof							x						\dashv		
	roa of c	elements		0		83		0.13		10.79					(30)
				foctivo wi	ndowlly	140.6		formula 1	/[/1/] volu	(a) = 0.041 c	n aivon in	paragraph			(31)
				nternal wal			aleu using	ionnula 1,	/[(1/ 0- valu	ie)+0.04j a	is given in	paragrapi	13.2		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				35.	19	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	892	2.6	(34)
Therm	al mass	parame	ter (TMF	² = Cm ÷	- TFA) ir	ר kJ/m²K			Indica	tive Value	: Medium		25	0	(35)
For desi	ign assess	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f			
		ad of a de													
	-	•			• •	pendix ł	<						5.7	7	(36)
			are not kn	own (36) =	= 0.15 x (3	1)			(00)	(00)					
	abric he			1						(36) =	0.5) (5)		40.8	38	(37)
ventila		1	i	monthly				•		$= 0.33 \times ($	1	1	1		
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			(29)
(38)m=	32.55	32.32	32.09	31.01	30.8	29.86	29.86	29.69	30.22	30.8	31.21	31.64	J		(38)
		coefficier	· · · · · · · · · · · · · · · · · · ·							= (37) + (3	-		1		
(39)m=	73.43	73.2	72.97	71.89	71.68	70.74	70.74	70.57	71.11	71.68	72.09	72.52			(a -)
										Average =	Sum(39)1	12 /12=	71.8	38	(39)

Heat lo	oss para	ımeter (H	HLP). W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.44	1.44	1.43	1.41	1.41	1.39	1.39	1.38	1.39	1.41	1.41	1.42		
			I					1	,	Average =	Sum(40)1	₁₂ /12=	1.41	(40)
NUMDE		/s in mo	<u> </u>	r í	Max	lun	1.1	A	Con	Oat	Nev	Dee	l	
(11)m-	Jan	Feb 28	Mar	Apr 30	May	Jun 30	Jul 31	Aug	Sep 30	Oct 31	Nov	Dec 21		(41)
(41)m=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF. if TF.	A > 13. A £ 13.	9, N = 1	+ 1.76 x)2)] + 0.0		TFA -13		72		(42)
Reduce	the annua	al average	hot water		5% if the c	lwelling is	designed	(25 x N) to achieve		se target o		.04		(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 T	Table 1c x	: (43)					I	
(44)m=	82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		-
Energy o	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		900.48	(44)
(45)m=	122.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	10 <mark>0.01</mark>	109.17	118.55		_
lf instant	aneous v	vater heati	ng at poin	t of use (no	o hot wate	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	-	1180.67	(45)
(46)m=	18.36	16.06	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(46)
· · ·	storage		10.07	14.40	13.00	11.50	11.00	12.12	12.01	10	10.07	11.10		()
Storage	e volum	e (litres)	includir	ng any se	olar or V	/WHRS	storage	within sa	a <mark>me ve</mark> s	sel		150		(47)
	-	-		ank in dw	-									
	vise it no storage		hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/dav):				0	24		(48)
		actor fro				,	,					54		(49)
				e, kWh/ye	ear			(48) x (49) =			13		(50)
,				cylinder							L			
		-		rom Tabl	le 2 (kW	h/litre/da	ay)					0		(51)
		eating s from Ta		on 4.3								0	l	(52)
		actor fro		2b								0		(52)
				e, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54)
•••		(54) in (5	-	,, y					, , , ,	,		13		(55)
Water	storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m				
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
	er contain	s dedicate	l d solar sto	l orage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	i0), else (5	1 7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	• 3			•				0		(58)
Primar	y circuit	loss cal	culated	for each	month (. ,	65 × (41)		r than a				
(moc (59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	ng and a 23.26	22.51	23.26	stat) 22.51	23.26		(59)
(53)11=	20.20	21.01	20.20	22.01	20.20	22.01	20.20	23.20	22.01	23.20	22.01	20.20		(00)

Combi	loss ca	alculated	for eac	h 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 rec	uired for	water h	neating c	alculated	l fo	r each	n month	(62)m =	0.85 × ((45)m	+ (46)m +	(57)m +	- · (59)m + (61)m	
(62)m=	149.67	131.68	137.74	122.7	119.68	10	06.13	101.16	112.06	112.19	127.2	7 135.55	145.81		(62)
Solar DI	-IW input	calculated	using Ap	pendix G o	or Appendix	: H (negativ	e quantity	v) (enter '0	' if no sola	r contrib	oution to wate	er heating)		
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	ap	plies,	see Ap	pendix (G)				-	
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	from v	vater hea	ter		_						-			_	
(64)m=	149.67	131.68	137.74	122.7	119.68	10	06.13	101.16	112.06	112.19	127.2	7 135.55	145.81		-
									Outp	out from w	ater hea	ter (annual)	12	1501.63	(64)
Heat g	ains fro	om water	heating	g, kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)ı	m + (57)m	+ (59)m	<u>]</u>]	
(65)m=	62.51	55.3	58.54	53.13	52.54	4	7.62	46.38	50	49.64	55.06	5 57.4	61.23		(65)
inclu	ide (57)m in calo	culation	of (65)n	n only if c	ylir	nder is	s in the c	dwelling	or hot w	ater is	from com	munity ł	neating	
5. Int	ternal g	ains (see	Table	5 and 5a	a):										
Metab	olic gai	ns (Table	e 5), Wa	itts										_	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	8	5.98	85.98	85.98	85.98	8 <mark>5.98</mark>	8 85.98	85.98		(66)
Ligh <mark>tin</mark>	<mark>g g</mark> ains	(calcula	ted in A		L, equat	ion	L9 or	[.] L9a), a	lso see	Table 5					
(67)m=	1 <mark>3.38</mark>	11.88	9.66	7.31	5.47	4	4.62	4.99	6.48	8.7	11.05	5 12.9	13.75		(67)
App <mark>lia</mark>	nces ga	ains (ca <mark>lc</mark>	ulated i	n Appen	dix L, eq	uat	ion L1	13 o <mark>r L1</mark> :	3a), also	<mark>se</mark> e Ta	ble <mark>5</mark>				
(68)m=	149.83	151.39	147.47	139.13	128.6	1	18.7	112.09	110.54	114.45	122.8	133.32	143.22		(68)
Cookir	ng gains	s (calcula	ted in A	Appendix	L, equat	tion	1 L15 (or L15a)	, also se	e Table	5				
(69)m=	31.6	31.6	31.6	31.6	31.6	3	31.6	31.6	31.6	31.6	31.6	31.6	31.6		(69)
Pumps	and fa	ins gains	(Table	5a)								-		-	
(70)m=	3	3	3	3	3		3	3	3	3	3	3	3]	(70)
Losses	s e.g. e	vaporatic	n (nega	ative valu	ues) (Tab	le :	5)			•	•		-	-	
(71)m=	-68.78	-68.78	-68.78	-68.78	-68.78	-6	68.78	-68.78	-68.78	-68.78	-68.7	8 -68.78	-68.78]	(71)
Water	heating	, g gains (T	able 5)		•	•						•	•	-	
(72)m=	84.02	82.28	78.69	73.79	70.61	6	6.14	62.34	67.21	68.94	74.01	79.73	82.29]	(72)
Total i	nterna	I gains =					(66)	m + (67)m	+ (68)m -	⊦ (69)m +	(70)m +	(71)m + (72))m	-	
(73)m=	299.02	297.34	287.61	272.03	256.47	24	41.25	231.21	236.02	243.89	259.6	4 277.74	291.05]	(73)
6. So	lar gain	IS:		•											
Solar g	ains are	calculated	using sol	ar flux fron	n Table 6a	and	associ	ated equa	tions to co	onvert to th	ne applio	able orientat	tion.		
Orienta		Access F Table 6d		Area m²	a		Flu: Tab	x ble 6a	Т	g_ able 6b		FF Table 6c		Gains (W)	
Southe	ast <mark>0.9x</mark>	0.77	,	5.	21	x	3	6.79	x	0.63	x	0.7	=	58.58	(77)
Southe	ast <mark>0.9x</mark>	0.77	,	< 5.	21	x	6	2.67	x	0.63	×	0.7	=	99.79	(77)
Southe	ast <mark>0.9x</mark>	0.77	,		21	x		5.75	x	0.63	×	0.7	=	136.54	(77)
Southe	ast <mark>0.9x</mark>	0.77		< 5.	21	x	10	06.25	x	0.63	×	0.7	=	169.18](77)
Southe	ast <mark>0.9x</mark>	0.77	,	5 .	21	x	11	19.01	x	0.63	×	0.7	=	189.49	(77)

					-					_				_
Southeast 0.9x	0.77	x	5.2	1	×	1	18.15	x	0.63	x	0.7	=	188.12	(77)
Southeast 0.9x	0.77	x	5.2	1	x	1	13.91	x	0.63	x	0.7	=	181.37	(77)
Southeast 0.9x	0.77	x	5.2	!1	×	1	04.39	x	0.63	x	0.7	=	166.22	(77)
Southeast 0.9x	0.77	X	5.2	!1	×	ç	92.85	x	0.63	x	0.7	=	147.84	(77)
Southeast 0.9x	0.77	x	5.2	1	x	6	9.27	x	0.63	x	0.7	=	110.29	(77)
Southeast 0.9x	0.77	x	5.2	!1	×	4	4.07	x	0.63	x	0.7	=	70.17	(77)
Southeast 0.9x	0.77	x	5.2	!1	× [3	31.49	x	0.63	x	0.7	=	50.14	(77)
Southwest _{0.9x}	0.77	x	2.8	3	× [3	86.79]	0.63	x	0.7	=	31.49	(79)
Southwest _{0.9x}	0.77	x	2.9	4	x	3	86.79		0.63	x	0.7	=	33.06	(79)
Southwest0.9x	0.77	x	2.8	3	×	6	62.67]	0.63	x	0.7	=	53.63	(79)
Southwest _{0.9x}	0.77	x	2.9	4	×	6	62.67]	0.63	x	0.7	=	56.31	(79)
Southwest _{0.9x}	0.77	x	2.8	3	×	8	35.75		0.63	x	0.7	=	73.38	(79)
Southwest _{0.9x}	0.77	x	2.9	4	× [8	35.75]	0.63	x	0.7	=	77.05	(79)
Southwest _{0.9x}	0.77	x	2.8	3	x [1	06.25]	0.63	x	0.7	=	90.92	(79)
Southwest _{0.9x}	0.77	x	2.9	94	× [1	06.25		0.63	x	0.7	=	95.47	(79)
Southwest _{0.9x}	0.77	x	2.8	3	×	1	19.01]	0.63	x	0.7	=	101.84	(79)
Southwest _{0.9x}	0.77	x	2.9	4	×	1	19.01	1	0.63	x	0.7	=	106.93	(79)
Sout <mark>hwest</mark> 0.9x	0.77	x	2.8	3	×	1	18.15		0.63	x	0.7	=	101.1	(79)
Sout <mark>hwest</mark> 0.9x	0.77	×	2.9	4	x	1	18.15	1	0.63	x	0.7		106.16	(79)
Sout <mark>hwest</mark> 0.9x	0.77	×	2.8	3	x	1	13.91		0.63	x	0.7	=	97.47	(79)
Sout <mark>hwest</mark> 0.9x	0.77	×	2.9	4	×	1	13.91	1	0.63	x	0.7	=	102.35	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77	x	2.8	3	×	1	04.39	Ī	0.63	x	0.7	=	89.33	(79)
Sout <mark>hwest</mark> 0.9x	0.77	×	2.9	4	×	1	04.39	1	0.63	x	0.7	=	93.8	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77	x	2.8	3	×	ç	2.85	1	0.63	x	0.7	=	79.45	(79)
Southwest <mark>0.9x</mark>	0.77	x	2.9	94	×		2.85	1	0.63	x	0.7	=	83.43	(79)
Southwest _{0.9x}	0.77	x	2.8	3	×	6	9.27	1	0.63	x	0.7	=	59.27	(79)
Southwest _{0.9x}	0.77	x	2.9	4	×	6	9.27	1	0.63	x	0.7	=	62.24	(79)
Southwest _{0.9x}	0.77	x	2.8	3	×	4	4.07	1	0.63	x	0.7	=	37.71	(79)
Southwest _{0.9x}	0.77	x	2.9	4	×	4	4.07	1	0.63	x	0.7	=	39.6	(79)
Southwest0.9x	0.77	x	2.8	3	×	3	31.49	1	0.63	x	0.7	=	26.94	(79)
Southwest _{0.9x}	0.77	x	2.9	4	×	3	31.49	1	0.63	x	0.7	=	28.29	(79)
					-			•						
Solar <u>g</u> ains in	watts, ca	lculated	for eac	n montl	<u>า</u>		-	(83)m	i = Sum(74)m	(82)m			_	
(83)m= 123.13		286.97	355.57	398.26		95.38	381.19	349	.34 310.73	231.8	147.48	105.37		(83)
Total gains –			(84)m =	· ,	<u>,</u>	33)m	, watts						1	
(84)m= 422.15	507.08	574.58	627.59	654.74	63	36.64	612.4	585	.36 554.62	491.4	5 425.22	396.43		(84)
7. Mean inte	rnal temp	erature	(heating	seaso	n)									
Temperature	during h	eating p	eriods ir	n the liv	ing a	area	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for ga	ains for I	iving are	ea, h1,r	n (se	ee Ta	ble 9a)					-		_
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	0.98	0.96	0.92	0.82	0).66	0.49	0.5	63 0.76	0.94	0.99	0.99	J	(86)
Mean interna	al tempera	ature in	living are	ea T1 (†	follo	w ste	ps 3 to 7	7 in T	able 9c)					
Mean interna (87)m= 19.59	al tempera 19.81	ature in 20.12	living are 20.48	ea T1 († 20.77	-	w ste 0.94	ps 3 to 7 20.99	7 in T 20.9		20.5	19.98	19.55]	(87)

Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)						
(88)m=	19.73	19.74	19.74	19.76	19.76	19.77	19.77	19.78	19.77	19.76	19.75	19.75			(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)							
(89)m=	0.99	0.98	0.95	0.89	0.76	0.55	0.36	0.4	0.67	0.91	0.98	0.99			(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=	17.9	18.22	18.66	19.18	19.55	19.73	19.77	19.77	19.68	19.22	18.48	17.86			(90)
									f	LA = Livin	g area ÷ (4	4) =	0.6	I	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2						-
(92)m=	18.93	19.19	19.55	19.97	20.29	20.47	20.51	20.5	, 20.41	20	19.39	18.89			(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate					
(93)m=	18.93	19.19	19.55	19.97	20.29	20.47	20.51	20.5	20.41	20	19.39	18.89			(93)
8. Sp	ace hea	ting requ	uirement	t											
				mperatui using Ta		ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate		
the ut	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisa			ains, hm	· ·	iviay	Juli	501	Aug	Oep	001	INOV	Dec			
(94)m=	0.99	0.98	0.95	0.89	0.79	0.61	0.44	0.48	0.72	0.91	0.98	0.99			(94)
Us <mark>efu</mark>	l gains,	hmGm	, W = (9	4)m x (84	4)m										
(95)m=	417.11	494.53	545.69	560.52	514.25	<mark>38</mark> 9.83	271.58	282.61	397.87	449.13	415.42	392.7			(95)
Mo <mark>nt</mark> ł	nly avera	age exte	ernal terr	perature	e from Ta	able 8		7							
(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	los <mark>s rate</mark>	e for me	an interr	nal tempe	erature,	Lm , W =	=[(39)m :	x [(93)m·	– (96)m]					
(97)m=		1045.84		795.88	615.8	414.95	276.47	289.65	448.52	673.48	885.85	1065.3			(97)
				<mark>or eac</mark> h n			1	_ ,							
(98)m=	488.74	370.48	302.31	169.46	75.55	0	0	0	0	166.92	338.71	500.42			1
								Tota	l per year	(kWh/year) = Sum(98	8)15,912 =	2412	58	(98)
Space	e heatin	g require	ement in	kWh/m ²	²/year								47.3	1	(99)
9a. En	ergy rec	luiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)						
-	e heatir	-													-
				econdar		mentary	system						0		(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1		(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 – ((203)] =			1		(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								93.	5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0		(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kV	Vh/yea	_ Ir
Space	e heatin	g require	ement (c	alculate	d above))								-	
	488.74	370.48	302.31	169.46	75.55	0	0	0	0	166.92	338.71	500.42			
(211)m	n = {[(98)m x (20	94)] } x 1	00 ÷ (20)6)										(211)
	522.72	396.23	323.32	181.24	80.81	0	0	0	0	178.52	362.25	535.21			
				•				Tota	l (kWh/yea	ar) =Sum(2	2 11) _{15,1012}	=	2580	.3	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month										-
)1)]}x 1	00 ÷ (20)8)											
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0			-
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0		(215)

Water heating

Mater Heating								
Output from water heater (calculated above)				-		-		
149.67 131.68 137.74 122.7 119.68 10	06.13 101.16	112.06	112.19	127.27	135.55	145.81		
Efficiency of water heater							79.8	(216
(217)m= 87.74 87.43 86.85 85.68 83.63 7	79.8 79.8	79.8	79.8	85.54	87.16	87.84		(217)
Fuel for water heating, kWh/month								
(219)m = (64)m x 100 ÷ (217)m							1	
(219)m= 170.58 150.62 158.58 143.21 143.11	133 126.77	140.43	140.59	148.78	155.52	165.99		-
		Tota	l = Sum(2	19a) ₁₁₂ =			1777.18	(219)
Annual totals				k	Wh/yea	r	kWh/year	-
Space heating fuel used, main system 1							2580.3	
Water heating fuel used							1777.18	
Electricity for pumps, fans and electric keep-hot								-
central heating pump:						30		(230
boiler with a fan-assisted flue						45		(230)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231
Electricity for lighting							236.22	(232
12a. CO2 emissions - Individual heating systems	s including mi	cro-CHP						
	_			_				
	Energy				ion fac	tor	Em <mark>issio</mark> ns	
	kWh/year			kg CO	2/KVVN		kg CO2/yea	ar —
Space heating (main system 1)	(211) x			0.2	16	=	5 <mark>57.34</mark>	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	383.87	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				941.22	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267
Electricity for lighting	(232) x			0.5	19	=	122.6	(268
Total CO2, kg/year			sum o	f (265)(2	271) =		1102.74	(272
							[-

TER =

(273)

21.62

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa				Versic	n: 1.0.4.14	
		Pi	roperty A	Address:	Flat 3-0)3				
Address :										
1. Overall dwelling dime	nsions:		•	(2)			·		Malanaadaad	
Ground floor				a(m²)	(10) ×	Av. He	• • •	(2a) =	Volume(m ³	
	-) . (4 -) . (4 -) . (4 -) . (4 -				(1a) x	3	.08	(2a) =	221.4	(3a)
Total floor area $TFA = (1a)$	a)+(1D)+(1C)+(1d)+(1e	e)+(1n)	72	(4) (32)+(3b)	1+(3c)+(3d	l)+(3e)+	(3n) -		
Dwelling volume					(00)1(00)	11(00)1(00	i) (() () ()	.(01) =	221.4	(5)
2. Ventilation rate:	main se	econdar	M	other		total			m ³ per hou	r
		neating	у —	other		ioiai				
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	าร					3	x ′	10 =	30	(7a)
Number of passive vents						0	х ′	10 =	0	(7b)
Number of flueless gas fi	res				Γ	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimney						30		÷ (5) =	0.14	(8)
If a pressurisation test has be		ed, proceed	d to (17), c	otherwise c	ontinue fro	om (9) to ((16)			–
Number of storeys in the Additional infiltration	ie dwelling (ns)						[(0)]	-1]x0.1 =	0	(9)
Structural infiltration: 0.	25 for steel or timber	frame or	0.35 for	masonr	v constr	uction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are pr	resent, use the value corres				•	uotion			0	
deducting areas of openin If suspended wooden fl		led) or 0	1 (seale	d) else	enter 0				0	(12)
If no draught lobby, ent			1 (00010	u), 0100					0	(12)
Percentage of windows		ripped							0	(14)
Window infiltration	Ũ			0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cub	oic metre	s per ho	ur per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	•								0.39	(18)
Air permeability value applies		s been don	e or a deg	iree air pei	meability i	is being u	sed			-
Number of sides sheltere Shelter factor	a			(20) = 1 - [0.075 x (1	9)] =			0	(19) (20)
Infiltration rate incorporati	ing shelter factor			(21) = (18)		-/1			0.39	(20)
Infiltration rate modified for	-	4		x / x -/					0.39	
· · · · · · · ·	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	· _ ·	11								
r r	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		<u> </u>					1	1	I	
Wind Factor $(22a)m = (22)$ (22a)m 1.27 1.25	2)m ÷ 4 1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
(22a)m= 1.27 1.25	1.23 1.1 1.00	0.90	0.90	0.92	I	1.00	1.12	1.10		

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-			_	
<u> </u>	0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.39	0.41	0.43	0.45		
		<i>ctive air</i> al ventila	•	rate for t	ne appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	√5)), othei	rwise (23b) = (23a)			0	(23b)
			• • •	iency in %	, ,	, ,				, , ,			0	(23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	m = (2)	2b)m + (23b) x [[,]	1 – (23c)		(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	coverv (N	//V) (24b)m = (22	1 2b)m + (;	1 23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If	whole h	iouse ex	tract ver	tilation o	or positiv	ve input v	ventilatio	n from c	outside				1	
,				hen (24a	•	•				5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous		•								
1	, <i>,</i>	I	<u>, , ,</u>	m = (22t	<i>.</i>	<u> </u>	, 		,		1	1	1	
(24d)m=		0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6	J	(24d)
1			·	nter (24a		r i	, <u>,</u>	, 1	· ,	0.50	0.50		1	(25)
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	oaramete	er:									
ELEN	1ENT	Gros		Openin m		Net Ar		U-valı W/m2		A X U (W/I		k-value		A X k kJ/K
Doors		area	(111-)		F-	A ,n		1		`		KJ/11-•1	\mathbf{x}	
	ws Type	. 1				1.8		/[1/(1.4)+	=	1.8	8			(26)
						4.65				6.16	H			(27)
	ws Type					1.34		/[1/(1.4)+		1.78	L.			(27)
	ws Type -					7.94		/[1/(1.4)+	L L	10.53	\exists			(27)
	ws Type	94 				2.27	x1/	/[1/(1.4)+	0.04] =	3.01	╡,			(27)
Walls 7		63.3	32	16.2	2	47.12	<u>x</u>	0.18	= [8.48			\exists	(29)
Walls 7		4.7		1.8		2.93	X	0.18	=	0.53				(29)
Total a	rea of e	elements	, m²			68.05	5							(31)
				effective wi Internal wall			ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
		ss, W/K :			o una pun			(26)(30)	+ (32) =				32.29) (33)
		Cm = S(- /					((28)	(30) + (32	2) + (32a).	(32e) =	9157.	
			,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K				tive Value			250	(35)
		•		tails of the				ecisely the	indicative	values of	TMP in Ta	able 1f		(' '
		ad of a de												
	-		,	culated u	• •		<						4.84	(36)
	of therma abric he		are not kr	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			07.44	(27)
			alculator	d monthly							(25)m x (5)		37.13	3 (37)
ventila	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	= 0.33 x (25)m x (5) Nov	Dec	1	
(38)m=	45.36	45.01	44.68	43.1	42.8	41.43	41.43	41.18	41.96	42.8	43.4	44.03		(38)
					.2.0								I	()
Heat tr (39)m=	82.49	coefficier 82.14	1t, VV/K 81.81	80.23	79.94	78.56	78.56	78.31	(39)m 79.09	= (37) + (3 79.94	80.53	81.16	1	
(00)11-	02.40			00.20		. 0.00	. 0.00	. 0.01			Sum(39)1		80.23	3 (39)

