		l Iser E	Details:						
Assessor Name:	Chris Hocknell	- USCI -L	Strom	a Num	ber:		STRO	016363	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.10	
	F	roperty	Address	: Flat 06					
Address:									
Overall dwelling dimer	ISIONS:	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Basement				(1a) x		2.5	(2a) =	162.74	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	65.1	(4)			_		
Dwelling volume				I (3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	162.74	(5)
2. Ventilation rate:								·	
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0		0	Ī = Ē	0	x	20 =	0	(6b)
Number of intermittent far	ns				0	x -	10 =	0	(7a)
Number of passive vents				Ē	0	x -	10 =	0	(7b)
Number of flueless gas fir	es			Ī	0	x	40 =	0	(7c)
				_					
		_	,_ ,	_				nanges per ho	_
•	rs, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in th					(0) (0)	(1.6)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of opening	•	o ine grea	iei waii are	a (anei					
•	oor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0 and doors draught stripped							0	(13)
Window infiltration	and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(14)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) ·	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
•	ty value, then (18) = [(17) ÷ 20]+(0.15	(18)
Air permeability value applies Number of sides sheltered	s if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	ı		(20) = 1 -	[0.075 x (19)] =			0	(20)
Infiltration rate incorporati	ng shelter factor		(21) = (18	s) x (20) =				0.15	(21)
Infiltration rate modified for	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	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 = (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]	

djusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
<i>Calculate effe</i> If mechanic		_	rate for t	he appli	cable ca	se						0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				73.95	(23
a) If balance	ed mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [′	1 – (23c)) ÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(24
b) If balance	ed mech	anical ve	entilation	without	heat red	overy (I	MV) (24b)m = (22	2b)m + (23b)		-	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•		on from (c) = (22b		5 × (23b))			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)r							on from I 0.5 + [(2		0.5]	•	•	•	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)		•		•	
25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31]	(2
3. Heat losse	e and he	nat loce i	aramot	or:								_	
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	K)	k-value		X k J/K
/indows Type	e 1				17.75	x1	/[1/(1.2)+	0.04] =	20.32				(2
Vindows Type	e 2				4.65	x1	/[1/(1.2)+	0.04] =	5.32				(2
/indows Type	e 3				4.65	x1	/[1/(1.2)+	0.04] =	5.32	=			(2
/alls Type1	61.7	76	27.0	5	34.71	x	0.16		5.55	Ħ r			(2
/alls Type2	26.6		0		26.68	_	0.16	<u> </u>	4.27	=			
otal area of e					88.44	_	00						` (3
for windows and		•	effective wi	ndow U-va			a formula 1	/[(1/U-valu	ıe)+0.041 a	as aiven in	paragrapl	h 3.2	(0
include the area							,		, ,	J	7		
abric heat lo	ss, W/K	= S (A x	U)				(26) (30)) + (32) =				40.8	(3
eat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	11663.72	(3
hermal mass	parame	ter (TMF	P = Cm +	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design asses				construct	ion are no	known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
an be used inste hermal bridg				ısina Ar	nendiy k	<i>(</i>						12.00	(3
details of therma	,	•			•	`						12.08	(
otal fabric he			()	(0	.,			(33) +	(36) =			52.88	(3
entilation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
8)m= 17.27	17.07	16.86	15.86	15.66	14.65	14.65	14.45	15.05	15.66	16.06	16.46	1	(3
		-1 \\\\\\\	•		•		•	(00)	- (07) : (20\m			
eat transfer of	coefficiei	ητ. VV/K						(39)m	= (37) + 0	١١١(٥٥			
eat transfer (9)m= 70.15	69.95	69.74	68.74	68.54	67.53	67.53	67.33	67.93	68.54	68.94	69.34	1	

Heat loss para	ımeter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.08	1.07	1.07	1.06	1.05	1.04	1.04	1.03	1.04	1.05	1.06	1.07		
	!	!		!	<u> </u>	ļ	ļ	· · · · · · · · · · · · · · · · · · ·	Average =	Sum(40) ₁	12 /12=	1.06	(40)
Number of day	s in mo	nth (Tab	le 1a)										
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. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		12		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.59		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								<u> </u>					
(44)m= 93.04	89.66	86.28	82.89	79.51	76.13	76.13	79.51	82.89	86.28	89.66	93.04		
	ļ			ļ		ļ	<u> </u>		I Total = Su	m(44) _{1 12} =	<u> </u> =	1015.03	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 137.98	120.68	124.53	108.57	104.17	89.9	83.3	95.59	96.73	112.73	123.05	133.63		
		•							Total = Su	m(45) _{1 12} =	-	1330.87	(45)
If instantaneous w	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(46)m= 20.7	18.1	18.68	16.29	15.63	13.48	12.5	14.34	14.51	16.91	18.46	20.04		(46)
Water storage		\		-1	/\/\ IDO	- 4							
Storage volum	•					_		ame ves	sei		0		(47)
If community h	-			_			, ,	ora) onto	or 'O' in <i>(</i>	(47)			
Otherwise if no Water storage		not wate	i (uns ii	iciudes i	HStafftaf	ieous co	ווטט וטווונ	ers) erite	ei 0 iii (47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f					`	, ,					0		(49)
Energy lost fro				ear			(48) x (49)) =			0		(50)
b) If manufact		_	-		or is not		(12)11(12)	,			<u> </u>		(00)
Hot water stor	age loss	factor fr	om Tab	le 2 (kW	h/litre/da	ay)					0		(51)
If community h	•		on 4.3										
Volume factor			OI-							-	0		(52)
Temperature f											0		(53)
Energy lost fro		•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	`	,									0		(55)
Water storage	loss cal	culated t	or each	month	•		((56)m = (55) × (41)	m 				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•	. ,	. ,						
(modified by					i			<u> </u>		' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' 			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

					<i>,</i> ,									
Combi loss o	- r				`	- ` `	_				T	l	1	(04)
(61)m= 47.41		43.97	40.88	40.52	37.54	38.79	40.5		40.88	43.97	44.22	47.41		(61)
						1	`	_			ì ´	` 	(59)m + (61)m	
(62)m= 185.4		168.5	149.45	144.69	127.44	122.09	136.		137.61	156.7	167.27	181.04		(62)
Solar DHW inpu										r contribut	tion to wate	er heating)		
(add addition		r —				 	·				1 .		1	(00)
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output from						,					,		1	
(64)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.	.11	137.61	156.7	167.27	181.04		7
							(Outp	ut from wa	ater heate	r (annual)₁	12	1838.24	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (6	1)m] + 0.8 x	([(46)m	+ (57)m	+ (59)m	.1	
(65)m= 57.73	50.44	52.4	46.32	44.77	39.28	37.4	41.9	91	42.38	48.47	51.97	56.29		(65)
include (57	')m in cal	culation (of (65)m	only if c	ylinder	is in the	dwelli	ing (or hot w	ater is f	rom com	munity h	eating	
5. Internal	gains (see	Table 5	and 5a):										
Metabolic ga	ins (Table	e 5), Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(66)m= 106.0	3 106.08	106.08	106.08	106.08	106.08	106.08	106.	.08	106.08	106.08	106.08	106.08		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso se	ee T	Table 5			•	-	
(67)m= 16.55	14.7	11.95	9.05	6.76	5.71	6.17	8.0	2	10.76	13.67	15.95	17.01		(67)
Appliances g	ains (calc	ulated ir	Append	dix L. eq	uation L	.13 or L1	За), а	also	see Tal	ble 5	<u>.</u>		l	
(68)m= 185.6		182.67	172.34	159.3	147.04	138.85	136.		141.78	152.11	165.15	177.41		(68)
Cooking gair	ns (calcula	ited in A	opendix	L. eguat	ion L15	or L15a), also	o se	e Table	5	Į.	<u>!</u>	ı	
(69)m= 33.61	`	33.61	33.61	33.61	33.61	33.61	33.6	_	33.61	33.61	33.61	33.61		(69)
Pumps and f	 ans gains	(Table ^p	L 5a)			1	<u> </u>	!			Į.	1		
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses e.g. e				<u> </u>	<u> </u>	1 -					1 -		I	` ,
(71)m= -84.86		-84.86	-84.86	-84.86	-84.86	-84.86	-84.8	86	-84.86	-84.86	-84.86	-84.86	1	(71)
` ′	!	<u> </u>	04.00	04.00	04.00	04.00	U - 1.	00	04.00	04.00	04.00	04.00		(* -7
Water heatin	75.06	70.43	64.33	60.17	54.55	50.26	56.3	33	58.86	65.15	72.18	75.65	1	(72)
` '	_!	l	04.00	00.17	<u> </u>	i)m + (67)m								(12)
(73)m= 337.5	_ `		202.54	204.05		253.11	·	·	, ,	, ,	•		1	(73)
` '		322.87	303.54	284.05	265.12	253.11	259	'-	269.23	288.75	311.11	327.89		(73)
6. Solar gains are		usina sola	r flux from	Table 6a	and assoc	riated equa	itions t	0 00	nvert to th	e annlical	nle orientat	tion		
Orientation:		•	Area		Flı	·	itions t	.0 001	g_	Саррпса	FF	uon.	Gains	
Officiation.	Table 6d		m ²			ble 6a		Ta	9_ able 6b	Т	able 6c		(W)	
Northeast 0.9x	0.77	x	4.6	55	х	11.28] _× [0.55	Т х Г	0.7		14	(75)
Northeast 0.9x		_			_] L] [╡╞		= =](75)
Northeast 0.9x		×	4.6			22.97]		0.55		0.7	╡ -	28.49](75)](75)
Northeast 0.9x		×	4.6			41.38]		0.55		0.7	_	51.34	╡ .
		X	4.6	==	—	67.96	X		0.55	_	0.7	_	84.31	(75)
Northeast 0.9x	0.77	X	4.6	35	X	91.35	X		0.55	X	0.7	=	113.33	(75)

Northeast 0.9x	(75) (75) (75) (75) (75) (75) (79) (79) (79) (79) (79) (79) (79) (79
Northeast 0.9x	(75) (75) (75) (75) (79) (79) (79) (79) (79) (79) (79) (79
Northeast 0.9x	(75) (75) (75) (79) (79) (79) (79) (79) (79) (79) (79
Northeast 0.9x	(75) (75) (75) (79) (79) (79) (79) (79) (79) (79) (79
Northeast 0.9x	(75) (75) (79) (79) (79) (79) (79) (79) (79) (79
Northeast 0.9x	(75) (79) (79) (79) (79) (79) (79) (79) (79
Southwesto.9x 0.77 x 4.65 x 36.79 0.55 x 0.7 = 45.65 Southwesto.9x 0.77 x 4.65 x 62.67 0.55 x 0.7 = 77.76 Southwesto.9x 0.77 x 4.65 x 85.75 0.55 x 0.7 = 106.39 Southwesto.9x 0.77 x 4.65 x 106.25 0.55 x 0.7 = 131.82 Southwesto.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 Southwesto.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 =<	(79) (79) (79) (79) (79) (79) (79) (79)
Southwesto.9x 0.77 x 4.65 x 62.67 0.55 x 0.7 = 77.76 Southwesto.9x 0.77 x 4.65 x 85.75 0.55 x 0.7 = 106.39 Southwesto.9x 0.77 x 4.65 x 106.25 0.55 x 0.7 = 131.82 Southwesto.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 Southwesto.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 146.58 Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 =	(79) (79) (79) (79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 4.65 x 85.75 0.55 x 0.7 = 106.39 Southwest0.9x 0.77 x 4.65 x 106.25 0.55 x 0.7 = 131.82 Southwest0.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 Southwest0.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 Southwest0.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 Southwest0.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 141.32 Southwest0.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 Southwest0.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 =	(79) (79) (79) (79) (79) (79) (79) (79)
Southwesto.9x 0.77 x 4.65 x 106.25 0.55 x 0.7 = 131.82 Southwesto.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 Southwesto.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 =<	(79) (79) (79) (79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 4.65 x 119.01 0.55 x 0.7 = 147.65 Southwest0.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 Southwest0.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 Southwest0.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 Southwest0.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 Southwest0.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 Southwest0.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 Southwest0.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 53.43 Northwest 0.9x 0.77 x 17.75 x 11.28<	(79) (79) (79) (79) (79) (79) (79) (79)
Southwesto.9x 0.77 x 4.65 x 118.15 0.55 x 0.7 = 146.58 Southwesto.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 Southwesto.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 Southwesto.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 Southwesto.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 Southwesto.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 Southwesto.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 Northwest 0.9x 0.77 x 17.75 x 11.28 x 0.55 x 0.7 = 53.43	(79) (79) (79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 4.65 x 113.91 0.55 x 0.7 = 141.32 Southwest0.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 Southwest0.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 Southwest0.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 Southwest0.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 Southwest0.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 Northwest 0.9x 0.77 x 17.75 x 11.28 x 0.55 x 0.7 = 53.43	(79) (79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 4.65 x 104.39 0.55 x 0.7 = 129.51 Southwest0.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 Southwest0.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 Southwest0.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 Southwest0.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 Northwest 0.9x 0.77 x 17.75 x 11.28 x 0.55 x 0.7 = 53.43	(79) (79) (79) (79) (79)
Southwest0.9x 0.77 x 4.65 x 92.85 0.55 x 0.7 = 115.2 Southwest0.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 Southwest0.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 Southwest0.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 Northwest 0.9x 0.77 x 17.75 x 11.28 x 0.55 x 0.7 = 53.43	(79) (79) (79) (79)
Southwest0.9x 0.77 x 4.65 x 69.27 0.55 x 0.7 = 85.94 Southwest0.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 Southwest0.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 Northwest 0.9x 0.77 x 17.75 x 11.28 x 0.55 x 0.7 = 53.43	(79) (79) (79)
Southwest0.9x 0.77 x 4.65 x 44.07 0.55 x 0.7 = 54.68 Southwest0.9x 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 Northwest 0.9x 0.77 x 17.75 x 11.28 x 0.55 x 0.7 = 53.43	(79) (79)
Southwest _{0.9x} 0.77 x 4.65 x 31.49 0.55 x 0.7 = 39.07 Northwest _{0.9x} 0.77 x 17.75 x 11.28 x 0.55 x 0.7 = 53.43	(79)
Northwest 0.9x 0.77 x 17.75 x 11.28 x 0.55 x 0.7 = 53.43	` <i>'</i>
Nighthand Control Cont	(81)
Northwest 0.9x 0.77 x 17.75 x 22.97 x 0.55 x 0.7 = 108.77	•
	(81)
Northwest 0.9x 0.77 x 17.75 x 41.38 x 0.55 x 0.7 = 195.96	(81)
Northwest 0.9x 0.77 x 17.75 x 67.96 x 0.55 x 0.7 = 321.82	(81)
Northwest 0.9x 0.77 x 17.75 x 91.35 x 0.55 x 0.7 = 432.6	(81)
Northwest 0.9x 0.77 x 17.75 x 97.38 x 0.55 x 0.7 = 461.19	(81)
Northwest 0.9x 0.77 x 17.75 x 91.1 x 0.55 x 0.7 = 431.44	(81)
Northwest 0.9x 0.77 x 17.75 x 72.63 x 0.55 x 0.7 = 343.95	(81)
Northwest 0.9x 0.77 x 17.75 x 50.42 x 0.55 x 0.7 = 238.78	(81)
Northwest 0.9x 0.77 x 17.75 x 28.07 x 0.55 x 0.7 = 132.92	(81)
Northwest 0.9x 0.77 x 17.75 x 14.2 x 0.55 x 0.7 = 67.23	(81)
Northwest 0.9x 0.77 x 17.75 x 9.21 x 0.55 x 0.7 = 43.64	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m	
(83)m= 113.08 215.01 353.69 537.95 693.57 728.59 685.78 563.56 416.53 253.68 139.52 94.13	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 450.64 550.12 676.56 841.5 977.63 993.71 938.89 822.66 685.76 542.43 450.63 422.02	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(86)m= 1 0.99 0.96 0.84 0.63 0.43 0.32 0.38 0.65 0.93 0.99 1	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
	(87)

