# **Regulations Compliance Report**

	ent L1A, 2013 Editior ober 2020 at 14:54:0		oma FSAP 2012 program, Vei	rsion: 1.0.5.9	
Project Information		-			
Assessed By:	Zahid Ashraf (STF	RO001082)	Building Type:	Flat	
Dwelling Details:					
NEW DWELLING	DESIGN STAGE		Total Floor Area: 8	80.71m²	
Site Reference :	Hermitage Lane		Plot Reference:	Plot 35	
Address :	-				
Client Details:					
Name: Address :					
-	rs items included w ete report of regulat	ithin the SAP calculations ions compliance.	5.		
1a TER and DEF		•			
	ting system: Mains g	as (c)			
Fuel factor: 1.00 (	mains gas (c))				
-	oxide Emission Rate		20.14 kg/m²		
	Dioxide Emission Rat	e (DER)	13.10 kg/m²		OK
1b TFEE and DF		、 、			
-	rgy Efficiency (TFEE		63.4 kWh/m <sup>2</sup>		
Dwelling Fabric Ei	nergy Efficiency (DFI	=E)	48.9 kWh/m <sup>2</sup>		ок
2 Fabric U-value	25				OR
Element		Average	Highest		
External		0.15 (max. 0.30)	0.15 (max. 0.70)		ок
Floor		(no floor)			
Roof		0.10 (max. 0.20)	0.10 (max. 0.35)		ОК
Openings	6	1.40 (max. 2.00)	1.40 (max. 3.30)		ОК
2a Thermal brid	ging				
Thermal	bridging calculated fi	om linear thermal transmitt	ances for each junction		
3 Air permeabili	ty				
	bility at 50 pascals		3.00 (design val	ue)	
Maximum			10.0		OK
4 Heating efficie	ency				
Main Heati	ng system:	Community heating sche	mes - mains gas		
			-		
_					
Secondary	heating system:	None			
5 Cylinder insul	ation				
Hot water S		No cylinder			
6 Controls					
Space heat	ting controls	Charging system linked to	o use of community heating,		
		programmer and at least			ОК
Hot water of	controls:	No cylinder thermostat			
		No cylinder			

## **Regulations Compliance Report**

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	1.02	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	2.03m <sup>2</sup>	
Windows facing: North West	4.05m <sup>2</sup>	
Windows facing: North East	8.65m <sup>2</sup>	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Roofs U-value	0.1 W/m²K	
Community heating, heat from boilers – mains gas		

Photovoltaic array

			User D	etails:						
Assessor Name:	Zahid Ashraf			Stroma	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 207	12		Softwa	are Ver	sion:		Versio	on: 1.0.5.9	
		Pr	operty A	Address:	Plot 35					
Address :										
1. Overall dwelling dimen	sions:									
•			Area	a(m²)		Av. Hei	ight(m)	-	Volume(m <sup>3</sup> )	-
Ground floor			8	0.71	(1a) x	2	5	(2a) =	201.77	(3a)
Total floor area TFA = (1a)	)+(1b)+(1c)+(1d)+(1e	e)+(1n	) 8	0.71	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	201.77	(5)
2. Ventilation rate:										
	main s heating l	econdary neating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	0 +	0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	i + F	0	i = F	0	x 2	20 =	0	(6b)
Number of intermittent fan	s					0	× ′	10 =	0	(7a)
Number of passive vents					Ē	0	x ^	10 =	0	(7b)
Number of flueless gas fire	es				Г	0	× 4	40 =	0	(7c)
								Air ch	anges per hou	ır
Infiltration due to obimpour	flues and fame (6	co) ( ( C h ) ( 7	o) (7b) (7	70) -				1		-
Infiltration due to chimneys If a pressurisation test has be					continue fro	0 om (9) to (		÷ (5) =	0	(8)
Number of storeys in the			( )/			() (	,		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber	frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre		sponding to	the greate	er wall area	a (after					
deducting areas of opening If suspended wooden flo		led) or 0.	1 (seale	d). else	enter 0				0	(12)
If no draught lobby, ente		,	(	-,,					0	(13)
Percentage of windows		tripped							0	(14)
Window infiltration	-			0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, q	50, expressed in cul	oic metres	s per ho	our per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabilit	y value, then (18) = [(1	17) ÷ 20]+(8	), otherwi	se (18) = (	16)				0.15	(18)
Air permeability value applies		s been don	e or a deg	ree air per	rmeability i	is being us	sed			-
Number of sides sheltered Shelter factor				(20) = 1 - [	0.075 x (1	9)] =			1	(19)
Infiltration rate incorporatir	na shelter factor			(21) = (18)		-/1			0.92	(20) (21)
Infiltration rate modified fo	-	ч		() ()	, (=0)				0.14	(21)
i i i	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		<u>.                                    </u>		~					I	
· · · · · · · · · · · · · · · · · · ·	.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		1 I							I	
Wind Factor $(22a)m = (22)$ (22a)m = 1.27 1.25 1.	0m ÷ 4 23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	l	
	1.1 1.00	0.95	0.90	0.92	-	1.00	1.12	1.10	l	

Adjust	ed infiltr	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
~	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16	]	
		al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , other	wise (23b	) = (23a)			0.5	(23b)
If bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h)	) =				79.05	(23c)
a) If	balance	d mecha	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	)m = (22	2b)m + ()	23b) x [ <sup>-</sup>	1 – (23c)		()
(24a)m=		0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27	]	(24a)
b) If	balance	d mecha	anical ve	ntilation	without	heat rec	covery (N	MV) (24b	)m = (22	2b)m + (2	23b)		1	
, (24b)m=		0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If	whole h	ouse ex	tract ver	tilation of	or positiv	ve input v	ventilatio	on from c	outside			<u>.</u>	-	
	if (22b)n	n < 0.5 ×	(23b), t	hen (240	c) = (23b	); otherv	wise (24	c) = (22b	) m + 0.	5 × (23b	)	-	_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
								on from l 0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in box	(25)				-	
(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27	]	(25)
3 He	at losse	s and he	eat loss p	naramete	∍r.									
	IENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>(</b> )	k-value kJ/m²·l		. X k J/K
Doors			( )			2	x	1.4	=	2.8	, ,			(26)
Windo	ws Type	e 1				2.025	5 x1	/[1/( 1.4 )+	0.04] =	2.68				(27)
Windo	ws Type	2				4.05		/[1/( 1.4 )+	0.04] =	5.37				(27)
Windo	ws Type	93				8.651	x1	/[1/( 1.4 )+	0.04] =	11.47				(27)
Walls <sup>-</sup>		68.8	8	14.73	3	54.07		0.15		8.11				(29)
Walls <sup>-</sup>		4.3		2		2.35		0.14		0.33	= 1		$\dashv$	(29)
Roof	71	76.9		0	=	76.9		0.1		7.69				(30)
	area of e	lements				150.0		0.1	I	7.00	L			(31)
* for win	ndows and	roof winde				alue calcul		g formula 1,	/[(1/U-valı	ıe)+0.04] a	ns given in	paragraph	h 3.2	(01)
			= S (A x					(26)(30)	+ (32) =				38.46	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	1482.04	(34)
Therm	al mass	parame	ter (TMF	• = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
	0		ere the de tailed calci		construct	ion are not	t known pr	recisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						22.59	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								_
	abric he									(36) =			61.05	(37)
Ventila			alculated							= 0.33 × (	1	i –	1	
(0.5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m=	18.75	18.52	18.29	17.14	16.91	15.75	15.75	15.52	16.21	16.91	17.37	17.83	J	(38)
		coefficier	r			1		,		= (37) + (3	-	1	1	
(39)m=	79.8	79.57	79.34	78.18	77.95	76.8	76.8	76.57	77.26	77.95	78.42	78.88	70.40	(20)
										Average =	oum(39)₁	12 /12=	78.13	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.99	0.99	0.98	0.97	0.97	0.95	0.95	0.95	0.96	0.97	0.97	0.98		
Numbe	ar of day		nth (Tab	le 12)				!		Average =	Sum(40)1.	.12 /12=	0.97	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		48		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o	97 f	7.9		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-	-				
(44)m=	107.7	103.78	99.86	95.95	92.03	88.11	88.11	92.03	95.95	99.86	103.78	107.7		_
Enerav (	content of	hot water	used - cal	culated m	onthly = 4	190 x Vd r	n x nm x [	)Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1174.86	(44)
(45)m=	159.71	139.68	144.14	125.66	120.58	104.05	96.42	110.64	111.96	130.48	142.43	154.67		
(40)11-	100.71	100.00	144.14	120.00	120.00	104.00	30.42	110.04			m(45) <sub>112</sub> =		1540.42	(45)
lf instant	aneous w	ater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46				I		
(46)m=	23.96	20.95	21.62	18.85	18.09	15.61	14.46	16.6	16.79	19.57	21.36	23.2		(46)
	storage		inoludir		olor or M		otorogo	within sa						(47)
-		. ,		ank in dw			•			501	(	0		(47)
	•	-			-			ombi boil	ers) ente	er '0' in (	47)			
	storage													
,				oss facto	or is kno	wn (kWł	n/day):				(	0		(48)
•			m Table								(	0		(49)
•••			-	e, kWh/ye cylinder l		or is not		(48) x (49)	) =		11	10		(50)
				rom Tabl							0.	02		(51)
	-	-	ee secti	on 4.3										
		from Ta		0								03		(52)
•			m Table					(			0.	.6		(53)
		m water (54) in (5	-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03 03		(54) (55)
		. , .	,	for each	month			((56)m = (	55) × (41)	m	1.	03		(00)
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
· · ·											H11) is fro		ix H	(00)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
					I	00.00	02.01	02.01	00.00	02.01				(58)
	-	•		om Table for each		59)m – 1	(58) ÷ 36	65 × (41)	m			0		(50)
	-						. ,	ng and a		r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