Heat lo	ss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.15	1.14	1.14	1.11	1.11	1.09	1.09	1.09	1.1	1.11	1.12	1.13		
Lumbo	r of dou		ı						,	Average =	Sum(40)1	12 /12=	1.11	(40)
	Jan	Feb	nth (Tab Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m=	31	28	31	30	31	30	31	31 Aug	30	31	30	31		(41)
(,	01]	(,
4. Wa	ter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		([1 - exp	o(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		29]	(42)
Reduce	the annua	al average	hot water	ge in litre usage by r day (all w	5% if the c	welling is	designed		+ 36 a water us	se target c		.68]	(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate		n litres pei I	r day for ea	ach month	Vd,m = fa			 I	1	1		r	1	
(44)m=	97.54	94	90.45	86.9	83.35	79.81	79.81	83.35	86.9	90.45	94	97.54	4004.4	
Ener <mark>gy c</mark>	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1064.1	(44)
(45)m=	144.65	126.51	130.55	113.82	109.21	94.24	87.33	100.21	101.41	118.18	129	140.09		_
lf instant	aneous v	vater heati	ng at point	t of use (no	o hot wate	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1395.2	(45)
(46)m=	21.7	18.98	19.58	17.07	16.38	14.14	13.1	15.03	15.21	17.73	19.35	21.01		(46)
Water s														
Storage	e volum	e (litres)	includir	ng any s	olar or V	WHRS	storage	within sa	a <mark>me ve</mark> s	sel		150		(47)
	-	-		ank in dw	-					(-1)				
Otherw Water			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
	-		eclared I	loss fact	or is kno	wn (kWł	n/dav):				0	24	1	(48)
			m Table				, ,) / .					54		(49)
				e, kWh/y	ear			(48) x (49) =			13		(50)
•••			-	cylinder		or is not	known:		, 				l	()
		-		rom Tab	le 2 (kW	h/litre/da	ay)					0		(51)
	-	ieating s from Ta	see secti	on 4.3								•	1	(50)
			om Table	2b								0		(52) (53)
				e, kWh/y	ear			(47) x (51) x (52) x (53) =		0]	(54)
0.		(54) in (•	,, y				() (0	, ~ (0_) ~ (,		13		(55)
	. ,	. , .		for each	month			((56)m = (55) × (41)	m		-	1	
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
			-								H11) is fro] lix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primary	v circuit	loss (ar	nual) fr	om Table	<u> </u>						·	0		(58)
-		•		for each		59)m = ((58) ÷ 36	65 × (41)	m		L		I	. /
(mod	lified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	, cylinde	r thermo	ostat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	:h m	nonth (61)m =	(60	D) ÷ 36	65 × (41))m								
(61)m=	0	0	0	Τ	0	0		0	0	0	0	(0	0	0			(61)
Total h	neat red	uired for	water	hea	ting ca	alculated	d fo	or each	n month	(62)m	= 0.85 ×	(45)r	m +	(46)m +	(57)r	m +	(59)m + (61)m	
(62)m=	171.91	151.14	157.81	Ţ.	140.2	136.47	1	20.62	114.59	127.4	7 127.79	145	5.44	155.38	167.	.35		(62)
Solar DI	HW input	calculated	using Ap	pen	dix G or	Appendix	ĸН	(negativ	e quantity	/) (enter	'0' if no sol	ar con	tribut	tion to wate	er heat	ting)		
(add a	ddition	al lines if	FGHR	S ar	nd/or V	VWHRS	S ap	oplies,	see Ap	pendix	(G)				-			
(63)m=	0	0	0		0	0		0	0	0	0	(0	0	0		I	(63)
Output	t from v	vater hea	ter				_							_				
(64)m=	171.91	151.14	157.81		140.2	136.47	1	20.62	114.59	127.4	7 127.79	145	5.44	155.38	167.	.35		-
										0	utput from v	vater h	neate	er (annual)₁	12		1716.17	(64)
Heat g	ains fro	om water	heating	g, k'	Wh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m] + 0.8	x [(46	6)m	+ (57)m	+ (59	9)m]	
(65)m=	69.91	61.76	65.22	;	58.95	58.12	5	52.44	50.84	55.13	54.82	61	1.1	64	68.3	39	l	(65)
inclu	ude (57)m in calo	culatior	n of	(65)m	only if c	yliı	nder is	s in the c	dwellin	g or hot v	water	is f	rom com	muni	ty h	eating	
5. In	ternal g	jains (see	e Table	5 a	ind 5a)):												
Metab	olic gai	ns (Table	e 5), Wa	atts								_		-	-			
	Jan	Feb	Mar		Apr	May		Jun	Jul	Auç	g Sep	C	Oct	Nov	D	ес		
(66)m=	114.68	114.68	114.68	3 1	114.68	114.68	1	14.68	114.68	114.6	8 114.68	114	1.68	114.68	114.	.68		(66)
Ligh <mark>tin</mark>	ig gains	s (calcula	ted in A	App	endix l	_, equat	ion	L9 or	[.] L9a), a	lso se	e Table 5				_			
(67)m=	18	15.99	13		9.84	7.36		6.21	6.71	8.72	11.71	14	.87	17.35	18.	.5		(67)
App <mark>lia</mark>	nces ga	ains (ca <mark>lc</mark>	ulated	in A	Append	lix L, eq	ua	tion L'	13 o <mark>r L1</mark> :	3a), al	so see Ta	able 5	5					
(68)m=	201.92	204.01	19 <mark>8.73</mark>	3 1	187 <mark>.49</mark>	173.3	1	59.97	151.06	148.9	6 154.24	165	5.48	179.67	193.	.01		(68)
Coo <mark>kir</mark>	ng gain	s (calcula	ted in A	App	endix	L, equa	tior	n L15	or L15a)	, also	see Tabl	e 5						
(69)m=	34.47	34.47	34.47	:	34. <mark>4</mark> 7	34.47	3	34.47	34.47	34.47	34.47	34	.47	34.47	34.4	47		(69)
Pumps	s and fa	ans gains	(Table	5a))													
(70)m=	3	3	3		3	3		3	3	3	3	;	3	3	3			(70)
Losse	s e.g. e	vaporatio	on (neg	ativ	e valu	es) (Tab	ble	5)		_								
(71)m=	-91.75	-91.75	-91.75	-	-91.75	-91.75	-!	91.75	-91.75	-91.7	5 -91.75	-91	.75	-91.75	-91.	75		(71)
Water	heating	g gains (1	able 5)	-			-										
(72)m=	93.96	91.91	87.66	1	81.87	78.12	7	72.83	68.34	74.1	76.14	82	.13	88.89	91.9	92		(72)
Total i	interna	l gains =						(66)	m + (67)m	ı + (68)r	n + (69)m +	(70)m	n + (7	71)m + (72)	m			
(73)m=	374.28	372.32	359.8	3	339.62	319.19	2	99.42	286.52	292.1	9 302.5	322	2.89	346.32	363.	.83		(73)
6. So	lar gair	ns:	-												•			
Solar ç	gains are	calculated	using so	lar flu	ux from	Table 6a	and	l associ	ated equa	tions to	convert to t	he app	olical	ble orientat	ion.			
Orient	ation:	Access F			Area			Flu			g_ Table Ch		т	FF			Gains	
		Table 6d		_	m²				ole 6a		Table 6b)	ı 	able 6c			(W)	-
	ast <mark>0.9x</mark>	0.77		×L	7.9	4	x	1	1.28	×	0.63		×L	0.7		=	27.38	(75)
	ast <mark>0.9x</mark>	0.77		×	7.9	4	x	2	2.97	x	0.63		× [0.7		=	55.73	(75)
	ast <mark>0.9x</mark>	0.77		×	7.9	4	x	4	1.38	×	0.63		×	0.7		=	100.41	(75)
	ast <mark>0.9x</mark>	0.77		×	7.9	4	x	6	7.96	x	0.63	:	×	0.7		=	164.9	(75)
Northe	ast <mark>0.9x</mark>	0.77		×	7.9	4	x	9	1.35	x	0.63	:	×	0.7		=	221.66	(75)

Northeast 0.9x	0.77	x	7.94	x	97.38	×	0.63	x	0.7	=	236.31	(75)
Northeast 0.9x	0.77	×	7.94	x	91.1	×	0.63	x	0.7	=	221.06	(75)
Northeast 0.9x	0.77	x	7.94	x	72.63	x	0.63	x	0.7	=	176.23	(75)
Northeast 0.9x	0.77	x	7.94	x	50.42	×	0.63	x	0.7	=	122.35	(75)
Northeast 0.9x	0.77	×	7.94	x	28.07	×	0.63	x	0.7	=	68.11	(75)
Northeast 0.9x	0.77	x	7.94	x	14.2	x	0.63	x	0.7	=	34.45	(75)
Northeast 0.9x	0.77	×	7.94	x	9.21	x	0.63	x	0.7	=	22.36	(75)
Southwest _{0.9x}	0.77	×	4.65	x	36.79	j	0.63	x	0.7	=	52.29	(79)
Southwest _{0.9x}	0.77	x	4.65	x	62.67		0.63	x	0.7	=	89.07	(79)
Southwest _{0.9x}	0.77	×	4.65	x	85.75		0.63	x	0.7	=	121.86	(79)
Southwest _{0.9x}	0.77	×	4.65	x	106.25		0.63	x	0.7	=	150.99	(79)
Southwest _{0.9x}	0.77	x	4.65	x	119.01		0.63	x	0.7	=	169.13	(79)
Southwest _{0.9x}	0.77	x	4.65	x	118.15		0.63	x	0.7	=	167.9	(79)
Southwest _{0.9x}	0.77	×	4.65	x	113.91		0.63	x	0.7	=	161.88	(79)
Southwest _{0.9x}	0.77	×	4.65	x	104.39		0.63	x	0.7	=	148.35	(79)
Southwest _{0.9x}	0.77	×	4.65	x	92.85]	0.63	x	0.7	=	131.95	(79)
Southwest _{0.9x}	0.77	x	4.65	x	69.27		0.63	x	0.7	=	98.44	(79)
Southwest0.9x	0.77	x	4.65	×	44.07		0.63	x	0.7	=	62.63	(79)
Southwest _{0.9x}	0.77	x	4.65	x	31.49		0.63	×	0.7	=	44.75	(79)
Northwest 0.9x	0.77	×	1.34	x	11.28	×	0.63	×	0.7	=	4.62	(81)
Northwest 0.9x	0.77	×	2.27	x	11.28	x	0.63	×	0.7	=	7.83	(81)
Northwest 0.9x	0.77	x	1.34	x	22.97	х	0.63	×	0.7	=	9.41	(81)
Northwest 0.9x	0.77	×	2.27	x	22.97	×	0.63	x	0.7	=	15.93	(81)
Northwest 0.9x	0.77	x	1.34	x	41.38	×	0.63	x	0.7	=	16.95	(81)
Northwest 0.9x	0.77	x	2.27	x	41.38	x	0.63	x	0.7	=	28.71	(81)
Northwest 0.9x	0.77	×	1.34	x	67.96	×	0.63	x	0.7	=	27.83	(81)
Northwest 0.9x	0.77	×	2.27	x	67.96	×	0.63	x	0.7	=	47.14	(81)
Northwest 0.9x	0.77	×	1.34	x	91.35	×	0.63	x	0.7	=	37.41	(81)
Northwest 0.9x	0.77	×	2.27	x	91.35	×	0.63	x	0.7	=	63.37	(81)
Northwest 0.9x	0.77	×	1.34	x	97.38	×	0.63	x	0.7	=	39.88	(81)
Northwest 0.9x	0.77	×	2.27	x	97.38	X	0.63	x	0.7	=	67.56	(81)
Northwest 0.9x	0.77	×	1.34	x	91.1	×	0.63	x	0.7	=	37.31	(81)
Northwest 0.9x	0.77	×	2.27	X	91.1	X	0.63	x	0.7	=	63.2	(81)
Northwest 0.9x	0.77	x	1.34	x	72.63	X	0.63	x	0.7	=	29.74	(81)
Northwest 0.9x	0.77	×	2.27	X	72.63	X	0.63	x	0.7	=	50.38	(81)
Northwest 0.9x	0.77	×	1.34	X	50.42	X	0.63	x	0.7	=	20.65	(81)
Northwest 0.9x	0.77	×	2.27	x	50.42	×	0.63	x	0.7	=	34.98	(81)
Northwest 0.9x	0.77	×	1.34	X	28.07	×	0.63	x	0.7	=	11.49	(81)
Northwest 0.9x	0.77	×	2.27	X	28.07	×	0.63	x	0.7	=	19.47	(81)
Northwest 0.9x	0.77	×	1.34	X	14.2	X	0.63	x	0.7	=	5.81	(81)
Northwest 0.9x	0.77	x	2.27	x	14.2	X	0.63	x	0.7	=	9.85	(81)

Northw						г			· —						(r_1)
Northw	L	0.77	×	1.3		×		9.21		0.63		0.7	=	3.77	(81)
Northw	est <mark>0.9x</mark>	0.77	X	2.2	27	x	ę	9.21	x	0.63	x	0.7	=	6.39	(81)
<u>.</u>											()				
Solar ((83)m=	92.11	watts, ca 170.13	alculated 267.92	1 for eac 390.87	h month 491.56	1	11.65	483.45	(83)m = S 404.71	um(74)m . 309.93	<mark>(82)m</mark> 197.51	112.74	77.27		(83)
		nternal a							404.71	309.93	197.51	112.74	11.21		(00)
(84)m=	466.4	542.45	627.72	730.48	810.75	т`	11.07	769.96	696.9	612.43	520.39	459.06	441.1		(84)
		I		I	I		11.07	105.50	000.0	012.40	020.00	400.00	++1.1		(01)
		nal temp		, , , , , , , , , , , , , , , , , , ,		<i>´</i>									
		during h	• •			-			ole 9, Th	1 (°C)				21	(85)
Utilisa		tor for g		<u> </u>		T Ì		, ,					_	l	
	Jan	Feb	Mar	Apr	May	-	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(2.2)
(86)m=	1	0.99	0.98	0.93	0.8		0.6	0.45	0.51	0.79	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.81	19.98	20.25	20.62	20.87	2	0.98	21	20.99	20.92	20.57	20.13	19.79		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dw	elling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.96	19.97	19.97	19.99	19.99	2	0.01	20.01	20.01	20	19.99	19.99	19.98		(88)
l Itilis:	ation fac	tor for g	ains for	rest of d	welling	h2	m (se	e Table	9a)						
(89)m=	1	0.99	0.97	0.91	0.74	1).52	0.35	0.4	0.71	0.95	0.99	1		(89)
		1 temper 18.63			01 dwell	<u> </u>	<u> </u>		<u>i – – – – – – – – – – – – – – – – – – –</u>	7 in Tabl 19.94	e 9 <mark>c)</mark> 19.5	10.07	10.07		(90)
(90)m=	18.38	18.63	19.03	19.55	19.88		9.99	20.01	20.01			18.87 g area ÷ (4	18.37	0.50	
												ig alea ÷ (-	+) -	0.52	(91)
Me <mark>an</mark>		l temper													
(92)m=	19.12	19.33	19.67	20.11	20.39		20.5	20.52	20.52	20.44	20.05	19.52	19.1		(92)
	<u> </u>	1	i	1	· · ·	1		i	1	ere appro	r <u> </u>	1			(22)
(93)m=	19.12	19.33	19.67	20.11	20.39	2	20.5	20.52	20.52	20.44	20.05	19.52	19.1		(93)
		ting requ			• . •						/	>			
		mean int factor fo		•		ned	at ste	ep 11 of	I able 9	b, so tha	t II,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Γ	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	L	tor for g			inay		ourr	Uui	7.009	000	000	1107	200		
(94)m=	1	0.99	0.97	0.91	0.77).56	0.4	0.46	0.75	0.95	0.99	1		(94)
Usefu	ul gains,	hmGm ,	, W = (9	4)m x (8-	4)m			1	1		1	1			
(95)m=	464.15	536.75	610.14	665.36	622.04	45	52.91	306.39	319.44	456.64	494.2	454.48	439.48		(95)
Montl	hly aver	age exte	rnal tem	perature	e from T	able	ə 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al temp	erature,	Lm	, W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1222.54	1185.05	1077.01	898.99	694.96	46	63.85	307.91	322.48	501.82	755.53	1000.29	1209.56		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	564.24	435.65	347.35	168.21	54.25		0	0	0	0	194.43	392.98	572.94		
									Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	2730.06	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year									37.92	(99)
9a. En	erav rec	quiremer	nts – Ind	ividual h	eating s	vste	ems i	ncluding	micro-C	CHP)					
	e heatir					<i></i>	1								
•		bace hea	at from s	econdar	y/supple	eme	entary	system						0	(201)
	•							-						<u> </u>	1

Fracti	on of sp	bace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatir	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space		g require	,	r		· · · · · ·						1	1	
	564.24	435.65	347.35	168.21	54.25	0	0	0	0	194.43	392.98	572.94		
(211)m 	i = {[(98 603.47	6)m x (20 465.94	4)]	00 ÷ (20 179.9	6) 58.02	0	0	0	0	207.94	420.3	612.77	1	(211)
l	603.47	400.94	371.5	179.9	56.02	0	0	-	-	ar) =Sum(2			2919.85	(211)
= {[(98))m x (20	ig fuel (se 01)] } x 1	00 ÷ (20)8)										
(215)m=	0	0	0	0	0	0	0	0 Tota	0	0 ar) =Sum(2	0	0	0	(215)
Wator	heating	7						Tota	i (ittili yot		- 1 0 / 15,1012	2	0	(213)
		ater heat	ter (calc	ulated al	oove)					-	-		_	
-	171.91	151.14	157.81	140.2	136.47	120.62	114.59	127.47	127.79	145.44	155.38	167.35		_
		ater hea											79.8	(216)
(217)m=		87.48	86.86	85.3	82.58	79.8	79.8	79.8	79.8	85.59	87.19	87.84		(217)
		heating, m x 100												
(219) <mark>m=</mark>		172.77	181.68	164.36	165.26	151.15	143.59	159.74	160.13	169.93	178.22	190.52		
								Tota	l = Sum(2	19a) ₁₁₂ =			2033.27	(219)
	l totals		d main	avetam	1					k	Wh/year	•	kWh/year	
		fuel use		system	'								2919.85	4
		fuel use											2033.27	
		oumps, fa		electric	keep-ho	t								
centra	al heatir	ng pump:										30		(230c)
boiler	with a	fan-assis	ted flue									45		(230e)
Total e	lectricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electric	city for I	ighting											317.86	(232)
12a. (CO2 err	nissions -	– Individ	ual heati	ng syste	ems inclu	uding mi	cro-CHP	1					
							ergy /h/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space	heating) (main s	ystem 1)		(211	l) x			0.2	16	=	630.69	(261)
Space	heating	(second	dary)			(215	5) x			0.5	19	=	0	(263)
Water I	heating					(219	9) x			0.2	16	=	439.19	(264)
Space	and wa	ter heati	ng			(261	I) + (262)	+ (263) + (264) =				1069.87	(265)
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t (231	I) x			0.5	19	=	38.93	(267)
Electric	city for I	ighting				(232	2) x			0.5	19	=	164.97	(268)
										-				

Total CO2, kg/year sum of (265)...(271) = 1273.77 (272) TER = 17.69 (273)



				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012			Strom Softwa	are Ver	sion:		Versio	n: 1.0.4.14	
			P	roperty .	Address	Flat 4-0)6 Duple	X			
Address :											
1. Overall dwelling dime	ensions:			A	- (A 11a) / o lumo o (mo 2)	
Ground floor				Area	a (m²)	(1a) x	Av. He	.85	(2a) =	219.45	(3a)
]	219.40	1
First floor					56	(1b) x	2	.75	(2b) =	154	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+((1d)+(1e)	+(1r	ו)	133	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	373.45	(5)
2. Ventilation rate:											_
	main		condar	У	other		total			m ³ per hour	
Number of chimneys	heating	+ [eating 0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	 +	0		0	」 <u>「</u>] = [0	x 2	20 =	0] (6b)
Number of intermittent fa	ins						4	x 1	10 =	40](7a)
Number of passive vents							0	x 1	10 =	0	(7b)
Number of flueless gas fi							0	x 4	40 =	0	(7c)
						L	0			ange <mark>s per</mark> hou	J
Infiltration due to chimne	ys, flu <mark>es an</mark> d fa	ans = (6a)+(6b)+(7	<mark>a)+</mark> (7b)+(7c) =		40	- ·	÷ (5) =	0.11	(8)
If a pressurisation test has b	been ca <mark>rried o</mark> ut or	r is intended	d, procee	d to (17), o	otherwise o	continue fro	om (9) to ((16)			J
Number of storeys in the store of store of the store of t	he dw <mark>elling</mark> (na	6)								0	(9)
Additional infiltration								[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0							uction			0	(11)
if both types of wall are p deducting areas of openii			onaing to	the great	er wall are	a (atter					
If suspended wooden f	floor, enter 0.2	(unseale	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else e	enter 0								0	(13)
Percentage of windows	s and doors dr	aught str	ipped							0	(14)
Window infiltration					0.25 - [0.2		-			0	(15)
Infiltration rate					(8) + (10)					0	(16)
Air permeability value,	• •			•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabil	-						:			0.36	(18)
Air permeability value applie Number of sides sheltere		on test nas	been aon	ie or a deg	gree air pe	rmeability	is being us	sea		0	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			1	(20)
Infiltration rate incorporat	ting shelter fac	tor			(21) = (18) x (20) =				0.36	(21)
Infiltration rate modified f	-										J -
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tabl	e 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 F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltra	ation rat	e (allow	ing for sł	nelter an	nd wind s	peed) =	(21a) x	(22a)m	-				
	0.46	0.45	0.44	0.39	0.38	0.34	0.34	0.33	0.36	0.38	0.4	0.42		
	<i>ate effec</i> echanica		-	rate for t	he appli	cable ca	se	•	-	-		ـــــــــــــــــــــــــــــــــــــ		(00-)
				endix N (2	¹ 3h) – (23a	a) × Fmv (e	equation (I	N5)) othe	rwise (23t	(23a)		l	0	(23a)
						for in-use f) = (200)		l	0	(23b) (23c)
					•					2h)m + (23h) x [[,]	L 1 – (23c)	-	(230)
(24a)m=					0				0				. 100]	(24a)
		d mech	ı anical ve	I entilation	ı without	heat rec	L coverv (N	I MV) (24t	(2) m = (2)	1 2b)m + ()	1 23b)	1		
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	tract ver	ntilation of	or positiv	/e input v	ventilatio	on from (outside	1		I		
,	if (22b)n	n < 0.5 ×	‹ (23b), †	then (24	c) = (23b	o); otherv	wise (24	c) = (22l	b) m + 0	.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
						ve input				- - 1				
	<u> </u>		<u>, </u>	· · ·	,	erwise (2	, <u> </u>		- <u></u>	<u> </u>	0.50			(24d)
(24d)m=		0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(240)
(25)m=	0.6	change 0.6	rate - er	0.58	0.57	o) or (24)	c) or (24 0.56	a) in bo:	0.56	0.57	0.58	0.59		(25)
(23)11-	0.0	0.0	0.0	0.00	0.07	0.00	0.50	0.55	0.50	0.57	0.00	0.39		(20)
3. He	at losse	s and he	eat loss	paramet							_		_	
ELEN		Gros area		Openin m	-	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-k		A X k kJ/K
Doors						1.8	×	1		1.8				(26)
Windo	ws Type	e 1				6.12		/[1/(1.4)+	0.04] =	8.11	-			(27)
Windo	ws Type	2				2.71		/[1/(1.4)+	0.04] =	3.59	=			(27)
Windo	ws Type	e 3				7.74		/[1/(1.4)+	0.04] =	10.26	\dashv			(27)
Windo	ws Type) 4				7.74	-	/[1/(1.4)+	0.04] =	10.26				(27)
	ws Type					5.13	-	/[1/(1.4)+	0.04] =	6.8				(27)
Rooflig	ghts					2.0214	_ .	/[1/(1.7) +	0.04] =	3.43652	9			(27b)
Walls		57.	3	8.83	3	48.47		0.18		8.72				(29)
Walls ⁻		4.3		1.8		2.5	x	0.18		0.45			\dashv	(29)
Walls		63.2		20.6		42.64		0.18		7.68			\exists	(29)
Roof		64		2.02		61.98		0.13		8.06			\exists	(30)
	area of e				I	188.8					L			(31)
				effective wi	indow U-va			g formula 1	!/[(1/U-vali	ue)+0.04] a	as given in	paragraph	3.2	(-)