Tomp	oraturo	during h	ooting n	oriode ir	roct of	dwolling	from To	blo 0 Ti	h2 (°C)					
(88)m=	20.02	20.02	eating p	20.04	20.04	20.05	20.05	20.05	20.05	20.04	20.03	20.03		(88)
, ,			<u> </u>			<u> </u>			20.00	20.04	20.00	20.00		()
(89)m=	0.99	tor for g 0.98	ains for i	0.8	weiling, 0.57	0.37	0.25	9a) 0.3	0.58	0.91	0.99	1		(89)
			<u> </u>			<u> </u>			<u> </u>	<u> </u>	0.99	'		(00)
		<u> </u>	ature in			<u> </u>			ì				l	(00)
(90)m=	18.62	18.92	19.37	19.84	20.01	20.05	20.05	20.05	20.03	19.71	19.07	18.58		(90)
									Ī	fLA = Livin	g area ÷ (4	4) =	0.42	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.18	19.44	19.84	20.25	20.41	20.45	20.45	20.45	20.43	20.13	19.57	19.14		(92)
Apply	adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.03	19.29	19.69	20.1	20.26	20.3	20.3	20.3	20.28	19.98	19.42	18.99		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9	b, so tha	nt Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains										I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm										l	(5.1)
(94)m=	0.99	0.98	0.94	0.8	0.58	0.39	0.27	0.32	0.59	0.91	0.98	0.99		(94)
			, W = (94			I				T	I	T	ĺ	(0.5)
(95)m=		539.79	635.78	676.28	571.43	383.6	249.91	262.48	407.75	491.23	443.48	419.86		(95)
			rnal tem			ı			I	T		<u> </u>	ĺ	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern	<u>.</u>			<u> </u>		· · ·	-			l	(0-)
	1033.17		919.65	770.02	586.96	384.93	250.05	262.83	419.5	642.57	849.41	1025.56		(97)
•			ement fo			i	1		ì	í - `	r ·		l	
(98)m=	435.75	313.51	211.2	67.49	11.56	0	0	0	0	112.6	292.27	450.64		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1895.02	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								29.11	(99)
8c. S	pace co	oling red	uiremen	ıt										
		Ĭ	July and		See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	E Lm (ca	lculated		5°C inter	nal tem	perature			nperatur	e from T	able 10)	J	
(100)m=	0	0	0	0	0	634.77	499.71	511.69	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm						•	•	•	•		
(101)m=	0	0	0	0	0	0.99	0.99	0.99	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	/atts) = (100)m x	(101)m	•			•	•	•	•		
(102)m=	0	0	0	0	0	626.44	496.92	506.09	0	0	0	0		(102)
Gains	s (solar g	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)				,	
(103)m=	0	0	0	0	0	1232.17	1166.77	1031.74	0	0	0	0		(103)
` '		a roquir	ement fo	r month,	whole c	lwelling,	continue	ous (kW	h = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
	e coolin	y require			۱m								•	
Space			104)m <	3 × (98)111					1				
Space	04)m to		104)m <	3 × (98	0	436.12	498.37	391.08	0	0	0	0		
Space set (1 (104)m=	04)m to	zero if (· ·		436.12	498.37	391.08	Total	I I = Sum(104)	=	1325.58	(104)
Space set (1 (104)m=	04)m to 0 fraction	zero if (0	0		436.12	498.37	391.08	Total	l .	104)	=	1325.58 0.7	(104) (105)
Space set (1 (104)m=	04)m to 0 fraction ittency f	zero if (0 n actor (Ta	o able 10b	0	0				Total f C =	I = Sum(cooled	104) area ÷ (4	= 4) =		
Space set (1 (104)m=	04)m to 0 fraction ittency f	zero if (0	0		436.12 0.25	0.25	0.25	Total f C =	I = Sum(cooled a	104) area ÷ (4	=		(105)
Space set (1 (104)m= Cooled Intermit (106)m=	04)m to 0 d fraction ittency f	zero if (0 n actor (Ta	o able 10b	0	0	0.25	0.25		Total f C =	I = Sum(cooled	104) area ÷ (4	= 4) =	0.7	

Space cooling	requirer	ment for	month =	(104)m	``	``	1						
107)m= 0	0	0	0	0	76.21	87.08	68.34	0 Tatal	0	0	0		7,,,,
									= Sum(107)	=	231.63	(10
Space cooling	•							` ') ÷ (4) =		L	3.56	(10
a. Energy red		nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating Fraction of sp	•	nt from s	econdar	v/supple	mentary	svstem					Г	0	(20
Fraction of sp						•	(202) = 1	- (201) =			<u> </u>	1	- (20)
Fraction of to			•				(204) = (2	02) × [1 –	(203)] =		<u> </u>	1	\(20
Efficiency of r		_	•				, , ,	, •	` '2		<u> </u>	90.4	\(20
Efficiency of s	•		•		a system	n %					L F	0	(20
Cooling Syste					g oyoton	1, 70					L F	5.13	(20
	Feb				1	1		Con	004	Nav	L Dool		
Jan Space heating		Mar ement (c	Apr	May d above	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	aı
435.75	313.51	211.2	67.49	11.56	0	0	0	0	112.6	292.27	450.64		
 211)m = {[(98)m x (20	4)] } x 1	00 ÷ (20)6)	ļ	!	!		ļ.				(21
482.02	346.81	233.63	74.66	12.79	0	0	0	0	124.55	323.31	498.5		·
			!		!		Tota	l (kWh/yea	ar) =Sum(2	211),15,10. 12	=	2096.26	(21
Space heating	g fuel (s	econdar	y), kWh/	month							_		
= {[(98 <u>)</u> m x (20	1)]} x 1	00 ÷ (20	(8)			T	T	-	-		, ,		
215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	I (kWh/yea	ar) =Sum(2	215) _{15,10. 12}		0	(21
Vater heating		4/1-		l \									
Output from wa	161.95	ter (caic 168.5	<u>ulated a</u>	144.69	127.44	122.09	136.11	137.61	156.7	167.27	181.04		
Efficiency of w		li			<u> </u>						1	80.3	(21
217)m= 87.13	86.69	85.62	83.19	80.97	80.3	80.3	80.3	80.3	84.23	86.44	87.25		` (21
uel for water	heating,	kWh/mo	onth		<u>I</u>	<u> </u>	<u> </u>						
219)m = (64)			1										
219)m= 212.78	186.82	196.79	179.64	178.7	158.7	152.05	169.5	171.37	186.02	193.5	207.49		٦
							TOLA	I = Sum(2	19a) ₁₁₂ =		L	2193.38	(21
Space cooling 221)m = (107	•		ntn.										
221)m= 0	0	0	0	0	14.86	16.98	13.32	0	0	0	0		
			ı				Tota	I = Sum(2)	21) ₆₈ =			45.15	(22
Annual totals									k۱	Wh/yeaı	r	kWh/yea	' r
Space heating	fuel use	ed, main	system	1						•		2096.26	
Vater heating	fuel use	d									Ī	2193.38	Ħ
Space cooling	fuel use	:d										45.15	╡
Electricity for p			electric	keep-ho	t						L	10.10	
mechanical v	•			•		nput fron	n outside	9			134.02		(23
oui v	o,	. Salai	.55G, CAL	. 40. O. P			5415140	-			107.02		(20
central heatin											30		(23

Total electricity for the above, kWh/year	sum of (230a)	(230g) =	164.02	(231)
Electricity for lighting			292.21	(232)
Electricity generated by PVs			-271.71	(233)

12a. CO2 emissions – Individual heating system	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	452.79 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	473.77 (264)
Space and water heating	(261) + (262) + (263) + (264) =		926.56 (265)
Space cooling	(221) x	0.519	23.43 (266)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	85.13 (267)
Electricity for lighting	(232) x	0.519	151.66 (268)
Energy saving/generation technologies Item 1		0.519 =	-141.02 (269)
Total CO2, kg/year	sum	of (265) (271) =	1045.76 (272)
Dwelling CO2 Emission Rate	(272)) ÷ (4) =	16.06 (273)
El rating (section 14)			87 (274)

		l Isar I	Details:						
Assessor Name:	Chris Hocknell	0 3 C F L	Strom	a Num	ber:		STRO	016363	
Software Name:	Stroma FSAP 2012		Softwa	_				on: 1.0.4.10	
	F	Property	Address	Flat 07					
Address: 1. Overall dwelling dime	pnoiona:								
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)
Basement				(1a) x		2.5	(2a) =	179.81	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	71.92	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	179.81	(5)
2. Ventilation rate:									
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		- + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0		0	j - L	0	x	20 =	0	(6b)
Number of intermittent fa	ins			֓֟֟֝֟֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֓֡֓֓֡֓֡֓֡	0	x -	10 =	0	(7a)
Number of passive vents	3			Ē	0	x .	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our —
	ys, flues and fans = (6a)+(6b)+(been carried out or is intended, procee			continue fr	0		÷ (5) =	0	(8)
Number of storeys in t		<i>a to</i> (17),	ourerwise (onunae n	om (9) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t ngs); if equal user 0.35	o the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
Percentage of window Window infiltration	s and doors draught stripped		0.25 - [0.2	v (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)		_	+ (15) =		0	(15)
	q50, expressed in cubic metro	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] +$	(8), otherw	vise (18) = (16)				0.15	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.075 x (1	19)] =			0	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =	~			0.15	(21)
Infiltration rate modified f								00	` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
_								_	

	ation rate	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effecture of the Calculate of		_	rate for t	he appli	cable ca	se			-		-	0.5	(23
If exhaust air h	eat pump ι	using Appe	endix N, (2	(23a) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				73.95	(23
a) If balance	ed mecha	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (23b) × [′	1 – (23c)) ÷ 100]	
24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(24
b) If balance	ed mecha	anical ve	entilation	without	heat red	overy (I	MV) (24t	o)m = (22	2b)m + (2	23b)		-	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	nouse ext n < 0.5 ×			•	•				.5 × (23b))			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural if (22b)n	ventilation								0.5]	•	•	1	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in bo	x (25)				-	
25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
3. Heat losse	s and he	eat loss i	naramet	≏r.									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²·		X k /K
Vindows Type	e 1				17.75	x1	/[1/(1.2)+	0.04] =	20.32				(2
Vindows Type	e 2				4.65	x1	/[1/(1.2)+	0.04] =	5.32				(2
Vindows Type	e 3				4.65	x1	/[1/(1.2)+	0.04] =	5.32				(2
Valls Type1	68.6	36	27.0	5	41.61	X	0.16		6.66				(2
Valls Type2	17.7	<u></u>	0		17.76	x	0.16	<u> </u>	2.84	T i			
otal area of e	elements	, m²			86.42								 (3
for windows and include the area					alue calcul		g formula 1	/[(1/U-valu	ıe)+0.04] a	ıs given in	paragrapl	h 3.2	
abric heat los	ss, W/K =	= S (A x	U)				(26) (30)) + (32) =				40.47	(3
leat capacity	Cm = S((A x k)						((28)	(30) + (32	2) + (32a)	(32e) =	11280.49	(3
hermal mass	parame	ter (TMF	= Cm -	+ TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(3
or design assess an be used inste				construct	ion are no	known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		_
hermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						12.41	(3
details of therma otal fabric he		are not kn	own (36) :	= 0.15 x (3	11)			(33) +	(36) =			50.00	٦,,
otal labile lie		alculatec	l monthly	N.				, ,	= 0.33 × (25\m v (5)		52.88	(3
entilation bod	21 10 15 5 1 7	aicuialeC		y				ااارەد)	- u.uu ^ (·	T _	1	
entilation hea	1	Mar	Anr	May	lun	lul	۸۱۱۵	Son	Oc+	l Nov			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov 17.74	Dec 18 19		(3
Jan 88)m= 19.08	Feb 18.85	18.63	Apr 17.52	May 17.3	Jun 16.18	Jul 16.18	Aug 15.96	16.63	17.3	17.74	18.19		(3
Jan	Feb 18.85	18.63		<u> </u>	-			16.63	-	17.74	-	1	(3