$(61)m =$ 0000000000Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)m + (46)m + (57)m + (59)m + (61)$ $(62)m =$ 214.99189.61199.42179.16175.86157.54151.69165.92165.46185.76195.92209.95	(61) m (62)
(62)m= 214.99 189.61 199.42 179.16 175.86 157.54 151.69 165.92 165.46 185.76 195.92 209.95	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 214.99 189.61 199.42 179.16 175.86 157.54 151.69 165.92 165.46 185.76 195.92 209.95	
Output from water heater (annual) <sub>112</sub> 2191.26	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]	
(65)m= 97.32 86.39 92.15 84.58 84.31 77.39 76.28 81.01 80.02 87.61 90.15 95.65	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 123.81 123.81 123.81 123.81 123.81 123.81 123.81 123.81 123.81 123.81 123.81 123.81 123.81 123.81	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 20.07 17.83 14.5 10.98 8.21 6.93 7.49 9.73 13.06 16.58 19.35 20.63	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 220.92 223.21 217.43 205.14 189.61 175.02 165.27 162.98 168.76 181.06 196.58 211.17	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 35.38 35.38 35.38 35.38 35.38 35.38 35.38 35.38 35.38 35.38 35.38 35.38 35.38 35.38 35.38	(69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m = -99.05 -99.0	(71)
Water heating gains (Table 5)	
(72)m= 130.81 128.55 123.85 117.47 113.32 107.49 102.53 108.88 111.14 117.75 125.21 128.56	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	(/
(73)m= 431.95 429.73 415.93 393.73 371.28 349.58 335.43 341.74 353.1 375.53 401.29 420.5	(73)
6. Solar gains:	()
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6dm²Table 6aTable 6bTable 6c(W)	
Northeast 0.9x 0.77 x 8.65 x 11.28 x 0.63 x 0.7 = 29.83	(75)
Northeast 0.9x 0.77 x 8.65 x 22.97 x 0.63 x 0.7 = 60.72	(75)
Northeast 0.9x         0.77         x         8.65         x         41.38         x         0.63         x         0.77         =         109.4	(75)
Northeast 0.9x         0.77         x         8.65         x         67.96         x         0.63         x         0.77         =         179.67	(75)
Northeast 0.9x 0.77 x 8.65 x 91.35 x 0.63 x 0.7 = 241.51	(75)

									-						_
Northeast 0.9x	0.77	X	8.6	65	x	g	7.38	X		0.63	×	0.7	=	257.47	(75)
Northeast 0.9x	0.77	x	8.6	65	×	9	91.1	x		0.63	x	0.7	=	240.86	(75)
Northeast 0.9x	0.77	x	8.6	65	×	7	2.63	x		0.63	x	0.7	=	192.02	(75)
Northeast 0.9x	0.77	x	8.6	65	×	5	0.42	x		0.63	x	0.7	=	133.31	(75)
Northeast 0.9x	0.77	x	8.6	65	×	2	8.07	x		0.63	x	0.7	=	74.21	(75)
Northeast 0.9x	0.77	x	8.6	65	×		14.2	x		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	x	8.6	65	x	ļ	9.21	x		0.63	x	0.7	=	24.36	(75)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	3	6.79			0.63	x	0.7	=	22.77	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	6	2.67			0.63	x	0.7	=	38.79	(79)
Southwest0.9x	0.77	x	2.0	)3	× [	8	5.75			0.63	x	0.7	=	53.07	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	<b>x</b>	1	06.25			0.63	x	0.7	=	65.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	1	19.01			0.63	x	0.7	=	73.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	1	18.15			0.63	x	0.7	=	73.12	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	1	13.91			0.63	x	0.7	=	70.49	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	1	04.39	İ		0.63	x	0.7	=	64.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	g	2.85	i		0.63	×	0.7	=	57.46	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	6	9.27	İ		0.63	×	0.7	=	42.87	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	4	4.07	İ		0.63	×	0.7	=	27.27	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	×	3	31.49	i		0.63	- x	0.7	= =	19.49	(79)
Northwest 0.9x	0.77	x	4.0	)5	×	1	1.28	x		0.63	×	0.7	=	13.97	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	2	2.97	x		0.63	×	0.7	=	28.43	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	4	1.38	x		0.63	۲ ×	0.7	=	51.22	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	6	57.96	x		0.63	x	0.7	=	84.11	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	g	1.35	x		0.63	×	0.7	=	113.06	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	g	7.38	x		0.63	- x	0.7	= =	120.54	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	(	91.1	x		0.63	×	0.7	=	112.76	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	7	2.63	x		0.63	×	0.7	=	89.89	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	5	0.42	x		0.63	×	0.7	=	62.41	(81)
Northwest 0.9x	0.77	x	4.0	)5	×	2	8.07	x		0.63	x	0.7	=	34.74	(81)
Northwest 0.9x	0.77	x	4.0	)5	×		14.2	x		0.63	×	0.7	=	17.57	(81)
Northwest 0.9x	0.77	x	4.0	)5	× [	ļ	9.21	x		0.63	×	0.7	=	11.4	(81)
-															_
Solar gains in	watts, ca	lculated	for eac	h month	า		-	(83)m	n = Su	m(74)m .	(82)m				
(83)m= 66.57	127.93	213.68	329.53	428.22		51.13	424.11	346	.51	253.18	151.81	82.38	55.25		(83)
Total gains – i	nternal a	nd solar	(84)m =	= (73)m	+ (8	33)m	, watts								
(84)m= 498.51	557.67	629.62	723.26	799.5	8	00.7	759.54	688	.25	606.28	527.34	483.67	475.76		(84)
7. Mean inter	rnal temp	erature	(heating	seasor	n)										
Temperature	during h	eating p	eriods ir	n the liv	ing a	area	from Tab	ole 9,	, Th1	(°C)				21	(85)
Utilisation fac	ctor for ga	ains for I	iving are	ea, h1,n	n (se	ee Ta	ble 9a)								
Jan	Feb	Mar	Apr	Мау	,	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 0.96	0.95	0.91	0.83	0.71	C	).55	0.42	0.4	17	0.7	0.88	0.95	0.97		(86)
Mean interna	al tempera	ature in	living ar	ea T1 (f	follo	w ste	ps 3 to 7	' in T	able	9c)					
			3	•						,					
(87)m= 19	19.23	19.65	20.19	20.62	-	0.87	20.96	20.	- T	, 20.74	20.18	19.51	18.96	]	(87)