** include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	68.96	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	12926.91	(34)
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K	Indicative Value: Medium	250	(35)
For design assessments where the details of the construction are not known r	precisely the indicative values of TMP in Table 1f		-

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

can be u	sed inste	ad of a dei	tailed calc	ulation.										
Therma	al bridge	es : S (L	x Y) cal	culated ι	using Ap	pendix l	<						8.64	(36)
if details	of therma	al bridging	are not kn	own (36) =	: 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			77.6	(37)
Ventila	tion hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	74.39	73.9	73.41	71.13	70.7	68.71	68.71	68.34	69.48	70.7	71.56	72.47		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	151.99	151.5	151.01	148.73	148.3	146.31	146.31	145.94	147.08	148.3	149.16	150.07		
				· · · ·						-	Sum(39)1.	.12 /12=	148.73	(39)
		meter (H	HLP), W/	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.14	1.14	1.14	1.12	1.12	1.1	1.1	1.1	1.11	1.12	1.12	1.13		_
Numbe	er of dav	s in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁ .	.12 /12=	1.12	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ener	gy requ	irement:								kWh/ye	ear:	
Assumed occupancy, N														(42)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1														
				ge in <mark>litre</mark> usage by t						se target o		3.13		(43)
				day (all w		-	7			9.00				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate				ach month				-	000	000	1107	200		
(44)m=	113.44	109.32	105.19	101.07	96.94	92.82	92.82	96.94	101.07	105.19	109.32	113.44		
(++)///-	110.44	100.02	100.10	101.07	50.54	52.02	52.02	50.54			m(44) ₁₁₂ =		1237.58	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)Tm / 3600					1237.30	
(45)m=	168.23	147.14	151.83	132.37	127.02	109.6	101.56	116.55	117.94	137.45	150.03	162.93		
									-	Total = Su	m(45) ₁₁₂ =		1622.66	(45)
lf instant	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46,) to (61)					
(46)m=	25.24	22.07	22.78	19.86	19.05	16.44	15.23	17.48	17.69	20.62	22.5	24.44		(46)
	storage												l	
-		. ,		ng any so			-		ame ves	sel		150		(47)
	•	-		ink in dw	-			. ,		(0) (
			hot wate	er (this in	cludes i	nstantar	neous co		ers) ente	er '0' in (47)			
	storage		olarad I	occ facto	n ie kno	$wp (k) \Lambda/k$	o/dov/):						l	(40)
				oss facto		wn (kvvi	i/day).				0.	24		(48)
		actor fro									0.	54		(49)
			-	, kWh/ye		or is not		(48) x (49)	=		0.	13		(50)
•				cylinder l com Tabl)		(51)
		leating s				.,	- J /				L	J		
	-	from Tal)		(52)
Tempe	rature f	actor fro	m Table	2b))		(53)

•••		om water (54) in (5	-	, kWh/ye	ear			(47) x (51) x (52) x (53) =				0		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			. ,
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
	er contain	s dedicate	l d solar sto	rage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5 ⁻	7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
		i	·	·	· · · · · ·	· · · · · ·	ter heatir	-	· ·	i	<u>,</u>		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 each	month	(61)m =	(60) ÷ 30	65 × (41))m		-	-			
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	195.49	171.76	179.09	158.75	154.28	135.99	128.82	143.81	144.32	164.71	176.41	190.19		(62)
							ve quantity			r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)	r	r		I	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter										I	
(64)m=	195.49	171.76	179.09	158.75	154.28	135.99	128.82	143.81	144.32	164.71	176.41	190.19		
									out from wa				1943.62	(64)
Heat g		m water	heating	kWh/m	onth 0.2	-				(<mark>(46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	77.75	68.62	72.29	65.12	64.04	57.55	55.58	60.56	60.32	67.51	70.99	75.98		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	is (Table	e 5), Wat	ts		1	i		· · · · · ·	i	- 			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		()
		145.12					145.12			145.12	145.12	145.12		(66)
0	<u> </u>	È	· · · · ·	·	· ·		r L9a), a			i	i		1	()
(67)m=	26.86	23.86	19.4	14.69	10.98	9.27	10.02	13.02	17.48	22.19	25.9	27.61		(67)
		<u>`</u>	· · · · · ·	· · ·	· · · ·	· · · · · ·	13 or L1	,	I			1	I	()
(68)m=	301.3	304.43	296.55	279.78	258.6	238.7	225.41	222.28	230.16	246.93	268.11	288.01		(68)
	<u> </u>	r`			· ·		or L15a)			-			1	
(69)m=	37.51	37.51	37.51	37.51	37.51	37.51	37.51	37.51	37.51	37.51	37.51	37.51		(69)
Pumps		ns gains	(Table !	5a)									1	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses		aporatic	· ·	tive valu	es) (Tab	le 5)	i	r	i	i	i	i		
(71)m=	-116.09	-116.09	-116.09	-116.09	-116.09	-116.09	-116.09	-116.09	-116.09	-116.09	-116.09	-116.09		(71)
		gains (T	able 5)				,						I	
(72)m=	104.5	102.12	97.17	90.44	86.08	79.93	74.7	81.4	83.78	90.74	98.6	102.13		(72)
Total i	r	gains =	i			· · ·	m + (67)m		i .	· · ·	1	i	1	
(73)m=	502.2	499.94	482.66	454.44	425.19	397.44	379.66	386.24	400.95	429.4	462.14	487.28		(73)
6. So	lar gain:	S:												

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.71	x	11.28	x	0.63	x	0.7	=	9.34	(75)
Northeast 0.9x	0.77	x	7.74	x	11.28	x	0.63	x	0.7	=	26.69	(75)
Northeast 0.9x	0.77	x	2.71	x	22.97	x	0.63	x	0.7	=	19.02	(75)
Northeast 0.9x	0.77	x	7.74	x	22.97	x	0.63	x	0.7	=	54.33	(75)
Northeast 0.9x	0.77	x	2.71	x	41.38	x	0.63	x	0.7	=	34.27	(75)
Northeast 0.9x	0.77	x	7.74	x	41.38	x	0.63	x	0.7	=	97.88	(75)
Northeast 0.9x	0.77	x	2.71	x	67.96	x	0.63	x	0.7	=	56.28	(75)
Northeast 0.9x	0.77	x	7.74	x	67.96	x	0.63	x	0.7	=	160.75	(75)
Northeast 0.9x	0.77	x	2.71	x	91.35	x	0.63	x	0.7	=	75.65	(75)
Northeast 0.9x	0.77	x	7.74	x	91.35	x	0.63	x	0.7	=	216.07	(75)
Northeast 0.9x	0.77	x	2.71	x	97.38	x	0.63	x	0.7	=	80.65	(75)
Northeast 0.9x	0.77	x	7.74	x	97.38	x	0.63	x	0.7	=	230.36	(75)
Northeast 0.9x	0.77	x	2.71	x	91.1	x	0.63	x	0.7	=	75.45	(75)
Northeast 0.9x	0.77	x	7.74	x	91.1	x	0.63	x	0.7	=	215.49	(75)
Northeast 0.9x	0.77	x	2.71	x	72.63	x	0.63	x	0.7	=	60.15	(75)
Northeast 0.9x	0.77	x	7.74	×	72.63	х	0.63	x	0.7	=	171.79	(75)
Northeast 0.9x	0.77	x	2.71	x	50.42	x	0.63	x	0.7	=	41.76	(75)
Northeast 0.9x	0.77	x	7.74	x	50.42	×	0.63	x	0.7	=	119.27	(75)
Northeast 0.9x	0.77	x	2.71	x	28.07	x	0.63	x	0.7	=	23.25	(75)
Northeast 0.9x	0.77	x	7.74	x	28.07	х	0.63	x	0.7	=	66.39	(75)
Northeast 0.9x	0.77	x	2.71	x	14.2	×	0.63	x	0.7	=	11.76	(75)
Northeast 0.9x	0.77	x	7.74	x	14.2	x	0.63	x	0.7	=	33.58	(75)
Northeast 0.9x	0.77	x	2.71	x	9.21	x	0.63	x	0.7	=	7.63	(75)
Northeast 0.9x	0.77	x	7.74	x	9.21	x	0.63	x	0.7	=	21.8	(75)
Southeast 0.9x		x	6.12	x	36.79	x	0.63	x	0.7	=	68.82	(77)
Southeast 0.9x	0.77	x	7.74	x	36.79	x	0.63	x	0.7	=	87.03	(77)
Southeast 0.9x	0.77	x	6.12	x	62.67	x	0.63	x	0.7	=	117.22	(77)
Southeast 0.9x		x	7.74	x	62.67	x	0.63	x	0.7	=	148.25	(77)
Southeast 0.9x	0.77	x	6.12	x	85.75	x	0.63	x	0.7	=	160.39	(77)
Southeast 0.9x	0.77	x	7.74	x	85.75	x	0.63	x	0.7	=	202.84	(77)
Southeast 0.9x		x	6.12	x	106.25	x	0.63	x	0.7	=	198.73	(77)
Southeast 0.9x	0.77	x	7.74	x	106.25	x	0.63	x	0.7	=	251.33	(77)
Southeast 0.9x		x	6.12	x	119.01	x	0.63	x	0.7	=	222.59	(77)
Southeast 0.9x	0.77	x	7.74	x	119.01	x	0.63	x	0.7	=	281.51	(77)
Southeast 0.9x	0.77	x	6.12	x	118.15	x	0.63	x	0.7	=	220.98	(77)
Southeast 0.9x		x	7.74	x	118.15	x	0.63	x	0.7	=	279.48	(77)
Southeast 0.9x		x	6.12	x	113.91	x	0.63	x	0.7	=	213.05	(77)
Southeast 0.9x	_	x	7.74	x	113.91	x	0.63	x	0.7	=	269.45	(77)
Southeast 0.9x	0.77	x	6.12	x	104.39	x	0.63	x	0.7	=	195.25	(77)

Southeast 0.9x	0.77	×	7.74	×	104.39	×	0.63	x	0.7	=	246.93	(77)
Southeast 0.9x	0.77	x	6.12	x	92.85	x	0.63	x	0.7	=	173.67	(77)
Southeast 0.9x	0.77	x	7.74	x	92.85	x	0.63	x	0.7	=	219.64	(77)
Southeast 0.9x	0.77	x	6.12	x	69.27	x	0.63	x	0.7	=	129.55	(77)
Southeast 0.9x	0.77	x	7.74	x	69.27	×	0.63	x	0.7	=	163.85	- (77)
Southeast 0.9x	0.77	x	6.12	x	44.07	×	0.63	x	0.7	=	82.43	(77)
Southeast 0.9x	0.77	x	7.74	x	44.07	×	0.63	x	0.7	=	104.25	(77)
Southeast 0.9x	0.77	x	6.12	x	31.49	×	0.63	x	0.7	=	58.89	(77)
Southeast 0.9x	0.77	x	7.74	x	31.49	×	0.63	x	0.7	=	74.48	(77)
Northwest 0.9x	0.77	x	5.13	x	11.28	x	0.63	x	0.7	=	17.69	(81)
Northwest 0.9x	0.77	x	5.13	x	22.97	x	0.63	x	0.7	=	36.01	(81)
Northwest 0.9x	0.77	x	5.13	x	41.38	x	0.63	x	0.7	=	64.87	(81)
Northwest 0.9x	0.77	x	5.13	x	67.96	x	0.63	x	0.7	=	106.54	(81)
Northwest 0.9x	0.77	×	5.13	x	91.35	×	0.63	x	0.7	=	143.21	(81)
Northwest 0.9x	0.77	×	5.13	x	97.38	×	0.63	x	0.7	=	152.68	(81)
Northwest 0.9x	0.77	×	5.13	x	91.1	×	0.63	x	0.7	=	142.83	(81)
Northwest 0.9x	0.77	x	5.13	x	72.63	x	0.63	x	0.7	=	113.86	(81)
Northwest 0.9x	0.77	×	5.13	×	50.42	x	0.63	x	0.7	=	79.05	(81)
Northwest 0.9x	0.77	x	5.13	x	28.07	x	0.63	x	0.7	=	44	(81)
Northwest 0.9x	0.77	×	5.13	x	14.2	×	0.63	x	0.7	=	22.26	(81)
Northwest 0.9x	0.77	×	5.13	x	9.21	x	0.63	x	0.7	=	14.45	(81)
Rooflights 0.9x	1	x	2.02	x	26	x	0.63	x	0.7	=	20.86	(82)
Rooflights 0.9x	1	x	2.02	x	54	×	0.63	x	0.7	=	43.33	(82)
Rooflights 0.9x	1	x	2.02	x	96	x	0.63	x	0.7	=	77.02	(82)
Rooflights 0.9x	1	x	2.02	x	150	x	0.63	x	0.7	=	120.35	(82)
Rooflights 0.9x	1	x	2.02	x	192	x	0.63	x	0.7	=	154.05	(82)
Rooflights 0.9x	1	x	2.02	x	200	x	0.63	x	0.7	=	160.47	(82)
Rooflights 0.9x	1	x	2.02	x	189	x	0.63	x	0.7	=	151.64	(82)
Rooflights 0.9x	1	x	2.02	x	157	x	0.63	x	0.7	=	125.97	(82)
Rooflights 0.9x	1	x	2.02	x	115	x	0.63	x	0.7	=	92.27	(82)
Rooflights 0.9x	1	×	2.02	×	66	×	0.63	x	0.7	=	52.95	(82)
Rooflights 0.9x	1	×	2.02	×	33	×	0.63	x	0.7	=	26.48	(82)
Rooflights 0.9x	1	×	2.02	×	21	×	0.63	x	0.7	=	16.85	(82)
Solar gains in	watts, calcul	ated	for each mon	th		(83)m	n = Sum(74)m(82)m			1	

Solar g	ains in	watts, ca	alculated	for eac	n month			(83)m = S	um(74)m .	(82)m				
(83)m=	230.43	418.15	637.28	893.98	1093.09	1124.62	1067.91	913.95	725.65	480	280.75	194.1		(83)
Total g	ains – ir	nternal a	nd solar	⁻ (84)m =	- (73)m -	+ (83)m	, watts							
(84)m=	732.63	918.09	1119.93	1348.42	1518.29	1522.05	1447.57	1300.19	1126.59	909.39	742.89	681.37		(84)
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 l	iving are	ea, h1,m	(see Ta	ble 9a)							_
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(86)m= 1 1 0.98 0.93 0.79 0.6 0.44 0.51 0.79 0.97 1 1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 19.72 19.92 20.23 20.61 20.88 20.98 21 20.99 20.91 20.53 20.05 19.	7 (87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	
(88)m= 19.97 19.97 19.97 19.99 19.99 20 20 20 20 19.99 19.98 19.5	98 (88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	
(89)m= 1 0.99 0.98 0.91 0.74 0.51 0.34 0.4 0.71 0.96 1 1	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m= 18.26 18.55 19 19.55 19.88 19.99 20 20 19.93 19.45 18.75 18.2	23 (90)
$fLA = Living area \div (4) =$	0.46 (91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	9 (92)
(92)m= 18.93 19.18 19.57 20.04 20.34 20.44 20.46 20.38 19.95 19.35 18. Apply adjustment to the mean internal temperature from Table 4e, where appropriate	9 (32)
(93)m= 18.93 19.18 19.57 20.04 20.34 20.44 20.46 20.38 19.95 19.35 18.	9 (93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-	calculate
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	ec
Utilisation factor for gains, hm:	
(94)m= 1 0.99 0.97 0.91 0.76 0.55 0.39 0.45 0.75 0.96 0.99 1	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 730.83 911.17 1091.73 1227.04 1152.39 836.05 562.14 586.91 839.97 870.87 738.51 680	.2 (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	2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	
(97)m= 2224.25 2163.74 1973.17 1656.62 1281.04 855.19 564.7 592.27 924.11 1386.25 1827.88 2206	6.63 (97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$	
(98)m= 1111.1 841.72 655.8 309.29 95.71 0 0 0 0 383.45 784.34 1135	
Total per year (kWh/year) = Sum(98) _{15.9}	12 = 5317.08 (98)
Space heating requirement in kWh/m²/year	39.98 (99)
9a. Energy requirements – Individual heating systems including micro-CHP)	
Space heating:	
Fraction of space heat from secondary/supplementary 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 De	ec kWh/year
Space heating requirement (calculated above)	
1111.1 841.72 655.8 309.29 95.71 0 0 0 383.45 784.34 1135	5.67
(211)m = {[(98)m x (204)] } x 100 ÷ (206)	(211)
1188.35 900.24 701.39 330.8 102.36 0 0 0 410.1 838.87 1214	
Total (kWh/year) =Sum(211) _{15.1012} =	5686.72 (211)

Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)								
			1		1		I	
(215)m= 0 0 0 0 0	0 0		0	0	0	0		
		Tota	al (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(21
Water heating								
Output from water heater (calculated above)							I	
	135.99 128	.82 143.81	144.32	164.71	176.41	190.19		_
Efficiency of water heater							79.8	(210
(217)m= 88.72 88.49 87.97 86.56 83.58	79.8 79.	.8 79.8	79.8	87	88.33	88.79		(21)
Fuel for water heating, kWh/month								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 220.35 194.1 203.59 183.4 184.58	170.41 161	.43 180.21	180.85	189.33	199.73	214.19		
(219)11 220.33 194.1 203.39 163.4 164.36	170.41 101		al = Sum(2)		199.75	214.19	0000.47	
		1012			A/I- /		2282.17	(219
Annual totals Space heating fuel used, main system 1				K	Wh/year		kWh/yea 5686.72	
Water heating fuel used							2282.17	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230
boiler with a fan-assisted flue						45		(230
Total electricity for the above, kWh/year		sum	of (230a).	<mark>(2</mark> 30g) =			75	(23
Electricity for lighting							474.00	 (232
Electricity for lighting								
							474.38	`
12a. CO2 emissions – Individual heating system	ns including	nicro-CHF	2				474.38	
12a. CO2 emissions – Individual heating system	ns including Energy			Emiss	ion fac	tor	Emission]
12a. CO2 emissions – Individual heating system		/		Emiss kg CO		tor		s
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy	/			2/kWh	tor =	Emission	s
	Energy kWh/ye	/		kg CO	2/kWh		Emission kg CO2/ye	s ar
Space heating (main system 1)	Energy kWh/ye	/		kg CO	2/kWh 16 19	=	Emission kg CO2/ye	s ear
Space heating (main system 1) Space heating (secondary)	Energy kWh/ye (211) x (215) x (219) x	/		kg CO. 0.2 0.5	2/kWh 16 19	=	Emission kg CO2/ye 1228.33 0	s ear (26)
Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/ye (211) x (215) x (219) x	ar		kg CO. 0.2 0.5	2/kWh 16 19 16	=	Emission kg CO2/ye 1228.33 0 492.95	s ear (26) (26) (26)
Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/ye (211) x (215) x (219) x (261) + (2	ar		kg CO 0.2 0.5	2/kWh 16 19 16 19	= =	Emission kg CO2/ye 1228.33 0 492.95 1721.28	s ar (26) (26) (26) (26)

TER =

15.09 (273)

			User D	etails:									
Assessor Name: Software Name:	Stroma FSAP 20'			Stroma Softwa	re Ver	sion:		Versio	on: 1.0.4.14				
		P	roperty A	Address:	Flat 4-0)2							
Address :													
1. Overall dwelling dimer	ISIONS:		•	(A 11	·) / - I				
Ground floor				a(m²)	(10) ×		ight(m)	(20) -	Volume(m ³				
	· / 4 · · · / 4 · · · / 4 · · · / 4	N			(1a) x	2	.85	(2a) =	185.25	(3a)			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	65	(4)					_			
Dwelling volume					(3a)+(3b)	+(3C)+(3d	l)+(3e)+	.(3n) =	185.25	(5)			
2. Ventilation rate:	·								<u> </u>				
		econdar heating	У	other		total			m ³ per hou	•			
Number of chimneys	0 +	0	+	0] = [0	X	40 =	0	(6a)			
Number of open flues	0 +	0	+	0] = [0	x	20 =	0	(6b)			
Number of intermittent far	IS					2	x 7	10 =	20	(7a)			
Number of passive vents					Γ	0	x	10 =	0	(7b)			
Number of flueless gas fir	es				Γ	0	x	40 =	0	(7c)			
Number of flueless gas fires 0 × 40 = 0 (7c) Air changes per hour													
Infiltration due to chimney						20		÷ (5) =	0.11	(8)			
If a pressurisation test has be		ed, proceed	d to (17), c	otherwise c	ontinue fro	om (9) to ((16)						
Number of storeys in the Additional infiltration	e dweiling (ns)						[(9)]	-1]x0.1 =	0	(9) (10)			
Structural infiltration: 0.2	25 for steel or timber	frame or	0.35 for	masonr	v constr	uction	[(0)	1100.1 -	0				
if both types of wall are pre	esent, use the value corres								Ŭ				
deducting areas of opening If suspended wooden flo	- · ·	led) or 0	1 (spala	d) also	ontor ()					(12)			
If no draught lobby, enter			i (Scale	u), cise '					0	(12)			
Percentage of windows	·	tripped							0	(14)			
Window infiltration	j			0.25 - [0.2	x (14) ÷ 1	= [00		·	0	(15)			
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)			
Air permeability value, o	50, expressed in cul	bic metre	s per ho	our per so	quare m	etre of e	nvelope	area	5	(17)			
If based on air permeabilit	y value, then (18) = [(*	17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.36	(18)			
Air permeability value applies		s been don	e or a deg	ree air per	meability	is being us	sed	1		_			
Number of sides sheltered Shelter factor	1			(20) = 1 - [0 075 x (1	9)] –			0	(19)			
Infiltration rate incorporation	na shelter factor			(21) = (18)		0/] –			1	(20)			
Infiltration rate modified for	-	Ч		(21) = (10)	x (20) -				0.36	(21)			
· · · · · · · · · · · · · · · · · · ·	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind spe		- our	041	, (49	000	000		200					
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7					
	II	1]				L	I	1	I				
Wind Factor $(22a)m = (22a)m $, 								I				
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18					