Heat loss para	ımeter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1	1	0.99	0.98	0.98	0.96	0.96	0.96	0.97	0.98	0.98	0.99		
	<u> </u>	!		<u> </u>		ļ	ļ		L Average =	Sum(40) ₁	12 /12=	0.98	(40)
Number of day	/s in mo	nth (Tab	le 1a)	•									
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. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (TFA -13		29		(42)
Annual averag Reduce the annua not more that 125	je hot wa al average	hot water	usage by	5% if the a	welling is	designed t			se target o		.63		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in										1			
(44)m= 97.5	93.95	90.41	86.86	83.31	79.77	79.77	83.31	86.86	90.41	93.95	97.5		
	ļ.	!		ļ.		<u> </u>	<u> </u>		Total = Su	m(44) _{1 12} =		1063.6	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 144.58	126.45	130.49	113.76	109.16	94.2	87.29	100.16	101.36	118.12	128.94	140.02		_
If instantaneous w	vator hoati	na at point	of use (no	hot water	r eterage)	ontor O in	havas (16		Total = Su	m(45) _{1 12} =	•	1394.54	(45)
													(40)
(46)m= 21.69 Water storage	18.97 loss:	19.57	17.06	16.37	14.13	13.09	15.02	15.2	17.72	19.34	21		(46)
Storage volum) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufact				or is kno	wn (kWl	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufactHot water store			-								0		(51)
If community h	•			_ (- 7 /					<u> </u>		(-1)
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (. , .	,									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated for each	month (61)m =	(60) ÷ 365 × (4	1)m				
(61)m= 49.68 43.24 46.07	42.84 42.46	39.34 40.65	42.46 42.84	46.07 46.33	49.68		(61)
Total heat required for water he	eating calculated	d for each mont	h (62)m = 0.85	< (45)m + (46)m +	· (57)m +	ı (59)m + (61)m	
(62)m= 194.27 169.7 176.56	156.6 151.62	133.53 127.94	142.62 144.1	9 164.19 175.27	189.71		(62)
Solar DHW input calculated using Appe	endix G or Appendix	κ Η (negative quant	ity) (enter '0' if no so	plar contribution to wat	er heating)		
(add additional lines if FGHRS	and/or WWHRS	S applies, see A	ppendix G)				
(63)m= 0 0 0	0 0	0 0	0 0	0 0	0		(63)
Output from water heater							
(64)m= 194.27 169.7 176.56	156.6 151.62	133.53 127.94	142.62 144.1	9 164.19 175.27	189.71		
		-	Output from	water heater (annual)	1 12	1926.19	(64)
Heat gains from water heating,	kWh/month 0.2	5 ´ [0.85 × (45)	m + (61)m] + 0.8	3 x [(46)m + (57)m	n + (59)m]	
(65)m= 60.49 52.86 54.91	48.54 46.91	41.15 39.19	43.92 44.41	50.79 54.46	58.98		(65)
include (57)m in calculation of	of (65)m only if c	cylinder is in the	dwelling or hot	water is from con	nmunity h	neating	
5. Internal gains (see Table 5	and 5a):						
Metabolic gains (Table 5), Watt	:S						
Jan Feb Mar	Apr May	Jun Jul	Aug Ser	Oct Nov	Dec		
(66)m= 114.6 114.6 114.6	114.6 114.6	114.6 114.6	114.6 114.6	114.6	114.6		(66)
Lighting gains (calculated in Ap	pendix L, equat	ion L9 or L9a),	also see Table			•	
(67)m= 17.99 15.97 12.99	9.84 7.35	6.21 6.71	8.72 11.7	14.86 17.34	18.49		(67)
Appliances gains (calculated in	Appendix L, eq	uation L13 or L	13a), also see ⅂	able 5			
(68)m= 201.75 203.84 198.56	187.33 173.16	159.83 150.93	3 148.84 154.1	1 165.34 179.52	192.84		(68)
Cooking gains (calculated in Ap	pendix L, equa	tion L15 or L15	a), also see Tab	le 5	•		
(69)m= 34.46 34.46 34.46	34.46 34.46	34.46 34.46	34.46 34.46	34.46 34.46	34.46		(69)
Pumps and fans gains (Table 5	a)		•	, ,	•		
(70)m= 3 3 3	3 3	3 3	3 3	3 3	3		(70)
Losses e.g. evaporation (negat	ive values) (Tab	ole 5)	,			ı	
(71)m= -91.68 -91.68 -91.68	-91.68 -91.68	-91.68 -91.68	-91.68 -91.68	3 -91.68 -91.68	-91.68		(71)
Water heating gains (Table 5)	•		, ,			ı	
(72)m= 81.31 78.66 73.8	67.41 63.05	57.16 52.67	59.03 61.68	68.27 75.63	79.27		(72)
Total internal gains =		(66)m + (67))m + (68)m + (69)m	+ (70)m + (71)m + (72	2)m	_	
(73)m= 361.42 358.85 345.73	324.96 303.94	283.58 270.68	3 276.96 287.8	7 308.85 332.87	350.98		(73)
6. Solar gains:				1			
Solar gains are calculated using solar	flux from Table 6a	and associated equ	uations to convert to	the applicable orienta	ition.		
Orientation: Access Factor	Area	Flux	g_	FF		Gains	
Table 6d	m²	Table 6a	Table 6	b Table 6c		(W)	
Northeast 0.9x 0.77 x	4.65	x 11.28	× 0.55	x 0.7	=	14	(75)
Northeast 0.9x 0.77 x	4.65	x 22.97	X 0.55	x 0.7	=	28.49	(75)
Northeast 0.9x 0.77 x	4.65	x 41.38	x 0.55	x 0.7	=	51.34	(75)
Northeast 0.9x 0.77 x	4.65	x 67.96	x 0.55	x 0.7	=	84.31	(75)
Northeast 0.9x 0.77 x	4.65	x 91.35	x 0.55	x 0.7	=	113.33	(75)

Northeast 0.9x 0.77	1		l		1		¬ г			400.00	7(75)
Northanda] X]	4.65	X	97.38	X 1	0.55	X	0.7	_ =	120.82	(75)
Nedersel	J X 1	4.65	X	91.1	X	0.55	_ ×	0.7	_	113.02	(75)
Northeast 0.9x 0.77] X]	4.65	X	72.63	X	0.55	_ ×	0.7	=	90.1	(75)
Northeast 0.9x 0.77	X	4.65	X	50.42	X	0.55	X	0.7	_ =	62.55	(75)
Northeast 0.9x 0.77	X	4.65	X	28.07	X	0.55	X	0.7	=	34.82	(75)
Northeast 0.9x 0.77	X	4.65	X	14.2	X	0.55	X	0.7	=	17.61	(75)
Northeast 0.9x 0.77	X	4.65	X	9.21	X	0.55	X	0.7	=	11.43	(75)
Southeast 0.9x 0.77	X	17.75	X	36.79	X	0.55	X	0.7	=	174.25	(77)
Southeast 0.9x 0.77	X	17.75	X	62.67	X	0.55	X	0.7	=	296.81	(77)
Southeast 0.9x 0.77	X	17.75	X	85.75	X	0.55	x	0.7	=	406.11	(77)
Southeast 0.9x 0.77	X	17.75	X	106.25	X	0.55	x	0.7	=	503.19	(77)
Southeast 0.9x 0.77	X	17.75	X	119.01	X	0.55	X	0.7	=	563.61	(77)
Southeast 0.9x 0.77	X	17.75	x	118.15	x	0.55	x [0.7	=	559.53	(77)
Southeast 0.9x 0.77	X	17.75	x	113.91	x	0.55	x	0.7	_	539.45	(77)
Southeast 0.9x 0.77	X	17.75	x	104.39	x	0.55	X	0.7	=	494.37	(77)
Southeast 0.9x 0.77	x	17.75	x	92.85	x	0.55	x	0.7	=	439.73	(77)
Southeast 0.9x 0.77	x	17.75	x	69.27	x	0.55	x	0.7		328.04	(77)
Southeast 0.9x 0.77	x	17.75	x	44.07	x	0.55	x	0.7	=	208.71	(77)
Southeast 0.9x 0.77	x	17.75	x	31.49	x	0.55	x	0.7	=	149.12	(77)
Southwest _{0.9x} 0.77	x	4.65	x	36.79	ĺ	0.55	x	0.7	_	45.65	(79)
Southwest _{0.9x} 0.77	x	4.65	x	62.67	ĺ	0.55	×	0.7	_	77.76	(79)
Southwest _{0.9x} 0.77	x	4.65	x	85.75	j	0.55	×	0.7		106.39	(79)
Southwest _{0.9x} 0.77	X	4.65	x	106.25	j	0.55	×	0.7		131.82	(79)
Southwest _{0.9x} 0.77	X	4.65	x	119.01	j	0.55	×	0.7	=	147.65	(79)
Southwest _{0.9x} 0.77	X	4.65	x	118.15	İ	0.55] x	0.7	=	146.58	(79)
Southwest _{0.9x} 0.77	X	4.65	x	113.91	İ	0.55	×	0.7	=	141.32	(79)
Southwest _{0.9x} 0.77	X	4.65	X	104.39	j	0.55	_ x [0.7		129.51	(79)
Southwest _{0.9x} 0.77	X	4.65	X	92.85	j	0.55	_ x [0.7		115.2	(79)
Southwest _{0.9x} 0.77	X	4.65	X	69.27	İ	0.55	X	0.7	_	85.94	(79)
Southwest _{0.9x} 0.77) x	4.65	X	44.07	ĺ	0.55	_ x [0.7		54.68	(79)
Southwest _{0.9x} 0.77) x	4.65	X	31.49	i	0.55	_	0.7		39.07	(79)
	J		ı		ı						 ` ′
Solar gains in watts, calcul	ated	for each mon	th		(83)m	n = Sum(74)m	(82)m				
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 	3.83	719.31 824.59	_	26.93 793.79	713	.99 617.48	448.79	281	199.62		(83)
Total gains – internal and s	olar	(84)m = (73) n	า + (83)m , watts		•				•	
(84)m= 595.31 761.91 909	.56	1044.27 1128.5	i2 1 ⁻	110.51 1064.48	990	.95 905.35	757.64	613.87	550.6		(84)
7. Mean internal temperat	ure (heating seaso	n)								
Temperature during heati	ng p	eriods in the li	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation factor for gains	for li	ving area, h1,	m (s	ee Table 9a)							
Jan Feb M	1ar	Apr May	yΤ	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.99 0.97 0.	9	0.75 0.57	\top	0.4 0.29	0.3	32 0.52	0.84	0.97	0.99		(86)
Mean internal temperature	e in I	iving area T1	(falle	w stens 3 to 7	in T	able 9c)				•	
(87)m= 20.18 20.44 20		20.91 20.98	Ì	21 21	2	 	20.87	20.48	20.13		(87)
										I	