$ \begin{array}{c} \mbox{truck} & \mbox{truck} $	Temp	erature	during h	neating p	periods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
(8)m=         0.96         0.94         0.91         0.81         0.87         0.49         0.35         0.4         0.84         0.85         0.94         0.96         (98)           Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)         (90)m=         17.4         17.74         18.33         19.11         18.95         20.01         20.08         18.95         19.11         18.15         17.35         (90)m=         (91)           Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2         (92)m=         17.95         18.25         18.78         19.48         20.01         20.3         20.37         20.15         19.47         18.61         17.9         (92)           (92)m=         17.95         18.25         18.78         19.48         20.01         20.3         20.37         20.15         19.47         18.61         17.9         (92)           (93)m=         17.95         18.25         18.76         19.48         20.01         20.3         20.37         20.15         19.47         18.61         17.9         (92)           St T to the mean internal temperature obtained at step 11 of Table 9b, so that Ti.m=(76)m and re-calculate         the utilisation factor for gains, nm:         (94)         (94) </td <td>=m(88)</td> <td>20.09</td> <td>20.1</td> <td>20.1</td> <td>20.11</td> <td>20.11</td> <td>20.12</td> <td>20.12</td> <td>20.13</td> <td>20.12</td> <td>20.11</td> <td>20.11</td> <td>20.1</td> <td></td> <td>(88)</td>	=m(88)	20.09	20.1	20.1	20.11	20.11	20.12	20.12	20.13	20.12	20.11	20.11	20.1		(88)
Wean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)       (90)         (90)       (91)       17.4       17.74       18.33       19.11       19.89       20.01       20.08       19.85       19.11       18.15       17.35       (90)         (92)       (91)       17.95       18.25       18.78       19.48       20.01       20.3       20.39       20.37       20.15       19.47       18.61       17.9       (92)         (92)       (92)       (91)       17.95       18.25       18.78       19.48       20.01       20.3       20.39       20.37       20.15       19.47       18.61       17.9       (93)         8.       Space heating requirement       19.48       20.01       20.3       20.39       20.37       20.15       19.47       18.61       17.9       (93)         8.       Space heating requirement       temes internal temperature from Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, mm:       (94)       1.01       Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, mm:       (94)       (94)       1.02       1.08       1.02       1.02       1.08       1.02       1.02       1.02       1.02       1.02       1.02       1.02	Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(90)me       17.4       17.7.4       18.33       19.11       19.69       20.09       20.08       19.85       19.11       18.15       17.35       (90         Mean internal temperature (for the whole dwelling) = LA x T1 + (1 - fLA) x T2       (91       0.34       (91         (92)me       17.95       18.25       18.76       19.48       20.01       20.3       20.37       20.15       19.47       18.61       17.9       (92         (92)me       17.95       18.25       18.78       19.48       20.01       20.3       20.37       20.15       19.47       18.61       17.9       (92         (92)me       17.95       18.25       18.78       19.48       20.01       20.3       20.37       20.15       19.47       18.61       17.9       (92         Strit to the mean internal temperature botained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate       the utilisation factor for gains, nm:       (94)me       0.94       0.92       0.88       0.79       0.66       0.5       0.37       0.42       0.64       0.84       0.92       0.95       (94         Ulsiation factor for gains, nm:       (93)me       (94.02.6       443.54       449.94       (95       (96)m       (96)m       (96)m	(89)m=	0.96	0.94	0.9	0.81	0.67	0.49	0.35	0.4	0.64	0.85	0.94	0.96		(89)
If A = Living area + (4) =       0.34       (91)         (17 s5       18.25       18.78       19.48       20.01       20.3       20.37       20.15       19.47       18.61       17.9       (92)          17.95       18.25       18.78       19.48       20.01       20.3       20.37       20.15       19.47       18.61       17.9       (92)          17.95       18.25       18.78       19.48       20.01       20.3       20.37       20.15       19.47       18.61       17.9       (93)          17.95       18.25       18.78       19.48       20.01       20.3       20.37       20.15       19.47       18.61       17.9       (93)          13.07       19.48       20.01       20.3       20.39       20.37       20.15       19.47       18.61       17.9       (93)          13.01       Feb       Mar       Apr       Mar       Apr       Mar       Apr       Mar       Apr	Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to <sup>-</sup>	7 in Tabl	e 9c)				
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2         (12)           (12)         (17)         (18)         (12)         (13)         (14)         (14)         (14)         (14)         (14)         (14)         (14)         (14)         (15)         (14)         (14)         (15)	(90)m=	17.4	17.74	18.33	19.11	19.69	20.01	20.09	20.08	19.85	19.11	18.15	17.35		(90)
(92)m=       17.85       18.25       18.78       19.48       20.31       20.37       20.15       19.47       18.61       17.9       (92)m         (93)m=       17.85       18.28       18.78       19.48       20.01       20.37       20.15       19.47       18.61       17.9       (93)m         (93)m=       17.85       18.28       18.78       19.48       20.01       20.32       20.37       20.15       19.47       18.61       17.9       (93)m         (93)m=       17.85       18.28       18.78       19.48       20.01       20.37       20.15       19.47       18.61       17.9       (93)m         (94)m=       18.28       18.78       19.48       20.01       20.37       20.15       19.47       18.61       17.9       (93)m         (94)m=       0.48       App May       Jun       Jun       Aug Sep       Oct       Nov       Dec       Utilisation factor for gains, hm:       (94)m       (94)m       (94)m       (94)m       (94)m       (94)m       (94)m       (95)m       (94)m       (95)m       (95)m       (94)m       (95)m       (95)m       (95)m       (94)m       (95)m       (95)m       (95)m       (96)m       (95)m <td></td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td>f</td> <td>LA = Livin</td> <td>ng area ÷ (</td> <td>4) =</td> <td>0.34</td> <td>(91)</td>					-					f	LA = Livin	ng area ÷ (	4) =	0.34	(91)
(92)m=       17.85       18.25       18.78       19.48       20.31       20.37       20.15       19.47       18.61       17.9       (92)m         (93)m=       17.85       18.28       18.78       19.48       20.01       20.37       20.15       19.47       18.61       17.9       (93)m         (93)m=       17.85       18.28       18.78       19.48       20.01       20.32       20.37       20.15       19.47       18.61       17.9       (93)m         (93)m=       17.85       18.28       18.78       19.48       20.01       20.37       20.15       19.47       18.61       17.9       (93)m         (94)m=       18.28       18.78       19.48       20.01       20.37       20.15       19.47       18.61       17.9       (93)m         (94)m=       0.48       App May       Jun       Jun       Aug Sep       Oct       Nov       Dec       Utilisation factor for gains, hm:       (94)m       (94)m       (94)m       (94)m       (94)m       (94)m       (94)m       (95)m       (94)m       (95)m       (95)m       (94)m       (95)m       (95)m       (95)m       (94)m       (95)m       (95)m       (95)m       (96)m       (95)m <td>Mean</td> <td>interna</td> <td>l temper</td> <td>ature (fo</td> <td>or the wh</td> <td>ole dwe</td> <td>llina) = f</td> <td>LA x T1</td> <td>+ (1 – fL</td> <td>.A) × T2</td> <td></td> <td></td> <td>I</td> <td></td> <td></td>	Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = f	LA x T1	+ (1 – fL	.A) × T2			I		
(93)m=       17.95       18.25       18.78       19.48       20.01       20.3       20.37       20.15       19.47       18.61       17.9       (93)         8. Space heating requirement       Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:       (94)m=       0.94       0.92       0.88       0.79       0.66       0.5       0.37       0.42       0.64       0.84       0.92       0.85       (94)m         (94)m=       0.94       0.92       0.88       0.79       0.66       0.5       0.37       0.42       0.64       0.84       0.92       0.85       (94)         Useful gains, hmGm, W = (94/m x (84)m       (95)m=       468.43       512.5       552.19       572.74       52.91       401.06       28.12       28.843       389.71       440.56       443.54       449.94       (95)         Heat loss rate for mean internal temperature, Lm, W = ((39)m x ((93)m - (96)m)       (97)m - (96)m] x (41)m       (98)m=       461.82       389.38       314.17       18.03       88.08       0       0       0       186.76       330.6       469.44       Total per year (kWhyear) = Sum(98).soc.a =       2403.29       (98)         Space heating requirement in kWhm?/year			<u> </u>	r `	1	i	<del>, ,</del>	r	<u>`</u>	r Ó	19.47	18.61	17.9		(92)
8. Space heating requirement           Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, sung Table 9a           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Utilisation factor for gains, hm:         (94)m=         0.94         0.92         0.88         0.79         0.66         0.5         0.37         0.42         0.64         0.84         0.92         0.95         (94)           (94)m=         0.94         0.92         0.88         0.79         0.66         0.5         0.37         0.42         0.64         0.84         0.92         0.95         (94)           Useful gains, hmGm, W = (94)m x (84)m         (95)m=         446.43         512.5         552.18         572.74         529.18         401.06         280.12         288.43         389.71         440.56         443.44         449.94         (95)m           (96)m=         4.3         4.9         6.5         8.9         11.7         1.4.6         16.6         16.4         14.1         10.6         7.1         4.2         (96)           (97)m=         108.916         102.17	Apply	adjustr	nent to t	he mear	n internal	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.94 0.92 0.88 0.79 0.66 0.5 0.37 0.42 0.64 0.84 0.92 0.95 (94 Useful gains, hmGm , W = (94)m x (84)m (96)m= 468.43 5125 552.19 572.74 529.18 401.06 280.12 288.43 389.71 440.56 443.54 449.94 (95 Monthly average external temperature from Table 8 (99)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96 Heat loss rate for mean internal temperature, Lm , W = ((33)m x ((33)m- (96)m) (97)m= 1089.16 1062.17 974.46 282.95 647.58 438.04 291 304.32 467.76 691.58 902.71 1080.92 (97 Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m (98)m= 461.82 389.38 314.17 183.03 88.08 0 0 0 0 188.76 891.58 902.71 1080.92 (97 Space heating requirement in kWh/m?/year 299.78 (98)m x (41)m (98)m= 461.82 389.38 314.17 183.03 88.08 0 0 0 0 188.76 891.58 902.71 1080.92 (97 Space heating requirement in kWh/m?/year 299.78 (98)m x (41)m (98)m= 461.82 389.38 314.17 183.03 88.08 0 0 0 0 188.76 891.58 902.71 1080.92 (97 Space heating requirement in kWh/m?/year 299.78 (98)m x (41)m (98)m= 461.82 389.38 314.17 183.03 88.08 0 0 0 0 188.76 891.58 902.71 1080.92 (97 Space heating requirement in kWh/m?/year 299.78 (98) Space heating requirement in kWh/m?/year 299.78 (98)m x (41)m (98)m= 461.82 389.38 314.17 183.03 88.08 0 0 0 0 188.76 891.58 (98).88.88 (98) 0 0 0 188.76 891.58 (98).88.88 (98) 0 0 0 188.76 891.58 (98).88.88 (98) 0 0 0 188.76 891.58 (98).88.88 (98) 0 0 0 188.76 891.58 (98).88.88 (98) 0 0 0 188.76 891.58 (98).88.88 (98) 0 0 0 0 188.76 891.58 (98).88.88 (98).88.88 (98) 0 0 0 0 188.76 891.58 (98).88.88 (98).88.88 (98) 0 0 0 0 188.76 891.58 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98).88.88 (98	(93)m=	17.95	18.25	18.78	19.48	20.01	20.3	20.39	20.37	20.15	19.47	18.61	17.9		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)mp 0.94 0.92 0.88 0.79 0.66 0.5 0.37 0.42 0.64 0.84 0.92 0.95 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 468.43 512.5 552.19 572.74 529.18 401.06 280.12 288.43 389.71 440.56 443.54 449.94 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.8 16.6 16.4 14.1 0.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W = ([93)m x ([93)m - (96)m] (97)m= 109.16 1062.17 1974.46 82.65 647.58 438.04 291 304.32 477.76 691.58 902.71 1080.92 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 461.82 369.38 314.17 183.03 88.08 0 0 0 0 1 186.76 330.6 469.44 Total per year (kWh/year) = Sum(98) = 2403.29 (98) Space heating requirement in kWh/m²/year 2.9.78 (99) 2. Energy requirement in kWh/m²/year 9. Energy requirement in kWh/m²/year 9. Energy requirement in kWh/m²/year 9. Energy requirement in kWh/m²/year 9. Total per year (kWh/year) = Sum(98) = 2403.29 (98) 9. Energy requirement in kWh/m²/year 9. Community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of space heat from Community boilers Fraction of total space heat from Community boilers Fraction of total space heat from Community boilers Fraction of total space heat from Community boilers Fraction of total space heat from Community boilers Fraction of total space heat from Community boilers Fraction of total space heat from Community heating system Distribution loss factor (Table 12c) for community heating system Distribution loss factor (Table 12c) for community heating system Distribution loss factor (Table 12c) for community heating system 1.05 (90) Space heat from Community boilers (98) x (304a) x (305) x (	8. Sp	ace hea	ting req	uirement	t										
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Utilisation factor for gains, hm:         (94)m= $0.94$ $0.92$ $0.88$ $0.79$ $0.66$ $0.5$ $0.37$ $0.42$ $0.64$ $0.84$ $0.92$ $0.95$ (94)m           Useful gains, hmGm, W = (94)m x (84)m         (95)m         468.43         512.5         552.19         572.74         529.18         401.06         280.12         288.43         389.71         440.56         443.54         449.94         (95)           Monthly average external temperature from Table 8         (96)m=         4.3         4.9         6.5         8.9         11.7         14.6         16.6         16.4         14.1         10.6         7.1         4.2         (96)           (97)m=         1089.16         1062.17         974.46         826.35         647.58         438.04         291         304.32         467.76         691.58         902.71         108.92         (97)           Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m         (98)m         (98)m         461.82         369.38         31							ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Utilisation factor for gains, hm:       (94) m = $0.94$ 0.92       0.88       0.73       0.66       0.5       0.37       0.42       0.64       0.84       0.92       0.95       (94)         (94)m=       0.94       0.92       0.88       0.73       0.66       0.5       0.37       0.42       0.64       0.84       0.92       0.95       (94)         Useful gains, hmGm, W = (94)m x (84)m       (95)       (96)me       48.43       512.5       552.19       572.74       529.18       401.06       280.12       288.43       389.71       440.56       443.54       449.94       (95)         Monthly average external temperature from Table 8       (95)me       4.3       4.9       6.5       8.9       11.7       14.6       16.6       16.1       14.1       10.6       7.1       4.2       (96)         Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m - (96)m]       (97)m - (95)m] x (41)m       (98)me       461.82       369.8       314.17       183.03       88.08       0       0       0       186.76       330.6       469.44       Total per year (kWh/year) = Sum(98)set       2403.29       (98)         Space heating requirement in kWh/m²/year       29.78       29.78       29.78       (99 </td <td>the ut</td> <td></td> <td>r</td> <td><u> </u></td> <td><u> </u></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td><u> </u></td> <td></td> <td></td> <td></td> <td></td>	the ut		r	<u> </u>	<u> </u>	1					<u> </u>				