Adjust	ed infiltr	ation rat	e (allowi	ing for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m				_		
	0.46	0.45	0.44	0.39	0.38	0.34	0.34	0.33	0.36	0.38	0.4	0.42			
		c <i>tive air</i> al ventila	•	rate for t	he appli	cable ca	se								
				endix N (2	(23a) = (23a	a) x Fmv (e	equation (I	N5)) , othe	rwise (23h) = (23a)				0	(23a)
								n Table 4h) = (204)				0	(23b)
			-	-	-					2b)m i (22h) v [1 – (23c)		0	(23c)
a) II (24a)m=									a = (22)			$\frac{1-(230)}{0}$	- 100]]		(24a)
		-	-		-	-	-	I MV) (24b		, ,	Ť	U	l		(=)
(24b)m=	r							0			230)	0	1		(24b)
· · ·								on from c		Ů	Ů	Ů	l		
,					•	•		c) = (22t		5 × (23b))				
(24c)m=		0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	lole hous	e positiv	/e input	ventilatio	on from l	oft			1	1		
,	if (22b)r	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]					
(24d)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59			(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in boy	x (25)						
(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59			(25)
3. He	at losse	s and he	eat loss i	paramet	er:							_			
		Gros		Openin		Net Ar	ea	U-valu	ue	AXU		k-value	e	A>	Χk
		area	(m²)	m) ²	A ,r	n²	W/m2	2K	(W/I	K)	kJ/m²·l	K	kJ/	ΊK
Doors						1.8	x	1	=	1.8					(26)
Windo	ows Type	e 1				7.99	x1	/[1/(1.4)+	0.04] =	10.59					(27)
Windo	ws Type	e 2				6.46	x1	/[1/(1.4)+	0.04] =	8.56					(27)
Walls	Type1	47.	9	14.4	5	33.45	5 X	0.18	=	6.02					(29)
Walls	Type2	5.3	3	1.8		3.5	x	0.18	=	0.63					(29)
Roof		65	;	0		65	x	0.13	=	8.45					(30)
Total a	area of e	elements	, m²			118.2	2								(31)
				effective wi nternal wal			ated using	g formula 1	/[(1/U-valı	ie)+0.04] a	as given in	paragraph	n 3.2		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				36	6.06	(33)
Heat c	capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	71	85.5	(34)
Therm	al mass	parame	eter (TMI	- = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		2	50	(35)
	•	sments wh ad of a de			construct	ion are noi	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f			
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						6	.45	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)									_
Total f	abric he	at loss							(33) +	(36) =			42	2.5	(37)
Ventila		i	1	d monthly					r	= 0.33 × (r	<u> </u>	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			/
(38)m=	36.93	36.69	36.44	35.31	35.09	34.1	34.1	33.92	34.48	35.09	35.52	35.97			(38)
Heat t	ransfer o	coefficie	nt, W/K		-	-			(39)m	= (37) + (38)m				
(39)m=	79.44	79.19	78.95	77.81	77.6	76.61	76.61	76.42	76.99	77.6	78.03	78.48			_
										Average =	Sum(39)	12 /12=	77	'.81	(39)

Heat lo	ss para	ımeter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.22	1.22	1.21	1.2	1.19	1.18	1.18	1.18	1.18	1.19	1.2	1.21		
		L							, ,	Average =	Sum(40)1.		1.2	(40)
edmuni		/s in mo	<u> </u>	, ,	Max	lun	1.1	<u> </u>	San	Oct	Nev	Dee		
(44)m	Jan	Feb	Mar	Apr 20	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		12		(42)
Reduce	the annua	al average	hot water	usage by	5% if the c	ay Vd,av dwelling is hot and co	designed	` '		se target o		.52		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	92.98	89.6	86.21	82.83	79.45	76.07	76.07	79.45	82.83	86.21	89.6	92.98		_
Ener <mark>gy c</mark>	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1014.29	(44)
(45)m=	137.88	120.59	124.44	108.49	104.1	89.83	83.24	95.52	96.66	112.65	122.96	133.53		_
lf instant	aneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1329.9	(45)
(46)m=	20.68	18.09	18.67	16.27	15.61	13.47	12.49	14.33	14.5	16.9	18.44	20.03		(46)
Water s		loss:												
Storage	e volum	e (litres)	includir	ng any se	olar o <mark>r N</mark>	WHRS	storage	within sa	a <mark>me ve</mark> s	sel		150		(47)
		•			•	enter 110		· · ·						
Water s			not wate	er (this ir	ICIUDES I	instantar	neous co	indi idmo	ers) ente	er 'O' in (47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/dav).				0	24		(48)
		actor fro				(" a a j) :					54		(49)
•				e, kWh/ye	ear			(48) x (49) =			13		(50)
•••			-			or is not	known:	(- / (- ,	, ,		0.	15		(00)
		age loss neating s			le 2 (kW	h/litre/da	ay)					0		(51)
	•	from Ta										0		(52)
Tempe	rature f	actor fro	m Table	e 2b								0		(53)
Energy	lost fro	m watei	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter ((50) or	(54) in (5	55)	-							0.	13		(55)
Water s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
If cylinde	r 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	lix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primary	v circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primary	y circuit	loss cal	culated	for each	month ((59)m = (• •	• •						
, L				ı —	· · · · · ·	solar wat		<u> </u>	· ·	· · · · · ·	, 		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	alculated	for eac	:h ı	month (61)m =	(60)) ÷ 36	65 × (41)	m						
(61)m=	0	0	0	Τ	0	0		0	0	0	0	0	0	0		(61)
Total h	neat rec	uired for	water	he	ating ca	alculated	d fo	r each	n month	(62)m =	= 0.85 ×	(45)m	+ (46)m +	(57)m	 + (59)m + (61)m	
(62)m=	165.14	145.21	151.7	Т	134.87	131.36	1	16.21	110.5	122.78	123.04	139.9	1 149.34	160.79	'	(62)
Solar DI	-IW input	calculated	using Ap	pe	ndix G or	Appendi	хH	(negativ	ve quantity	v) (enter '()' if no sola	r contrib	oution to wate	er heating	3)	
(add a	ddition	al lines if	FGHR	Sa	and/or V	VWHRS	S ap	oplies,	see Ap	pendix	G)		-		_	
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
•		vater hea	ter				-								_	
(64)m=	165.14	145.21	151.7		134.87	131.36	1	16.21	110.5	122.78	123.04	139.9		160.79		
													iter (annual)		1650.86	(64)
-		1		g, I			-	-		. ,	- <u> </u>	1 /	m + (57)m	<u> </u>	n] ¬	
(65)m=	67.65	59.79	63.18		57.18	56.42		60.97	49.49	53.57	53.24	59.26		66.21		(65)
	•	, 			. ,	•	cylir	nder is	s in the c	dwelling	or hot w	ater is	from com	munity	heating	
5. In	ternal g	jains (see	e Table	5	and 5a)):										
Metab		ns (Table					1							—	7	
(00)	Jan	Feb	Mar		Apr	May	-	Jun	Jul	Aug	Sep	Oct		Dec	-	
(66)m=	105.95		105.95		105.95	105.95		05.95	105.95	105.95	105.95	105.9	5 105.95	105.95		(66)
-		s (calcula		/bb			-	-	· ·		1		45.00	1 40.00	-	(67)
(67)m=	16.53	14.68	11.94		9.04	6.76	<u> </u>	5.7	6.16	8.01	10.75	13.65	15.93	16.99		(67)
		ains (ca <mark>lc</mark>	-	_			T							I	-	(00)
(68)m=	185.36		182.44	_	172.12	159.09	-	46.85	138.67	136.75	141.59	151.9	1 164.94	177.18		(68)
		s (calcula		Ap T			-						00.50	00.50	-	(60)
(69)m=	33.59	33.59	33.59		33. <mark>5</mark> 9	33.59	3	3.59	33.5 <mark>9</mark>	33.59	33.59	33.59	33.59	33.59		(69)
		ans gains	r`	58	,	-	1	_		-					7	(70)
(70)m=	3	3	3		3	3	Ļ	3	3	3	3	3	3	3		(70)
			<u> </u>			, (,	04.70	0470	0.4.70	0.4.7	0 04 70	04.70	7	(71)
		-84.76	ļ	_	-84.76	-84.76		34.76	-84.76	-84.76	-84.76	-84.7	6 -84.76	-84.76		(71)
	`	g gains (T 88.98	able 5) 	70.44	75.00	1.	70.0	00.54	70	70.05	70.00		00.00	7	(72)
(72)m=	90.93				79.41	75.83		70.8	66.51	72	73.95	79.66		88.99		(12)
(73)m=	350.6	l gains =	337.08		318.35	299.46		(66) 81.13	269.13	274.54	284.08	303	(71)m + (72 324.75	340.94	7	(73)
	lar gair		337.00	<u>'</u>	510.55	299.40	2	51.15	209.13	274.34	204.00	303	324.75	340.94		(70)
			using so	lar	flux from	Table 6a	and	associ	ated equa	tions to c	onvert to th	ne applio	able orienta	tion.		
-		Access F	-		Area			Flu			g_		FF		Gains	
		Table 6d			m²			Tab	ole 6a	٦	Table 6b		Table 6c		(W)	
Southe	ast <mark>0.9x</mark>	0.77		x	6.4	6	x	3	6.79	x	0.63	x	0.7	=	72.64	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.4	6	x	6	2.67	x	0.63	×	0.7	= =	123.73	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.4	6	x	8	5.75	x	0.63	×	0.7	=	169.3	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.4	6	x	1(06.25	x	0.63	×	0.7	=	209.77	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.4	6	x	1'	19.01	x	0.63	×	0.7	=	234.96	(77)

Southe	ast <mark>0.9x</mark>	0.77	x	6.4	6	x	1	18.15	x	0.63	x	0.7	=	233.26	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	6.46		x	1	13.91	x	0.63	x	0.7	=	224.89	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	6.46		x	10	04.39	x	0.63	×	0.7	=	206.09	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	6.46		x	9	2.85	x	0.63	×	0.7	=	183.31	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	6.46		x	6	9.27	x	0.63	×	0.7	=	136.75	(77)
Southe	ast 0.9x	0.77	x	6.46		x	4	4.07	x	0.63	×	0.7		87.01	(77)
Southe	ast 0.9x	0.77	×	6.46		x	3	1.49	x	0.63	×	0.7	= =	62.17	(77)
Southw	est <mark>0.9x</mark>	0.77	x	7.99		x	3	6.79	İ	0.63	× ٦	0.7	= =	89.84	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.99		x	6	2.67	İ	0.63	×	0.7	= =	153.04	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.99		x	8	5.75	İ	0.63	×	0.7	=	209.39	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.99		x	10	06.25	İ	0.63	×	0.7	= =	259.45	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.99		x	1	19.01	İ	0.63	×	0.7	= =	290.61	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.99		x	1	18.15	i	0.63	× ٦	0.7	= =	288.5	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.99		x	1	13.91	İ	0.63	×	0.7	= =	278.15	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.9	9	x	1	04.39	İ	0.63	×	0.7	=	254.91	(79)
Southw	est <mark>0.9x</mark>	0.77	×	7.99		x	9	2.85	İ	0.63	× ٦	0.7	= =	226.73	(79)
Southw	est <mark>0.9x</mark>	0.77	x	7.99		x	6	9.27	İ	0.63	×	0.7	= =	169.14	(79)
Sout <mark>hw</mark>	Southwest0.9x 0.77 x 7.99			9	x	4	4.07		0.63	x	0.7	-	107.61	(79)	
Southw	est <mark>0.9x</mark>	0.77	×	7.9	9	x	3	1.49		0.63	x	0.7	=	76.89	(79)
Solar	Color going in watte poloulated for each month														
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 162.49 276.77 378.69 469.22 525.56 521.76 503.04 461 410.04 305.89 194.62 139.05											1	(83)			
Total gains – internal and solar (84) m = (73) m + (83) m , watts															
(84)m= 513.09 625.5 715.77 787.57 825.03 802.89 772.16 735.54 694.12 608.9 519.37 479.99											(84)				
7 Me	7. Mean internal temperature (heating season)														
		during he		` °		<i>.</i>	area	from Tab	ole 9.	Th1 (°C)				21	(85)
		tor for ga	• •			-			,	(-)					
	Jan	Feb	Mar	Apr	May	T`	Jun	Jul	A	ug Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.98	0.96	0.89	0.77	-	0.59	0.43	0.4		0.92	0.99	1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)															
		r i r		-	,	-			i 7 in T	able 9c)	20.65	20.18	19.8]	(87)
(87)m=	19.84	20.06	20.34	20.66	20.88	2	20.97	21	7 in T 20.9	able 9c) 99 20.94	20.65	20.18	19.8]	(87)
(87)m= Temp	19.84 erature	20.06 during he	20.34 eating p	20.66 eriods ir	20.88 rest of	2 dw	20.97 velling	21 from Ta	7 in T 20.9	able 9c) 99 20.94 9, Th2 (°C)		_]	
(87)m= Temp (88)m=	19.84 erature 19.9	20.06 during he 19.91	20.34 eating p 19.91	20.66 eriods ir 19.92	20.88 n rest of 19.92	2 dw	20.97 velling 9.94	21 from Ta 19.94	7 in T 20.9 able 9	able 9c) 99 20.94 9, Th2 (°C)	20.65 19.92	_	19.8 19.91]	(87) (88)
(87)m= Temp (88)m= Utilisa	19.84 erature 19.9 ation fac	20.06 during he 19.91 ctor for gai	20.34 eating p 19.91 ins for r	20.66 eriods ir 19.92 rest of dr	20.88 n rest of 19.92 welling,	2 dw 1 h2,	20.97 velling 9.94 ,m (se	21 from Ta 19.94 ee Table	7 in T 20.9 able 9 19.9 9a)	able 9c) 99 20.94 9, Th2 (°C) 94 19.93	19.92	19.92	19.91]	(88)
(87)m= Temp (88)m=	19.84 erature 19.9	20.06 during he 19.91	20.34 eating p 19.91	20.66 eriods ir 19.92	20.88 n rest of 19.92	2 dw 1 h2,	20.97 velling 9.94	21 from Ta 19.94	7 in T 20.9 able 9	able 9c) 99 20.94 9, Th2 (°C) 94 19.93		_]]	
(87)m= Temp (88)m= Utilisa (89)m=	19.84 eerature 19.9 ation fac	20.06 during he 19.91 ctor for gai	20.34 eating p 19.91 ins for r 0.95	20.66 eriods ir 19.92 rest of d 0.86	20.88 n rest of 19.92 welling, 0.71	2 dw 1 h2,	20.97 velling 9.94 ,m (se 0.5	21 from Ta 19.94 ee Table 0.33	7 in T 20.9 able 9 19.9 9a) 0.3	able 9c) 99 20.94 9, Th2 (°C) 94 19.93	19.92 0.89	19.92	19.91]]	(88)
(87)m= Temp (88)m= Utilisa (89)m=	19.84 eerature 19.9 ation fac	20.06 during he 19.91 ctor for gai	20.34 eating p 19.91 ins for r 0.95	20.66 eriods ir 19.92 rest of d 0.86	20.88 n rest of 19.92 welling, 0.71	2 dw 1 h2,	20.97 velling 9.94 ,m (se 0.5	21 from Ta 19.94 ee Table 0.33	7 in T 20.9 able 9 19.9 9a) 0.3	able 9c) 99 20.94 9, Th2 (°C) 94 19.93 7 0.62 to 7 in Tabl 94 19.89	19.92 0.89 e 9c) 19.55	0.98 18.89	19.91 0.99 18.33]]]	(88) (89) (90)
(87)m= Temp (88)m= Utilisa (89)m= Mean	19.84 erature 19.9 ation fac 0.99 interna	20.06 during he 19.91 ctor for ga 0.98 I tempera	20.34 eating p 19.91 ins for r 0.95 ture in r	20.66 eriods ir 19.92 rest of dr 0.86 the rest	20.88 n rest of 19.92 welling, 0.71 of dwell	2 dw 1 h2,	20.97 velling 9.94 ,m (se 0.5 T2 (fe	21 from Ta 19.94 ee Table 0.33 ollow ste	7 in T 20.9 ble 9 19.9 9a) 0.3 eps 3	able 9c) 99 20.94 9, Th2 (°C) 94 19.93 7 0.62 to 7 in Tabl 94 19.89	19.92 0.89 e 9c) 19.55	0.98	19.91 0.99 18.33	0.62	(88)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	19.84 eerature 19.9 ation fac 0.99 interna 18.38	20.06 during he 19.91 ctor for ga 0.98 l tempera 18.7	20.34 eating p 19.91 ins for r 0.95 ture in 1 19.11	20.66 eriods ir 19.92 rest of dr 0.86 the rest 19.55	20.88 n rest of 19.92 welling, 0.71 of dwell 19.81	2 dw 1 h2,	20.97 velling 9.94 ,m (se 0.5 T2 (fo 9.92	21 from Ta 19.94 ee Table 0.33 ollow ste 19.94	7 in T 20.9 able 9 19.9 9a) 0.3 eps 3 19.9	able 9c) 99 20.94 9, Th2 (°C) 94 19.93 7 0.62 to 7 in Tabl 94 19.89	19.92 0.89 e 9c) 19.55	0.98 18.89	19.91 0.99 18.33	0.62	(88) (89) (90)
(87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	19.84 eerature 19.9 ation fac 0.99 interna 18.38	20.06 during he 19.91 ctor for ga 0.98 l tempera 18.7	20.34 eating p 19.91 ins for r 0.95 ture in 1 19.11	20.66 eriods ir 19.92 rest of dr 0.86 the rest 19.55	20.88 n rest of 19.92 welling, 0.71 of dwell 19.81	2 dw 1 h2, ing 1	20.97 velling 9.94 ,m (se 0.5 T2 (fo 9.92	21 from Ta 19.94 ee Table 0.33 ollow ste 19.94	7 in T 20.9 able 9 19.9 9a) 0.3 eps 3 19.9	able 9c) 99 20.94 9, Th2 (°C) 94 19.93 7 0.62 to 7 in Tabl 94 19.89 6 19.89 6 19.89	19.92 0.89 e 9c) 19.55	19.92 0.98 18.89 ring area ÷ (4	19.91 0.99 18.33	0.62	(88) (89) (90)

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

	1	(a a=						00 - ((02)
(93)m= 19.28	19.54	19.87	20.24	20.47	20.57	20.59	20.59	20.54	20.23	19.69	19.24		(93)
8. Space he									4 Τ ί του /'	70)			
Set Ti to the the utilisation			•		ied at ste	ерттог	Table 9	o, so tha	t 11,m=(76)m an	a re-caic	sulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm	:										
(94)m= 0.99	0.98	0.94	0.87	0.74	0.55	0.39	0.43	0.67	0.9	0.98	0.99		(94)
Useful gains	, hmGm	, W = (94	4)m x (84	4)m		r				r			
(95)m= 507.85		676.11	687.49	611.79	444.78	303.81	317.21	464.27	549.54	508.01	476.29		(95)
Monthly ave	1	1	r – – –	r	r							l	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra		1	· · ·	i	î .		1 /		-	000.40			(07)
	5 1159.34			680.59	457.55	305.74	320.21	495.72	747.15	982.16	1180.14		(97)
Space heating (98)m= 507.41	- · · ·	ement fo 282.48	1	1		n = 0.02)m – (95 0)mj x (4 ⁻ 147.02	1)m 341.39	523.67		
(98)m= 507.41	369.04	202.40	140.1	51.18	0	0	0					0000.00	
							lota	l per year	(kvvn/year	') = Sum(9	8)15,912 =	2362.28	(98)
Space heati	ng requir	ement in	kWh/m²	²/year								36.34	(99)
9a. Energy re	quireme	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	HP)					
Sp <mark>ace heat</mark>	-												
Fraction of s	pace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fra <mark>ction</mark> of s	pace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fra <mark>ction</mark> of t	otal hea <mark>t</mark> i	ng from	main sys	stem 1			(204) = (2	02) × [1 – ((203)] =			1	(204)
Eff <mark>icienc</mark> y of	main sp	ace heat	ing syste	em 1								93.5	(206)
Effi <mark>cienc</mark> y of	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ear
Space heati	ng requir											,	
507.41	369.04	282.48	140.1	51.18	0	0	0	0	147.02	341.39	523.67		
(211)m = {[(9	8)m x (20)4)] } x 1	00 ÷ (20)6)	•		•						(211)
542.68	í `	302.12	r Ò	, 54.74	0	0	0	0	157.24	365.12	560.07		
	-						Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	<i>,</i> =	2526.51	(211)
Space heati	ng fuel (s	econdar	v), kWh/	month									
- = {[(98)m x (2	-		• •										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
		-					Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,1012}		0	(215)
Water heatin	g												
Output <u>from v</u>	vater hea	ter (calc	ulated a	bove)	-		-						
165.14		151.7	134.87	131.36	116.21	110.5	122.78	123.04	139.91	149.34	160.79		_
Efficiency of v	water hea	ater										79.8	(216)
(217)m= 87.62	87.2	86.45	84.92	82.54	79.8	79.8	79.8	79.8	84.95	86.95	87.74		(217)
Fuel for wate	•												
(219)m = (64) (219)m = 188.49		0 ÷ (217) 175.48	m 158.83	159.15	145.63	138.47	153.86	154.19	164.7	171.76	183.27		
(213)11-100.49	100.00	170.40	100.00	100.10	1-10.00	130.47		$I = Sum(2^{2})$		171.70	100.27	1960.35	(219)
Annual total	6						1014			Nhhaa			
Space heatin		ed, main	system	1					ĸ	Wh/year		kWh/yea 2526.51	'
	-												