T		ما يم مياسي الم				al a 11: .a a	f T.	bla O T	LO (00)					
•	20.08	20.09	neating p	erioas ir 20.1	20.1	20.12	20.12	20.12	12 (°C) 20.11	20.1	20.1	20.09		(88)
(88)m=		<u>!</u>	<u> </u>						20.11	20.1	20.1	20.09		(00)
			ains for i			· ·		 						
(89)m=	0.99	0.96	0.88	0.71	0.52	0.34	0.23	0.26	0.46	0.79	0.96	0.99		(89)
Mean	interna	I temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	19.01	19.38	19.74	20.01	20.09	20.12	20.12	20.12	20.11	19.97	19.46	18.94		(90)
		-					=	=	f	LA = Livin	g area ÷ (4	4) =	0.42	(91)
Mean	interna	l temner	ature (fo	r the wh	ole dwel	lling) = fl	Δ × T1	+ (1 _ fl	Δ) x T2			'		_
(92)m=	19.5	19.82	20.15	20.39	20.46	20.48	20.49	20.49	20.48	20.35	19.88	19.44		(92)
			he mean				l m Table	ļ						
(93)m=	19.35	19.67	20	20.24	20.31	20.33	20.34	20.34	20.33	20.2	19.73	19.29		(93)
		L	uirement											
			ternal ter		e obtain	ed at ste	ep 11 of	Table 9	b. so tha	t Ti.m=(76)m an	d re-calc	ulate	
			or gains	•			- P		, 00	(
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.98	0.95	0.87	0.72	0.53	0.36	0.24	0.27	0.47	0.8	0.96	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (84	4)m									
(95)m=	585.88	724.39	794.74	749.92	596.57	395.41	257.94	270.92	429.63	604.09	589.28	544.47		(95)
Montl	nly avera	age exte	ernal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1082.64	1059.43	965.14	798.15	604.46	396.04	257.99	271.02	432.79	673.49	892.27	1072.32		(97)
Space	- 1 4:													
- 1	e neatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	369.59	g require 225.15	ement fo 126.77	r each n 34.72	onth, k\ 5.87	Wh/mont 0	th = 0.02	24 x [(97 0)m – (95 ₀)m] x (4 ² 51.64	1)m 218.16	392.72		
-								0		51.64	218.16	ļ	1424.61	(98)
(98)m=	369.59	225.15		34.72	5.87			0	0	51.64	218.16	ļ	1424.61	(98) (99)
(98)m=	369.59 e heatin	225.15 g require	126.77 ement in	34.72 kWh/m²	5.87			0	0	51.64	218.16	ļ		= ' '
(98)m= Space 8c. S	369.59 e heatin	225.15 g require	126.77 ement in quiremen	34.72 kWh/m²	5.87 ² /year	0		0	0	51.64	218.16	ļ		= ' '
(98)m= Space 8c. S	a69.59 e heatin	g require	126.77 ement in quiremen	34.72 kWh/m² t August.	5.87 ² /year See Tat	0 ble 10b	0	0 Tota	0 Il per year	51.64 (kWh/year	218.16) = Sum(9	8) _{15,912} =		= ' '
(98)m= Space 8c. S Calcu	e heatin pace coulated fo Jan	g require	ement in quirement July and Mar	34.72 kWh/m² t August. Apr	5.87 Yyear See Tat May	0 ble 10b Jun	Jul	0 Tota	0 ll per year	51.64 (kWh/year	218.16 r) = Sum(9	8) _{15,912} =	19.81	= ' '
(98)m= Space 8c. S Calcu	e heatin pace co lated fo Jan loss rate	g require	126.77 ement in quiremen	34.72 kWh/m² t August. Apr	5.87 Yyear See Tat May	0 ble 10b Jun	Jul	0 Tota	0 ll per year	51.64 (kWh/year	218.16 r) = Sum(9	8) _{15,912} =	19.81	= ' '
(98)m= Space 8c. S Calcu Heat (100)m=	a69.59 e heatin pace coulated fo Jan loss rate	g required oling record June, when February Carlors and Carlors are supported by the control of	ement in quirement July and Mar alculated	kWh/m² t August. Apr using 25	5.87 See Tat May S°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug and exte	0 ll per year Sep	51.64 (kWh/year Oct	218.16 Sum(9) Nov e from T	8) _{15,912} = Dec able 10)	19.81	(99)
(98)m= Space 8c. S Calcu Heat (100)m=	e heatin pace co plated fo Jan loss rate o ation face	g require coling recorder June, coling Feb e Lm (call	ement in quirement July and Mar alculated	kWh/m² t August. Apr using 25	5.87 See Tat May S°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug and exte	0 ll per year Sep	51.64 (kWh/year Oct	218.16 Sum(9) Nov e from T	8) _{15,912} = Dec able 10)	19.81	(99)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m=	ace considered for a co	g require coling recorder June, of Feb e Lm (cate of the Lm (c	ement in quirement July and Mar alculated 0 pss hm	kWh/m² t August. Apr using 25	5.87 See Tat May 5°C inter 0	0 Die 10b Jun rnal temp 649.22	Jul perature 511.08	O Total Aug and exte	0 on the second of the second	51.64 (kWh/year Oct nperatur 0	218.16 T) = Sum(9 Nov e from T 0	8) _{15,912} = Dec Table 10)	19.81	(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m=	e heatin pace co plated fo Jan loss rate o ation face	g require coling recorder June, of Feb e Lm (cate of the Lm (c	ement in quirement July and Mar alculated 0 pss hm 0	kWh/m² t August. Apr using 25	5.87 See Tat May 5°C inter 0	0 Die 10b Jun rnal temp 649.22	Jul perature 511.08	O Total Aug and exte	0 on the second of the second	51.64 (kWh/year Oct nperatur 0	218.16 T) = Sum(9 Nov e from T 0	8) _{15,912} = Dec Table 10)	19.81	(100)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	ation face of the state of the	g require r June, . Feb e Lm (ca 0 ctor for lo	ement in quirement July and Mar alculated 0 pss hm 0 Vatts) = (kWh/m² t August. Apr using 25 0 0 100)m x	5.87 See Tat May 5°C inter 0 (101)m	0 Die 10b Jun rnal temp 649.22 0.99	Jul perature 511.08	0 Tota Aug and exte 523.21 1	Sep ernal ten 0	51.64 (kWh/year Oct nperatur 0	218.16 Nov e from T 0	8) _{15,912} = Dec Table 10) 0	19.81	(100)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar o	g require r June, . Feb e Lm (ca 0 ctor for lo	ement in Quirement July and Mar Alculated 0 Dess hm 0 Vatts) = (kWh/m² t August. Apr using 25 0 0 100)m x	5.87 See Tat May 5°C inter 0 (101)m	0 Die 10b Jun rnal temp 649.22 0.99	Jul perature 511.08 1 509.83	0 Tota Aug and exte 523.21 1	Sep ernal ten 0	51.64 (kWh/year Oct nperatur 0	218.16 Nov e from T 0	8) _{15,912} = Dec Table 10) 0	19.81	(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin pace coulated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar o	g require oling red r June, v Feb e Lm (ca otor for lo nmLm (W otop on the capacity of	ement in Quirement July and Mar Ilculated 0 Dess hm 0 Vatts) = (0	kWh/m² t August. Apr using 2! 0 100)m x 0 for appli	5.87 See Tate May 5°C inter 0 (101)m 0 cable we	0 Die 10b Jun mal temp 649.22 0.99 644.84 eather re	Jul perature 511.08 1 509.83 egion, se 1319.4	0 Tota Aug and exte 523.21 1 521.19 ee Table 1234.38	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	218.16 Nov e from T 0 0 0	B) _{15,912} = Dec Table 10) 0 0	19.81	(100) (101) (102)
Space Space Space Space Space Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	ace cooling	g require r June, . Feb e Lm (ca 0 ctor for lo 0 nmLm (V 0 gains ca 0 g require	ement in quirement July and Mar alculated 0 oss hm 0 Vatts) = (0 lculated 0	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month,	See Tate May 5°C inter 0 (101)m 0 cable we 0 whole co	0 Die 10b Jun mal temp 649.22 0.99 644.84 eather re	Jul perature 511.08 1 509.83 egion, se 1319.4	0 Tota Aug and exte 523.21 1 521.19 ee Table 1234.38	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	218.16 Nov e from T 0 0 0	B) _{15,912} = Dec Table 10) 0 0	19.81	(100) (101) (102)
Space Space Space Space Space Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace co lated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar g 0 cooling 04)m to	g require r June, . Feb e Lm (ca 0 ctor for lo 0 nmLm (V 0 gains ca 0 g require	ement in quirement July and Mar alculated 0 pss hm 0 Vatts) = (0 lculated 0 ement for the sement in the sem	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month,	See Tate May 5°C inter 0 (101)m 0 cable we 0 whole co	0 Die 10b Jun mal temp 649.22 0.99 644.84 eather re	Jul perature 511.08 1 509.83 egion, se 1319.4	0 Tota Aug and exte 523.21 1 521.19 ee Table 1234.38	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	218.16 Nov e from T 0 0 0	B) _{15,912} = Dec Table 10) 0 0	19.81	(100) (101) (102)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	a heating pace cooling of the coolin	g require oling rec r June, Feb e Lm (ca 0 ctor for lo 0 mLm (V 0 gains ca 0 g require zero if (ement in quirement July and Mar alculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for (104)m <	kWh/m² t August. Apr using 2! 0 100)m x 0 for appli 0 r month, 3 × (98	5.87 See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	0 ole 10b Jun chal temp 649.22 0.99 644.84 eather re 1374.66	Jul perature 511.08 1 509.83 egion, se 1319.4 continue	0 Tota Aug and extended 523.21 1 521.19 te Table 1234.38 Dus (kW	0 1 10 0 10 0 10 0 10	51.64 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(218.16 Nov e from T 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	19.81	(100) (101) (102) (103)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	ation faction (a) a fraction of the cooling (b) at fraction definition (c) at the cooling	g require oling red r June, v Feb e Lm (ca otor for lo omLm (W ogains ca ogrequire zero if (ement in quirement July and Mar Alculated 0 oss hm 0 Vatts) = (0 lculated 0 ement foot (104)m < 0	kWh/m² t August. Apr using 2! 0 100)m x 0 for appli 0 r month, 3 × (98	5.87 See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	0 ole 10b Jun chal temp 649.22 0.99 644.84 eather re 1374.66	Jul perature 511.08 1 509.83 egion, se 1319.4 continue	0 Tota Aug and extended 523.21 1 521.19 te Table 1234.38 Dus (kW	0 1 10 0 10 0 10 0 10	51.64 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(218.16 Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	19.81 x (41)m	(100) (101) (102) (103)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Interm	a heatin pace could lated fo Jan loss rate 0 ation face 1 loss, he cooling 0 loss, he cooling 04)m to 1 loss factor ittency factor fact	g require oling rec r June, Feb e Lm (ca 0 ctor for lo 0 mLm (V 0 gains ca 0 g require zero if (0 n actor (Ta	ement in Quirement July and Mar Ilculated 0 Dess hm 0 Vatts) = (0 Iculated 0 ement for (104)m < 0	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month, 3 × (98	5.87 See Tate May 5°C inter 0 (101)m 0 cable we 0 whole of	0 ole 10b Jun onal temp 649.22 o.99 644.84 eather residently 1374.66 dwelling, 525.47	Jul perature 511.08 1 509.83 egion, se 1319.4 continue	0 Tota Aug and extended to the second of th	0 Sep ernal ten 0 0 10) 0 10 0 Total f C =	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	218.16 Nov e from T 0 0 0 0 104) area ÷ (4	Dec Dec O O O O O O O O O	19.81 x (41)m	(100) (101) (102) (103)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	a heatin pace could lated fo Jan loss rate 0 ation face 1 loss, he cooling 0 loss, he cooling 04)m to 1 loss factor ittency factor fact	g require oling red r June, v Feb e Lm (ca otor for lo omLm (W ogains ca ogrequire zero if (ement in quirement July and Mar Alculated 0 oss hm 0 Vatts) = (0 lculated 0 ement foot (104)m < 0	kWh/m² t August. Apr using 2! 0 100)m x 0 for appli 0 r month, 3 × (98	5.87 See Tab May 5°C inter 0 (101)m 0 cable we 0 whole o	0 ole 10b Jun chal temp 649.22 0.99 644.84 eather re 1374.66	Jul perature 511.08 1 509.83 egion, se 1319.4 continue	0 Tota Aug and extended 523.21 1 521.19 te Table 1234.38 Dus (kW	0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	218.16 Nov e from T 0 0 0 0 0 1,0,4) area ÷ (4	Dec Table 10 0 0 0 0 0 0 0 0 0	19.81 x (41)m 1658.4 0.7	(100) (101) (102) (103) (104) (105)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Interm (106)m=	a heatin pace could lated fo Jan loss rate 0 ation face 1 loss, he cooling 04)m to 1 loss factor ittency factor ittency factor ittency factor 1 loss factor	g require oling rec r June, Feb e Lm (ca 0 ctor for lo 0 mLm (V 0 gains ca 0 g require zero if (0 n actor (Ta	ement in Quirement July and Mar Ilculated 0 Dess hm 0 Vatts) = (0 Iculated 0 ement for (104)m < 0	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month, 3 × (98 0	5.87 See Tat May 5°C inter 0 (101)m 0 cable we 0 whole o)m 0	0 ole 10b Jun onal temp 649.22 o.99 644.84 eather recather 0 Jul perature 511.08 1 509.83 egion, se 1319.4 continue 602.32	0 Tota Aug and extended to the second of th	0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	218.16 Nov e from T 0 0 0 0 0 1,0,4) area ÷ (4	Dec Dec O O O O O O O O O	19.81 x (41)m 1658.4 0.7	(100) (101) (102) (103)	

Space cooling				<u> </u>		``	i e						
(107)m= 0	0	0	0	0	92.05	105.52	92.96	0 Total	0 - Sum/	0	0	000 70	7/40
Danes!in			·\						= Sum(IU./)	= [290.53	(10
Space cooling	· ·							` `) ÷ (4) =		L	4.04	(10
a. Energy red		nts — Indi	ividual n	eating sy	ystems i	ncluding	micro-C	HP)					
Space heating Fraction of space	•	at from s	econdar	v/supple	mentary	svstem					Γ	0	(20
Fraction of sp					,	•	(202) = 1 -	- (201) =			<u> </u>	1	(20
Fraction of to			-	• •			(204) = (2	02) × [1 –	(203)] =		<u> </u>	1	(20
Efficiency of		•	-								Ī	90.4	(20
Efficiency of	seconda	ry/supple	ementar	y heating	g systen	ո, %					Ĭ	0	(20
Cooling Syst	em Ener	gy Efficie	ency Rat	tio							Ī	5.13	(20
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ப ear
Space heating	g require	ement (c	<u> </u>		L		<u> </u>					•	
369.59	225.15	126.77	34.72	5.87	0	0	0	0	51.64	218.16	392.72		
211)m = {[(98)m x (20)4)] } x 1	00 ÷ (20	16)									(21
408.84	249.05	140.24	38.41	6.49	0	0	0	0	57.12	241.32	434.42		
							Tota	ıl (kWh/yea	ar) =Sum(2	211) _{15,10. 12}	=	1575.9	(21
Space heating	•		• .	month									
= {[(98)m x (20	T		r -										
215)m= 0	0	0	0	0	0	0	0 	0	0	0	0		٦,,,
							lota	ıl (kWh/yea	ar) =Sum(2	215) _{15,10. 12}		0	(21
Water heating Dutput from w		tor (calc	ulated al	hovo)									
194.27	169.7	176.56	156.6	151.62	133.53	127.94	142.62	144.19	164.19	175.27	189.71		
Efficiency of w	ater hea	iter			l	l	l	l				80.3	(21
217)m= 86.65	85.76	84.23	81.96	80.64	80.3	80.3	80.3	80.3	82.51	85.6	86.84		 (21
uel for water	heating,	kWh/mo	onth										
(64) (64) (64)	m x 100		m 191.06	188.03	166.29	159.32	177.61	179.57	199.01	204.75	210.45		
219)m= 224.21	197.07	209.61	191.00	100.03	100.29	159.32		I = Sum(2		204.75	218.45	2245.77	٦,,,
Space coolin	a fual k	Wh/mar	a+b				7010	Ouni(2	104) ₁₁₂		L	2315.77	(21
221)m = (107	_		iui.										
221)m= 0	0	0	0	0	17.94	20.57	18.12	0	0	0	0		
	•	•			•	!	Tota	I = Sum(2	21) ₆₈ =			56.63	(22
Annual totals	1								k۱	Wh/year		kWh/yea	r
Space heating	fuel use	ed, main	system	1								1575.9	
Vater heating	fuel use	ed .									Ī	2315.77	Ī
Space cooling	fuel use	ed									Ī	56.63	Ħ
Electricity for p			electric	keep-ho	t						L	-	
mechanical v				·		nnut fron	n outsida	<u>م</u>			148.07		(23
			iocu, cxl	ract or p	osiuve II	iiput iiUli	า บนเอเนเ	_			140.07		(23
central heatir											30		(23

Total electricity for the above, kWh/year	sum of (230a)	(230g) =	178.07	(231)
Electricity for lighting			317.63	(232)
Electricity generated by PVs			-271.71	(233)

12a. CO2 emissions – Individual heating system	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	340.39 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	500.21 (264)
Space and water heating	(261) + (262) + (263) + (264) =		840.6 (265)
Space cooling	(221) x	0.519	29.39 (266)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	92.42 (267)
Electricity for lighting	(232) x	0.519	164.85 (268)
Energy saving/generation technologies Item 1		0.519 =	-141.02 (269)
Total CO2, kg/year	sum	of (265) (271) =	986.25 (272)
Dwelling CO2 Emission Rate	(272	?) ÷ (4) =	13.71 (273)
El rating (section 14)			89 (274)

		l Iser E	Details:						
Assessor Name:	Chris Hocknell		Strom	a Num	ber		STRO	016363	
Software Name:	Stroma FSAP 2012		Softwa					n: 1.0.4.10	
	F	Property	Address	: Flat 08					
Address:									
Overall dwelling dimer	ISIONS:	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Basement				(1a) x		2.5	(2a) =	162.74	(3a)
Total floor area TFA = (1a	n)+(1b)+(1c)+(1d)+(1e)+(1	n)	65.1	(4)			_		
Dwelling volume				I (3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	162.74	(5)
2. Ventilation rate:								7,7_11	
2. Ventuation rate.	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0		0	Ī = Ē	0	x	20 =	0	(6b)
Number of intermittent far	ns				0	x -	10 =	0	(7a)
Number of passive vents				Ē	0	x -	10 =	0	(7b)
Number of flueless gas fir	es			Ī	0	x	40 =	0	(7c)
				_					
		_	,_	_				nanges per ho	_
•	rs, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			continue fr	0 rom (9) to		÷ (5) =	0	(8)
Number of storeys in th					o (o) to	(1.6)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of opening	· · ·	o ine grea	iei waii are	a (anei					
•	oor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0 and doors draught stripped							0	(13)
Window infiltration	and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(14)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)
•	ty value, then $(18) = [(17) \div 20] + (18)$							0.15	(18)
Air permeability value applies Number of sides sheltered	s if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	1		(20) = 1 -	[0.075 x (19)] =			0	(20)
Infiltration rate incorporati	ng shelter factor		(21) = (18	s) x (20) =				0.15	(21)
Infiltration rate modified for	or monthly wind speed						,		
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	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 = (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]	