(94) m= $0.94$ $0.92$ $0.88$ $0.79$ $0.66$ $0.5$ $0.37$ $0.42$ $0.84$ $0.92$ $0.95$ Useful gains, hmGm, W = (94)m x (84)m       (95)       (94)       (95)m= $468.43$ $512.5$ $552.19$ $572.74$ $529.18$ $401.06$ $280.12$ $286.43$ $399.71$ $440.56$ $443.54$ $449.94$ (95)         Monthly average external temperature from Table 8       (96)m = $4.3$ $4.9$ $6.5$ $8.9$ $11.7$ $14.6$ $16.6$ $16.4$ $14.1$ $10.6$ $7.1$ $4.2$ (96)         Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m / (96)m]       (97)m - (95)m] x (41)m       (97)m =       (98)       (91)m - (95)m] x (41)m       (98)m = $461.82$ $369.38$ $314.17$ $183.03$ $88.08$ $0$ $0$ $0$ $186.76$ $330.6$ $469.44$ $702$ $29.78$ (99) $90.5$ $502.71$ $1080.92$ $(98)$ $502.71$ $1080.92$ $(98)$ $502.71$ $1080.92$ $(98)$ $502.71$ $1080.92$ $(99)$ $502.71$ $1080.92$ $(98$	1.1411:				· ·	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = (94)m x (84)m       (95)m= $\frac{468.43}{3512.5}$ $552.19$ $572.74$ $529.18$ $401.06$ $280.12$ $288.43$ $389.71$ $440.56$ $443.54$ $449.94$ (95)         Monthly average external temperature from Table 8       (96)m= $\frac{4.3}{4.9}$ $6.5$ $8.9$ $11.7$ $14.6$ $16.6$ $16.4$ $14.1$ $10.6$ $7.1$ $4.2$ (96)         Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m]       (97)m= $1089.16$ $1062.17$ $974.46$ $826.95$ $647.58$ $438.04$ $291$ $304.32$ $467.76$ $691.58$ $902.71$ $1080.92$ (97)         Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m= $461.82$ $369.38$ $314.17$ $183.03$ $88.08$ $0$ $0$ $0$ $186.76$ $330.6$ $469.44$ Total per year (kWh/year) = Sum(98)s0 = $2403.29$ (98)         Space heating requirement in kWh/m²/year $29.78$ $29.78$ $92$ $29.78$ $92$ $9.78$ $92.78$ $92.78$ $92.78$ $92.78$ $92.78$ $92.78$ $92.78$			<u> </u>	î .	ì	0.66	0.5	0.27	0.42	0.64	0.84	0.02	0.95		(94)
(96)m= $468.43$ $512.5$ $552.19$ $572.74$ $529.18$ $401.06$ $280.12$ $288.43$ $389.71$ $440.56$ $443.54$ $449.94$ (95)         Monthly average external temperature from Table 8       (96)m= $4.3$ $4.9$ $6.5$ $8.9$ $11.7$ $14.6$ $16.4$ $14.11$ $10.6$ $7.1$ $4.2$ (96)         (97)m= $1089.16$ $1062.17$ $974.46$ $826.95$ $647.58$ $438.04$ $291$ $304.32$ $467.76$ $691.58$ $902.71$ $1080.92$ (97)         Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m= $461.82$ $369.38$ $314.17$ $183.03$ $88.08$ $0$ $0$ $0$ $186.76$ $330.6$ $469.44$ $760.297.76$ $991.58$ $902.71$ $1080.92$ (97)         Space heating requirement in kWh/m²/year $290.78$ $290.78$ $290.78$ $290.78$ $290.78$ $99$ $29.78$ $99$ $29.78$ $99$ $29.78$ $99$ $29.78$ $99$ $29.78$ $99$ $29.78$ $99$ <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.5</td> <td>0.57</td> <td>0.42</td> <td>0.04</td> <td>0.04</td> <td>0.92</td> <td>0.95</td> <td></td> <td>(34)</td>							0.5	0.57	0.42	0.04	0.04	0.92	0.95		(34)
Monthly average external temperature from Table 8 (96)me 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)m 1 (97)me 1089.16 1062.17 974.46 826.95 647.58 438.04 291 304.32 467.76 691.58 902.71 1080.92 (97)m 1089.16 1062.17 974.46 826.95 647.58 438.04 291 304.32 467.76 691.58 902.71 1080.92 (97)m 1080.91 (93)m 461.82 369.38 314.17 183.03 88.08 0 0 0 0 186.76 330.6 469.44 Total per year (kWh/year) = Sum(98)		-	1	i	<u> </u>	i	401.06	280.12	288.43	389.71	440.56	443.54	449.94		(95)
(96)me4.34.96.58.911.714.616.616.414.110.67.14.2(96)Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m](97)me1089.161062.17974.46826.95647.58438.04291304.32467.76691.58902.711080.92(97)Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)me461.82369.38314.17183.0388.08000186.76330.6469.44Total per year (kWh/year) = Sum(98)s.v29.78(98)Space heating requirement in kWh/m²/year29.78(98)Object to the provided by a community scheme.Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none0(30)Fraction of space heat from community system 1 - (301) =1(30)Fraction of heat from Community boilers(302) x (303a) =1(30)Fraction of total space heat from Community boilers(302) x (303a) =1(30)Fraction of total space heat from Community boilers(302) x (303a) =1(30)Fraction of total space heat from Community boilers(302) x (303a) =1(30)Fraction of total space heat from Community boilers(302) x (303a) =1(30)Fraction of total space heat from C									200110						
Heat loss rate for mean internal temperature, Lm , W =[(39)m × [(93)m - (96)m](97)m=1069.161062.17974.46826.95647.58438.04291304.32467.76691.58902.711080.92(97Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m=461.82369.38314.17183.0388.08000186.76330.6469.44Total per year (kWh/year) = Sum(98), .ssv =2403.29(98Space heating requirement in kWh/m²/year29.78(99Ob. Energy requirements - Community heating schemeThis part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of total space heat from Community boilers1(30Fraction of total space heat from Community boilers(302) x (303a) =1(30Fraction of total space heat from Community boilers(302) x (303a) =1(30Fraction of total space heat from Community boilers(302) x (303a) =1(30Fraction of total space heat from Community boilers(302) x (303a) =1(30Fraction of total space heat from Community boilers(302) x (303a) =1(30Fraction of total space heat from Community heating syste				r	r –	1	r	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m= 461.82 369.38 314.17 183.03 88.08 0 0 0 0 186.76 330.6 469.44 Total per year (kWh/year) = Sum(98)	Heat	loss rate	e for me	an interr	nal tempe	erature,	Lm,W:	i =[(39)m :	r x [(93)m	– (96)m	]	<b></b>			
(98)m=       461.82       369.38       314.17       183.03       88.08       0       0       0       186.76       330.6       469.44         Total per year (kWh/year) = Sum(98):s2       2403.29       (98         Space heating requirement in kWh/m²/year       29.78       (99         Sherergy requirements - Community heating scheme         This part is used for space heating, space cooling or water heating provided by a community scheme.         Fraction of space heat from community system 1 - (301) =       0       (30         The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.       1       (30         Fraction of total space heat from Community boilers       (302) x (303a) =       1       (30         Fraction of total space heat from Community boilers       (302) x (303a) =       1       (30         Fraction of total space heat from Community boilers       (302) x (303a) =       1       (30         Fractor for control and charging method (Table 4c(3)) for community heating system       1.05       (30         Distribution loss factor (Table 12c) for community heating system       1.05       (30         Space heating       (304a) x (305) x (306) =	(97)m=	1089.16	1062.17	974.46	826.95	647.58	438.04	291	304.32	467.76	691.58	902.71	1080.92		(97)
Total per year (kWh/year) = Sum(98)saz =       2403.29       (98         Space heating requirement in kWh/m²/year       29.78       (99         9b. Energy requirements - Community heating scheme       0       (30         This part is used for space heating, space cooling or water heating provided by a community scheme.       0       (30         Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none       0       (30         Fraction of space heat from community system 1 - (301) =       1       (30         The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.       1       (30         Fraction of total space heat from Community boilers       (302) x (303a) =       1       (30         Fractor for control and charging method (Table 4c(3)) for community heating system       1.05       (30         Distribution loss factor (Table 12c) for community heating system       1.05       (30         Space heating       2403.29       2403.29       2403.29         Space heat from Community boilers       (98) x (304a) x (305) x (306) =       2523.46       (30	Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
Space heating requirement in kWh/m²/year       29.78       (99         9b. Energy requirements - Community heating scheme       (99       (99         This part is used for space heating, space cooling or water heating provided by a community scheme.       0       (30         Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none       0       (30         Fraction of space heat from community system 1 - (301) =       1       (30         The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.       1       (30         Fraction of heat from Community boilers       1       (30       (302) × (303a) =       1       (30         Fraction of total space heat from Community boilers       (302) × (303a) =       1       (30         Fractor for control and charging method (Table 4c(3)) for community heating system       1       (30         Distribution loss factor (Table 12c) for community heating system       1.05       (30         Space heating       2403.29       (302.29)       (302.29)       (302.20)       (305.2)       (305.2)       (30         Space heat from Community boilers       (98) × (304a) × (305.2) × (306) =       2523.46       (30	(98)m=	461.82	369.38	314.17	183.03	88.08	0	0	0	0	186.76	330.6	469.44		
9b. Energy requirements – Community heating scheme         This part is used for space heating, space cooling or water heating provided by a community scheme.         Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none       0       (30         Fraction of space heat from community system 1 – (301) =       1       (30         The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.       1       (30         Fraction of heat from Community boilers       1       (30         Fraction of total space heat from Community boilers       1       (30         Fraction of total space heat from Community boilers       1       (30         Fractor for control and charging method (Table 4c(3)) for community heating system       1       (30         Distribution loss factor (Table 12c) for community heating system       1.05       (30         Space heating       2403.29       2403.29       2403.29         Space heat from Community boilers       (98) x (304a) x (305) x (306) =       2523.46       (30									Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2403.29	(98)
This part is used for space heating, space cooling or water heating provided by a community scheme.       0       (30)         Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none       0       (30)         Fraction of space heat from community system 1 – (301) =       1       (30)         The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.       1       (30)         Fraction of heat from Community boilers       1       (30)       1       (30)         Fraction of total space heat from Community boilers       (302) × (303a) =       1       (30)         Fractor for control and charging method (Table 4c(3)) for community heating system       1       (30)         Distribution loss factor (Table 12c) for community heating system       1.05       (30)         Annual space heating requirement       2403.29       2403.29         Space heat from Community boilers       (98) × (304a) × (305) × (306) =       2523.46       (30)	Space	e heatin	g require	ement in	ı kWh∕m²	²/year								29.78	(99)
This part is used for space heating, space cooling or water heating provided by a community scheme.       0       (30)         Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none       0       (30)         Fraction of space heat from community system 1 – (301) =       1       (30)         The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.       1       (30)         Fraction of heat from Community boilers       1       (30)       1       (30)         Fraction of total space heat from Community boilers       (302) × (303a) =       1       (30)         Fractor for control and charging method (Table 4c(3)) for community heating system       1       (30)         Distribution loss factor (Table 12c) for community heating system       1.05       (30)         Annual space heating requirement       2403.29       2403.29         Space heat from Community boilers       (98) × (304a) × (305) × (306) =       2523.46       (30)	9b. En	ergy rec	quiremer	nts – Coi	mmunity	heating	scheme	)							_
Fraction of space heat from community system 1 – (301) =       1       (30         The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.       1       (30         Fraction of heat from Community boilers       1       (30         Fraction of total space heat from Community boilers       (302) x (303a) =       1       (30         Fractor for control and charging method (Table 4c(3)) for community heating system       1       (30         Distribution loss factor (Table 12c) for community heating system       1.05       (30         Space heating       2403.29       2403.29       (30         Space heat from Community boilers       (98) x (304a) x (305) x (306) =       2523.46       (30	This pa	art is us	ed for sp	bace hea	ating, spa	ace cool	ing or wa	ater heat	ting prov	vided by	a comm	unity scł	neme.		_
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.         Fraction of heat from Community boilers       1       (30         Fraction of total space heat from Community boilers       (302) x (303a) =       1       (30         Factor for control and charging method (Table 4c(3)) for community heating system       1       (30         Distribution loss factor (Table 12c) for community heating system       1.05       (30         Space heating       2403.29       2403.29       (30         Space heat from Community boilers       (98) x (304a) x (305) x (306) =       2523.46       (30	Fractio	n of spa	ace heat	from se	condary	/supplen	nentary l	heating (	Table 1	1) '0' if n	one			0	(301)
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.       1       30         Fraction of heat from Community boilers       (302) x (303a) =       1       30         Fraction of total space heat from Community boilers       (302) x (303a) =       1       30         Factor for control and charging method (Table 4c(3)) for community heating system       1       30         Distribution loss factor (Table 12c) for community heating system       1.05       30         Space heating       kWh/year       2403.29       2403.29         Space heat from Community boilers       (98) x (304a) x (305) x (306) =       2523.46       30	Fractio	n of spa	ace heat	from co	mmunity	v system	1 – (30	1) =						1	(302)
Fraction of heat from Community boilers1(30Fraction of total space heat from Community boilers(302) x (303a) =1(30Factor for control and charging method (Table 4c(3)) for community heating system1(30Distribution loss factor (Table 12c) for community heating system1.05(30Space heatingkWh/yearSpace heating requirement2403.29Space heat from Community boilers(98) x (304a) x (305) x (306) =2523.46		-									up to four	other heat	sources; ti	he latter	
Fraction of total space heat from Community boilers(302) × (303a) =1(30Factor for control and charging method (Table 4c(3)) for community heating system1(30Distribution loss factor (Table 12c) for community heating system1.05(30Space heating1.05(30Space heating requirement2403.29Space heat from Community boilers(98) × (304a) × (305) × (306) =2523.46				-			rom powe	r stations.	See Appe	ndıx C.				1	(303a)
Factor for control and charging method (Table 4c(3)) for community heating system       1       (30         Distribution loss factor (Table 12c) for community heating system       1.05       (30         Space heating       kWh/year       2403.29         Space heat from Community boilers       (98) x (304a) x (305) x (306) =       2523.46       (30							oilore				(2	02) v (202	(a) -		4
Distribution loss factor (Table 12c) for community heating system       1.05       (30         Space heating       kWh/year       2403.29         Space heat from Community boilers       (98) x (304a) x (305) x (306) =       2523.46       (30						-						02) X (303	a) =		4
Space heating       kWh/year         Annual space heating requirement       2403.29         Space heat from Community boilers       (98) x (304a) x (305) x (306) =       2523.46									•	ating syst	tem			1	(305)
Annual space heating requirement2403.29Space heat from Community boilers(98) x (304a) x (305) x (306) =2523.46	Distrib	ution los	s factor	(Table '	12c) for c	commun	ity heati	ng syste	m					1.05	(306)
Space heat from Community boilers         (98) x (304a) x (305) x (306) =         2523.46         (30	-		-											-	–
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (30	•												=	2523.46	(307a)
	Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	: E)		0	(308