			ſ		1
Water heating fuel used			l	1960.35]
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	SI	um of (230a)(230g) =	[75	(231)
Electricity for lighting			[291.85	(232)
12a. CO2 emissions – Individual heating systems	including micro-Cl	HP	-		-
	Energy kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	= [545.73	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	= [423.44	(264)
Space and water heating	(261) + (262) + (263)	+ (264) =	[969.16	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [38.93	(267)
Electricity for lighting	(232) x	0.519	= [151.47	(268)
Total CO2, kg/year TER =		sum of (265)(271) =		1159.56	(272)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201			Stroma Softwa	re Ver	sion:		Versio	n: 1.0.4.14	
		Pr	operty A	Address:	Flat 1-0)1				
Address :										
1. Overall dwelling dime	nsions:			(0)						
Ground floor			Area	. ,	(4 -)	Av. Hei](0-) [Volume(m ³)	-
					(1a) x	3.	.15	(2a) =	160.65	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	51	(4)					_
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	160.65	(5)
2. Ventilation rate:		_								
		econdary leating	y	other		total			m ³ per hour	
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	x	20 =	0	(6b)
Number of intermittent far	าร				Ē	2	x ′	10 =	20	(7a)
Number of passive vents					Γ	0	x ′	10 =	0	(7b)
Number of flueless gas fir	res					0	X 4	40 =	0	(7c)
					_			Air ch	anges per ho	ur
Infiltration due to chimney						20		÷ (5) =	0.12	(8)
If a pressurisation test has be		ed, proceed	to (17), c	otherwise c	ontinue fro	om (9) to ((16)			
Number of storeys in th Additional infiltration	le dweining (ris)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	25 for steel or timber f	frame or	0.35 for	masonr	v constr	uction	[(0)	110.1 -	0	(11)
if both types of wall are pr	esent, use the value corres				•			I	, i i i i i i i i i i i i i i i i i i i	
deducting areas of openin			1 (222)2	d) alaa	ontor O			1	_	
If suspended wooden fl If no draught lobby, ent		ea) or 0.	i (seale	a), eise	enter U				0	(12)
Percentage of windows		rinned							0	(13) (14)
Window infiltration	and doors dradgin st	nppeu		0.25 - [0.2	x (14) ÷ 1	00] =			0	(14)
Infiltration rate				- (8) + (10) ·			+ (15) =		0	(16)
Air permeability value,	q50, expressed in cub	oic metres	s per ho	ur per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ty value, then $(18) = [(1)]$	7) ÷ 20]+(8), otherwi	se (18) = (16)				0.37	(18)
Air permeability value applies	s if a pressurisation test has	s been done	e or a deg	ıree air pei	meability i	is being us	sed			_
Number of sides sheltere	d			(00) 4 1	0.075 (4	0)]			0	(19)
Shelter factor	an al altra factor			(20) = 1 - [9)] =			1	(20)
Infiltration rate incorporati	-			(21) = (18)	x (20) =			l	0.37	(21)
Infiltration rate modified fo		<u> </u>	11	A.u.a.	San	Oct	Nov			
	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spectrum (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	···· ···		0.0	0.7	7	-1.0				
Wind Factor (22a)m = (22	2)m ÷ 4							·	I	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allow	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.37	0.4	0.42	0.44			
		c <i>tive air</i> al ventila	•	rate for t	he appli	cable ca	se								(23a)
				endix N. (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)				0	(23b)
								n Table 4h		, (,				0	(23c)
			-	-	-					2h)m + (23h) 🗙 [1 – (23c)		0	(200)
(24a)m=					0	0				0					(24a)
		l d mech	I anical ve	L entilation	L without	l heat rec	L coverv (N	I MV) (24b	l = (22)	l 2b)m + ()	L 23b)	1	J		
(24b)m=	r	0		0	0	0		0	0	0	0	0]		(24b)
		u ouse ex	ract ver	ntilation of	r positiv	input v	ventilatio	n from c	outside				1		
,					•	•		c) = (22b		5 × (23b))				
(24c)m=	- 0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	ve input	ventilatio	on from I	oft	•	-				
	<u> </u>		<u>, ,</u>	<u> </u>	· · · · · · · · · · · · · · · · · · ·	<u>`</u>	<u>,</u>	0.5 + [(2	2b)m² x	0.5]			1		
(24d)m=	0.61	0.61	0.61	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(24d)
Effe		<u> </u>		<u> </u>	í	<u> </u>	r i	d) in boy	k (25)	·			1		
(25)m=	0.61	0.61	0.61	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(25)
3. He	at losse	s and he	eat loss	paramet	er:							_			
ELEN		Gros		Openin		Net Ar		U-valu		AXU		k-value			Xk
_		area	(m²)	r) ²	A ,r	m²	W/m2	2K	(W/I	K)	kJ/m²•l	K	kJ	/K
Doors	_					1.8	x	1	=	1.8					(26)
	ws Type					5.21		/[1/(1.4)+		6.91					(27)
	ws Type					2.8		/[1/(1.4)+		3.71					(27)
Windo	ws Type	e 3				2.94	x1	/[1/(1.4)+	0.04] =	3.9					(27)
Walls	Type1	52.	9	10.9	5	41.95	5 X	0.18	=	7.55					(29)
Walls	Type2	4.7	3	1.8		2.93	X	0.18	=	0.53					(29)
Total a	area of e	elements	, m²			57.63	3								(31)
				effective wi nternal wal			lated using	g formula 1	/[(1/U-valı	ie)+0.04] a	as given in	n paragraph	1 3.2		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				24	4.4	(33)
Heat c	apacity	Cm = S((A x k)						((28).	.(30) + (32	2) + (32a)	(32e) =	81	75.6	(34)
Therm	al mass	parame	eter (TMI	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		2	50	(35)
	-	sments wh ad of a de			construct	ion are noi	t known pr	recisely the	e indicative	values of	TMP in T	able 1f			
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	K						5	.7	(36)
			are not kr	nown (36) =	= 0.15 x (3	1)									_
	abric he								(33) +	(36) =			30	0.09	(37)
Ventila		i	1	d monthl					r	= 0.33 × (r	1	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			1000
(38)m=	32.55	32.32	32.09	31.01	30.8	29.86	29.86	29.69	30.22	30.8	31.21	31.64]		(38)
Heat t	ransfer o	coefficie	nt, W/K	-				-	(39)m	= (37) + (3	38)m				
(39)m=	62.64	62.41	62.18	61.1	60.89	59.95	59.95	59.78	60.32	60.89	61.3	61.73			_
										Average =	Sum(39)	₁₂ /12=	61	.09	(39)

Heat lo	ss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.23	1.22	1.22	1.2	1.19	1.18	1.18	1.17	1.18	1.19	1.2	1.21		
Numba	r of do		I							Average =	Sum(40)1.	12 /12=	1.2	(40)
	Jan	Feb	nth (Tab Mar	r í	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	Apr 30	31	30	31	31 Aug	30	31	30	31		(41)
(41)11=		20	51	30	51	- 50	51	51	- 50	51	- 50	51		(41)
4. Wa	ter 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)] + 0.0	0013 x (⁻	TFA -13.		72		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.04		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)		-				
(44)m=	82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		_
Ener <mark>gy c</mark>	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		900.48	(44)
(45)m=	1 <mark>2</mark> 2.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	10 <mark>0.01</mark>	109.17	118.55		
If instant	aneous M	vətər həati	na at noin	t of use (n	hot water	r storage)	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1180.67	(45)
		-	-		<u> </u>					45	40.07	47.70		(46)
(46)m= Water	18.36 storage	16.06 loss:	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(40)
	-		includir	ng any s	olar or V	/WHRS	storage	within sa	a <mark>me ve</mark> s	sel		150		(47)
If comr	nunity h	neating a	and no ta	ank in dv	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					. /1 \ \ //	(1-)						I	
					or is kno	wn (kvvr	n/day):				0.	24		(48)
			m Table								0.	54		(49)
•••			-	e, kWh/ye cylindor	ear loss fact	or is not	known:	(48) x (49)) =		0.	13		(50)
Hot wa	ter stor	age loss	factor f	rom Tab	le 2 (kW							0		(51)
	-	from Ta	see secti	on 4.3								•		(50)
			om Table	2b								0		(52) (53)
				e, kWh/y	oor			(47) x (51)) x (52) x (53) -				
		(54) in (•	, KVVII/ y	cai)	00) -		0 13		(54) (55)
	. ,	. , .		for each	month			((56)m = (55) × (41)	m				()
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
			-					0), else (5				-	l ix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	 a 3			•				0		(58)
Primar	y circuit	loss ca	lculated	for each	month (. ,	65 × (41)		4 4 ha			I	
, i	-	r	1	1	r	· · · · · ·	· · · · · ·	ng and a	· ·	1	, 	00.00	l	(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h 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 rec	uired for	water h	neating c	alculated	l fo	r each	n month	(62)m =	0.85 × ((45)m	+ (46)m +	(57)m +	- · (59)m + (61)m	
(62)m=	149.67	131.68	137.74	122.7	119.68	10	06.13	101.16	112.06	112.19	127.2	7 135.55	145.81		(62)
Solar DI	-IW input	calculated	using Ap	pendix G o	or Appendix	: H (negativ	e quantity	v) (enter '0	' if no sola	r contrib	oution to wate	er heating)		
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	ap	plies,	see Ap	pendix (G)				-	
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	from v	vater hea	ter		_						-			_	
(64)m=	149.67	131.68	137.74	122.7	119.68	10	06.13	101.16	112.06	112.19	127.2	7 135.55	145.81		-
									Outp	out from w	ater hea	ter (annual)	12	1501.63	(64)
Heat g	ains fro	om water	heating	g, kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)ı	m + (57)m	+ (59)m	<u>]</u>]	
(65)m=	62.51	55.3	58.54	53.13	52.54	4	7.62	46.38	50	49.64	55.06	5 57.4	61.23		(65)
inclu	ide (57)m in calo	culation	of (65)n	n only if c	ylir	nder is	s in the c	dwelling	or hot w	ater is	from com	munity ł	neating	
5. Int	ternal g	ains (see	Table	5 and 5a	a):										
Metab	olic gai	ns (Table	e 5), Wa	itts										_	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	8	5.98	85.98	85.98	85.98	8 <mark>5.98</mark>	8 85.98	85.98		(66)
Ligh <mark>tin</mark>	<mark>g g</mark> ains	(calcula	ted in A		L, equat	ion	L9 or	[.] L9a), a	lso see	Table 5					
(67)m=	1 <mark>3.38</mark>	11.88	9.66	7.31	5.47	4	4.62	4.99	6.48	8.7	11.05	5 12.9	13.75		(67)
App <mark>lia</mark>	nces ga	ains (ca <mark>lc</mark>	ulated i	n Appen	dix L, eq	uat	ion L1	13 o <mark>r L1</mark> :	3a), also	<mark>se</mark> e Ta	ble <mark>5</mark>				
(68)m=	149.83	151.39	147.47	139.13	128.6	1	18.7	112.09	110.54	114.45	122.8	133.32	143.22		(68)
Cookir	ng gains	s (calcula	ted in A	Appendix	L, equat	tion	1 L15 (or L15a)	, also se	e Table	5				
(69)m=	31.6	31.6	31.6	31.6	31.6	3	31.6	31.6	31.6	31.6	31.6	31.6	31.6		(69)
Pumps	and fa	ins gains	(Table	5a)								-		-	
(70)m=	3	3	3	3	3		3	3	3	3	3	3	3]	(70)
Losses	s e.g. e	vaporatic	n (nega	ative valu	ues) (Tab	le :	5)			•	•		-	-	
(71)m=	-68.78	-68.78	-68.78	-68.78	-68.78	-6	68.78	-68.78	-68.78	-68.78	-68.7	8 -68.78	-68.78]	(71)
Water	heating	, g gains (T	able 5)		•	•						•	•	-	
(72)m=	84.02	82.28	78.69	73.79	70.61	6	6.14	62.34	67.21	68.94	74.01	79.73	82.29]	(72)
Total i	nterna	I gains =					(66)	m + (67)m	+ (68)m -	⊦ (69)m +	(70)m +	(71)m + (72))m	-	
(73)m=	299.02	297.34	287.61	272.03	256.47	24	41.25	231.21	236.02	243.89	259.6	4 277.74	291.05]	(73)
6. So	lar gain	IS:		•											
Solar g	ains are	calculated	using sol	ar flux fron	n Table 6a	and	associ	ated equa	tions to co	onvert to th	ne applio	able orientat	tion.		
Orienta		Access F Table 6d		Area m²	a		Flu: Tab	x ble 6a	Т	g_ able 6b		FF Table 6c		Gains (W)	
Southe	ast <mark>0.9x</mark>	0.77	,	5.	21	x	3	6.79	x	0.63	x	0.7	=	58.58	(77)
Southe	ast <mark>0.9x</mark>	0.77	,	< 5.	21	x	6	2.67	x	0.63	×	0.7	=	99.79	(77)
Southe	ast <mark>0.9x</mark>	0.77	,		21	x		5.75	x	0.63	×	0.7	=	136.54	(77)
Southe	ast <mark>0.9x</mark>	0.77		< 5.	21	x	10	06.25	x	0.63	×	0.7	=	169.18](77)
Southe	ast <mark>0.9x</mark>	0.77	,	5 .	21	x	11	19.01	x	0.63	×	0.7	=	189.49	(77)

								_			_				
Southeast 0.9x	0.77	×	5.:	21	x	1	18.15	x	0.63	×		0.7	=	188.1	2 (77)
Southeast 0.9x	0.77	×	5.	21	x	1	13.91	x	0.63	×		0.7	=	181.3	7 (77)
Southeast 0.9x	0.77	×	5.	21	x	1	04.39	x	0.63	×		0.7	=	166.2	2 (77)
Southeast 0.9x	0.77	×	5.	21	x	g	2.85	x	0.63	×		0.7	=	147.8	4 (77)
Southeast 0.9x	0.77	×	5.	21	x	6	9.27	x	0.63	×		0.7	=	110.2	9 (77)
Southeast 0.9x	0.77	×	5.	21	x	4	4.07	x	0.63	×		0.7	=	70.17	7 (77)
Southeast 0.9x	0.77	×	5.	21	x	3	31.49	x	0.63	×		0.7	=	50.14	4 (77)
Southwest _{0.9x}	0.77	×	2	.8	x	3	6.79]	0.63	×		0.7	=	31.49) (79)
Southwest _{0.9x}	0.77	×	2.	94	x	3	6.79]	0.63	×		0.7	=	33.06	6 (79)
Southwest0.9x	0.77	×	2	8	x	6	2.67]	0.63	×		0.7	=	53.63	3 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	6	2.67]	0.63	×		0.7	=	56.3 ²	1 (79)
Southwest _{0.9x}	0.77	×	2	8	x	8	5.75]	0.63	×		0.7	=	73.38	3 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	8	5.75]	0.63	×	Γ	0.7	=	77.0	5 (79)
Southwest _{0.9x}	0.77	×	2.	8	x	1	06.25]	0.63	×	Ľ	0.7	=	90.92	2 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	1	06.25]	0.63	×	Γ	0.7	=	95.47	7 (79)
Southwest _{0.9x}	0.77	×	2.	8	x	1	19.01]	0.63	×	Γ	0.7	=	101.8	4 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	1	19.01]	0.63	×	Γ	0.7	=	106.9	3 (79)
Southwest0.9x	0.77	×	2.	.8	X	1	18.15		0.63	×		0.7	=	101.1	1 (79)
Sout <mark>hwest_{0.9x}</mark>	0.77	×	2.9	94	x	1	18.15]	0.63	×	Γ	0.7	- 1	106.1	6 (79)
Sout <mark>hwest</mark> 0.9x	0.77	×	2.	.8	x	1	13.91		0.63	×	Γ	0.7	=	97.47	7 (79)
Sout <mark>hwest</mark> 0.9x	0.77	×	2.	94	x	1	13.91		0.63	×	Γ	0.7	=	102.3	5 (79)
Sout <mark>hwest_{0.9x}</mark>	0.77	×	2	.8	x	1	04.39	1	0.63	×	Ē	0.7	_ =	89.33	3 (79)
Sout <mark>hwest_{0.9x}</mark>	0.77	×	2.	94	x	1	04.39		0.63	×	Ē	0.7	_ =	93.8	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77	×	2	8	x	9	2.85	Ī	0.63	×	Ē	0.7		79.4	5 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	9	2.85	Ī	0.63	×	Γ	0.7	= =	83.43	3 (79)
Southwest _{0.9x}	0.77	×	2	8	x	6	9.27	1	0.63	×	Γ	0.7	_ =	59.27	7 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	6	9.27]	0.63	×	Γ	0.7	=	62.24	4 (79)
Southwest _{0.9x}	0.77	×	2	8	x	4	4.07]	0.63	×	Γ	0.7	_ =	37.7	1 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	4	4.07]	0.63	×	Γ	0.7	=	39.6	(79)
Southwest0.9x	0.77	×	2.	8	x	3	31.49]	0.63	×	Γ	0.7	=	26.94	4 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	3	31.49]	0.63	×	Γ	0.7	_ =	28.29) (79)
								-							
Solar gains in	watts, ca	alculate	d for eac	h mont	h			(83)m	n = Sum(74)m	า(82)	m			-	
(83)m= 123.13		286.97	355.57	398.26		95.38	381.19	349	.34 310.73	3 231	.8	147.48	105.37		(83)
Total gains –			r (84)m : T	· · ·	<u> </u>	83)m	, watts							-	
(84)m= 422.15	507.08	574.58	627.59	654.74	6	36.64	612.4	585	.36 554.62	2 491	45	425.22	396.43		(84)
7. Mean inte	rnal temp	erature	(heating	g seaso	n)										
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21												(85)			
Utilisation fa	ctor for ga	ains for	living ar	ea, h1,	m (s	ee Ta	ble 9a)			_				-	
Jan	Feb	Mar	Apr	May	/	Jun	Jul	A	ug Sep		ct	Nov	Dec		
(86)m= 0.99	0.98	0.95	0.89	0.76		0.58	0.43	0.4	46 0.69	0.9	2	0.98	0.99]	(86)
Mean interna	al tempera	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	able 9c)						
(87)m= 19.86	20.08	20.36	20.67	20.88	2	20.98	21	20.	99 20.94	20.	67	20.21	19.83]	(87)
					_			_							

Temp	erature	during h	neating p	periods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.9	19.9	19.9	19.92	19.92	19.94	19.94	19.94	19.93	19.92	19.92	19.91		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.99	0.97	0.94	0.86	0.7	0.49	0.33	0.36	0.61	0.88	0.98	0.99		(89)
Mean	interna	l temper	rature in	the rest	of dwelli	ing T2 (fo	ollow ste	eps 3 to 3	7 in Tabl	e 9c)				
(90)m=	18.41	18.73	19.12	19.56	19.82	19.93	19.94	19.94	19.89	19.57	18.93	18.37		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.61	(91)
Mean	interna	l temper	rature (fc	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.29	19.55	19.87	20.23	20.46	20.56	20.58	20.58	20.53	20.23	19.71	19.26		(92)
Apply	adjustr	nent to t	he mear	n internal	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.29	19.55	19.87	20.23	20.46	20.56	20.58	20.58	20.53	20.23	19.71	19.26		(93)
			uirement											
				mperatur using Ta		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
ine ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			jains, hm	· ·	Iviay	Juli	Jui	Aug		001	1107	Dee		
(94)m=	0.99	0.97	0.94	0.87	0.74	0.55	0.39	0.42	0.66	0.89	0.97	0.99		(94)
Us <mark>ef</mark> u	ul gains,	hmGm	, W = (9	4)m x (84	4)m								_	
(95)m=	416.97	493.14	540.43	544.48	481.59	3 <mark>4</mark> 8.17	237.28	247.77	365.05	439.48	414.35	392.68		(95)
Mo <mark>ntl</mark>	hly aver	age ex <mark>te</mark>	ernal terr	nperature	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)
				nal tempe										
(97)m=	939.12	914.1	831.58	692.49	533.63	357.55	238.67	249.9	387.94	586.71	772.77	929.54		(97)
	-		1	o <mark>r eac</mark> h m	1		i	1				000.40		
(98)m=	388.48	282.88	216.61	106.57	38.72	0	0	0	0	109.54	258.06	399.42		
								lota	l per year	(kWh/year) = Sum(98	8)15,912 =	1800.29	(98)
Space	e heatin	g requir	ement in	n kWh/m²	²/year								35.3	(99)
9a. En	ergy rec	quiremer	nts – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heatir	-			, .									
	•			econdar		mentary	-						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 ·	– (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 – ((203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ting syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	/ear
Space	e heatin	g requir	ement (c	calculate	d above))								
	388.48	282.88	216.61	106.57	38.72	0	0	0	0	109.54	258.06	399.42		
(211)m	า = {[(98)m x (20)4)] } x 1	100 ÷ (20)6)									(211)
	415.49	302.55	231.67	113.97	41.41	0	0	0	0	117.16	276	427.19		
			•	-				Tota	l (kWh/yea	ar) =Sum(2	2 11) _{15,1012}	=	1925.44	(211)
Spac	e heatin	g fuel (s	econdar	′y), kWh/	month									
	í Ó	01)]}x 1	00 ÷ (20)8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ll (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	-	0	(215)

Water heating

Hator Hoating														
Output from water heater (calculated above)							•							
149.67 131.68 137.74 122.7 119.68 10	06.13 101.16	112.06	112.19	127.27	135.55	145.81		_						
Efficiency of water heater							79.8	(216						
(217)m= 87.25 86.8 86.02 84.44 82.17 7	79.8 79.8	79.8	79.8	84.42	86.51	87.37		(217						
Fuel for water heating, kWh/month														
$(219)m = (64)m \times 100 \div (217)m$	400 400 77	4 4 9 4 9	4.40.50	450.70	450.00	400.00	1							
(219)m= 171.55 151.7 160.13 145.31 145.64	133 126.77	140.43	140.59	150.76	156.69	166.89		7						
		Tota	I = Sum(2				1789.45	(219						
Annual totals				k	Wh/yea	r	kWh/year	٦						
Space heating fuel used, main system 1							1925.44	ļ						
Water heating fuel used							1789.45							
Electricity for pumps, fans and electric keep-hot														
central heating pump:						30]	(230						
boiler with a fan-assisted flue						45		(230						
Total electricity for the above, kWh/year														
Electricity for lighting							236.22	(232						
12a. CO2 emissions - Individual heating systems	s includina mi	cro-CHP)					_						
	Energy				ion fac	tor	Em <mark>issio</mark> ns							
	kWh/year			kg CO	2/kVVh		kg CO2/yea	ar						
Space heating (main system 1)	(211) x			0.2	16	=	415.9	(261						
Space heating (secondary)	(215) x			0.5	19	=	0	(263						
Water heating	(219) x			0.2	16	=	386.52	(264						
Space and water heating	(261) + (262)	+ (263) + (264) =				802.42	(265						
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267						
Electricity for lighting	(232) x			0.5	19	=	122.6	(268						
Total CO2, kg/year			sum o	of (265)(271) =		963.94	(272						
								_						
								-						

TER =

(273)