0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
alculate effec		_	ate for t	he appli	cable ca	se						, 	—
If mechanica			andiv N. (2	2h) = (22a	a) v Emu (a	auation (N	JE)) otho	aviaa (22h) = (220)			0.5	(2
If exhaust air he) - (23a)			0.5	(2
If balanced with		-	-	_					21- \ <i>(</i>	001-1 [4 (00 -)	73.95	(2
a) If balance	0.32	o.31	ntilation 0.3	0.29	at recove	0.27	1R) (24a 0.27	0.28	2b)m + (2 0.29	23b) × [0.3	1 – (23c) 0.31) ÷ 100]]	(2
·		<u> </u>					l				0.31		(2
b) If balance	a mecna	anicai ve	ntilation	without	neat red	overy (i	//V) (24b)m = (22 0	2b)m + (2 0	i	Ι ,	1	(2
							<u> </u>		U	0	0		(2
c) If whole h if (22b)n				•	•				5 x (23h	1)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural		on or wh	ole hous	e nositiv		ventilatio						J	·
if (22b)n									0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		•	•	•	
5)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31]	(
		1			•						•	•	
. Heat losse		·			Net Ar	20	LLvol	10	AXU		k volu	^	Χk
LEMENT	Gros area	-	Openin m	Ξ	A,r		U-valı W/m2		(W/I	〈)	k-value kJ/m²·		J/K
indows Type	: 1				17.75	x1.	/[1/(1.2)+	0.04] =	20.32				(
indows Type	2				4.65	x1.	/[1/(1.2)+	0.04] =	5.32	Ħ			(
indows Type	3				4.65	x1.	/[1/(1.2)+	0.04] =	5.32	=			(
alls Type1	61.7	76	27.0	5	34.71	x	0.16	<u>-</u>	5.55	=		7 [
alls Type2	26.6	88	0	=	26.68	=	0.16	≓ ₌¦	4.27	=		╡	<u> </u>
oof	64.7		0	=	64.78	=	0.12		7.77	╡ ;		╡ ├─	= `
otal area of e					153.2	=	0.12		1.11				\ (
or windows and			ffective wi	ndow H-va			formula 1	/[(1/Ll-valu	ıe)+0 041 a	ns aiven in	naragranl	132	(
include the area						atou uomg	Torritaia T	n (mo vana	0,10.01,4	io giveii iii	paragrapi	. 0.2	
bric heat los	s, W/K :	= S (A x	U)				(26) (30)	+ (32) =				48.57	(
eat capacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	12246.78	(
nermal mass	parame	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(
r design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		_
n be used inste						,							_
ermal bridge	•	,		• .	•	(12.25	(
letails of therma Ital fabric he		are not kn	own (36) =	= 0.15 X (3	11)			(33) +	(36) =			60.02	(
entilation hea		alculated	monthly	,					= 0.33 × (25)m x (5))	60.82	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
3)m= 17.27	17.07	16.86	15.86	15.66	14.65	14.65	14.45	15.05	15.66	16.06	16.46		(
		<u> </u>	. 5.50	. 5.50	L	L	L			<u> </u>	1 . 0. 10	J	(
eat transfer of					ı	1	I .	· , ,	= (37) + (3		T	1	
9)m= 78.09	77.89	77.68	76.68	76.48	75.47	75.47	75.27	75.87	76.48	76.88	77.28		

Heat loss parar	meter (k	JI D) \\/\	m²k′					(40)m	= (39)m ÷	- (A)			
(40)m= 1.2	1.2	1.19	1.18	1.17	1.16	1.16	1.16	1.17	1.17	1.18	1.19		
(10)		1.10	1.10	1.17	1.10	1.10	1.10			Sum(40) ₁		1.18	(40)
Number of days	s in moi	nth (Tabl	e 1a)					•	o.ago	Cu(10)1	127.1		(\
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
L													
4. Water heati	ng enei	rgy requi	rement:								kWh/ye	ear:	
Assumed occup if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.(0013 x (¯	TFA -13.		12		(42)
Annual average Reduce the annual not more that 125 l	hot wa average	hot water	usage by	5% if the a	welling is	designed t			se target o		.59		(43)
					_	,	A	0			D		
Jan Hot water usage in	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
		 					` ′	00.00		T 00 00	00.04		
(44)m= 93.04	89.66	86.28	82.89	79.51	76.13	76.13	79.51	82.89	86.28	89.66	93.04	4045.00	7(44)
Energy content of h	hot water	used - cald	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600			m(44) _{1 12} = ables 1b, 1		1015.03	(44)
(45)m= 137.98	120.68	124.53	108.57	104.17	89.9	83.3	95.59	96.73	112.73	123.05	133.63		
(10)	120.00	12 1.00	100.01	101.11	00.0	55.5	00.00	l		m(45) _{1 12} =	l	1330.87	(45)
If instantaneous wa	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar ou	m(10)1 12	1	1000.01	
(46)m= 20.7	18.1	18.68	16.29	15.63	13.48	12.5	14.34	14.51	16.91	18.46	20.04		(46)
Water storage I	oss:							ļ					
Storage volume	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community he	_			_									
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage I		oolorod k	ooo foot	ar io kno	up (k\\/k	2/dox4):							(40)
a) If manufactu				DI IS KITO	WII (KVVI	i/day).					0		(48)
Temperature fa											0		(49)
Energy lost fror b) If manufactu		-	-		or ie not		(48) x (49)) =			0		(50)
Hot water stora			-								0		(51)
If community he	-			`		,							, ,
Volume factor f	rom Ta	ble 2a									0		(52)
Temperature fa	ctor fro	m Table	2b								0		(53)
Energy lost fror	n water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (5	54) in (5	55)									0		(55)
Water storage I	oss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit I	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit I	•	•			59)m = ((58) ÷ 36	5 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

					<i>,</i> ,									
Combi loss o	- r				`	- ` `	_				T	l	1	(04)
(61)m= 47.41		43.97	40.88	40.52	37.54	38.79	40.5		40.88	43.97	44.22	47.41		(61)
						1	`	_			ì ´	` 	(59)m + (61)m	
(62)m= 185.4		168.5	149.45	144.69	127.44	122.09	136.		137.61	156.7	167.27	181.04		(62)
Solar DHW inpu										r contribut	tion to wate	er heating)		
(add addition		r —				 	·				1 .		1	(00)
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output from						,					,		1	
(64)m= 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.	.11	137.61	156.7	167.27	181.04		7
							(Outp	ut from wa	ater heate	r (annual)₁	12	1838.24	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (6	1)m] + 0.8 x	([(46)m	+ (57)m	+ (59)m	.1	
(65)m= 57.73	50.44	52.4	46.32	44.77	39.28	37.4	41.9	91	42.38	48.47	51.97	56.29		(65)
include (57	')m in cal	culation (of (65)m	only if c	ylinder	is in the	dwelli	ing (or hot w	ater is f	rom com	munity h	eating	
5. Internal	gains (see	Table 5	and 5a):										
Metabolic ga	ins (Table	e 5), Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(66)m= 106.0	3 106.08	106.08	106.08	106.08	106.08	106.08	106.	.08	106.08	106.08	106.08	106.08		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso se	ee T	Table 5			•	-	
(67)m= 16.55	14.7	11.95	9.05	6.76	5.71	6.17	8.0	2	10.76	13.67	15.95	17.01		(67)
Appliances g	ains (calc	ulated ir	Append	dix L. eq	uation L	.13 or L1	За), а	also	see Tal	ble 5	<u>.</u>		ı	
(68)m= 185.6		182.67	172.34	159.3	147.04	138.85	136.		141.78	152.11	165.15	177.41		(68)
Cooking gair	ns (calcula	ited in A	opendix	L. eguat	ion L15	or L15a), also	o se	e Table	5	Į.	<u>!</u>	ı	
(69)m= 33.61	`	33.61	33.61	33.61	33.61	33.61	33.6	_	33.61	33.61	33.61	33.61		(69)
Pumps and f	 ans gains	(Table ^p	L 5a)			1	<u> </u>	!			Į.	1		
(70)m= 3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses e.g. e				<u> </u>	<u> </u>	1 -					1 -		I	` ,
(71)m= -84.86		-84.86	-84.86	-84.86	-84.86	-84.86	-84.8	86	-84.86	-84.86	-84.86	-84.86	1	(71)
` ′	!	<u> </u>	04.00	04.00	04.00	04.00	U - 1.	00	04.00	04.00	04.00	04.00		(* -7
Water heatin	75.06	70.43	64.33	60.17	54.55	50.26	56.3	33	58.86	65.15	72.18	75.65	1	(72)
` '	_!	l	04.00	00.17	<u>l</u>	i)m + (67)m								(12)
(73)m= 337.5	_ `		202.54	204.05		253.11	·	·	, ,	, ,	•		1	(73)
` '		322.87	303.54	284.05	265.12	253.11	259	'-	269.23	288.75	311.11	327.89		(73)
6. Solar gains are		usina sola	r flux from	Table 6a	and assoc	riated equa	itions t	0 00	nvert to th	e annlical	nle orientat	tion		
Orientation:		•	Area		Flı	·	itions t	.0 001	g_	Саррпса	FF	uon.	Gains	
Officiation.	Table 6d		m ²			ble 6a		Ta	9_ able 6b	Т	able 6c		(W)	
Northeast 0.9x	0.77	x	4.6	55	х	11.28] _× [0.55	Т х Г	0.7		14	(75)
Northeast 0.9x		_			_] L] [╡╞		= =](75)
Northeast 0.9x		×	4.6			22.97]		0.55		0.7	╡ -	28.49](75)](75)
Northeast 0.9x		×	4.6			41.38]		0.55		0.7	_	51.34	╡ .
		X	4.6	==	—	67.96	X		0.55	_	0.7	_	84.31	(75)
Northeast 0.9x	0.77	X	4.6	35	X	91.35	X		0.55	X	0.7	=	113.33	(75)

Northeast _{0.9x}					٦.,		7.00	1		0.55	ا پر ا	0.7	- -	400.00	(75)
Northeast 0.9x	0.77	×		1.65] X]	\vdash	7.38	X 1		0.55	x	0.7	<u>-</u> -	120.82	(75)
Northeast 0.9x	0.77	×		1.65] X	_	91.1	X		0.55	X	0.7	╡ -	113.02	(75)
<u> </u>	0.77	×		1.65	X	_	2.63] X]		0.55	X	0.7	_ =	90.1	(75)
Northeast 0.9x	0.77	×		ł.65	J X	\vdash	0.42] X		0.55	×	0.7	- ⁼	62.55	(75)
Northeast _{0.9x}	0.77	×		.65	X	2	8.07	X		0.55	X	0.7	ᆗ ⁼	34.82	(75)
Northeast _{0.9x}	0.77	×		.65	X		14.2	X		0.55	X	0.7	=	17.61	(75)
Northeast 0.9x	0.77	x	4	.65	X		9.21	X		0.55	X	0.7	=	11.43	(75)
Southwest _{0.9x}	0.77	×	4	.65	X	3	6.79	<u> </u>		0.55	X	0.7	=	45.65	(79)
Southwest _{0.9x}	0.77	x		.65	X	6	2.67]		0.55	X	0.7	=	77.76	(79)
Southwest _{0.9x}	0.77	×	4	.65	X	8	5.75			0.55	X	0.7	=	106.39	(79)
Southwest _{0.9x}	0.77	X	4	.65	X	1	06.25			0.55	X	0.7	=	131.82	(79)
Southwest _{0.9x}	0.77	X	4	.65	X	1	19.01			0.55	X	0.7	=	147.65	(79)
Southwest _{0.9x}	0.77	×	4	.65	x	1	18.15]		0.55	X	0.7		146.58	(79)
Southwest _{0.9x}	0.77	X	4	.65	x	1	13.91			0.55	x	0.7	-	141.32	(79)
Southwest _{0.9x}	0.77	×	4	1.65	x	1	04.39	ĺ		0.55	x	0.7	╡ =	129.51	(79)
Southwest _{0.9x}	0.77	×		l.65	x	9	2.85	ĺ		0.55	X	0.7	╡ -	115.2	(79)
Southwest _{0.9x}	0.77	×	4	l.65	X	6	9.27	j		0.55	×	0.7	╡ -	85.94	(79)
Southwest _{0.9x}	0.77	×		1.65	x	4	4.07	ĺ		0.55	×	0.7	╡ -	54.68	(79)
Southwest _{0.9x}	0.77	x		1.65	x	3	1.49	i		0.55	= x	0.7	╡ -	39.07	(79)
Northwest _{0.9x}	0.77	x	1	7.75	X	1	1.28	X		0.55	×	0.7	╡.	53.43	(81)
Northwest _{0.9x}	0.77	x	1	7.75	X		2.97	X		0.55	×	0.7		108.77	(81)
Northwest _{0.9x}	0.77	x	1	7.75	j x	4	1.38	X		0.55	= x	0.7	╡.	195.96	(81)
Northwest _{0.9x}	0.77	x	1	7.75	X	-	7.96	X		0.55	x	0.7	╡ -	321.82	(81)
Northwest _{0.9x}	0.77	x		7.75	X	_	1.35]] x		0.55	╡ ×	0.7	╡ -	432.6	(81)
Northwest _{0.9x}	0.77	x		7.75]] x	\vdash	7.38]]		0.55	٦ ×	0.7	╡.	461.19	(81)
Northwest _{0.9x}	0.77	x		7.75]]	_	91.1) x		0.55	ا x	0.7	╡.	431.44	(81)
Northwest 0.9x	0.77	x		7.75]]	_	2.63]] x		0.55	ا ×	0.7	╡ -	343.95	(81)
Northwest 0.9x	0.77	x	-	7.75]]	—	0.42]] _X		0.55	ا ×	0.7	╡ -	238.78	(81)
Northwest 0.9x	0.77	^		7.75] x	_	28.07) ^] x		0.55		0.7	╡ -	132.92	(81)
Northwest 0.9x	0.77	^		7.75] ^] x		14.2] ^] x		0.55	^ x	0.7	╡ ₌		(81)
Northwest 0.9x	0.77	^	-	7.75] ^] x	_	9.21] ^] x		0.55	-	0.7	╡ ₌	43.64	(81)
1101111110010.9X	0.77	^	<u> </u>	7.75	^		9.21			0.55	^	0.7		43.04	(01)
Solar gains in	vatte ca	doulate	d for ea	ch mon	th			(83)m	s = Su	m(74)m	(82)m				
(83)m= 113.08	215.01	353.69	537.95		-	28.59	685.78	563	$\overline{}$	416.53	253.68	3 139.52	94.13	٦	(83)
Total gains – ir							ı , watts						<u> </u>	_	
(84)m= 450.64	550.12	676.56	841.5	977.6	`	93.71	938.89	822	.66	685.76	542.43	3 450.63	422.02	7	(84)
7. Mean inter	nal temp	erature	(heatir	ng seas	on)			•		•		•			
Temperature			`	Ĭ		area ·	from Tal	ole 9.	. Th1	(°C)				21	(85)
Utilisation fac	•				_				,	(-)					` ′
Jan	Feb	Mar	Apr	Ma	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	7	
(86)m= 1	0.99	0.97	0.87	0.68		0.48	0.35	0.4	-	0.7	0.95	0.99	1	┥	(86)
	!		<u>!</u>	<u> </u>			<u> </u>			!			L	_	
Mean internal	19.99	20.32	20.72		`	ow ste 20.99	ps 3 to 1	2		9C) 20.94	20.6	20.11	19.74	٦	(87)
(0.7	. 5.55		1	1 20.00						T		1 20.11	1 .0., 4	_	V- · /