Space heating requirement from second	lary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2191.26	]
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	2300.83	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	'e) + (310a)(310e)] =	48.24	(313)
Cooling System Energy Efficiency Ratio	I.			0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extra		ide		313.86	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =	313.86	(331)
Energy for lighting (calculated in Append	dix L)			354.49	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-815.12	(333)
Electricity generated by wind turbine (Ap	opendix M) (negative quantit	y)		0	(334)
12b. CO2 Emissions – Community heati	ing scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)		kWh/year	kg CO2/kWh	kg CO2/year	(367a)
•	vater heating (not CHP) If there is CHP using two	kWh/year	kg CO2/kWh (366) for the second fue	kg CO2/year	](367a) ](367)
Efficiency of heat source 1 (%)	vater heating (not CHP) If there is CHP using two	<b>kWh/year</b> fuels repeat (363) to )] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue 0.22	kg CO2/year	а Т
Efficiency of heat source 1 (%) CO2 associated with heat source 1	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313)	<b>kWh/year</b> fuels repeat (363) to )] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	kg CO2/year 94 = 1108.56	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313) ystems (363).	kWh/year fuels repeat (363) to )] x 100 ÷ (367b) x x (366) + (368)(372	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 2) =	kg CO2/year 94 = 1108.56 = 25.04	(367) (372)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313) ystems (363). condary) (309)	kWh/year fuels repeat (363) to )] x 100 ÷ (367b) x x (366) + (368)(372 x	kg CO2/kWh         (366) for the second fue         0.22         0.52         2)         0	kg CO2/year 94 = 1108.56 = 25.04 = 1133.6	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (sec	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313) ystems (363). condary) (309) sion heater or instantaneous	kWh/year fuels repeat (363) to )] x 100 ÷ (367b) x x (366) + (368)(372 x	kg CO2/kWh         (366) for the second fue         0.22         0.52         2)         0	kg CO2/year 94 = 1108.56 = 25.04 = 1133.6 = 0	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (sec CO2 associated with water from immers	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313) ystems (363). condary) (309) sion heater or instantaneous ater heating (373)	kWh/year fuels repeat (363) to )] x 100 ÷ (367b) x x (366) + (368)(372 x heater (312) x + (374) + (375) =	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 2) = 0 = 0.22 =	kg CO2/year 94 = 1108.56 = 25.04 = 1133.6 = 0 = 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (sec CO2 associated with water from immers Total CO2 associated with space and wa	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313) ystems (363). condary) (309) sion heater or instantaneous ater heating (373) os and fans within dwelling	kWh/year fuels repeat (363) to )] x 100 ÷ (367b) x x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         0         0.52         0         0.22         1         0.52         1         0.52         1         0.52         1         0.52	kg CO2/year 94 = 1108.56 = 25.04 = 1133.6 = 0 = 0 1133.6	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (sec CO2 associated with water from immers Total CO2 associated with space and wa CO2 associated with electricity for pump	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313) ystems (363). condary) (309) sion heater or instantaneous ater heating (373) os and fans within dwelling ng (332)	kWh/year fuels repeat (363) to )] x 100 ÷ (367b) x x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         0         0.52         0         0.22         0         0.52         1         0.52         1         0.52	kg CO2/year 94 94 1108.56 25.04 1133.6 0 1133.6 10 1133.6 162.89	(367) (372) (373) (374) (375) (376) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (sec CO2 associated with space heating (sec CO2 associated with space and wa CO2 associated with electricity for pump CO2 associated with electricity for pump CO2 associated with electricity for lightin Energy saving/generation technologies (	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313) ystems (363). condary) (309) sion heater or instantaneous ater heating (373) os and fans within dwelling ng (332)	kWh/year fuels repeat (363) to )] x 100 ÷ (367b) x x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         0         0.52         0         0.52         0         0.52         1         0.52         1         0.52         1         0.52         1         0.52	kg CO2/year 94 1108.56 25.04 1133.6 0 1133.6 102.89 183.98	(367) (372) (373) (374) (374) (375) (376) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community sy CO2 associated with space heating (sec CO2 associated with space heating (sec CO2 associated with space and wa CO2 associated with electricity for pump CO2 associated with electricity for pump CO2 associated with electricity for lightin Energy saving/generation technologies of Item 1	vater heating (not CHP) If there is CHP using two [(307b)+(310b [(313) ystems (363). condary) (309) sion heater or instantaneous ater heating (373) os and fans within dwelling ng (332)) (333) to (334) as applicable	kWh/year fuels repeat (363) to )] x 100 ÷ (367b) x x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh         (366) for the second fue         0.22         0.52         0         0.52         0         0.52         0         0.52         1         0.52         1         0.52         1         0.52         1         0.52	kg CO2/year 94 94 1108.56 25.04 1133.6 0 1133.6 0 1133.6 162.89 183.98 -423.05	(367) (372) (373) (374) (374) (375) (376) (376) (378) (379) (380)