18.9

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa				Versic	on: 1.0.4.14	
		Pr	operty A	Address:	Flat 1-0	3				
Address :										
1. Overall dwelling dime	nsions:			(0)						
Ground floor				a(m²)	(4 -)	Av. Hei	• • •		Volume(m ³	
	· · · · · · · · · · · · · · · · · · ·	· · · ·			(1a) x	3	.08	(2a) =	221.4	(3a)
Total floor area TFA = (1a	3)+(1b)+(1c)+(1d)+(1e	e)+(1n)	72	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	221.4	(5)
2. Ventilation rate:				_		_				
		econdary neating	y	other		total			m ³ per hou	r
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	x	20 =	0	(6b)
Number of intermittent far	ns		_			3	x '	10 =	30	(7a)
Number of passive vents					Г	0	x ′	10 =	0	(7b)
Number of flueless gas fir	res				Γ	0	X 4	40 =	0	(7c)
								Air ch	anges per ho	our
Infiltration due to chimney						30		÷ (5) =	0.14	(8)
If a pressurisation test has be		ed, proceed	l to (17), o	otherwise c	ontinue fro	om (9) to ((16)			
Number of storeys in th Additional infiltration	le dwelling (lis)						[(9)	-1]x0.1 =	0	(9)
Structural infiltration: 0.	25 for steel or timber	frame or	0.35 for	masonr	v constr	uction	[(0)	110000 -	0	(11)
if both types of wall are pr	esent, use the value corres				•					
deducting areas of openin If suspended wooden fl		ed) or 0	1 (seale	d) else	enter ()				0	(12)
If no draught lobby, ent		ou) or o.	1 (00010	a), 0100					0	(12)
Percentage of windows		ripped							0	(14)
Window infiltration	Ũ	••		0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cub	oic metres	s per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ty value, then (18) = [(1	7) ÷ 20]+(8), otherwis	se (18) = (16)				0.39	(18)
Air permeability value applies		s been don	e or a deg	ree air per	meability i	is being us	sed			_
Number of sides sheltered Shelter factor	d			(20) = 1 - [0 075 x (1	9)1 –			0	(19)
Infiltration rate incorporati	ing shelter factor			(21) = (18)		0)] –			1	(20)
Infiltration rate modified for	-	4		(21) = (10)	x (20) -				0.39	(21)
i	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spo			001	, lug	Cop	001	1101	200		
r	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
				-				1	Į	
Wind Factor $(22a)m = (22a)m $	· · · · ·	, , , , , , , , , , , , , , , , , , ,					1		I	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-			_	
<u> </u>	0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.39	0.41	0.43	0.45		
		<i>ctive air</i> al ventila	•	rate for t	ne appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	√5)), othei	rwise (23b) = (23a)			0	(23b)
			• • •	iency in %	, ,	, ,				, , ,			0	(23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	m = (2)	2b)m + (23b) x [[,]	1 – (23c)		(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	coverv (N	//V) (24b)m = (22	1 2b)m + (;	1 23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If	whole h	iouse ex	tract ver	tilation of	or positiv	ve input v	ventilatic	n from c	outside				1	
,				hen (24a	•	•				5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous		•								
1	, <i>,</i>	I	<u>, ,</u>	m = (22t	<i>.</i>	<u> </u>	, 		,		1		1	
(24d)m=		0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6	J	(24d)
1			·	nter (24a		r i	, <u>,</u>	, 1	· ,	0.50	0.50		1	(25)
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	oaramete	er:									
ELEN	1ENT	Gros		Openin m		Net Ar		U-valı W/m2		A X U (W/I		k-value		A X k kJ/K
Doors		area	(111-)		F-	A ,n		1		`		KJ/11-•1	\mathbf{x}	
	ws Type	. 1				1.8		/[1/(1.4)+	=	1.8	H			(26)
						4.65				6.16	H			(27)
	ws Type					1.34		/[1/(1.4)+		1.78	L.			(27)
	ws Type -					7.94		/[1/(1.4)+	L L	10.53	\exists			(27)
	ws Type	94 				2.27	x1/	/[1/(1.4)+	0.04] =	3.01	╡,			(27)
Walls 7		63.3	32	16.2	2	47.12	<u>x</u>	0.18	= [8.48			\exists	(29)
Walls 7		4.7		1.8		2.93	X	0.18	=	0.53				(29)
Total a	rea of e	elements	, m²			68.05	5							(31)
				effective wi Internal wall			ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
		ss, W/K :			o una pun			(26)(30)	+ (32) =				32.29) (33)
		Cm = S(- /					((28)	(30) + (32	2) + (32a).	(32e) =	9157.	
			,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K				tive Value			250	(35)
		•		tails of the				ecisely the	indicative	values of	TMP in Ta	able 1f		(' '
		ad of a de												
	-		,	culated u	• •		<						4.84	(36)
	of therma abric he		are not kr	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			07.44	(27)
			alculator	d monthly							(25)m x (5)		37.13	3 (37)
ventila	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	= 0.33 x (25)m x (5) Nov	Dec	1	
(38)m=	45.36	45.01	44.68	43.1	42.8	41.43	41.43	41.18	41.96	42.8	43.4	44.03		(38)
					.2.0								I	()
Heat tr (39)m=	82.49	coefficier 82.14	1t, VV/K 81.81	80.23	79.94	78.56	78.56	78.31	(39)m 79.09	= (37) + (3 79.94	80.53	81.16	1	
(00)11-	02.40			00.20		. 0.00	. 0.00	. 0.01			Sum(39)1		80.23	3 (39)

Heat lo	ss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.15	1.14	1.14	1.11	1.11	1.09	1.09	1.09	1.1	1.11	1.12	1.13		
Lumbo	r of dou		ı						,	Average =	Sum(40)1	12 /12=	1.11	(40)
	Jan	Feb	nth (Tab Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m=	31	28	31	30	31	30	31	31 Aug	30	31	30	31		(41)
(,	01													(,
4. Wa	ter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		([1 - exp	o(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		29]	(42)
Reduce	the annua	al average	hot water	ge in litre usage by r day (all w	5% if the c	welling is	designed		+ 36 a water us	se target c		.68]	(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Hot wate		n litres pei I	r day for ea	ach month	Vd,m = fa			 I	1	1		r	1	
(44)m=	97.54	94	90.45	86.9	83.35	79.81	79.81	83.35	86.9	90.45	94	97.54	4004.4	
Ener <mark>gy c</mark>	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1064.1	(44)
(45)m=	144.65	126.51	130.55	113.82	109.21	94.24	87.33	100.21	101.41	118.18	129	140.09		_
lf instant	aneous v	vater heati	ng at point	t of use (no	o hot wate	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1395.2	(45)
(46)m=	21.7	18.98	19.58	17.07	16.38	14.14	13.1	15.03	15.21	17.73	19.35	21.01		(46)
Water s														
Storage	e volum	e (litres)	includir	ng any s	olar or V	WHRS	storage	within sa	a <mark>me ve</mark> s	sel		150		(47)
	-	-		ank in dw	-					(-1)				
Otherw Water			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
	-		eclared I	loss fact	or is kno	wn (kWł	n/dav):				0	24	1	(48)
			m Table				, ,) / .					54		(49)
				e, kWh/y	ear			(48) x (49) =			13		(50)
•••			-	cylinder		or is not	known:		, 				l	()
		-		rom Tab	le 2 (kW	h/litre/da	ay)					0		(51)
	-	ieating s from Ta	see secti	on 4.3								•	1	(50)
			om Table	2b								0		(52) (53)
				e, kWh/y	ear			(47) x (51) x (52) x (53) =		0]	(54)
0.		(54) in (•	,, y				() (0	, ~ (0_) ~ (,		13		(55)
	. ,	. , .		for each	month			((56)m = (55) × (41)	m		-	1	
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
			-								H11) is fro] lix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primary	v circuit	loss (ar	nual) fr	om Table	<u> </u>						·	0		(58)
-		•		for each		59)m = ((58) ÷ 36	65 × (41)	m		L		I	. /
(mod	lified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	, cylinde	r thermo	ostat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	:h m	nonth (61)m =	(60	D) ÷ 36	65 × (41))m								
(61)m=	0	0	0	Τ	0	0		0	0	0	0	(0	0	0			(61)
Total h	neat red	uired for	water	hea	ting ca	alculated	d fo	or each	n month	(62)m	= 0.85 ×	(45)r	m +	(46)m +	(57)r	m +	(59)m + (61)m	
(62)m=	171.91	151.14	157.81	Ţ.	140.2	136.47	1	20.62	114.59	127.4	7 127.79	145	5.44	155.38	167.	.35		(62)
Solar DI	HW input	calculated	using Ap	pen	dix G or	Appendix	ĸН	(negativ	e quantity	/) (enter	'0' if no sol	ar con	tribut	tion to wate	er heat	ting)		
(add a	ddition	al lines if	FGHR	S ar	nd/or V	VWHRS	S ap	oplies,	see Ap	pendix	(G)				-			
(63)m=	0	0	0		0	0		0	0	0	0	(0	0	0		I	(63)
Output	t from v	vater hea	ter				_							_				
(64)m=	171.91	151.14	157.81		140.2	136.47	1	20.62	114.59	127.4	7 127.79	145	5.44	155.38	167.	.35		-
										0	utput from v	vater h	neate	er (annual)₁	12		1716.17	(64)
Heat g	ains fro	om water	heating	g, k'	Wh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m] + 0.8	x [(46	6)m	+ (57)m	+ (59	9)m]	
(65)m=	69.91	61.76	65.22	;	58.95	58.12	5	52.44	50.84	55.13	54.82	61	1.1	64	68.3	39	l	(65)
inclu	ude (57)m in calo	culatior	n of	(65)m	only if c	yliı	nder is	s in the c	dwellin	g or hot v	water	is f	rom com	muni	ty h	eating	
5. In	ternal g	jains (see	e Table	5 a	ind 5a)):												
Metab	olic gai	ns (Table	e 5), Wa	atts								_		-				
	Jan	Feb	Mar		Apr	May		Jun	Jul	Auç	g Sep	C	Oct	Nov	D	ec		
(66)m=	114.68	114.68	114.68	3 1	114.68	114.68	1	14.68	114.68	114.6	8 114.68	114	1.68	114.68	114.	.68		(66)
Ligh <mark>tin</mark>	ig gains	s (calcula	ted in A	App	endix l	_, equat	ion	L9 or	[.] L9a), a	lso se	e Table 5				_			
(67)m=	18	15.99	13		9.84	7.36		6.21	6.71	8.72	11.71	14	.87	17.35	18.	.5		(67)
App <mark>lia</mark>	nces ga	ains (ca <mark>lc</mark>	ulated	in A	Append	lix L, eq	ua	tion L'	13 o <mark>r L1</mark> :	3a), al	so see Ta	able 5	5					
(68)m=	201.92	204.01	19 <mark>8.73</mark>	3 1	187 <mark>.49</mark>	173.3	1	59.97	151.06	148.9	6 154.24	165	5.48	179.67	193.	.01		(68)
Coo <mark>kir</mark>	ng gain	s (calcula	ted in A	App	endix	L, equa	tior	n L15	or L15a)	, also	see Tabl	e 5						
(69)m=	34.47	34.47	34.47	:	34. <mark>4</mark> 7	34.47	3	34.47	34.47	34.47	34.47	34	.47	34.47	34.4	47		(69)
Pumps	s and fa	ans gains	(Table	5a))													
(70)m=	3	3	3		3	3		3	3	3	3	;	3	3	3			(70)
Losse	s e.g. e	vaporatio	on (neg	ativ	e valu	es) (Tab	ble	5)		_								
(71)m=	-91.75	-91.75	-91.75	-	-91.75	-91.75	-!	91.75	-91.75	-91.7	5 -91.75	-91	.75	-91.75	-91.	75		(71)
Water	heating	g gains (1	able 5)	-			-										
(72)m=	93.96	91.91	87.66	1	81.87	78.12	7	72.83	68.34	74.1	76.14	82	.13	88.89	91.9	92		(72)
Total i	interna	l gains =						(66)	m + (67)m	ı + (68)r	n + (69)m +	(70)m	n + (7	71)m + (72)	m			
(73)m=	374.28	372.32	359.8	3	339.62	319.19	2	99.42	286.52	292.1	9 302.5	322	2.89	346.32	363.	.83		(73)
6. So	lar gair	ns:	-												•			
Solar ç	gains are	calculated	using so	lar fli	ux from	Table 6a	and	l associ	ated equa	tions to	convert to t	he app	olical	ble orientat	ion.			
Orient	ation:	Access F			Area			Flu			g_ Table Ch		т	FF			Gains	
		Table 6d		_	m²				ole 6a		Table 6b)	ı 	able 6c			(W)	-
	ast <mark>0.9x</mark>	0.77		×L	7.9	4	x	1	1.28	×	0.63		×L	0.7		=	27.38	(75)
	ast <mark>0.9x</mark>	0.77		×	7.9	4	x	2	2.97	×	0.63		× [0.7		=	55.73	(75)
	ast <mark>0.9x</mark>	0.77		×	7.9	4	x	4	1.38	×	0.63		×	0.7		=	100.41	(75)
	ast <mark>0.9x</mark>	0.77		×	7.9	4	x	6	7.96	x	0.63	:	×	0.7		=	164.9	(75)
Northe	ast <mark>0.9x</mark>	0.77		×	7.9	4	x	9	1.35	x	0.63	:	×	0.7		=	221.66	(75)

Northeast 0.9x	0.77	x	7.94	x	97.38	×	0.63	x	0.7	=	236.31	(75)
Northeast 0.9x	0.77	×	7.94	x	91.1	×	0.63	x	0.7	=	221.06	(75)
Northeast 0.9x	0.77	x	7.94	x	72.63	x	0.63	x	0.7	=	176.23	(75)
Northeast 0.9x	0.77	x	7.94	x	50.42	×	0.63	x	0.7	=	122.35	(75)
Northeast 0.9x	0.77	×	7.94	x	28.07	×	0.63	x	0.7	=	68.11	(75)
Northeast 0.9x	0.77	x	7.94	x	14.2	x	0.63	x	0.7	=	34.45	(75)
Northeast 0.9x	0.77	×	7.94	x	9.21	x	0.63	x	0.7	=	22.36	(75)
Southwest _{0.9x}	0.77	×	4.65	x	36.79	j	0.63	x	0.7	=	52.29	(79)
Southwest _{0.9x}	0.77	x	4.65	x	62.67		0.63	x	0.7	=	89.07	(79)
Southwest _{0.9x}	0.77	×	4.65	x	85.75		0.63	x	0.7	=	121.86	(79)
Southwest _{0.9x}	0.77	x	4.65	x	106.25		0.63	x	0.7	=	150.99	(79)
Southwest _{0.9x}	0.77	x	4.65	x	119.01		0.63	x	0.7	=	169.13	(79)
Southwest _{0.9x}	0.77	x	4.65	x	118.15		0.63	x	0.7	=	167.9	(79)
Southwest _{0.9x}	0.77	×	4.65	x	113.91		0.63	x	0.7	=	161.88	(79)
Southwest _{0.9x}	0.77	×	4.65	x	104.39		0.63	x	0.7	=	148.35	(79)
Southwest _{0.9x}	0.77	×	4.65	x	92.85]	0.63	x	0.7	=	131.95	(79)
Southwest _{0.9x}	0.77	x	4.65	x	69.27		0.63	x	0.7	=	98.44	(79)
Southwest0.9x	0.77	x	4.65	×	44.07		0.63	x	0.7	=	62.63	(79)
Southwest _{0.9x}	0.77	x	4.65	x	31.49		0.63	×	0.7	=	44.75	(79)
Northwest 0.9x	0.77	×	1.34	x	11.28	×	0.63	×	0.7	=	4.62	(81)
Northwest 0.9x	0.77	x	2.27	x	11.28	x	0.63	×	0.7	=	7.83	(81)
Northwest 0.9x	0.77	x	1.34	x	22.97	х	0.63	×	0.7	=	9.41	(81)
Northwest 0.9x	0.77	×	2.27	x	22.97	×	0.63	x	0.7	=	15.93	(81)
Northwest 0.9x	0.77	x	1.34	x	41.38	×	0.63	x	0.7	=	16.95	(81)
Northwest 0.9x	0.77	x	2.27	x	41.38	x	0.63	x	0.7	=	28.71	(81)
Northwest 0.9x	0.77	×	1.34	x	67.96	×	0.63	x	0.7	=	27.83	(81)
Northwest 0.9x	0.77	×	2.27	x	67.96	×	0.63	x	0.7	=	47.14	(81)
Northwest 0.9x	0.77	×	1.34	x	91.35	×	0.63	x	0.7	=	37.41	(81)
Northwest 0.9x	0.77	×	2.27	x	91.35	×	0.63	x	0.7	=	63.37	(81)
Northwest 0.9x	0.77	×	1.34	x	97.38	×	0.63	x	0.7	=	39.88	(81)
Northwest 0.9x	0.77	×	2.27	x	97.38	X	0.63	x	0.7	=	67.56	(81)
Northwest 0.9x	0.77	×	1.34	x	91.1	×	0.63	x	0.7	=	37.31	(81)
Northwest 0.9x	0.77	×	2.27	X	91.1	X	0.63	x	0.7	=	63.2	(81)
Northwest 0.9x	0.77	x	1.34	x	72.63	X	0.63	x	0.7	=	29.74	(81)
Northwest 0.9x	0.77	×	2.27	X	72.63	X	0.63	x	0.7	=	50.38	(81)
Northwest 0.9x	0.77	×	1.34	X	50.42	X	0.63	x	0.7	=	20.65	(81)
Northwest 0.9x	0.77	×	2.27	x	50.42	×	0.63	x	0.7	=	34.98	(81)
Northwest 0.9x	0.77	×	1.34	X	28.07	×	0.63	x	0.7	=	11.49	(81)
Northwest 0.9x	0.77	×	2.27	X	28.07	×	0.63	x	0.7	=	19.47	(81)
Northwest 0.9x	0.77	×	1.34	X	14.2	X	0.63	x	0.7	=	5.81	(81)
Northwest 0.9x	0.77	x	2.27	x	14.2	X	0.63	x	0.7	=	9.85	(81)

Northw						г			· —						(r_1)
Northw	L	0.77	×	1.3		×		9.21		0.63		0.7	=	3.77	(81)
Northw	est <mark>0.9x</mark>	0.77	X	2.2	27	x	ę	9.21	x	0.63	x	0.7	=	6.39	(81)
<u>.</u>											()				
Solar ((83)m=	92.11	watts, ca 170.13	alculated 267.92	1 for eac 390.87	h month 491.56	1	11.65	483.45	(83)m = S 404.71	um(74)m . 309.93	<mark>(82)m</mark> 197.51	112.74	77.27		(83)
		nternal a							404.71	309.93	197.51	112.74	11.21		(00)
(84)m=	466.4	542.45	627.72	730.48	810.75	т`	11.07	769.96	696.9	612.43	520.39	459.06	441.1		(84)
		I		I	I		11.07	105.50	000.0	012.40	020.00	400.00	++1.1		(01)
		nal temp		· · · · ·		<i>´</i>									
		during h	• •			-			ole 9, Th	1 (°C)				21	(85)
Utilisa		tor for g		<u> </u>		T Ì		, ,					_	l	
	Jan	Feb	Mar	Apr	May	-	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(2.2)
(86)m=	1	0.99	0.98	0.93	0.8		0.6	0.45	0.51	0.79	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.81	19.98	20.25	20.62	20.87	2	0.98	21	20.99	20.92	20.57	20.13	19.79		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dw	elling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.96	19.97	19.97	19.99	19.99	2	0.01	20.01	20.01	20	19.99	19.99	19.98		(88)
l Itilis:	ation fac	tor for g	ains for	rest of d	welling	h2	m (se	e Table	9a)						
(89)m=	1	0.99	0.97	0.91	0.74	1).52	0.35	0.4	0.71	0.95	0.99	1		(89)
		1 temper 18.63			01 dwell	<u> </u>	<u> </u>		<u>i – – – – – – – – – – – – – – – – – – –</u>	7 in Tabl 19.94	e 9 <mark>c)</mark> 19.5	10.07	10.07		(90)
(90)m=	18.38	18.63	19.03	19.55	19.88		9.99	20.01	20.01			18.87 g area ÷ (4	18.37	0.50	
												ig alea ÷ (-	+) -	0.52	(91)
Me <mark>an</mark>		l temper													
(92)m=	19.12	19.33	19.67	20.11	20.39		20.5	20.52	20.52	20.44	20.05	19.52	19.1		(92)
	<u> </u>	1	i	1	· · ·	1		i	1	ere appro	r <u> </u>	1			(22)
(93)m=	19.12	19.33	19.67	20.11	20.39	2	20.5	20.52	20.52	20.44	20.05	19.52	19.1		(93)
		ting requ			• . •						/	>			
		mean int factor fo		•		ned	at ste	ep 11 of	I able 9	b, so tha	t II,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Γ	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	L	tor for g			inay		ourr	Uui	7.009	000	000	1107	200		
(94)m=	1	0.99	0.97	0.91	0.77).56	0.4	0.46	0.75	0.95	0.99	1		(94)
Usefu	ul gains,	hmGm ,	, W = (9	4)m x (8-	4)m			1	1		1	1			
(95)m=	464.15	536.75	610.14	665.36	622.04	45	52.91	306.39	319.44	456.64	494.2	454.48	439.48		(95)
Montl	hly aver	age exte	rnal tem	perature	e from T	able	ə 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al temp	erature,	Lm	, W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1222.54	1185.05	1077.01	898.99	694.96	46	63.85	307.91	322.48	501.82	755.53	1000.29	1209.56		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	564.24	435.65	347.35	168.21	54.25		0	0	0	0	194.43	392.98	572.94		
									Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	2730.06	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year									37.92	(99)
9a. En	erav rec	quiremer	nts – Ind	ividual h	eating s	vste	ems i	ncluding	micro-C	CHP)					
	e heatir					<i></i>	1								
•		bace hea	at from s	econdar	y/supple	eme	entary	system						0	(201)
	•							-						L	1

Fracti	on of sp	bace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatir	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space		g require	,	r		· · · · · ·						1	1	
	564.24	435.65	347.35	168.21	54.25	0	0	0	0	194.43	392.98	572.94		
(211)m 	i = {[(98 603.47	6)m x (20 465.94	4)]	00 ÷ (20 179.9	6) 58.02	0	0	0	0	207.94	420.3	612.77	1	(211)
l	603.47	400.94	371.5	179.9	56.02	0	0	-	-	ar) =Sum(2			2919.85	(211)
= {[(98))m x (20	ig fuel (se 01)] } x 1	00 ÷ (20)8)										
(215)m=	0	0	0	0	0	0	0	0 Tota	0	0 ar) =Sum(2	0	0	0	(215)
Wator	heating	7						Tota	i (ittili yot		- 1 0 / 15,1012	2	0	(213)
		ater heat	ter (calc	ulated al	oove)	-				-	-		_	
-	171.91	151.14	157.81	140.2	136.47	120.62	114.59	127.47	127.79	145.44	155.38	167.35		_
	ciency of water heater m= 87.75 87.48 86.86 85.3 82.58 79.8 79.8 79.8 79.8 85.59 87.19 87.84													
(217)m=					82.58	79.8	79.8	79.8	79.8	85.59	87.19	87.84		(217)
		heating, m x 100												
(219) <mark>m=</mark>		172.77	181.68	164.36	165.26	151.15	143.59	159.74	160.13	169.93	178.22	190.52		
								Tota	l = Sum(2	19a) ₁₁₂ =			2033.27	(219)
	l totals		d main	avetam	1					k	Wh/year	•	kWh/year	
		fuel use		system	'								2919.85	4
		fuel use											2033.27	
		oumps, fa		electric	keep-ho	t								
centra	al heatir	ng pump:										30		(230c)
boiler	with a	fan-assis	ted flue									45		(230e)
Total e	lectricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electric	city for I	ighting											317.86	(232)
12a. (CO2 err	nissions -	– Individ	ual heati	ng syste	ems inclu	uding mi	cro-CHP	1					
							ergy /h/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space	heating) (main s	ystem 1)		(211	l) x			0.2	16	=	630.69	(261)
Space	heating	(second	dary)			(215	5) x			0.5	19	=	0	(263)
Water I	heating					(219	9) x			0.2	16	=	439.19	(264)
Space	and wa	ter heati	ng			(261	I) + (262)	+ (263) + (264) =				1069.87	(265)
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t (231	I) x			0.5	19	=	38.93	(267)
Electric	city for I	ighting				(232	2) x			0.5	19	=	164.97	(268)
										-				

Total CO2, kg/year sum of (265)...(271) = 1273.77 (272) TER = 17.69 (273)



			User D	etails:											
Assessor Name: Software Name:	Stroma FSAP 201			Stroma Softwa	re Ver	sion:		Versio	n: 1.0.4.14						
		Pr	operty A	Address:	Flat 2-0)1									
Address :															
1. Overall dwelling dime	ensions:		A	(A 11.)/ a la una a (ma 2)						
Ground floor			Area		(1a) x	Av. Hei		(2a) =	Volume(m ³)	(3a)					
	-) . (4 -) . (4 -) . (4 -) . (4 -					3.	.15	(2a) =	160.65	_(^{3a)}					
Total floor area $TFA = (1$	a)+(10)+(10)+(10)+(10)	e)+(1n))	51	(4) (2a) (2b)	() () a) () d		(2n)		٦					
Dwelling volume					(38)+(30)	1+(30)+(30	l)+(3e)+	.(31) =	160.65	(5)					
2. Ventilation rate:				- 41		4 - 4 - 1									
		econdary neating		other		total			m ³ per hou						
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)					
Number of open flues	0 +	0] + [0] = [0	x	20 =	0	(6b)					
Number of intermittent fa	ins					2	x ′	10 =	20	(7a)					
Number of passive vents	\$					0	x ′	10 =	0	(7b)					
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)					
	anges per ho	ur													
	er of passive vents er of flueless gas fires 0 x 10 = 0 0 x 40 = 0 Air chan tion due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20 \div (5) = $(5) = 0$ pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) nber of storeys in the dwelling (ns)														
		ed, proceed	to (17), c	otherwise c	ontinue fro	om (9) to ((16)			-					
Number of storeys in the Additional infiltration	he dwelling (ns)						[(0)	11-0.1 -	0	(9)					
Structural infiltration: 0	25 for steel or timber	frame or (0.35 for	masonr	v constr	uction	[(9)	-1]x0.1 =	0	(10) (11)					
	resent, use the value corres				•	aotion			0						
deducting areas of openi			. / .	N 1						-					
If suspended wooden t		led) or 0.1	i (seale	a), eise	enter U				0	(12)					
If no draught lobby, en Percentage of windows		trippod							0	(13)					
Window infiltration	s and doors draught s	inpped		0.25 - [0.2	x (14) ÷ 1	001 =		-	0	(14) (15)					
Infiltration rate				(8) + (10) -			+ (15) =		0	(16)					
Air permeability value,	a50. expressed in cut	oic metres						area	5	(17)					
If based on air permeabil			•	•	•				0.37	(18)					
Air permeability value applie	•					is being us	sed								
Number of sides sheltere	эd								0	(19)					
Shelter factor				(20) = 1 - [9)] =			1	(20)					
Infiltration rate incorporat	-			(21) = (18)	x (20) =				0.37	(21)					
Infiltration rate modified f		b L							1						
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Monthly average wind sp	eed from Table 7								1						
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7							
Wind Factor (22a)m = (2	2)m ÷ 4														
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18							