Tomn	oroturo	during h	ootina n	oriodo ir	root of	dwalling	from To	hla O T	h2 (°C)					
(88)m=	19.92	19.92	neating p	19.94	19.94	19.95	19.95	19.96	19.95	19.94	19.94	19.93		(88)
		<u>!</u>	<u>!</u>			<u> </u>	<u> </u>	<u>!</u>	10.00	10.04	10.04	10.00		(/
(89)m=	0.99	0.99	ains for 1	0.83	weiling, 1	n2,m (se	0.27	9a) 0.32	0.62	0.92	0.99	1		(89)
		<u>!</u>	<u>!</u>				<u> </u>	<u> </u>	<u> </u>	<u> </u>	0.99	'		(00)
			ature in			- ` `	i e	·	1	 		1		
(90)m=	18.31	18.61	19.09	19.63	19.88	19.95	19.95	19.95	19.91	19.49	18.8	18.26		(90)
									1	fLA = Livin	g area ÷ (4	4) =	0.42	(91)
Mean	interna	I temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	_A) × T2					
(92)m=	18.93	19.19	19.61	20.09	20.33	20.39	20.39	20.39	20.34	19.96	19.35	18.89		(92)
Apply	adjustr	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.78	19.04	19.46	19.94	20.18	20.24	20.24	20.24	20.19	19.81	19.2	18.74		(93)
8. Sp	ace hea	iting requ	uirement				•	•						
Set T	i to the	mean int	ternal ter	nperatui	e obtain	ed at ste	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:			_	_		_	_			
(94)m=	0.99	0.98	0.95	0.83	0.63	0.42	0.29	0.35	0.64	0.92	0.99	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (8	4)m									
(95)m=	447.53	540.59	641.27	701.74	616.8	421.96	274.63	288.37	438.95	498.87	443.97	419.84		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8	_	_		_	_			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1130.52	1101.34	1006.95	846.68	648.22	425.51	275.05	289.38	462.4	704.19	930.38	1123.5		(97)
Space	- h4:-													
•	e neaun	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	508.15	g require 376.83	272.07	r each n 104.36	23.37	Wh/mon	th = 0.02	24 x [(97 0)m — (95 0)m] x (4 ⁻¹	1)m 350.21	523.52		
•		ř 				i	i	0	i `	152.75	350.21	<u> </u>	2311.26	(98)
(98)m=	508.15	376.83		104.36	23.37	i	i	0	0	152.75	350.21	<u> </u>	2311.26	(98)
(98)m=	508.15 e heatin	376.83	272.07 ement in	104.36 kWh/m²	23.37	i	i	0	0	152.75	350.21	<u> </u>		= ` `
(98)m= Space 8c. Si	508.15 e heatin	g require	272.07 ement in quiremen	104.36 kWh/m²	23.37 ² /year	0	i	0	0	152.75	350.21	<u> </u>		= ` `
(98)m= Space 8c. Si	508.15 e heatin cace co	g require	272.07 ement in quiremen July and	104.36 kWh/m² it August.	23.37 ² /year See Tal	0 ole 10b	0	0 Tota	0 al per year	152.75 (kWh/year	350.21 r) = Sum(9	8) _{15,912} =		= ` `
(98)m= Space 8c. Si Calcu	508.15 e heatin pace co plated fo	g require	ement in quiremen July and Mar	kWh/m² t August. Apr	23.37 Yyear See Tal May	oble 10b	0 Jul	0 Tota	0 al per year	152.75 (kWh/year	350.21 -) = Sum(9 Nov	8) _{15,912} =	35.5	= ` `
(98)m= Space 8c. Si Calcu	e heatin pace co llated fo Jan loss rate	g require	272.07 ement in quiremen July and	kWh/m² t August. Apr	23.37 Yyear See Tal May	oble 10b	0 Jul	0 Tota	0 al per year	152.75 (kWh/year	350.21 -) = Sum(9 Nov	8) _{15,912} =	35.5	= ` `
(98)m= Space 8c. Si Calcu Heat (100)m=	508.15 e heatin cace co lated fo Jan loss rate	g require oling rec r June, c Feb e Lm (ca	ement in quirement July and Mar lculated 0	kWh/m² t August. Apr using 25	23.37 See Tat May S°C inter	ole 10b Jun	Jul perature	0 Tota Aug	0 al per year Sep ernal ten	152.75 (kWh/year	350.21 r) = Sum(9 Nov e from T	8) _{15,912} = Dec able 10)	35.5	(99)
Space 8c. Space Calcu Heat (100)m= Utilisa	e heatin pace co plated fo Jan loss rate 0 ation face	g require oling rec r June, Feb e Lm (ca	ement in quirement July and Mar lculated 0	kWh/m² t August. Apr using 25	23.37 See Tat May S°C inter	ole 10b Jun	Jul perature	0 Tota Aug	0 al per year Sep ernal ten	152.75 (kWh/year	350.21 r) = Sum(9 Nov e from T	8) _{15,912} = Dec able 10)	35.5	(99)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m=	e heatin cace co lated fo Jan loss rate 0 ation fac	g require oling red r June, Feb e Lm (ca	ement in quirement July and Mar July and Loulated 0 pss hm 0	kWh/m² t August. Apr using 2!	23.37 See Tal May 5°C inter 0	0 Jun rnal temp 709.4	Jul perature 558.47	Aug and exte	0 al per year Sep ernal ten	152.75 (kWh/year Oct nperatur 0	350.21 T) = Sum(9 Nov e from T	8) _{15,912} = Dec Table 10)	35.5	(100)
Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu	e heatin pace co llated fo Jan loss rate 0 ation face 1 ll loss, h	g require oling red r June, Feb e Lm (ca	ement in quirement July and Mar llculated 0 pss hm 0 Vatts) = (kWh/m² t August. Apr using 2!	23.37 See Tal May 5°C inter 0	ole 10b Jun rnal temp 709.4	Jul perature 558.47	Aug and exte 572.03	0 al per year Sep ernal ten	152.75 (kWh/year Oct nperatur 0	350.21 T) = Sum(9 Nov e from T	8) _{15,912} = Dec Table 10) 0	35.5	(100) (101)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin coace co lated fo Jan loss rate 0 ation face 0 Il loss, h	g require oling red r June, c Feb e Lm (ca 0 ctor for lo	ement in quirement July and Mar Ilculated 0 pss hm 0 Vatts) = (kWh/m² t August. Apr using 25 0 100)m x	23.37 See Tal May 5°C inter 0 (101)m 0	0 Jun rnal temp 709.4 0.97	Jul perature 558.47 0.99	0 Tota Aug and exte 572.03	Sep ernal ten 0	Oct nperatur 0	350.21 Nov e from T 0	8) _{15,912} = Dec Table 10)	35.5	(100)
Space 8c. Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	e heatin pace co lated fo Jan loss rate 0 ation face 1 loss, h 0 s (solar see	g require oling red r June, c Feb e Lm (ca 0 ctor for lo	ement in quirement July and Mar llculated 0 pss hm 0 Vatts) = (kWh/m² t August. Apr using 25 0 100)m x	23.37 See Tal May 5°C inter 0 (101)m 0	0 ole 10b Jun nal temp 709.4 0.97 689.57 eather re	Jul perature 558.47 0.99 551.03 egion, se	0 Tota Aug and exte 572.03 0.98	Sep ernal ten 0 0 10)	Oct nperatur 0	350.21 Nov e from T 0	8) _{15,912} = Dec Table 10) 0	35.5	(100) (101) (102)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin pace co plated fo Jan loss rate 0 ation face 0 Il loss, h 0 s (solar g	g require oling red r June, v Feb e Lm (ca 0 ctor for lo nmLm (W 0 gains ca 0	ement in quirement July and Mar liculated 0 oss hm 0 Vatts) = (0 liculated 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	23.37 See Tal May 5°C inter 0 (101)m 0 cable we	0 Dile 10b Jun The control of the contro	Jul perature 558.47 0.99 551.03 egion, se	Aug and extension of the second of the secon	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	350.21 Nove from T 0 0	8) _{15,912} = Dec Table 10) 0 0	35.5	(100) (101)
Space 8c. Space 8c. Space Reat (100)m= Utilisa (101)m= Useft (102)m= Gains (103)m= Space	be heating to be cooling to be cooling to be seen as the cooling to be c	g require oling rec r June, v Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 g require	ement in quirement July and Mar llculated 0 oss hm 0 Vatts) = (0	kWh/m² t August. Apr using 29 0 (100)m x 0 for appli 0 r month,	23.37 See Tak May S°C inter 0 (101)m 0 cable we 0 whole co	0 Dile 10b Jun The control of the contro	Jul perature 558.47 0.99 551.03 egion, se	Aug and extension of the second of the secon	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	350.21 Nove from T 0 0	8) _{15,912} = Dec Table 10) 0 0	35.5	(100) (101) (102)
Space Sc. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace co lated fo Jan loss rate 0 ation face 1 loss, h 0 (solar) 6 (solar) 6 (cooling 0 (od))m to	g require oling rec r June, v Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 g require	ement in quiremen July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0	kWh/m² t August. Apr using 29 0 (100)m x 0 for appli 0 r month,	23.37 See Tak May S°C inter 0 (101)m 0 cable we 0 whole co	0 Dile 10b Jun The control of the contro	Jul perature 558.47 0.99 551.03 egion, se 1166.77	Aug and extension of the second of the secon	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	350.21 Nove from T 0 0	8) _{15,912} = Dec Table 10) 0 0	35.5	(100) (101) (102)
Space Sc. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	e heatin pace co lated fo Jan loss rate 0 ation face 1 loss, h 0 (solar) 6 (solar) 6 (cooling 0 (od))m to	g require oling red r June, Feb e Lm (ca 0 ctor for lo 0 nmLm (V 0 gains ca 0 g require 0 zero if (ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month, 3 × (98	23.37 See Tale May S°C inter 0 (101)m 0 cable we 0 whole o)m	ole 10b Jun rnal temp 709.4 0.97 689.57 eather re 1232.17	Jul perature 558.47 0.99 551.03 egion, see 1166.77 continue	0 Tota Aug and exte 572.03 0.98 558.31 ee Table 1031.74 ous (kW	0 0 0	152.75 (kWh/year Oct Oct O O O O O O 24 x [(10)]	350.21 Nove from T 0 0 0 0 0 0 0 0 0	Dec Table 10) 0 0 102)m];	35.5	(100) (101) (102)
Space Sc. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 loss, h 0 (solar) 6 (solar) 6 (cooling 0 (od))m to	g require oling rec oling rec or June, Feb e Lm (ca 0 ctor for lo 0 mmLm (V 0 gains ca 0 g require o zero if (ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month, 3 × (98	23.37 See Tale May S°C inter 0 (101)m 0 cable we 0 whole o)m	ole 10b Jun rnal temp 709.4 0.97 689.57 eather re 1232.17	Jul perature 558.47 0.99 551.03 egion, see 1166.77 continue	0 Tota Aug and exte 572.03 0.98 558.31 ee Table 1031.74 ous (kW	0 0 0 0 0 0 0 0 0 0 Total	152.75 (kWh/year Oct nperatur 0 0 24 x [(10)	350.21 Nov e from T 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	35.5 x (41)m	(100) (101) (102) (103)
Space State (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	be heating of the cooling of the coo	g require oling red r June, c Feb e Lm (ca otor for lo omLm (W ogains ca o zero if (o	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for	kWh/m² t August. Apr using 2! 0 100)m x 0 for appli 0 r month, 3 × (98) 0	23.37 See Tale May S°C inter 0 (101)m 0 cable we 0 whole o)m	ole 10b Jun rnal temp 709.4 0.97 689.57 eather re 1232.17	Jul perature 558.47 0.99 551.03 egion, see 1166.77 continue	0 Tota Aug and exte 572.03 0.98 558.31 ee Table 1031.74 ous (kW	0 0 0 0 0 0 0 0 0 0 Total	152.75 (kWh/year Oct nperatur 0	350.21 Nov e from T 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	35.5 x (41)m	(100) (101) (102) (103)
Space State (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 s (solar grade) c (solar grade) d fraction attency f	g require oling red r June, c Feb e Lm (ca otor for lo omLm (W ogains ca o zero if (o	ement in quirement in Mar Mar liculated 0 oss hm 0 Vatts) = (0 liculated 0 oss hm 0 liculated	kWh/m² t August. Apr using 2! 0 100)m x 0 for appli 0 r month, 3 × (98) 0	23.37 See Tale May S°C inter 0 (101)m 0 cable we 0 whole o)m	ole 10b Jun rnal temp 709.4 0.97 689.57 eather re 1232.17	Jul perature 558.47 0.99 551.03 egion, see 1166.77 continue	0 Tota Aug and exte 572.03 0.98 558.31 ee Table 1031.74 ous (kW	0 0 0 0 0 0 0 0 0 0 Total	152.75 (kWh/year Oct nperatur 0	350.21 Nov e from T 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	35.5 x (41)m	(100) (101) (102) (103)
Space 8c. Space 8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi	e heatin pace co lated fo Jan loss rate 0 ation face 1 s (solar grade) c (solar grade) d fraction attency f	g require oling rec r June, c Feb e Lm (ca 0 ctor for lo 0 mLm (V 0 gains ca 0 g require 0 zero if (0	ement in quirement July and Mar llculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for (104)m < 0	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month, 3 × (98	23.37 See Tat May 5°C inter 0 (101)m 0 cable we 0 whole come	0 ole 10b Jun mal temp 709.4 0.97 eather re 1232.17 dwelling, 390.67	Jul perature 558.47 0.99 551.03 egion, se 1166.77 continue	0 Tota Aug and exte 572.03 0.98 558.31 ee Table 1031.74 ous (kW	0 0 0 0 0 0 0	152.75	350.21 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	8) _{15,912} = Dec able 10) 0 0 102)m] :	35.5 x (41)m	(100) (101) (102) (103)

Space cooling				<u> </u>	``	·							
107)m= 0	0	0	0	0	68.26	80.05	61.55	0 Total	0 = Sum(107)	= 0	200.00	(10
enace cooling	roquiror	mont in l	11/h/m ² / ₂	(OOr					•	1,0,1	_	209.86	╡`
Space cooling	•		-		votomo i	م مار د ما نام م	mioro C	` ') ÷ (4) =			3.22	(10
a. Energy red Space heati		ils – Inai	ividuai ni	eating sy	ystems i	nciuaing	micro-C	,ПР)					
Fraction of sp	•	at from s	econdary	y/supple	mentary	system					Γ	0	(20
Fraction of sp			•		·	•	(202) = 1 -	- (201) =			F	1	(20
Fraction of to			-				(204) = (2	02) × [1 –	(203)] =		F	1	(20
Efficiency of		•	-								F	90.4	(20
Efficiency of	•		• •		g system	ո, %					<u> </u>	0	(20
Cooling Syste			,		5 ,	•					F	5.13	(20
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
Space heating	L				l	<u> </u>	₁ / tug	ОСР	000	1101		KVVIII y C	Zui
508.15	376.83	272.07	104.36	23.37	0	0	0	0	152.75	350.21	523.52		
211)m = {[(98)m x (20)4)] } x 1	00 ÷ (20)6)	•	•	•		•				(21
562.11	416.84	300.96	115.44	25.85	0	0	0	0	168.98	387.4	579.12		
			-		-	-	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,10. 12}	=	2556.7	(2
Space heatin	g fuel (s	econdar	y), kWh/	month							_		
: {[(98 <u>)</u> m x (20	T	1	r -			ı	ı						
215)m= 0	0	0	0	0	0	0	0	0	0	0	0		- 1
							lota	I (kWh/yea	ar) =Sum(2	215) _{15,10. 12}	<u></u>	0	(21
Vater heating		tor (oolo	ام امطمان)									
Output from w 185.4	161.95	168.5	149.45	144.69	127.44	122.09	136.11	137.61	156.7	167.27	181.04		
 fficiency of w	ater hea	iter										80.3	(2
217)m= 87.46	87.11	86.25	84.17	81.57	80.3	80.3	80.3	80.3	84.99	86.87	87.57		(2 ²
uel for water	heating,	kWh/ma	onth										
219)m = (64)	T												
219)m= 211.98	185.92	195.36	177.56	177.39	158.7	152.05	169.5	171.37	184.38	192.56	206.74		_
							rota	I = Sum(2 ⁻	19a) ₁₁₂ =		L	2183.5	(21
Space coolin 221)m = (107	_		nth.										
221)m= 0	0	0	0	0	13.31	15.6	12	0	0	0	0		
	ļ.		ļ.				Tota	I = Sum(22	21) ₆₈ =		<u> </u>	40.91	(22
Annual totals									k\	Wh/year		kWh/yea	 r
Space heating		ed, main	system	1						, , , , , , , , , , , , , , , , , , ,		2556.7	1
Vater heating	fuel use	ed.									ř	2183.5	=
Space cooling											L 	40.91	╡
Electricity for p			electric l	keep-ho	t						L	70.31	
	entilation	ղ - balan	iced. ext	ract or n	ositive i	nput fron	n outside	9			134.02		(23
mechanical v			iced, ext	ract or p	ositive ii	nput fron	n outside	e			134.02		(23 (23