### SAP 2012 Overheating Assessment

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

Property Details: Plot 35

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shut Ventilation rate during Overheating Details:	es: eter: ters:	ather (a	ch):	Flat England Thames valley Yes 1 South East Average or unknown None Indicative Value Low False 6 ( Windows fully open)						
Summer ventilation h Transmission heat los Summer heat loss co	ss coeffi	cient:	ent:	399.51 61				(P1) (P2)		
Overhangs:	enicient.			460.56				(P2)		
Orientation: South West (SW) North West (NW) North East (NE)	<b>Ratio:</b> 0 0 0		<b>Z_overhangs:</b> 1 1 1							
Solar shading:										
Orientation: South West (SW)	<b>Z blind</b> 1	ls:	Solar access:		hangs:	Z summer:		(P8)		
North West (NW) North East (NE) Solar gains:	1 1 1		0.9 0.9	1 1 1		0.9 0.9 0.9		(P8) (P8)		
North West (NW) North East (NE)	1	<b>Area</b> 2.03 4.05 8.65	0.9	1	<b>FF</b> 0.7 0.7 0.7	0.9	<b>Gains</b> 86.75 143 305.45 535.2	(P8)		

		User	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	0	Strom Softwa					001082 n: 1.0.5.9	
Software Name.			/ Address		51011.		V CI 310	1. 1.0.3.3	
Address :		riopen	/ Address	1 101 00					
1. Overall dwelling dime	nsions:								
		Ar	ea(m²)		Av. He	ight(m)		Volume(m <sup>3</sup> )	)
Ground floor			80.71	(1a) x	2	2.5	(2a) =	201.77	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)	)+(1n)	80.71	(4)					-
Dwelling volume				(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	201.77	(5)
2. Ventilation rate:									
		condary eating	other		total			m <sup>3</sup> per hou	r
Number of chimneys		0 +	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	าร			- 	3	x 1	0 =	30	(7a)
Number of passive vents					0	x 1	0 =	0	(7b)
Number of flueless gas fir	res			Γ	0	x 4	40 =	0	(7c)
							Air ch	anges per ho	ur
Infiltration due to chimney	(a, f) = a a b b c a b	a)+(6b)+(7a)+(7b)	+(7c) -	Г				•••	_
If a pressurisation test has be				continue fro	30 om (9) to (		÷ (5) =	0.15	(8)
Number of storeys in th		.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,			-/		0	(9)
Additional infiltration						[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber f	rame or 0.35 f	or masoni	y constr	uction			0	(11)
	esent, use the value corresp	oonding to the gre	ater wall are	a (after					
deducting areas of openin If suspended wooden fl		ed) or 0.1 (sea	led). else	enter 0				0	(12)
If no draught lobby, ent			,,					0	(13)
Percentage of windows		ripped					·	0	(14)
Window infiltration	-		0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =	·	0	(16)
Air permeability value,	q50, expressed in cubi	ic metres per l	nour per s	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	ty value, then (18) = [(17	7) ÷ 20]+(8), other	wise (18) = (	16)				0.3	(18)
Air permeability value applies		been done or a d	legree air pe	rmeability i	s being u	sed			_
Number of sides sheltered Shelter factor	d		(20) = 1 -	[0.075 x (1	9)1 =			1	(19)
Infiltration rate incorporati	ng shelter factor		(21) = (18		•)]			0.92	(20)
Infiltration rate modified for	-		((	, (==)				0.28	(21)
· · · · · · · · · · · · · · · · · · ·	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								
r	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
	· · · · · ·	I							
Wind Factor (22a)m = (22 (22a)m = 1.27 1.25	2)m ÷ 4 1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		
		0.00		·		l <b>-</b>			

Adjust	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
<u> </u>	0.35	0.35	0.34	0.3	0.3	0.26	0.26	0.26	0.28	0.3	0.31	0.32		
	ate effec echanica		-	rate for t	he appli	cable ca	se							(23a)
				endix N. (2	3b) = (23a	a) x Fmv (e	equation (1	N5)), othei	wise (23b	) = (23a)			0	(23a) (23b)
		• •	0 11		, ,	, ,	• •	n Table 4h		) (200)			0	
			-	-	-					2b)m ± ('	23b) v [	1 – (23c)	0	(23c)
(24a)m=				0				0	0			$\frac{1-(230)}{0}$	]	(24a)
		-	-	-	-	-		́ ИV) (24b	-	-	Ů	Ů	]	( ,
(24b)m=				0	0			0	0		0	0	1	(24b)
		-	-	-	-	-	_	n from c		0	0	0	1	(=)
,					•	•		c) = (22b		5 × (23b	))			
(24c)m=	r í	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If	natural	ventilatio	n or wh	ole hous	e positiv	ve input '	ventilatio	on from l	oft			ļ	1	
,						•		0.5 + [(2		0.5]			_	
(24d)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in boy	(25)				_	
(25)m=	0.56	0.56	0.56	0.55	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
3 He	at losse	s and he	at loss r	paramete	ər.									
	/IENT	Gros		Openin		Net Ar	ea	U-valı	Je	AXU		k-value	9	AXk
		area		m		A ,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²-		kJ/K
Doors						2	x	1.4	=	2.8				(26)
Windo	ws Type	e 1				2.025	5 x1	/[1/( 1.4 )+	0.04] =	2.68				(27)
Windo	ws Type	2				4.05	x1	/[1/( 1.4 )+	0.04] =	5.37				(27)
Windo	ws Type	93				8.651		/[1/( 1.4 )+	0.04] =	11.47				(27)
Walls <sup>-</sup>	Type1	68.8	8	14.73	3	54.07	7 X	0.15		8.11				(29)
Walls -	Type2	4.3	5	2		2.35	×	0.14	=	0.33	= i		$\dashv$	(29)
Roof	,,	76.9		0		76.9		0.1		7.69			$\dashv$	(30)
	area of e					150.0		0.1	I	7.00	L			(31)
				effective wi	ndow U-va			i formula 1	/[(1/U-valu	ie)+0.041 a	ns aiven in	paragraph	132	(01)
				nternal wal							- <b>3</b>	p =:: =: <b>g</b> : = p =		
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				38.46	(33)
Heat c	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	1482.04	4 (34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
	ign assess used instea				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						22.59	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	:1)								
Total f	abric he	at loss							(33) +	(36) =			61.05	(37)
Ventila	ation hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (	25)m x (5	)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ļ	
(38)m=	37.42	37.26	37.11	36.37	36.23	35.59	35.59	35.47	35.83	36.23	36.51	36.8	J	(38)
Heat tr	ransfer c	coefficier	nt, W/K	_					(39)m	= (37) + (3	38)m		_	
(39)m=	98.47	98.31	98.15	97.42	97.28	96.63	96.63	96.51	96.88	97.28	97.56	97.85	<u> </u>	
										Average =	Sum(39)1	12 /12=	97.41	(39)

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.22	1.22	1.22	1.21	1.21	1.2	1.2	1.2	1.2	1.21	1.21	1.21		
Numbe	er of day	ys in mo	nth (Tab	le 1a)	•		•	-	,	Average =	Sum(40)1.	.12 /12=	1.21	(40)
- tainio (	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.			: [1 - exp	(-0.0003	849 x (TF	-A -13.9	)2)] + 0.(	)013 x (	TFA -13	.9)	48		(42)
	A £ 13. I averac		ater usa	ae in litre	es per da	av Vd.av	erade =	(25 x N)	+ 36		97	' 9		(43)
Reduce	the annua	, al average	hot water		5% if the a	lwelling is	designed	to achieve		se target o				( - )
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	in litres pe	r day for e	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	107.7	103.78	99.86	95.95	92.03	88.11	88.11	92.03	95.95	99.86	103.78	107.7		_
Enorm	contont of	f hot wator	used ea	loulated m	onthly - 1	100 v Vd r	т v nm v Г	)Tm / 260(			m(44) <sub>112</sub> = ables 1b, 1		1174.86	(44)
					· ·	i				· ·		-		
(45)m=	159.71	139.68	144.14	125.66	120.58	104.05	96.42	110.64	111.96	130.48	142.43 m(45) <sub>112</sub> =	154.67	1540.42	(45)
lf instan	taneous v	vater heati	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		10tal = 3u	III(4J)112 =		1340.42	(40)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage										·			
-		. ,		• •			-	within sa	ame ves	sel	(	0		(47)
	•	-		ank in dw ar (this in	-			(47) ombi boil	ers) ente	r 'O' in <i>(</i>	(47)			
	storage		not wat			notantai								
a) If m	anufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):				(	0		(48)
Tempe	erature f	actor fro	m Table	2b							(	C		(49)
			-	e, kWh/ye				(48) x (49)	) =		(	0		(50)
				cylinder l rom Tabl										(54)
		neating s				1/11110/02	iy)				(	0		(51)
	-	from Ta									(	0		(52)
Tempe	erature f	actor fro	m Table	2b							(	)		(53)
			-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	(	C		(54)
	. ,	(54) in (5	,								(	0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5 -	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)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3						(	0		(58)
	•						. ,	65 × (41)		- <b>1</b> 1-	- ( - ()			
		1		I	· · · · · ·	1	ter heati	ng and a	· ·	· · · · · ·	, 	0		(59)
(59)m=	0	0	0	0	0	0		0	0	0	0	0		(33)

Combi	loss ca	lculated	for each	month	(61)m =	(60	) ÷ 36	65 × (41)	)m							
(61)m=	0	0	0	0	0		0	0	0		0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l fo	r eacł	n month	(62)	m =	0.85 ×	(45)m +	(46)m +	(57)m +	- (59)m + (61)m	
(62)m=	135.75	118.73	122.52	106.81	102.49	8	8.44	81.95	94.	04	95.17	110.91	121.07	131.47	]	(62)
Solar DI	-IW input	calculated	using App	endix G o	r Appendix	(H (	negativ	ve quantity	y) (ent	er '0	' if no sola	r contribu	tion to wate	er heating	)	
(add a	dditiona	I lines if	FGHRS	and/or \	WWHRS	s ap	plies,	, see Ap	penc	lix C	G)				_	
(63)m=	0	0	0	0	0		0	0	0		0	0	0	0		(63)
Output	t from w	ater hea	iter													
(64)m=	135.75	118.73	122.52	106.81	102.49	8	8.44	81.95	94.	04	95.17	110.91	121.07	131.47	]	
										Outp	out from w	ater heate	er (annual)	112	1309.36	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′	[0.85	× (45)m	ı + (6	1)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)n	ן ו	
(65)m=	33.94	29.68	30.63	26.7	25.62	2	2.11	20.49	23.	51	23.79	27.73	30.27	32.87	]	(65)
inclu	de (57)	m in cal	culation	of (65)m	only if c	ylir	nder is	s in the o	dwell	ing	or hot w	vater is f	rom com	Imunity l	neating	
5. In	ternal g	ains (see	e Table (	5 and 5a	):											
		ns (Table			,											
motab	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec	]	
(66)m=	123.81	123.81	123.81	123.81	123.81	12	23.81	123.81	123	.81	123.81	123.81	123.81	123.81	1	(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion	L9 or	r L9a), a	lso s	ee <sup>-</sup>	Table 5			1	7	
(67)m=	20.07	17.83	14.5	10.98	8.21	1	6.93	7.49	9.7		13.06	16.58	19.35	20.63	1	(67)
Applia	nces da	ins (calc	ulated i	n Appeno	dix L. ea	uat	ion L'	13 or L1	і За), а	alsc	see Ta	ble 5	1	I	1	
(68)m=	220.92	223.21	217.43	205.14	189.61	r	75.02	165.27	162		168.76	181.06	196.58	211.17	1	(68)
	L gains	i (calcula	I ated in A	ı ppendix	L equat	L tion	115	or I 15a	) als	0.56	e Table				1	
(69)m=	35.38	35.38	35.38	35.38	35.38	-	5.38	35.38	35.		35.38	35.38	35.38	35.38	1	(69)
		ı ns gains			I	L									1	
(70)m=				0	0		0	0	0		0	0	0	0	1	(70)
				tive valu				-			-	-			]	
(71)m=	-99.05	-99.05	-99.05	-99.05	-99.05	r –	99.05	-99.05	-99.	05	-99.05	-99.05	-99.05	-99.05	1	(71)
				00.00	00.00	Ľ	0.00	00.00	00.		00.00	00.00	00.00	00.00	]	(11)
(72)m=	45.62	gains (1 44.17	41.17	37.09	34.44	3	0.71	27.54	31.	6	33.04	37.27	42.04	44.18	1	(72)
				57.05	34.44								71)m + (72		]	(12)
(73)m=	346.75	gains =	333.24	313.34	292.4		(00)	260.44	264		275	295.05	318.11	336.12	1	(73)
	lar gain	1	333.24	313.34	292.4	2	12.0	200.44	204	.40	275	295.05	310.11	550.12	<u>]</u>	(13)
	Ŭ		using sola	ar flux from	Table 6a	and	associ	ated equa	ations	to co	nvert to th	ne applica	ble orienta	tion.		
		Access F	•	Area			Flu				g_	ie applied	FF		Gains	
•		Table 6d		m²				ole 6a		Т	able 6b	Т	able 6c		(W)	
Northe	ast <mark>0.9x</mark>	0.77	x	8.6	65	x	1	1.28	x		0.63	x	0.7	=	29.83	(75)
Northe	ast <mark>0.9x</mark>	0.77	x	8.6	65	x	2	2.97	x		0.63	× [	0.7	=	60.72	(75)
Northe	ast <mark>0.9x</mark>	0.77	x	8.6	65	x	4	1.38	x		0.63	× [	0.7	=	109.4	(75)
Northe	ast <mark>0.9x</mark>	0.77	x	8.6	65	x	6	7.96	x		0.63		0.7	=	179.67	(75)
Northe	ast <mark>0.9x</mark>	0.77	x	8.6	65	x	9	1.35	x		0.63		0.7	=	241.51	(75)