Adjust	ed infiltr	ation rat	e (allow	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.37	0.4	0.42	0.44			
		c <i>tive air</i> al ventila	•	rate for t	he appli	cable ca	se								(23a)
				endix N. (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)				0	(23b)
								n Table 4h		, (,				0	(23c)
			-	-	-					2h)m + (23h) 🗙 [1 – (23c)		0	(200)
(24a)m=					0	0				0					(24a)
		l d mech	I anical ve	L entilation	L without	l heat rec	L coverv (N	I MV) (24b	l = (22)	l 2b)m + ()	L 23b)	1	J		
(24b)m=	r	0		0	0	0		0	0	0	0	0]		(24b)
		u ouse ex	ract ver	ntilation of	r positiv	input v	ventilatio	n from c	outside				1		
,					•	•		c) = (22b		5 × (23b)				
(24c)m=	- 0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	ve input	ventilatio	on from I	oft	•	-				
	<u> </u>		<u>, ,</u>	<u> </u>	·	<u>`</u>	<u>,</u>	0.5 + [(2	2b)m² x	0.5]			1		
(24d)m=	0.61	0.61	0.61	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(24d)
Effe		<u> </u>		<u> </u>	í	<u> </u>	r i	d) in boy	k (25)	·			1		
(25)m=	0.61	0.61	0.61	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(25)
3. He	at losse	s and he	eat loss	paramet	er:							_			
ELEN		Gros		Openin		Net Ar		U-valu		AXU		k-value			Xk
_		area	(m²)	r) ²	A ,r	m²	W/m2	2K	(W/I	K)	kJ/m²•l	K	kJ	/K
Doors	_					1.8	X	1	=	1.8					(26)
	ws Type					5.21		/[1/(1.4)+		6.91					(27)
	ws Type					2.8		/[1/(1.4)+		3.71					(27)
Windo	ws Type	e 3				2.94	x1	/[1/(1.4)+	0.04] =	3.9					(27)
Walls	Type1	52.	9	10.9	5	41.95	5 X	0.18	=	7.55					(29)
Walls	Type2	4.7	3	1.8		2.93	X	0.18	=	0.53					(29)
Total a	area of e	elements	, m²			57.63	3								(31)
				effective wi nternal wal			lated using	g formula 1	/[(1/U-valı	ie)+0.04] a	as given in	n paragraph	1 3.2		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				24	4.4	(33)
Heat c	apacity	Cm = S((A x k)						((28).	.(30) + (32	2) + (32a)	(32e) =	81	75.6	(34)
Therm	al mass	parame	eter (TMI	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		2	50	(35)
	-	sments wh ad of a de			construct	ion are noi	t known pr	recisely the	e indicative	values of	TMP in T	able 1f			
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	K						5	.7	(36)
			are not kr	nown (36) =	= 0.15 x (3	1)									_
	abric he								(33) +	(36) =			30	0.09	(37)
Ventila		i	1	d monthl					r	= 0.33 × (r	1	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			1000
(38)m=	32.55	32.32	32.09	31.01	30.8	29.86	29.86	29.69	30.22	30.8	31.21	31.64]		(38)
Heat t	ransfer o	coefficie	nt, W/K	-				-	(39)m	= (37) + (3	38)m				
(39)m=	62.64	62.41	62.18	61.1	60.89	59.95	59.95	59.78	60.32	60.89	61.3	61.73			_
										Average =	Sum(39)	₁₂ /12=	61	.09	(39)

Heat lo	ss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.23	1.22	1.22	1.2	1.19	1.18	1.18	1.17	1.18	1.19	1.2	1.21		
Numba	r of do		I							Average =	Sum(40)1.	12 /12=	1.2	(40)
	Jan	Feb	nth (Tab Mar	r í	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	Apr 30	31	30	31	31 Aug	30	31	30	31		(41)
(41)11=		20	51	30	51	- 50	51	51	- 50	51	- 50	51		(41)
4. Wa	ter 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	-A -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		72		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.04		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)		-				
(44)m=	82.54	79.54	76.54	73.54	70.54	67.54	67.54	70.54	73.54	76.54	79.54	82.54		_
Ener <mark>gy c</mark>	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		900.48	(44)
(45)m=	1 <mark>2</mark> 2.41	107.06	110.48	96.32	92.42	79.75	73.9	84.8	85.81	10 <mark>0.01</mark>	109.17	118.55		
If instant	aneous M	vətər həati	na at noin	t of use (n	hot water	r storage)	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1180.67	(45)
		-	-		<u> </u>					45	40.07	47.70		(46)
(46)m= Water	18.36 storage	16.06 loss:	16.57	14.45	13.86	11.96	11.08	12.72	12.87	15	16.37	17.78		(40)
	-		includir	ng any s	olar or V	/WHRS	storage	within sa	a <mark>me ve</mark> s	sel		150		(47)
If comr	nunity h	neating a	and no ta	ank in dv	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					. /1 \ \ //	(1-)						I	
					or is kno	wn (kvvr	n/day):				0.	24		(48)
			m Table								0.	54		(49)
•••			-	e, kWh/ye cylindor	ear loss fact	or is not	known:	(48) x (49)) =		0.	13		(50)
Hot wa	ter stor	age loss	factor f	rom Tab	le 2 (kW							0		(51)
	-	from Ta	see secti	on 4.3								•		(50)
			om Table	2b								0		(52) (53)
				e, kWh/y	oar			(47) x (51)) x (52) x (53) -				
		(54) in (•	, KVVII/ y	cai)	00) -		0 13		(54) (55)
	. ,	. , .		for each	month			((56)m = (55) × (41)	m				()
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
	-		-					0), else (5				-	l ix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	 a 3			•				0		(58)
Primar	y circuit	loss ca	lculated	for each	month (. ,	65 × (41)		4 4 ha			I	
, i	-	r	1	1	r	· · · · · ·	· · · · · ·	ng and a	· ·	1	, 	00.00	l	(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h 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 rec	uired for	water h	neating c	alculated	l fo	r each	n month	(62)m =	0.85 × ((45)m	+ (46)m +	(57)m +	- · (59)m + (61)m	
(62)m=	149.67	131.68	137.74	122.7	119.68	10	06.13	101.16	112.06	112.19	127.2	7 135.55	145.81		(62)
Solar DI	-IW input	calculated	using Ap	pendix G o	or Appendix	: H (negativ	e quantity	v) (enter '0	' if no sola	r contrib	oution to wate	er heating)		
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	ap	plies,	see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	from v	vater hea	ter		_						-			_	
(64)m=	149.67	131.68	137.74	122.7	119.68	10	06.13	101.16	112.06	112.19	127.2	7 135.55	145.81		-
									Outp	out from w	ater hea	ter (annual)	12	1501.63	(64)
Heat g	ains fro	om water	heating	g, kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)ı	m + (57)m	+ (59)m	<u>]</u>]	
(65)m=	62.51	55.3	58.54	53.13	52.54	4	7.62	46.38	50	49.64	55.06	5 57.4	61.23		(65)
inclu	ide (57)m in calo	culation	of (65)n	n only if c	ylir	nder is	s in the c	dwelling	or hot w	ater is	from com	munity ł	neating	
5. Int	ternal g	ains (see	Table	5 and 5a	a):										
Metab	olic gai	ns (Table	e 5), Wa	itts										_	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	85.98	85.98	85.98	85.98	85.98	8	5.98	85.98	85.98	85.98	8 <mark>5.98</mark>	8 85.98	85.98		(66)
Ligh <mark>tin</mark>	<mark>g g</mark> ains	(calcula	ted in A		L, equat	ion	L9 or	[.] L9a), a	lso see	Table 5					
(67)m=	1 <mark>3.38</mark>	11.88	9.66	7.31	5.47	4	4.62	4.99	6.48	8.7	11.05	5 12.9	13.75		(67)
App <mark>lia</mark>	nces ga	ains (ca <mark>lc</mark>	ulated i	n Appen	dix L, eq	uat	ion L1	13 o <mark>r L1</mark> :	3a), also	<mark>se</mark> e Ta	ble <mark>5</mark>				
(68)m=	149.83	151.39	147.47	139.13	128.6	1	18.7	112.09	110.54	114.45	122.8	133.32	143.22		(68)
Cookir	ng gains	s (calcula	ted in A	Appendix	L, equat	tion	1 L15 (or L15a)	, also se	e Table	5				
(69)m=	31.6	31.6	31.6	31.6	31.6	3	31.6	31.6	31.6	31.6	31.6	31.6	31.6		(69)
Pumps	and fa	ins gains	(Table	5a)								-		-	
(70)m=	3	3	3	3	3		3	3	3	3	3	3	3]	(70)
Losses	s e.g. e	vaporatic	n (nega	ative valu	ues) (Tab	le :	5)			•	•		-	-	
(71)m=	-68.78	-68.78	-68.78	-68.78	-68.78	-6	68.78	-68.78	-68.78	-68.78	-68.7	8 -68.78	-68.78]	(71)
Water	heating	, g gains (T	able 5)		•	•						•	•	-	
(72)m=	84.02	82.28	78.69	73.79	70.61	6	6.14	62.34	67.21	68.94	74.01	79.73	82.29]	(72)
Total i	nterna	I gains =					(66)	m + (67)m	+ (68)m -	⊦ (69)m +	(70)m +	(71)m + (72))m	-	
(73)m=	299.02	297.34	287.61	272.03	256.47	24	41.25	231.21	236.02	243.89	259.6	4 277.74	291.05]	(73)
6. So	lar gain	IS:		•											
Solar g	ains are	calculated	using sol	ar flux fron	n Table 6a	and	associ	ated equa	tions to co	onvert to th	ne applio	able orientat	tion.		
Orienta		Access F Table 6d		Area m²	a		Flu: Tab	x ble 6a	Т	g_ able 6b		FF Table 6c		Gains (W)	
Southe	ast <mark>0.9x</mark>	0.77	,	5.	21	x	3	6.79	x	0.63	x	0.7	=	58.58	(77)
Southe	ast <mark>0.9x</mark>	0.77	,	< 5.	21	x	6	2.67	x	0.63	×	0.7	=	99.79	(77)
Southe	ast <mark>0.9x</mark>	0.77	,		21	x		5.75	x	0.63	×	0.7	=	136.54	(77)
Southe	ast <mark>0.9x</mark>	0.77		< 5.	21	x	10	06.25	x	0.63	×	0.7	=	169.18](77)
Southe	ast <mark>0.9x</mark>	0.77	,	5 .	21	x	11	19.01	x	0.63	×	0.7	=	189.49	(77)

								_			_				
Southeast 0.9x	0.77	×	5.:	21	x	1	18.15	x	0.63	×		0.7	=	188.1	2 (77)
Southeast 0.9x	0.77	×	5.	21	x	1	13.91	x	0.63	×		0.7	=	181.3	7 (77)
Southeast 0.9x	0.77	×	5.	21	x	1	04.39	x	0.63	×		0.7	=	166.2	2 (77)
Southeast 0.9x	0.77	×	5.	21	x	g	2.85	x	0.63	×		0.7	=	147.8	4 (77)
Southeast 0.9x	0.77	×	5.	21	x	6	9.27	x	0.63	×		0.7	=	110.2	9 (77)
Southeast 0.9x	0.77	×	5.	21	x	4	4.07	x	0.63	×		0.7	=	70.17	7 (77)
Southeast 0.9x	0.77	×	5.	21	x	3	31.49	x	0.63	×		0.7	=	50.14	4 (77)
Southwest _{0.9x}	0.77	×	2	.8	x	3	6.79]	0.63	×		0.7	=	31.49) (79)
Southwest _{0.9x}	0.77	×	2.	94	x	3	6.79]	0.63	×		0.7	=	33.06	6 (79)
Southwest0.9x	0.77	×	2	8	x	6	2.67]	0.63	×		0.7	=	53.63	3 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	6	2.67]	0.63	×		0.7	=	56.3 ²	1 (79)
Southwest _{0.9x}	0.77	×	2	8	x	8	5.75]	0.63	×		0.7	=	73.38	3 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	8	5.75]	0.63	×	Γ	0.7	=	77.0	5 (79)
Southwest _{0.9x}	0.77	×	2.	8	x	1	06.25]	0.63	×	Ľ	0.7	=	90.92	2 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	1	06.25]	0.63	×	Γ	0.7	=	95.47	7 (79)
Southwest _{0.9x}	0.77	×	2.	8	x	1	19.01]	0.63	×	Γ	0.7	=	101.8	4 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	1	19.01]	0.63	×	Γ	0.7	=	106.9	3 (79)
Southwest0.9x	0.77	×	2.	.8	X	1	18.15		0.63	×		0.7	=	101.1	1 (79)
Sout <mark>hwest_{0.9x}</mark>	0.77	×	2.9	94	x	1	18.15]	0.63	×	Γ	0.7	- 1	106.1	6 (79)
Sout <mark>hwest</mark> 0.9x	0.77	×	2.	.8	x	1	13.91		0.63	×	Γ	0.7	=	97.47	7 (79)
Sout <mark>hwest</mark> 0.9x	0.77	×	2.	94	x	1	13.91		0.63	×	Γ	0.7	=	102.3	5 (79)
Sout <mark>hwest_{0.9x}</mark>	0.77	×	2	.8	x	1	04.39	1	0.63	×	Ē	0.7	_ =	89.33	3 (79)
Sout <mark>hwest_{0.9x}</mark>	0.77	×	2.	94	x	1	04.39		0.63	×	Ē	0.7	_ =	93.8	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77	×	2.	8	x	9	2.85	Ī	0.63	×	Ē	0.7		79.4	5 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	9	2.85	Ī	0.63	×	Γ	0.7	= =	83.43	3 (79)
Southwest _{0.9x}	0.77	×	2	8	x	6	9.27	1	0.63	×	Γ	0.7	_ =	59.27	7 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	6	9.27]	0.63	×	Γ	0.7	=	62.24	4 (79)
Southwest _{0.9x}	0.77	×	2	8	x	4	4.07]	0.63	×	Γ	0.7	_ =	37.7	1 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	4	4.07]	0.63	×	Γ	0.7	=	39.6	(79)
Southwest0.9x	0.77	×	2.	8	x	3	31.49]	0.63	×	Γ	0.7	=	26.94	4 (79)
Southwest _{0.9x}	0.77	×	2.	94	x	3	31.49]	0.63	×	Γ	0.7	_ =	28.29) (79)
								-							
Solar gains in	watts, ca	alculate	d for eac	h mont	h			(83)m	n = Sum(74)m	า(82)	m			-	
(83)m= 123.13		286.97	355.57	398.26		95.38	381.19	349	.34 310.73	3 231	.8	147.48	105.37		(83)
Total gains –			r (84)m : T	· · ·	<u> </u>	83)m	, watts							-	
(84)m= 422.15	507.08	574.58	627.59	654.74	6	36.64	612.4	585	.36 554.62	2 491	45	425.22	396.43		(84)
7. Mean inte	rnal temp	erature	(heating	g seaso	n)										
Temperature	e during h	eating	periods i	n the liv	/ing	area	from Tal	ole 9	, Th1 (°C)					21	(85)
Utilisation fa	ctor for ga	ains for	living ar	ea, h1,	m (s	ee Ta	ble 9a)			_				-	
Jan	Feb	Mar	Apr	May	/	Jun	Jul	A	ug Sep		ct	Nov	Dec		
(86)m= 0.99	0.98	0.95	0.89	0.76		0.58	0.43	0.4	46 0.69	0.9	2	0.98	0.99]	(86)
Mean interna	al tempera	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	able 9c)						
(87)m= 19.86	20.08	20.36	20.67	20.88	2	20.98	21	20.	99 20.94	20.	67	20.21	19.83]	(87)
					_			_							

Temp	erature	during h	neating p	periods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.9	19.9	19.9	19.92	19.92	19.94	19.94	19.94	19.93	19.92	19.92	19.91		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.99	0.97	0.94	0.86	0.7	0.49	0.33	0.36	0.61	0.88	0.98	0.99		(89)
Mean	interna	l temper	rature in	the rest	of dwelli	ing T2 (fo	ollow ste	eps 3 to 3	7 in Tabl	e 9c)				
(90)m=	18.41	18.73	19.12	19.56	19.82	19.93	19.94	19.94	19.89	19.57	18.93	18.37		(90)
									f	LA = Livin	g area ÷ (4	1) =	0.61	(91)
Mean	interna	l temper	rature (fc	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.29	19.55	19.87	20.23	20.46	20.56	20.58	20.58	20.53	20.23	19.71	19.26		(92)
Apply	adjustr	nent to t	he mear	n internal	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.29	19.55	19.87	20.23	20.46	20.56	20.58	20.58	20.53	20.23	19.71	19.26		(93)
			uirement											
				mperatur using Ta		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
ine ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			jains, hm	· ·	Iviay	Juli	Jui	Aug		001	1107	Dee		
(94)m=	0.99	0.97	0.94	0.87	0.74	0.55	0.39	0.42	0.66	0.89	0.97	0.99		(94)
Us <mark>ef</mark> u	ul gains,	hmGm	, W = (9	4)m x (84	4)m								_	
(95)m=	416.97	493.14	540.43	544.48	481.59	3 <mark>4</mark> 8.17	237.28	247.77	365.05	439.48	414.35	392.68		(95)
Mo <mark>ntl</mark>	hly aver	age ex <mark>te</mark>	ernal terr	nperature	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)
				nal tempe										
(97)m=	939.12	914.1	831.58	692.49	533.63	357.55	238.67	249.9	387.94	586.71	772.77	929.54		(97)
	-		1	o <mark>r eac</mark> h m	1		i	1				000.40		
(98)m=	388.48	282.88	216.61	106.57	38.72	0	0	0	0	109.54	258.06	399.42		
								lota	l per year	(kWh/year) = Sum(98	8)15,912 =	1800.29	(98)
Space	e heatin	g requir	ement in	n kWh/m²	²/year								35.3	(99)
9a. En	ergy rec	quiremer	nts – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heatir	-			, .									
				econdar		mentary	-						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 ·	– (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 – ((203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ting syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	/ear
Space	e heatin	g requir	ement (c	calculate	d above))								
	388.48	282.88	216.61	106.57	38.72	0	0	0	0	109.54	258.06	399.42		
(211)m	า = {[(98)m x (20)4)] } x 1	100 ÷ (20)6)									(211)
	415.49	302.55	231.67	113.97	41.41	0	0	0	0	117.16	276	427.19		
			•	-				Tota	l (kWh/yea	ar) =Sum(2	2 11) _{15,1012}	=	1925.44	(211)
Spac	e heatin	g fuel (s	econdar	′y), kWh/	month									
	í Ó	01)]}x 1	00 ÷ (20)8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ll (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	-	0	(215)

Water heating

Hator Hoating															
Output from water heater (calculated above)							•								
149.67 131.68 137.74 122.7 119.68 10	06.13 101.16	112.06	112.19	127.27	135.55	145.81		_							
Efficiency of water heater							79.8	(216							
(217)m= 87.25 86.8 86.02 84.44 82.17 7	79.8 79.8	79.8	79.8	84.42	86.51	87.37		(217							
Fuel for water heating, kWh/month															
$(219)m = (64)m \times 100 \div (217)m$	400 400 77	4 4 9 4 9	4.40.50	450.70	450.00	400.00	1								
(219)m= 171.55 151.7 160.13 145.31 145.64	133 126.77	140.43	140.59	150.76	156.69	166.89		7							
		Tota	I = Sum(2				1789.45	(219							
Annual totals				k	Wh/yea	r	kWh/year	٦							
Space heating fuel used, main system 1							1925.44	ļ							
Water heating fuel used							1789.45								
Electricity for pumps, fans and electric keep-hot															
central heating pump:	ral heating pump:														
boiler with a fan-assisted flue						45		(230							
Total electricity for the above, kWh/year	with a fan-assisted flue														
Electricity for lighting							236.22	(232							
12a. CO2 emissions - Individual heating systems	s includina mi	cro-CHP)					_							
							-								
	Energy				ion fac	tor	Em <mark>issio</mark> ns								
	kWh/year			kg CO	2/kVVh		kg CO2/yea	ar							
Space heating (main system 1)	(211) x			0.2	16	=	415.9	(261							
Space heating (secondary)	(215) x			0.5	19	=	0	(263							
Water heating	(219) x			0.2	16	=	386.52	(264							
Space and water heating	(261) + (262)	+ (263) + (264) =				802.42	(265							
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267							
Electricity for lighting	(232) x			0.5	19	=	122.6	(268							
Total CO2, kg/year			sum o	of (265)(271) =		963.94	(272							
								_							
								-							

TER =

(273)

18.9

			User D	etails:										
Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa				Versic	n: 1.0.4.14					
		Pr	operty A	Address:	Flat 2-0	3								
Address :														
1. Overall dwelling dime	nsions:			(0)										
Ground floor			Area	. ,	(4 -)	Av. Hei	• • •		Volume(m ³					
	· · · · · · · · · · · · · · · · · · ·	· · · ·			(1a) x	3	.08	(2a) =	221.4	(3a)				
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	72	(4)									
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	221.4	(5)				
2. Ventilation rate:	_			_		_								
		econdary neating	y	other		total			m ³ per hou	r				
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)				
Number of open flues	0 +	0	+	0] = [0	x	20 =	0	(6b)				
Number of intermittent far	าร		_			3	x '	10 =	30	(7a)				
Number of passive vents					Г	0	x ′	10 =	0	(7b)				
Number of flueless gas fir	res				Γ	0	X 4	40 =	0	(7c)				
Number of passive vents 0 $x 10 =$ Number of flueless gas fires 0 $x 40 =$ Air changeInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 30 \div (5) =														
	ber of passive vents $0 x ext{ 10 =} 0 x ext{ 10 =} 0 x ext{ 40 =} 0 x $													
		ed, proceed	l to (17), o	otherwise c	ontinue fro	om (9) to ((16)							
Additional infiltration	le dweiling (lis)						[(9)	-1]x0.1 =	0	(9) (10)				
Structural infiltration: 0.	25 for steel or timber	frame or	0.35 for	masonr	v constr	uction	[(0)	110000 -	0	(10)				
if both types of wall are pr	esent, use the value corres				•				0					
deducting areas of openin If suspended wooden fl		ed) or 0	1 (seale	d) else	enter ()				0	(12)				
If no draught lobby, ent		ou) or o.	1 (00010	a), 0100					0	(12)				
Percentage of windows		ripped							0	(14)				
Window infiltration	Ū	••		0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)				
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)				
Air permeability value,	q50, expressed in cub	oic metres	s per ho	our per so	quare m	etre of e	nvelope	area	5	(17)				
If based on air permeabili	ty value, then (18) = [(1	7) ÷ 20]+(8), otherwis	se (18) = (16)				0.39	(18)				
Air permeability value applies		s been don	e or a deg	ree air per	meability i	is being us	sed			_				
Number of sides sheltered Shelter factor	d			(20) = 1 - [0 075 x (1	9)1 –			0	(19)				
Infiltration rate incorporati	ing shelter factor			(21) = (18)		0)] –			1	(20)				
Infiltration rate modified for	-	4		(21) = (10)	x (20) -				0.39	(21)				
i i i	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind spe			001	, lug	Cop	001	1101	200						
r r	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7						
				-			<u> </u>	1	l					
Wind Factor $(22a)m = (22a)m $	· · · · · ·	, , , , , , , , , , , , , , , , , , ,					1		l					
(22a)m= 1.27 1.25 1	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18						