Total electricity for the above, kWh/year	sum of (230a)	(230g) =	164.02	(231)
Electricity for lighting			292.21	(232)
Electricity generated by PVs			-271.71	(233)

12a. CO2 emissions – Individual heating system	s including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	552.25 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	471.64 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1023.88 (265)
Space cooling	(221) x	0.519	21.23 (266)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	85.13 (267)
Electricity for lighting	(232) x	0.519 =	151.66 (268)
Energy saving/generation technologies Item 1		0.519 =	-141.02 (269)
Total CO2, kg/year	sum	of (265) (271) =	1140.88 (272)
Dwelling CO2 Emission Rate	(272	?) ÷ (4) =	17.53 (273)
El rating (section 14)			86 (274)

			User D	otaile:						
A N	Olavia I I a alva all							OTDO	040000	
Assessor Name: Software Name:	Chris Hocknell Stroma FSAP 201	2		Stroma Softwa	_				016363 on: 1.0.4.10	
Software Hame.	Ottoma i Orti 201			Address:		31011.		VCISIO	л. т.от.то	
Address :										
1. Overall dwelling dime	ensions:									
Basement				a(m²)	(4-)		ight(m)] ₍₀₌₎ =	Volume(m³)	_
	N. (41 N. (4 N. (4 N. (4	\. (4 \)			(1a) x		2.5	(2a) =	221.25	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)) [8	38.5	(4)					_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	221.25	(5)
2. Ventilation rate:	main se	econdary	,	other		total			m³ per hou	r
North an of alcheman	heating h	eating	, –		, _ c			40 - 1		_
Number of chimneys	0 +	0] + _	0] - [0		40 =	0	(6a)
Number of open flues	0 +	0	+	0] <u> </u>	0		20 =	0	(6b)
Number of intermittent fa					L	0	X '	10 =	0	(7a)
Number of passive vents	3				L	0	X ·	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Δir ch	nanges per ho	ur
Infiltration due to chimne	vs. flues and fans = (6)	a)+(6b)+(7a	ı)+(7b)+(7c) =	Г			÷ (5) =		\(\begin{array}{c} (8) \\ \exists (8
If a pressurisation test has b	•				continue fr	0 om (9) to		. (3) =	0	(0)
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	ruction			0	(11)
deducting areas of openi	resent, use the value corres ngs); if equal user 0.35	ponaing to t	ine great	er waii are	а (апег					
If suspended wooden		ed) or 0.1	l (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught st	ripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	. , ,	, , ,			0	(16)
Air permeability value,	•		•	-	•	etre of e	envelope	area	3	(17)
If based on air permeabil Air permeability value applie	-					is boing u	cod		0.15	(18)
Number of sides sheltere		s been done	or a deg	gree an per	пеаышу	is being u	seu		0	(19)
Shelter factor				(20) = 1 -	0.075 x (1	 9)] =			1	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.15	(21)
Infiltration rate modified f	for monthly wind speed	i						!		_
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
` ''					•		L <u>-</u>		J	

djusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.19	0.19	0.18	0.16	0.16	0.14	0.14	0.14	0.15	0.16	0.17	0.18		
Calculate effecture of the Calculate of		_	rate for t	he appli	cable ca	se					ı	0.5	(23
If exhaust air h			endix N (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) othei	wise (23b) = (23a)			0.5	—(2:
If balanced with		0		, ,	,	. `	,, .	•	, (200)			0.5	= `
		-	-	_					2h\m + /	22h) v [1 (22a)	73.95	(2:
a) If balance 24a)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31	+ 100j	(24
		<u> </u>			<u> </u>	<u> </u>					0.51		(_
b) If balance			0	without 0	0		0	0	0	0	0		(2
													(_
c) If whole h if (22b)n				•	•				5 × (23h	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilatio	n or wh	ole hous	e nositiv	/e innut	L ventilatio	n from l	oft					
if (22b)n				•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	•	•			
25)m= 0.32	0.32	0.31	0.3	0.29	0.27	0.27	0.27	0.28	0.29	0.3	0.31		(2
2	a and he	ot loss :	t	- W.									
3. Heat losse	s and ne Gros				Net Ar	00	U-valı	10	AXU		k-value	Λ Λ	Χk
LEMENT	area	-	Openin m		A,r		W/m2		(W/I		kJ/m ² ·ł		/K
Vindows Type	. 1				17.75	x1.	/[1/(1.2)+	0.04] =	20.32				(2
Vindows Type	2				4.65	x1.	/[1/(1.2)+	0.04] =	5.32	=			(2
Vindows Type	3				4.65		/[1/(1.2)+	0.04] =	5.32	=			(2
Vindows Type					11.88	= .	/[1/(1.2)+		13.6	=			(2
loor					16.16	=	0.1		1.6167	 			_ _ ₍₂
Valls Type1	70.0		38.9			^^				북 片		╡	=
	76.3			<u></u>	37.4	_	0.10		5.98	믁 ¦		╡	(2
Valls Type2	23.6		0	_	23.64	=	0.16	=	3.78	닠 ¦		╡	(2
Roof	88.		0		88.5	X	0.12	=	10.62	[(3
otal area of e					204.6								(3
for windows and include the area						ated using	formula 1.	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
abric heat los				o ana pan	iniono		(26) (30)	+ (32) =				66.58	(3
leat capacity		•	O ,				, , , ,	((28)	(30) + (32	2) + (32a)	(32e) =	13606.43	=\\(^3
hermal mass		,	P = Cm ÷	- TFA) ir	n k.l/m²K			(()	tive Value	, , ,	(020)	250	—(3
or design assess	•	`		,			ecisely the				able 1f	250	(3
an be used inste							,						
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						15.82	(3
details of therma		are not kn	own (36) =	= 0.15 x (3	1)								_
otal fabric he								(33) +	(36) =			82.4	(3
entilation hea		i				<u> </u>			= 0.33 × ((25)m x (5)) 	ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 23.47	23.2	22.93	21.56	21.28	19.91	19.91	19.64	20.46	21.28	21.83	22.38		(3
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
105.00	105.6	105.33	103.96	103.69	102.32	102.32	102.04	102.86	103.69	104.23	104.78		
89)m= 105.88	105.6	105.55	100.00	100.00			102.04	102.00	100.00	104.20	104.70		

Heat loss para	ımeter (I	HLP). W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.2	1.19	1.19	1.17	1.17	1.16	1.16	1.15	1.16	1.17	1.18	1.18		
	l			l					L Average =	Sum(40) ₁	12 /12=	1.17	(40)
Number of day	s in mo	nth (Tab	le 1a)										
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. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		.6		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.06		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in							•						
(44)m= 105.67	101.82	97.98	94.14	90.3	86.45	86.45	90.3	94.14	97.98	101.82	105.67		
									Total = Su	m(44) _{1 12} =		1152.72	(44)
Energy content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		<u> </u>
(45)m= 156.7	137.05	141.42	123.3	118.31	102.09	94.6	108.56	109.85	128.02	139.75	151.76		_
If instantaneous w	vator hooti	na at naint	of upo (ne	hot water	r ataraga)	antar O in	hayaa (16		Total = Su	m(45) _{1 12} =	=	1511.4	(45)
If instantaneous w			,	ı		·	` ′	·					(40)
(46)m= 23.5 Water storage	20.56 loss:	21.21	18.49	17.75	15.31	14.19	16.28	16.48	19.2	20.96	22.76		(46)
Storage volum) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	/elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWl	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufactHot water stora			-								0		(51)
If community h	_			_ (.,					<u> </u>		(0.)
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or ((54) in (55)									0		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated for e	ach month (61)m =	= (60) ÷ 365 × (4	1)m				
(61)m= 50.96 46.03 49.9		42.63 44.06	46.01 46.42	49.93 49.32	50.96		(61)
Total heat required for water	r heating calculate	ed for each mont	h (62)m = 0.85 ×	(45)m + (46)m +	(57)m +	(59)m + (61)m	
(62)m= 207.66 183.08 191.				177.95 189.06	202.71	. , . ,	(62)
Solar DHW input calculated using	Appendix G or Append	lix H (negative quant	ity) (enter '0' if no sola	ar contribution to water	er heating)		
(add additional lines if FGH	RS and/or WWHR	S applies, see A	ppendix G)				
(63)m= 0 0	0 0	0 0	0 0	0 0	0		(63)
Output from water heater			-				
(64)m= 207.66 183.08 191.	35 169.72 164.32	2 144.72 138.66	5 154.57 156.28	177.95 189.06	202.71		_
			Output from w	vater heater (annual)	1 12	2080.08	(64)
Heat gains from water heat	ing, kWh/month 0.	25 ´ [0.85 × (45)	m + (61)m] + 0.8	x [(46)m + (57)m	+ (59)m]	
(65)m= 64.84 57.08 59.8	51 52.6 50.84	44.6 42.47	47.6 48.13	55.05 58.79	63.2		(65)
include (57)m in calculati	on of (65)m only if	cylinder is in the	dwelling or hot w	vater is from com	munity h	eating	
5. Internal gains (see Tab	le 5 and 5a):						
Metabolic gains (Table 5), \	Vatts						
Jan Feb M	ar Apr May	/ Jun Jul	Aug Sep	Oct Nov	Dec		
(66)m= 130.23 130.23 130.	23 130.23 130.23	3 130.23 130.23	3 130.23 130.23	130.23 130.23	130.23		(66)
Lighting gains (calculated in	n Appendix L, equa	ation L9 or L9a),	also see Table 5				
(67)m= 21.07 18.71 15.2	22 11.52 8.61	7.27 7.86	10.21 13.7	17.4 20.31	21.65		(67)
Appliances gains (calculate	d in Appendix L, e	quation L13 or L	13a), also see Ta	ıble 5			
(68)m= 236.29 238.74 232.	56 219.41 202.81	187.2 176.77	7 174.32 180.5	193.65 210.26	225.87		(68)
Cooking gains (calculated i	n Appendix L, equ	ation L15 or L15	a), also see Table	÷ 5			
(69)m= 36.02 36.02 36.0	02 36.02 36.02	36.02 36.02	36.02 36.02	36.02 36.02	36.02		(69)
Pumps and fans gains (Tab	le 5a)		-		-		
(70)m= 3 3 3	3 3	3 3	3 3	3 3	3		(70)
Losses e.g. evaporation (ne	egative values) (Ta	able 5)					
(71)m= -104.19 -104.19 -104	.19 -104.19 -104.19	-104.19 -104.19	-104.19 -104.19	-104.19 -104.19	-104.19		(71)
Water heating gains (Table	5)						
(72)m= 87.15 84.93 79.9	98 73.06 68.33	61.95 57.08	63.98 66.85	73.99 81.66	84.94		(72)
Total internal gains =		(66)m + (67))m + (68)m + (69)m +	(70)m + (71)m + (72)m		
(73)m= 409.58 407.46 392	83 369.06 344.82	2 321.49 306.78	313.58 326.12	350.12 377.3	397.53		(73)
6. Solar gains:							
Solar gains are calculated using	solar flux from Table 6	a and associated equ	uations to convert to the	ne applicable orienta	tion.		
Orientation: Access Facto		Flux	g_ Table 6b	FF Table 6a		Gains	
Table 6d	m²	Table 6a	Table 6b	Table 6c		(W)	_
Northeast 0.9x 0.77	x 4.65	x 11.28	× 0.55	× 0.7	=	14	(75)
Northeast _{0.9x} 0.77	× 4.65	x 22.97	× 0.55	× 0.7	=	28.49	(75)
Northeast _{0.9x} 0.77	× 4.65	× 41.38	× 0.55	× 0.7	=	51.34	(75)
Northeast 0.9x 0.77	× 4.65	x 67.96	× 0.55	X 0.7	=	84.31	(75)
Northeast 0.9x 0.77	X 4.65	x 91.35	X 0.55	X 0.7	= [113.33	(75)