_					_			_							
Northeast 0.9x	0.77	>	8	65	x	9	97.38	x		0.63	x	0.7	=	257.47	(75)
Northeast 0.9x	0.77	>	8	65	x		91.1	x		0.63	x	0.7	=	240.86	(75)
Northeast 0.9x	0.77	>	8	65	x	7	2.63	x		0.63	x	0.7	=	192.02	(75)
Northeast 0.9x	0.77	>	8	65	x	5	50.42	x		0.63	x	0.7	=	133.31	(75)
Northeast 0.9x	0.77	)	8	65	x	2	28.07	x		0.63	x	0.7	=	74.21	(75)
Northeast 0.9x	0.77	)	8	65	x		14.2	x		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	>	8	65	x		9.21	x		0.63	x	0.7	=	24.36	(75)
Southwest <sub>0.9x</sub>	0.77	)	2	03	<b>x</b>	3	86.79	]		0.63	x	0.7	=	22.77	(79)
Southwest <sub>0.9x</sub>	0.77	)	2	03	<b>x</b>	6	62.67			0.63	x	0.7	=	38.79	(79)
Southwest0.9x	0.77	)	2	03	x	8	35.75	]		0.63	x	0.7	=	53.07	(79)
Southwest <sub>0.9x</sub>	0.77	)	2	03	<b>x</b>	1	06.25	]		0.63	x	0.7	=	65.76	(79)
Southwest <sub>0.9x</sub>	0.77	)	2	03	x	1	19.01	]		0.63	x	0.7	=	73.65	(79)
Southwest <sub>0.9x</sub>	0.77		2	03	x	1	18.15	Ī		0.63	x	0.7	=	73.12	(79)
Southwest <sub>0.9x</sub>	0.77	)	2	03	×	1	13.91	1		0.63	×	0.7	=	70.49	(79)
Southwest <sub>0.9x</sub>	0.77		2	03	] ×	1	04.39	i		0.63	×	0.7	=	64.6	(79)
Southwest <sub>0.9x</sub>	0.77	,	2	03	j ×	9	92.85	i		0.63	×	0.7	=	57.46	(79)
Southwest <sub>0.9x</sub>	0.77	)	2	03	x	6	9.27	1		0.63	×	0.7	=	42.87	(79)
Southwest <sub>0.9x</sub>	0.77	)	2	03	x	4	4.07	1		0.63	x	0.7	=	27.27	(79)
Southwest <sub>0.9x</sub>	0.77	,	2	03	j ×		31.49	1		0.63		0.7	=	19.49	(79)
Northwest 0.9x	0.77		4	05	j ×		1.28	x		0.63	×	0.7	=	13.97	(81)
Northwest 0.9x	0.77		4	05	] ×	2	2.97	x		0.63	- x	0.7		28.43	(81)
Northwest 0.9x	0.77		4	05	j ×	4	1.38	İ x		0.63	ا × آ	0.7	= =	51.22	(81)
Northwest 0.9x	0.77		4	05	j ×	6	67.96	x		0.63	×	0.7	=	84.11	(81)
Northwest 0.9x	0.77	,	4	05	j ×		91.35	x		0.63	×	0.7	=	113.06	(81)
Northwest 0.9x	0.77	,	4	05	j ×		97.38	x		0.63	×	0.7	=	120.54	(81)
Northwest 0.9x	0.77	)	4	05	x		91.1	x		0.63	×	0.7	=	112.76	(81)
Northwest 0.9x	0.77	)	4	05	j ×	7	2.63	x		0.63	x	0.7	=	89.89	(81)
Northwest 0.9x	0.77		4	05	x	5	50.42	x		0.63	x	0.7	=	62.41	(81)
Northwest 0.9x	0.77	)	4	05	x	2	28.07	x		0.63	x	0.7	=	34.74	(81)
Northwest 0.9x	0.77	)	4	05	] ×		14.2	x		0.63	x	0.7	=	17.57	(81)
Northwest 0.9x	0.77	)	4	05	] ×		9.21	x		0.63	×	0.7	=	11.4	(81)
-					4	•									
Solar <u>g</u> ains in	watts, ca	lculate	d for eac	ch mon	th		-	(83)m	n = Su	um(74)m .	(82)m			_	
(83)m= 66.57	127.93	213.68	329.53	428.2	2 4	151.13	424.11	346	6.51	253.18	151.81	82.38	55.25		(83)
Total gains – i	nternal a	nd sola	r (84)m	= (73)r	n + (	(83)m	, watts			,		_			
(84)m= 413.32	473.29	546.93	642.88	720.6	2 7	723.93	684.55	610	).97	528.18	446.86	6 400.49	391.37		(84)
7. Mean inter	nal temp	erature	(heatin	g seaso	on)										
Temperature	during h	eating	periods	in the li	ving	area	from Tal	ole 9	, Th1	1 (°C)				21	(85)
Utilisation fac	tor for ga	ains for	living a	ea, h1,	m (s	see Ta	ble 9a)								
Jan	Feb	Mar	Apr	Ma	y	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 0.98	0.97	0.94	0.89	0.79		0.66	0.54	0.	.6	0.8	0.93	0.97	0.98		(86)
Mean interna	l tempera	ature in	living a	rea T1	(follo	ow ste	ps 3 to 7	7 in T	Fable	e 9c)					
(87)m= 18.32	18.57	19.04	19.68	20.28	<u>`</u>	20.69	20.87	20.	- I	20.46	19.7	18.9	18.27		(87)
	· · · · · · ·		•	•	-			•							