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-			_	
<u> </u>	0.49	0.48	0.47	0.42	0.41	0.37	0.37	0.36	0.39	0.41	0.43	0.45		
		<i>ctive air</i> al ventila	•	rate for t	ne appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	√5)), othei	rwise (23b) = (23a)			0	(23b)
			• • •	iency in %	, ,	, ,				, , ,			0	(23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	m = (2)	2b)m + (23b) x [[,]	1 – (23c)	_	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	coverv (N	//V) (24b)m = (22	1 2b)m + (;	1 23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	iouse ex	tract ver	tilation of	or positiv	ve input v	ventilatio	n from c	outside				1	
,				hen (24a	•	•				5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
,				ole hous		•								
1	, <i>,</i>	I	<u>, ,</u>	m = (22t	<i>.</i>	<u>`</u>	, 		,		1	1	1	
(24d)m=		0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6	J	(24d)
1			·	nter (24a		r i	, <u>,</u>	, 1	· ,	0.50	0.50		1	(25)
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.57	0.59	0.59	0.6		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	oaramete	er:									
ELEN	1ENT	Gros		Openin m		Net Ar		U-valı W/m2		A X U (W/I		k-value		A X k kJ/K
Doors		area	(111-)		F-	A ,n				`		KJ/11-•1	n i i i i i i i i i i i i i i i i i i i	
	ws Type	. 1				1.8		1 /[1/(1.4)+	=	1.8	H			(26)
						4.65				6.16	H			(27)
	ws Type					1.34		/[1/(1.4)+		1.78	L.			(27)
	ws Type -					7.94		/[1/(1.4)+	L L	10.53	\exists			(27)
	ws Type	94 				2.27	x1/	/[1/(1.4)+	0.04] =	3.01	╡,			(27)
Walls 7		63.3	32	16.2	2	47.12	<u>x</u>	0.18	= [8.48			\exists	(29)
Walls 7		4.7		1.8		2.93	X	0.18	=	0.53				(29)
Total a	rea of e	elements	, m²			68.05	5							(31)
				effective wi Internal wall			ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
		ss, W/K :			o una pun			(26)(30)	+ (32) =				32.29) (33)
		Cm = S(- /					((28)	(30) + (32	2) + (32a).	(32e) =	9157.	
			,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K				tive Value			250	(35)
		•		tails of the				ecisely the	indicative	values of	TMP in Ta	able 1f		(' '
		ad of a de											-	
	-		,	culated u	• •		<						4.84	(36)
	of therma abric he		are not kr	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			07.4	(27)
			alculator	d monthly							(25)m x (5)		37.13	3 (37)
ventila	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	= 0.33 x (25)m x (5) Nov	Dec	1	
(38)m=	45.36	45.01	44.68	43.1	42.8	41.43	41.43	41.18	41.96	42.8	43.4	44.03	1	(38)
					.2.0								1	()
Heat tr (39)m=	82.49	coefficier 82.14	1t, VV/K 81.81	80.23	79.94	78.56	78.56	78.31	(39)m 79.09	= (37) + (3 79.94	80.53	81.16	1	
(00)11-	02.40			00.20		. 0.00	. 0.00	. 0.01			Sum(39)1		80.23	3 (39)

Heat lo	ss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.15	1.14	1.14	1.11	1.11	1.09	1.09	1.09	1.1	1.11	1.12	1.13		
Lumbo	r of dou		ı						,	Average =	Sum(40)1	12 /12=	1.11	(40)
	Jan	Feb	nth (Tab Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m=	31	28	31	30	31	30	31	31 Aug	30	31	30	31		(41)
(,	01]	(,
4. Wa	ter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 88.68													(42)
Reduce	the annua	al average	hot water		5% if the c	welling is	designed		+ 36 a water us	se target c		.68]	(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Hot wate		n litres pei I	r day for ea	ach month	Vd,m = fa			 I	1	1		r	1	
(44)m=	97.54	94	90.45	86.9	83.35	79.81	79.81	83.35	86.9	90.45	94	97.54	4004.4	
Ener <mark>gy c</mark>	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1064.1	(44)
(45)m=	144.65	126.51	130.55	113.82	109.21	94.24	87.33	100.21	101.41	118.18	129	140.09		_
lf instant	Total = $Sum(45)_{112}$ = instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)												1395.2	(45)
(46)m=	21.7	18.98	19.58	17.07	16.38	14.14	13.1	15.03	15.21	17.73	19.35	21.01		(46)
Water s														
Storage	Storage volume (litres) including any solar or WWHRS storage within same vessel 150													(47)
	-	-		ank in dw	-					(-1)				
Otherw Water			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
	-		eclared I	loss fact	or is kno	wn (kWł	n/dav):				0	24	1	(48)
			m Table				, ,) / .					54		(49)
				e, kWh/y	ear			(48) x (49) =			13		(50)
•••			-	cylinder		or is not	known:		, 				l	()
		-		rom Tab	le 2 (kW	h/litre/da	ay)					0		(51)
	-	ieating s from Ta	see secti	on 4.3								•	1	(50)
			om Table	2b								0		(52) (53)
				e, kWh/y	ear			(47) x (51) x (52) x (53) =		0]	(54)
0.		(54) in (•	,, y	cui			() (0	, ~ (0_) ~ (,		13		(55)
	. ,	. , .		for each	month			((56)m = (55) × (41)	m		-	1	
(56)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(56)
	-		-								H11) is fro] lix H	
(57)m=	4	3.61	4	3.87	4	3.87	4	4	3.87	4	3.87	4		(57)
Primary	v circuit	loss (ar	nual) fr	om Table	<u> </u>						·	0		(58)
-		•		for each		59)m = ((58) ÷ 36	65 × (41)	m		L		I	. /
(mod	lified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	, cylinde	r thermo	ostat)			
(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 ea	ch	month ((61)m =	(60)) ÷ 36	65 × (41))m						
(61)m=	0	0	0		0	0	Ť	0	0	0	0	0	0	0	7	(61)
Total h	heat rec	uired for	water	he	ating ca	alculate	d fo	r eacl	h month	(62)m :	= 0.85 ×	(45)m	+ (46)m +	(57)m +	- + (59)m + (61)m	ı
(62)m=	171.91	151.14	157.8	1	140.2	136.47	1	20.62	114.59	127.47	127.79	145.4	4 155.38	167.35]	(62)
Solar D	HW input	calculated	using A	ppe	endix G or	Appendi	хH	(negati	ve quantity	• /) (enter '	D' if no sola	ar contrib	ution to wate	er heating)	
(add a	dditiona	al lines if	FGHR	Sa	and/or \	WWHR	S ap	plies	, see Ap	pendix	G)				_	
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Outpu	t from v	vater hea	iter			-			-	-	-			_		
(64)m=	171.91	151.14	157.8	1	140.2	136.47	1	20.62	114.59	127.47	127.79	145.4	4 155.38	167.35		_
	Output from water heater $(annual)_{112}$ 1716.17 (64) leat gains from water heating, kWh/month 0.25 $(0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m]$															
Heat g	ains fro	om water	heatin	g,	kWh/m	onth 0.2	25 ´	[0.85	× (45)m	+ (61)r	n] + 0.8 :	x [(46)ı	m + (57)m	+ (59)n	<u>n</u>]	
(65)m=	69.91	61.76	65.22	2	58.95	58.12	5	52.44	50.84	55.13	54.82	61.1	64	68.39		(65)
inclu	ude (57)m in calo	culatio	n o	of (65)m	only if	cyliı	nder i	s in the o	dwelling	or hot w	vater is	from com	munity	heating	
5. In	ternal g	ains (see	e Table	e 5	and 5a):										
Metab	olic gai	ns (Table	e 5), W	att	S										_	
	Jan	Feb	Ма	r	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	114.68	114.68	114.6	8	114.68	114.68	1	14.68	114.68	114.68	114.68	114.6	8 114.68	114.68		(66)
Ligh <mark>tir</mark>	ig gains	s (calcula	ted in	Ap	<mark>pen</mark> dix	L, equa	tion	L9 oi	r L9a), <mark>a</mark>	lso see	Table 5					
(67)m=	18	15.99	13		9.84	7.36		6.21	6.71	8.72	11.71	14.87	17.35	18.5	1	(67)
Applia	Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5															
(68)m=	201.92	204.01	19 <mark>8.7</mark>	3	187.49	173.3	1	59.97	151.06	148.96	154.24	165.4	8 179.67	193.01	1	(68)
Cookir	ng gains	s (calcula	ated in	Ap	pendix	L, equa	tior	L15 ו	or L15a)), also s	ee Table	95				
(69)m=	34.47	34.47	34.47	·	34.47	34.47	3	34.47	34.47	34.47	34.47	34.47	34.47	34.47	1	(69)
Pumps	s and fa	ans gains	(Table	e 5	a)											
(70)m=	3	3	3		3	3		3	3	3	3	3	3	3	1	(70)
Losse	s e.g. e	vaporatio	n (neg	jati	ive valu	es) (Tal	ble	5)			•	•	•		-	
(71)m=	-91.75	-91.75	-91.7	5	-91.75	-91.75	-9	91.75	-91.75	-91.75	-91.75	-91.7	5 -91.75	-91.75]	(71)
Water	heating	, g gains (1	Fable 5	5)			-					•	•	<u>.</u>	-	
(72)m=	93.96	91.91	87.66	;	81.87	78.12	7	2.83	68.34	74.1	76.14	82.13	88.89	91.92	1	(72)
Total	interna	l gains =	:					(66)	m + (67)m	n + (68)m	+ (69)m +	(70)m +	(71)m + (72)m	-	
(73)m=	374.28	372.32	359.8	;	339.62	319.19	2	99.42	286.52	292.19	302.5	322.8	9 346.32	363.83	1	(73)
6. So	lar gain	is:	<u>.</u>											<u> </u>		
Solar (gains are	calculated	using so	olar	flux from	Table 6a	and	assoc	iated equa	tions to c	onvert to th	ne applic	able orienta	tion.		
Orient		Access F Table 6d			Area m²			Flu Tal	x ole 6a	-	g_ Table 6b		FF Table 6c		Gains (W)	
Northe	ast <mark>0.9x</mark>	0.77		x	7.9	94	x	1	1.28	x	0.63	x	0.7	=	27.38	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	7.9		x		2.97	× [0.63	×	0.7	=	55.73	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	7.9		x		1.38	× [0.63	×	0.7	=	100.41	(75)
Northe	ast <mark>0.9x</mark>	0.77		x	7.9		x		57.96	 [0.63	×	0.7		164.9	(75)
Northe			x	7.9				1.35	x	0.63	×	0.7	=	221.66	(75)	

Northeast 0.9x	0.77	×	7.94	×	97.38	×	0.63	x	0.7	=	236.31	(75)
Northeast 0.9x	0.77	x	7.94	x	91.1	×	0.63	x	0.7	=	221.06	(75)
Northeast 0.9x	0.77	x	7.94	x	72.63	×	0.63	x	0.7	=	176.23	(75)
Northeast 0.9x	0.77	x	7.94	x	50.42	×	0.63	x	0.7	=	122.35	(75)
Northeast 0.9x	0.77	x	7.94	x	28.07	×	0.63	x	0.7	=	68.11	(75)
Northeast 0.9x	0.77	x	7.94	x	14.2	x	0.63	x	0.7	=	34.45	(75)
Northeast 0.9x	0.77	x	7.94	x	9.21	×	0.63	x	0.7	=	22.36	(75)
Southwest _{0.9x}	0.77	x	4.65	x	36.79	j	0.63	x	0.7	=	52.29	(79)
Southwest _{0.9x}	0.77	x	4.65	x	62.67		0.63	x	0.7	=	89.07	(79)
Southwest _{0.9x}	0.77	×	4.65	x	85.75		0.63	x	0.7	=	121.86	(79)
Southwest _{0.9x}	0.77	x	4.65	x	106.25		0.63	x	0.7	=	150.99	(79)
Southwest _{0.9x}	0.77	x	4.65	×	119.01		0.63	x	0.7	=	169.13	(79)
Southwest _{0.9x}	0.77	x	4.65	×	118.15		0.63	x	0.7	=	167.9	(79)
Southwest _{0.9x}	0.77	x	4.65	x	113.91		0.63	x	0.7	=	161.88	(79)
Southwest _{0.9x}	0.77	x	4.65	x	104.39		0.63	x	0.7	=	148.35	(79)
Southwest _{0.9x}	0.77	x	4.65	x	92.85]	0.63	x	0.7	=	131.95	(79)
Southwest _{0.9x}	0.77	x	4.65	x	69.27		0.63	x	0.7	=	98.44	(79)
Southwest0.9x	0.77	x	4.65	×	44.07		0.63	x	0.7	=	62.63	(79)
Southwest _{0.9x}	0.77	x	4.65	x	31.49		0.63	×	0.7	=	44.75	(79)
Northwest 0.9x	0.77	x	1.34	x	11.28	×	0.63	×	0.7	=	4.62	(81)
Northwest 0.9x	0.77	×	2.27	X	11.28	x	0.63	x	0.7	=	7.83	(81)
Northwest 0.9x	0.77	x	1.34	x	22.97	х	0.63	x	0.7	=	9.41	(81)
Northwest 0.9x	0.77	×	2.27	x	22.97	×	0.63	x	0.7	=	15.93	(81)
Northwest 0.9x	0.77	x	1.34	×	41.38	×	0.63	x	0.7	=	1 <mark>6.95</mark>	(81)
Northwest 0.9x	0.77	x	2.27	x	41.38	×	0.63	x	0.7	=	28.71	(81)
Northwest 0.9x	0.77	x	1.34	x	67.96	×	0.63	x	0.7	=	27.83	(81)
Northwest 0.9x	0.77	x	2.27	x	67.96	×	0.63	x	0.7	=	47.14	(81)
Northwest 0.9x	0.77	×	1.34	x	91.35	x	0.63	x	0.7	=	37.41	(81)
Northwest 0.9x	0.77	x	2.27	×	91.35	×	0.63	x	0.7	=	63.37	(81)
Northwest 0.9x	0.77	X	1.34	X	97.38	×	0.63	x	0.7	=	39.88	(81)
Northwest 0.9x	0.77	X	2.27	X	97.38	×	0.63	x	0.7	=	67.56	(81)
Northwest 0.9x	0.77	×	1.34	X	91.1	X	0.63	x	0.7	=	37.31	(81)
Northwest 0.9x	0.77	X	2.27	X	91.1	X	0.63	x	0.7	=	63.2	(81)
Northwest 0.9x	0.77	X	1.34	X	72.63	X	0.63	x	0.7	=	29.74	(81)
Northwest 0.9x	0.77	×	2.27	×	72.63	X	0.63	x	0.7	=	50.38	(81)
Northwest 0.9x	0.77	X	1.34	X	50.42	×	0.63	x	0.7	=	20.65	(81)
Northwest 0.9x	0.77	X	2.27	×	50.42	×	0.63	X	0.7	=	34.98	(81)
Northwest 0.9x	0.77	X	1.34	×	28.07	×	0.63	X	0.7	=	11.49	(81)
Northwest 0.9x	0.77	X	2.27	×	28.07	×	0.63	X	0.7	=	19.47	(81)
Northwest 0.9x	0.77	X	1.34	×	14.2	×	0.63	x	0.7	=	5.81	(81)
Northwest 0.9x	0.77	x	2.27	X	14.2	x	0.63	x	0.7	=	9.85	(81)

Northw						г			· —						(r_1)
Northw	L	0.77	×	1.3		×		9.21		0.63		0.7	=	3.77	(81)
Northw	est <mark>0.9x</mark>	0.77	X	2.2	27	x	ę	9.21	x	0.63	x	0.7	=	6.39	(81)
<u>.</u>											()				
Solar ((83)m=	92.11	watts, ca 170.13	alculated 267.92	1 for eac 390.87	h month 491.56	1	11.65	483.45	(83)m = S 404.71	um(74)m . 309.93	<mark>(82)m</mark> 197.51	112.74	77.27		(83)
		nternal a							404.71	309.93	197.51	112.74	11.21		(00)
(84)m=	466.4	542.45	627.72	730.48	810.75	т`	11.07	769.96	696.9	612.43	520.39	459.06	441.1		(84)
		I		I	I		11.07	105.50	000.0	012.40	020.00	400.00	++1.1		(01)
		nal temp		· · · · ·		<i>´</i>									
		during h	• •			-			ole 9, Th	1 (°C)				21	(85)
Utilisa		tor for g		<u> </u>		T Ì		, ,					_	l	
	Jan	Feb	Mar	Apr	May	-	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(2.2)
(86)m=	1	0.99	0.98	0.93	0.8		0.6	0.45	0.51	0.79	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.81	19.98	20.25	20.62	20.87	2	0.98	21	20.99	20.92	20.57	20.13	19.79		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dw	elling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.96	19.97	19.97	19.99	19.99	2	0.01	20.01	20.01	20	19.99	19.99	19.98		(88)
l Itilis:	ation fac	tor for g	ains for	rest of d	welling	h2	m (se	e Table	9a)						
(89)m=	1	0.99	0.97	0.91	0.74	1).52	0.35	0.4	0.71	0.95	0.99	1		(89)
		1 temper 18.63			01 dwell	<u> </u>	<u> </u>		<u>i – – – – – – – – – – – – – – – – – – –</u>	7 in Tabl 19.94	e 9 <mark>c)</mark> 19.5	10.07	10.07		(90)
(90)m=	18.38	18.63	19.03	19.55	19.88		9.99	20.01	20.01			18.87	18.37	0.50	
	$fLA = Living area \div (4) =$ Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$												0.52	(91)	
Me <mark>an</mark>															
(92)m=	19.12	19.33	19.67	20.11	20.39		20.5	20.52	20.52	20.44	20.05	19.52	19.1		(92)
	<u> </u>	1	i	1	· · ·	1		i	1	ere appro	r <u> </u>	1			(22)
(93)m=	19.12	19.33	19.67	20.11	20.39	2	20.5	20.52	20.52	20.44	20.05	19.52	19.1		(93)
		ting requ			• . •						/	>			
		mean int factor fo		•		ned	at ste	ep 11 of	I able 9	b, so tha	t II,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Γ	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	L	tor for g			inay		ourr	Uui	7.009	000	000	1107	200		
(94)m=	1	0.99	0.97	0.91	0.77).56	0.4	0.46	0.75	0.95	0.99	1		(94)
Usefu	ul gains,	hmGm .	, W = (9	4)m x (8-	ـــــــــــــــــــــــــــــــــــــ				I						
(95)m=	464.15	536.75	610.14	665.36	622.04	45	52.91	306.39	319.44	456.64	494.2	454.48	439.48		(95)
Montl	hly aver	age exte	rnal tem	perature	e from T	able	ə 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al temp	erature,	Lm	, W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1222.54	1185.05	1077.01	898.99	694.96	46	63.85	307.91	322.48	501.82	755.53	1000.29	1209.56		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	564.24	435.65	347.35	168.21	54.25		0	0	0	0	194.43	392.98	572.94		
									Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	2730.06	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year									37.92	(99)
9a. En	erav rec	quiremer	nts – Ind	ividual h	eating s	vste	ems i	ncluding	micro-C	CHP)					
	e heatir					<i></i>	1								
•		-	at from s	econdar	y/supple	eme	entary	system						0	(201)
	Fraction of space heat from secondary/supplementary system												<u> </u>	1	

Fracti	on of sp	bace hea	at from n	nain syst	em(s)			(202) = 1 -	1	(202)				
Fracti	Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$												1	(204)
Efficie	Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, %													(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space		g require	r È	1	í – – – – – – – – – – – – – – – – – – –		1				1	1	1	
	564.24	435.65	347.35	168.21	54.25	0	0	0	0	194.43	392.98	572.94		
(211)m		8)m x (20	r	<u> </u>	<u> </u>				0	007.04	400.0	040 77	1	(211)
	603.47	465.94	371.5	179.9	58.02	0	0	0 Tota	0 l (kWb/yea	207.94	420.3 211) _{15.1012}	612.77	2919.85	(211)
= {[(98])m x (20	ig fuel (s 01)] } x 1	00 ÷ (20)8)									2010.00	
(215)m=	0	0	0	0	0	0	0	0 Tota	0 (kWb/yea	0	0 215) _{15,1012}	0	0	(215)
Wator	heating	7						i otal	i (ittilii) yoo	(2) –Oum(2	- 10) _{15,1012}	2	0	(210)
		ater hea	ter (calc	ulated a	bove)									
	171.91	151.14	157.81	140.2	136.47	120.62	114.59	127.47	127.79	145.44	155.38	167.35		
Efficier	ncy of w	ater hea	iter					_					79.8	(216)
(217)m=		87.48	86.86	85.3	82.58	79.8	79.8	79.8	79.8	85.59	87.19	87.84		(217)
		heating, m x 100												
(219)m=		172.77	18 <mark>1.68</mark>	164.36	165.26	151.15	143.59	159.74	160.13	169.93	178.22	190.52		
		·						Total	I = Sum(2	19a) ₁₁₂ =			2033.27	(219)
	I totals									k	Wh/year	r	k <mark>Wh/y</mark> ear	
Space	heating	fuel use	ed, main	system	1								2919.85	
Water	heating	fuel use	d										2033.27	
Electric	city for p	oumps, f	ans and	electric	keep-ho	t								
centra	al heatir	ng pump	:									30		(230c)
boiler	with a	fan-assis	sted flue									45		(230e)
Total e	lectricit	y for the	above,	kWh/yea	ır			sum	of (230a).	(230g) =			75	(231)
Electric	city for I	ighting											317.86	(232)
12a. (CO2 err	nissions -	– Individ	lual heat	ing syste	ems inclu	uding mi	cro-CHP						
					Ŭ					F usies	: (4	F uele el en e	
						kΜ	ergy /h/year			kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space	heating) (main s	ystem 1)		(217	1) x			0.2	16	=	630.69	(261)
Space	heating	(second	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating					(219	9) x			0.2	16	=	439.19	(264)
Space	and wa	iter heati	ng			(261	1) + (262) ·	+ (263) + (2	264) =		_		1069.87	(265)
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t (23 ⁻	1) x			0.5	19	=	38.93	(267)
Electric	city for I	ighting				(232	2) x			0.5	19	=	164.97	(268)

Total CO2, kg/year sum of (265)...(271) = 1273.77 (272) TER = 17.69 (273)