Northeast _{0.9x}	0.77	٦	1.05	1 .,	07.00	1 .,	0.55	l	0.7	1 _	400.00	7(75)
Northeast 0.9x	0.77	X	4.65	X	97.38	X	0.55	X	0.7] = 1	120.82	(75)
<u> </u>	0.77	X	4.65	X	91.1	X	0.55	X	0.7] = 1	113.02	(75)
Northeast 0.9x	0.77	」 X □	4.65	X	72.63	X	0.55	X	0.7] = 1	90.1	(75)
Northeast 0.9x	0.77	」 ^X ¬	4.65	X	50.42	X	0.55	X	0.7] = 1	62.55	(75)
Northeast 0.9x	0.77	X	4.65	X	28.07	X	0.55	X	0.7] = 1	34.82	(75)
Northeast _{0.9x}	0.77	X	4.65	X	14.2	X	0.55	X	0.7] =	17.61	(75)
Northeast 0.9x	0.77	X	4.65	X	9.21	X	0.55	X	0.7] =	11.43	(75)
Southeast 0.9x	0.77	X	17.75	X	36.79	X	0.55	X	0.7	=	174.25	(77)
Southeast 0.9x	0.77	X	17.75	X	62.67	X	0.55	X	0.7	=	296.81	(77)
Southeast 0.9x	0.77	X	17.75	X	85.75	X	0.55	X	0.7	=	406.11	(77)
Southeast 0.9x	0.77	X	17.75	X	106.25	X	0.55	X	0.7	<u> </u>	503.19	(77)
Southeast _{0.9x}	0.77	X	17.75	X	119.01	X	0.55	X	0.7	=	563.61	(77)
Southeast _{0.9x}	0.77	X	17.75	X	118.15	X	0.55	X	0.7	=	559.53	(77)
Southeast _{0.9x}	0.77	X	17.75	X	113.91	X	0.55	X	0.7	_ =	539.45	(77)
Southeast _{0.9x}	0.77	X	17.75	X	104.39	X	0.55	X	0.7	=	494.37	(77)
Southeast _{0.9x}	0.77	X	17.75	X	92.85	X	0.55	X	0.7	=	439.73	(77)
Southeast _{0.9x}	0.77	X	17.75	X	69.27	X	0.55	X	0.7	=	328.04	(77)
Southeast 0.9x	0.77	X	17.75	X	44.07	x	0.55	X	0.7	=	208.71	(77)
Southeast _{0.9x}	0.77	X	17.75	X	31.49	X	0.55	X	0.7	=	149.12	(77)
Southwest _{0.9x}	0.77	X	4.65	X	36.79		0.55	X	0.7	=	45.65	(79)
Southwest _{0.9x}	0.77	X	4.65	X	62.67]	0.55	X	0.7	=	77.76	(79)
Southwest _{0.9x}	0.77	x	4.65	x	85.75]	0.55	x	0.7	=	106.39	(79)
Southwest _{0.9x}	0.77	x	4.65	X	106.25		0.55	x	0.7	=	131.82	(79)
Southwest _{0.9x}	0.77	x	4.65	x	119.01		0.55	X	0.7	=	147.65	(79)
Southwest _{0.9x}	0.77	x	4.65	X	118.15		0.55	X	0.7	=	146.58	(79)
Southwest _{0.9x}	0.77	x	4.65	x	113.91]	0.55	X	0.7	=	141.32	(79)
Southwest _{0.9x}	0.77	x	4.65	x	104.39]	0.55	x	0.7] =	129.51	(79)
Southwest _{0.9x}	0.77	x	4.65	x	92.85		0.55	x	0.7	=	115.2	(79)
Southwest _{0.9x}	0.77	x	4.65	x	69.27		0.55	x	0.7	=	85.94	(79)
Southwest _{0.9x}	0.77	X	4.65	x	44.07]	0.55	x	0.7] =	54.68	(79)
Southwest _{0.9x}	0.77	x	4.65	x	31.49	Ì	0.55	x	0.7] <u>=</u>	39.07	(79)
Northwest _{0.9x}	0.77	x	11.88	x	11.28	x	0.55	x	0.7	Ī =	35.76	(81)
Northwest 0.9x	0.77	X	11.88	x	22.97	x	0.55	x	0.7	Ī =	72.8	(81)
Northwest 0.9x	0.77	x	11.88	x	41.38	х	0.55	х	0.7	j =	131.16	(81)
Northwest 0.9x	0.77	х	11.88	x	67.96	х	0.55	x	0.7	j =	215.4	(81)
Northwest _{0.9x}	0.77	x	11.88	x	91.35	x	0.55	х	0.7	j =	289.53	(81)
Northwest _{0.9x}	0.77	×	11.88	×	97.38	x	0.55	x	0.7	j =	308.67	(81)
Northwest _{0.9x}	0.77	×	11.88	×	91.1	x	0.55	x	0.7	i =	288.76	(81)
Northwest _{0.9x}	0.77	X	11.88	X	72.63	X	0.55	x	0.7	j =	230.2	(81)
Northwest _{0.9x}	0.77	X	11.88	X	50.42	X	0.55	x	0.7] =	159.82	(81)
Northwest _{0.9x}	0.77	X	11.88	X	28.07	X	0.55	x	0.7	=	88.96	(81)
<u> </u>		_		1		1		I	<u> </u>	1		_ ' '

Northwe	est _{0.9x}	0.77	×	11.	88	x	,	14.2	x		0.55	×	0.7	=	45	(81)
Northwe	est _{0.9x}	0.77	X	11.	88	x	9	9.21	x		0.55	×	0.7	=	29.21	(81)
	_								_							_
Solar g	ains in	watts, ca	alculated	I for eacl	n month				(83)m =	= Sur	m(74)m	(82)m				
(83)m=	269.66	475.85	694.99	934.71	1114.12	11	35.61	1082.55	944.1	9	777.29	537.76	326	228.82		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	(73)m	+ (8	33)m	, watts					•	•	•	
(84)m=	679.24	883.31	1087.82	1303.77	1458.94	14	457.1	1389.33	1257.	77	1103.42	887.8	7 703.29	626.35]	(84)
7. Me	an inter	nal temp	erature	(heating	season)								·		
Temp	erature	during h	eating p	eriods ir	the livi	ng a	area f	rom Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ation fac	tor for a	ains for I	iving are	ea. h1.m) (Se	ee Ta	ble 9a)			` '					
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Au	a T	Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.98	0.94	0.82	0.63	┿	0.44	0.32	0.37	-	0.62	0.9	0.99	1	1	(86)
\	:	4	-4 !		T4 /f:	- 11 -	4-	0 4 . 7			0-\				J	
	19.85	20.12	20.46	living are	20.95	_	w ste	ps 3 to 7		Bidie	9C) 20.97	20.71	20.2	19.8	1	(87)
(87)m=	19.85	20.12	20.46	20.8	20.95		0.99	21	21		20.97	20.71	20.2	19.8		(07)
Temp	erature	<u>_</u>	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9,	Th	2 (°C)				1	
(88)m=	19.92	19.93	19.93	19.94	19.94	1	9.96	19.96	19.96	6	19.95	19.94	19.94	19.93		(88)
Utilisa	ation fac	tor for ga	ains for i	rest of d	welling,	h2,	m (se	e Table	9a)							
(89)m=	0.99	0.97	0.92	0.77	0.57	_).37	0.25	0.29		0.53	0.87	0.98	0.99]	(89)
Mean	internal	temper	ature in	the rest	of dwell	ina	T2 (f	allow ste	ne 3 t		in Tahl	a 9c)			4	
(90)m=	18.41	18.8	19.29	19.73	19.9	Ť	9.95	19.95	19.96	-	19.93	19.63	18.93	18.35	1	(90)
(00)	10.11	10.0	10.20	10.70	10.0	<u> </u>	0.00	10.00	10.0		l		ving area ÷ (ļ	0.4	(91)
													3 (,	0.4	(01)
			<u> </u>	r the wh		_			<u> </u>	$\overline{}$			-		1	
(92)m=	18.98	19.32	19.75	20.15	20.32	<u> </u>	0.36	20.37	20.3		20.34	20.06		18.92		(92)
				internal		_				_	''	•	1		1	
(93)m=	18.83	19.17	19.6	20	20.17	2	0.21	20.22	20.22	2	20.19	19.91	19.28	18.77		(93)
		ting requ														
				mperatui using Ta		ned	at ste	ep 11 of	Table	9b,	so that	t Ti,m=	=(76)m an	id re-cal	culate	
lile ul						Г	lun	led	۸		Con	Oct	Nov	Doo	1	
l Itilion	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Au	9	Sep	Oct	Nov	Dec		
(94)m=	0.99	tor for ga	0.91	0.78	0.58		0.39	0.27	0.31	\neg	0.55	0.86	0.98	0.99	1	(94)
				1)m x (84			7.55	0.27	0.51	Ļ_	0.55	0.00	0.90	0.99		(01)
(95)m=	672.1	855.16	992.36	1013.26	848.17	T 57	70.97	369.75	388.8	16 T	609.71	767.7	685.74	621.68	1	(95)
				perature				000.70	000.0	, _	000.71	101.1	000.74	021.00]	()
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16.4	Т	14.1	10.6	7.1	4.2	1	(96)
				al tempe									7	7.2		(00)
(97)m=	1538.4			1153.87		_	74.28	370.11	389.6	_	626.39	965.0 ₄	1 1270.07	1526.93	1	(97)
` ′				r each n		<u> </u>				!_				1 .323.00	J	()
(98)m=	644.53	438.35	288.46	101.24	22.11	V V I I	0	0.02	0	J /)!	0	146.82	<u> </u>	673.51	1	
(55)111	5 . 1.00	.55.55	_55.70	.51.27						otal			ear) = Sum(9	<u> </u>	2735.72	(98)
										- will				- AL DH 12 -		()
0	- 1			kWh/m²	· · · · · ·						, , , , , , , , , , , , , , , , , , , ,	,	,a., Ga(6	7	30.91	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rate	· `								_		r i		(400)
(100)m= 0	0	0	0	0	961.78	757.15	775.53	0	0	0	0		(100)
Utilisation fac	tor for io	oss nm	0	0	0.98	0.99	0.98	0	0	0	0		(101)
Useful loss, h						0.99	0.90	U	U	0	U		(101)
(102)m = 0	0	0	0	0	941.52	749.96	763.59	0	0	0	0		(102)
Gains (solar													(- /
(103)m= 0	0	0	0	0		1711.21		0	0	0	0		(103)
Space cooling	a reauire	ement fo	r month.	whole a				(h) = 0.0	24 x [(10)3)m – (لــــــــــا (102)m ر	x (41)m	
set (104)m to					- J/		,		21	-/ (· /	
(104)m= 0	0	0	0	0	612.48	715.17	591.49	0	0	0	0		
									= Sum(=	1919.14	(104)
Cooled fraction								f C =	cooled a	area ÷ (4	1) =	0.7	(105)
Intermittency f	<u> </u>		i –	0	0.05	0.05	0.05	0	0				
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0 Total	0	0	0		7(400)
Space cooling	requirer	ment for	month =	(104)m	× (105)	x (106)r	n	rotai	' = Sum(1 ₀₄)	=	0	(106)
$\frac{\text{(107)m=}}{\text{0}}$	0	0	0	0	107.27	125.26	103.59	0	0	0	0		
				-				Total	= Sum(107)	=	336.12	(107)
Space cooling	requirer	nent in k	·\//h/m²/\	/ear					÷ (4) =	,	ŀ	3.8	(108)
	•				ratama i	naludina	miere C	` ′	(4) =			3.0	(100)
9a. Energy red Space heating		ils – mai	vidual II	eaung sy	ystems i	riciuairig	IIIICIO-C	,ПР)					
Fraction of sp	•	it from se	econdar	v/supple	mentary	system					ĺ	0	(201)
Fraction of sp					,	-	(202) = 1 -	- (201) =			l	1	(202)
Fraction of to			-	, ,			(204) = (20	02) × [1 – ((203)] =		 	1	(204)
		_	-				() (/ [: .	(/)		l		⊣
Efficiency of	•					0/					ļ	90.4	(206)
Efficiency of				•	g system	1, %					ļ	0	(208)
Cooling Syste	em Ener	gy Efficie	ency Ra	tio								5.13	(209)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heatin				i									
644.53	438.35	288.46	101.24	22.11	0	0	0	0	146.82	420.71	673.51		
	$\lambda m \times (20)$	1)1 1 v 1											
$(211)m = \{[(98)]$	7111 × (20	4)] } X I	00 ÷ (20	6)									(211)
(211)m = {[(98 712.98	484.9	319.09	00 ÷ (20 111.99	96) 24.45	0	0	0	0	162.41	465.39	745.03		(211)
` /	í `		· `		0	0						3026.24	(211)
712.98 Space heatin	484.9	319.09 econdary	111.99 y), kWh/	24.45	0	0		0				3026.24	_
712.98 Space heatin = {[(98)m x (20	484.9	319.09 econdary	111.99 y), kWh/ 8)	24.45 month	-		Tota	0 I (kWh/yea		211) _{15,10. 12}	=	3026.24	_
712.98 Space heatin	484.9	319.09 econdary	111.99 y), kWh/	24.45	0	0	Tota 0	0 I (kWh/yea	o 0	0	0	3026.24	(211)
712.98 Space heatin = {[(98)m x (20	484.9 ag fuel (so (31)] } x 1	319.09 econdary 00 ÷ (20	111.99 y), kWh/ 8)	24.45 month	-		Tota 0	0 I (kWh/yea	o 0	0	0	3026.24	_
712.98 Space heatin = {[(98)m x (20) (215)m= 0 Water heating	484.9 g fuel (so 01)] } x 1	319.09 econdar 00 ÷ (20	111.99 y), kWh/ 8) 0	24.45 month	-		Tota 0	0 I (kWh/yea	o 0	0	0		(211)
Space heatin = {[(98)m x (20) (215)m= 0 Water heating Output from w	484.9 g fuel (second) } x 1 0 ater hea	319.09 econdar: 00 ÷ (20 0	111.99 y), kWh/ 8) 0	24.45 month 0	0	0	Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea	0 0 ar) =Sum(2	0	0		(211)
712.98 Space heatin = {[(98)m x (20(215)m= 0)] Water heating Output from w 207.66	484.9 g fuel (second)] } x 1 0 ater hea 183.08	319.09 econdar; 00 ÷ (20 0 ter (calc	111.99 y), kWh/ 8) 0	24.45 month	-		Tota 0	0 I (kWh/yea	o 0	0	0	0	(211)
Space heatin = {[(98)m x (20) (215)m= 0 Water heating Output from w	484.9 g fuel (second)] } x 1 0 ater hea 183.08	319.09 econdar; 00 ÷ (20 0 ter (calc	111.99 y), kWh/ 8) 0	24.45 month 0	0	0	Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea	0 0 ar) =Sum(2	0	0		(211)

219)m= 236.75 210.02 222.29 202.54 201.92 1	80.23 172	.67 192.49	194.62	210.42	217.29	230.77		
	•	Tota	I = Sum(2	19a) ₁₁₂ =	•		2472.01	(2
Space cooling fuel, kWh/month.						'		
221)m = (107)m÷ (209) 221)m=	20.91 24.	42 20.19	0	0	0	0		
			I = Sum(2:		<u> </u>		65.52	(2:
Annual totals				k\	Wh/year		kWh/yea	
Space heating fuel used, main system 1					•		3026.24	
Vater heating fuel used							2472.01	
Space cooling fuel used							65.52	Ī
Electricity for pumps, fans and electric keep-hot						'		_
mechanical ventilation - balanced, extract or pos	sitive input	from outside	е			182.2		(2
central heating pump:						30		(2
otal electricity for the above, kWh/year		sum	of (230a)	(230g) =			212.2	(2
Electricity for lighting							372.02	(2:
Electricity generated by PVs							-1086.82	= (23
12a. CO2 emissions – Individual heating system	s including	micro-CHF						
				Emiss	ion fac	tor	Emissions	
	Energy kWh/ye			kg CO			kg CO2/ye	ar
Space heating (main system 1)					2/kWh	=	kg CO2/ye 653.67	ar](20
Space heating (main system 1) Space heating (secondary)	kWh/ye			kg CO	2/kWh	=		_
	kWh/ye			kg CO:	2/kWh		653.67](20
Space heating (secondary)	(211) x (215) x (219) x		(264) =	0.2 0.5	2/kWh	=	653.67	(2)
Space heating (secondary) Vater heating	(211) x (215) x (219) x	ear	(264) =	0.2 0.5	2/kWh 16 19 16	=	653.67 0 533.95	(2i](2i](2i
Space heating (secondary) Vater heating Space and water heating	(211) x (215) x (219) x (261) + (2	ear	(264) =	0.2 0.5 0.2	2/kWh 16 19 16	=	653.67 0 533.95 1187.62	(2 (2 (2 (2

sum of (265) (271) =

 $(272) \div (4) =$

Total CO2, kg/year

El rating (section 14)

Dwelling CO2 Emission Rate

960.78

10.86

90

(272)

(273)

(274)