remp	erature	during h	eating p	periods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.9	19.91	19.91	19.91	19.92	19.92	19.92	19.92	19.92	19.92	19.91	19.91		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	n2,m (se	e Table	9a)						
(89)m=	0.97	0.96	0.93	0.87	0.75	0.59	0.43	0.49	0.74	0.91	0.96	0.98		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.45	17.7	18.16	18.8	19.36	19.73	19.86	19.84	19.54	, 18.83	18.04	17.41		(90)
I			I						f	LA = Livin	g area ÷ (	4) =	0.34	(91)
Maan	interne		atura (fr			line or ) fi	ΔΤ4	. / 4 . 41						
(92)m=	17.75	17.99	18.46	or the wh	19.67	20.06	20.21	+ (1 – 1L 20.18	A) × 12	19.13	18.33	17.7		(92)
				internal							10.55	17.7		(02)
(93)m=	17.75	17.99	18.46	19.1	19.67	20.06	20.21	20.18	19.86	19.13	18.33	17.7		(93)
		ting requ	I			20100		20110	10100	10110	10100			()
				mperatu	e obtain	ed at st	on 11 of	Table 9	h so tha	t Ti m–('	76)m an	d re-calc	ulate	
				using Ta					o, oo ina	(	<i>i</i> 0)11 an		alato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hr	יייייי ו:										
(94)m=	0.96	0.95	0.92	0.85	0.74	0.6	0.46	0.52	0.74	0.89	0.95	0.97		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (84	4)m									
(95)m=	397.9	448.52	501.31	547.03	535.45	432.72	314.91	317.57	389.27	398.5	380.03	378.47		(95)
Month	nly avera	age exte	rnal terr	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 I	oss rate	e for mea	an interr	al tempe	erature, l	Lm , W =	- =[(39)m :	x [(93)m	– (96)m	]				
(97)m=	1324.27	1287.36	1174.1	993.65	775.53	527.44	348.7	364.49	557.77	829.46	1095.65	1321.11		(97)
Space	e heatin	g require	ement fo	r each n	honth, kV	Nh/mon	th = 0.02	4 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	689.21	563.7	500.55	321.57	178.62	0	0	0	0	320.63	515.25	701.32		
I									-					
								Tota	l per year	(kWh/year	<u>.</u> ) = Sum(9	8)15,912 =	3790.85	(98)
Space	e heatin	g require	1	ı kWh/m²				Tota		(kWh/year	') = Sum(9	8)15,912 =	3790.85 46.97	(98) (99)
· · ·		• •	ement in	ı kWh/m²			I	Tota		(kWh/year	r) = Sum(9	8)15.912 =		<u> </u>
8c. Sp	bace co	oling rec	ement in Juiremer	ו kWh/m² זt	/year	ble 10b		Tota		(kWh/year	r) = Sum(9	8)15,912 =		<u> </u>
8c. Sp	bace co lated fo	oling rec	ement in Juiremer July and	t kWh/m² nt August.	/year See Tat		Jul		l per year					<u> </u>
8c. Sp Calcu	bace co lated fo Jan	oling rec r June, c Feb	ement in luiremer July and Mar	n kWh/m² nt August. Apr	/year See Tat May	Jun	Jul	Aug	l per year Sep	Oct	Nov	Dec		<u> </u>
8c. Sp Calcu	bace co lated fo Jan	oling rec r June, c Feb	ement in luiremer July and Mar	t kWh/m² nt August.	/year See Tat May	Jun		Aug	l per year Sep	Oct	Nov	Dec		<u> </u>
8c. Sp Calcu Heat I (100)m=	Dace co lated fo Jan oss rate	oling rec r June, J Feb e Lm (ca	ement in Juiremer July and Mar Iculated 0	ht KWh/m² August. Apr using 25	/year See Tat May 5°C inter	Jun nal temp	perature	Aug and exte	l per year Sep ernal ten	Oct	Nov e from T	Dec able 10)		(99)
8c. Sp Calcu Heat I (100)m=	Dace co lated fo Jan oss rate	oling rec r June, c Feb e Lm (ca 0	ement in Juiremer July and Mar Iculated 0	ht KWh/m² August. Apr using 25	/year See Tat May 5°C inter	Jun nal temp	perature	Aug and exte	l per year Sep ernal ten	Oct	Nov e from T	Dec able 10)		(99)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m=	lated fo Jan oss rate 0 ation fac	oling rec r June, c Feb e Lm (ca 0 tor for lc	ement in July and Mar Iculated 0 oss hm 0	kWh/m² nt August. Apr using 25 0	/year See Tab May 5°C inter 0	Jun nal temp 908.36	perature 715.09	Aug and exte 733.51	l per year Sep ernal tem 0	Oct peratur 0	Nov e from T 0	Dec able 10) 0		(99)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m=	lated fo Jan oss rate 0 ation fac	oling rec r June, c Feb e Lm (ca 0 tor for lc	ement in July and Mar Iculated 0 oss hm 0	t kWh/m² August. Apr using 25	/year See Tab May 5°C inter 0	Jun nal temp 908.36	perature 715.09	Aug and exte 733.51	l per year Sep ernal tem 0	Oct peratur 0	Nov e from T 0	Dec able 10) 0		(99)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0	kWh/m² ht August. Apr using 25 0 0 (100)m x 0	/year See Tab May 5°C inter 0 (101)m	Jun nal temp 908.36 0.73 662.76	0.79 566.09	Aug and exte 733.51 0.75 551	Sep ernal ten 0	Oct nperatur 0	Nov e from T 0	Dec able 10) 0		(100) (101)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0	t kWh/m² August. Apr using 25 0 (100)m x	/year See Tab May 5°C inter 0 (101)m	Jun nal temp 908.36 0.73 662.76	0.79 566.09	Aug and exte 733.51 0.75 551	Sep ernal ten 0	Oct nperatur 0	Nov e from T 0	Dec able 10) 0		(100) (101)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h 0 (solar ( 0	oling rec r June, J Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0	ement in July and Mar Iculated 0 ss hm 0 Vatts) = 0 Iculated 0	kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0	/year See Tab May 5°C inter 0 (101)m 0 (101)m 0 cable we 0	Jun nal temp 908.36 0.73 662.76 eather re 938.4	0.79 0.79 566.09 9gion, se 890.5	Aug and exte 733.51 0.75 551 e Table 806.05	Sep ernal ten 0 10) 0	Oct nperatur 0 0	Nov e from T 0 0	Dec able 10) 0	46.97	(100) (101) (102)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	lated fo Jan oss rate 0 ation fac 0 I loss, h 0 s (solar g 0 e cooling	oling reo r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 g require	ement in July and Mar Iculated 0 Sss hm 0 Vatts) = 0 Iculated 0 ement for	t August. Apr using 25 0 (100)m x 0 for appli	/year See Tab May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole o	Jun nal temp 908.36 0.73 662.76 eather re 938.4	0.79 0.79 566.09 9gion, se 890.5	Aug and exte 733.51 0.75 551 e Table 806.05	Sep ernal ten 0 10) 0	Oct nperatur 0 0	Nov e from T 0 0	Dec able 10) 0	46.97	(100) (101) (102)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	lated fo Jan oss rate 0 ation fac 0 I loss, h 0 s (solar g 0 e cooling	oling reo r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 g require	ement in July and Mar Iculated 0 Sss hm 0 Vatts) = 0 Iculated 0 ement for	kWh/m² August. Apr using 25 0 (100)m x (100)m x for appli 0 r month,	/year See Tab May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole o	Jun nal temp 908.36 0.73 662.76 eather re 938.4	0.79 0.79 566.09 9gion, se 890.5	Aug and exte 733.51 0.75 551 e Table 806.05	Sep ernal ten 0 10) 0	Oct nperatur 0 0	Nov e from T 0 0	Dec able 10) 0	46.97	(100) (101) (102)
8c. Sr Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	ace co lated fo Jan oss rate 0 ation fac 0 I loss, h 0 (solar g 0 e cooling 04)m to	oling reo r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (	ement in July and Mar Iculated 0 oss hm 0 /atts) = 0 Iculated 0 ement fo 104)m <	kWh/m² August. Apr using 25 0 (100)m x 0 (100)m x 0 for appli 0 r month, < 3 × (98	/year See Tat May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole o )m	Jun nal temp 908.36 0.73 662.76 eather re 938.4 lwelling,	0.79 0.79 566.09 990.5 continue	Aug and exte 733.51 0.75 551 e Table 806.05 pus ( kW	Sep           ernal ten           0           10)           0           10)           0           0           0	Oct nperatur 0 0 0 24 x [(10	Nov e from T 0 0 0 0 0 0 3) <i>m</i> – (	Dec able 10) 0 0 0 102)m ] 3	46.97	(100) (101) (102)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h 0 (solar ( 0 (solar ( 0 (solar ( 0 (solar ( 0)))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0)))) (solar ( 0)))) (solar ( 0)))) (solar ( 0)))))) (solar ( 0))))))))))))))))))))))))))))))))))))	oling rec r June, C Feb E Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 gains ca 0 g require zero if ( 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement fc 104)m < 0	kWh/m²         August.         Apr         using 25         0         (100)m ×         0         for appli         0         or month,         3 × (98)         0	/year See Tat May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole o )m	Jun nal temp 908.36 0.73 662.76 eather re 938.4 lwelling,	0.79 0.79 566.09 990.5 continue	Aug and exte 733.51 0.75 551 e Table 806.05 pus ( kW	Sep           ernal tem           0           10)           0           10)           0           10)           0           10)           0           10)           0           Total	Oct nperatur 0 0 0 24 x [(10 0 = Sum(	Nov e from T 0 0 0 0 0 0 3) <i>m</i> – (	Dec able 10) 0 0 0 102)m ] 2 0 =	46.97 < (41)m	(100) (101) (102) (103)
8c. Sr Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Cooled Intermi	lated fo Jan oss rate 0 ation fac 0 I loss, h 0 (solar ( 0 (solar ( 0 (solar ( 0 (solar ( 0)))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0)))) (solar ( 0)))) (solar ( 0)))) (solar ( 0)))))) (solar ( 0))))))))))))))))))))))))))))))))))))	oling req r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if ( 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement fc 104)m < 0	kWh/m²         August.         Apr         using 25         0         (100)m ×         0         for appli         0         or month,         3 × (98)         0	/year See Tat May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole o )m	Jun nal temp 908.36 0.73 662.76 eather re 938.4 lwelling,	241.36	Aug and exte 733.51 0.75 551 e Table 806.05 ous ( kW 189.76	Sep           ernal tem           0           10)           0           10)           0           10)           0           10)           0           10)           0           Total	Oct nperatur 0 0 0 24 x [(10 0 = Sum(	Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 4 )	Dec able 10) 0 0 0 102)m ] 2 0 =	46.97 < (41)m 629.58	(100) (101) (102) (103) (104)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h 0 (solar ( 0 (solar ( 0 (solar ( 0 (solar ( 0)))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0))) (solar ( 0)))) (solar ( 0)))) (solar ( 0)))) (solar ( 0)))))) (solar ( 0))))))))))))))))))))))))))))))))))))	oling rec r June, C Feb E Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 gains ca 0 g require zero if ( 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement fc 104)m < 0	kWh/m²         August.         Apr         using 25         0         (100)m ×         0         for appli         0         or month,         3 × (98)         0	/year See Tat May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole o )m	Jun nal temp 908.36 0.73 662.76 eather re 938.4 lwelling,	0.79 0.79 566.09 990.5 continue	Aug and exte 733.51 0.75 551 e Table 806.05 pus ( kW	Sep           ernal tem           0           Total           f C =           0	Oct nperatur 0 0 0 24 x [(10 0 = Sum( cooled a 0	Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1,0,4) area ÷ (4 0	Dec able 10) 0 0 0 102)m ] 2 0 =	46.97 < (41)m 629.58	(100) (101) (102) (103) (104) (105)
8c. Sr Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Cooled Intermi (106)m=	lated fo Jan oss rate 0 ation fac 0 1 loss, h 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0) (solar g 0 (solar g 0) (solar br>(sola) (so	oling reo r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if ( 0 n actor (Ta 0	ement in July and Mar Iculated 0 sss hm 0 Vatts) = 0 Iculated 0 ement fo 104)m < 0 able 10b 0	kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 or month, < 3 x (98 0	/year See Tab May 5°C inter 0 i (101)m 0 cable we 0 whole a )m 0	Jun nal temp 908.36 0.73 662.76 eather re 938.4 <i>Iwelling,</i> 198.46	0.79 0.79 566.09 egion, se 890.5 continuo 241.36	Aug and exte 733.51 0.75 551 e Table 806.05 ous ( kW 189.76	Sep           ernal tem           0           Total           f C =           0	Oct peratur 0 0 0 24 x [(10 0 = Sum( cooled a	Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1,0,4) area ÷ (4 0	Dec able 10) 0 0 0 102)m ] 2 0 = 4) =	46.97 < (41)m 629.58	(100) (101) (102) (103) (104) (105) (106)

Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n		_		-	_	
(107)m=	0	0	0	0	0	49.61	60.34	47.44	0	0	0	0	]	
-							Total	= Sum(	107)	=	157.39	(107)		
Space	cooling	requirer	nent in k	(Wh/m²/y	/ear				(107)	) ÷ (4) =			1.95	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	l only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabric	Energy	/ Efficier	псу						(99) ·	+ (108) =	=		48.92	(109)

## SAP Input

Property Details: Pl	lot 35							
Address: Located in: Region: UPRN: Date of assessm Date of certifica Assessment type Transaction type Tenure type: Related party di Thermal Mass Pa Water use <= 1 PCDF Version:	te: e: e: sclosure: arameter:	New dv New dv Unknov No rela Indicati	s valley 2020 ober 2020 velling design sta velling	ge				
Property description	n:							
Dwelling type: Detachment: Year Completed: Floor Location:		Flat 2020 Floor	area:					
		00 71 m	-2	S	torey height 2.5 m	:		
Floor 0 Living area:			m <sup>2</sup> (fraction 0.3	42)	2.5 M			
Front of dwelling f	aces:	South E	East					
Opening types: Name:	Source:	Ту	/pe:	Glazing:		Argon:	Fram	
SE SW NW NE	Manufacturer Manufacturer Manufacturer Manufacturer	Sc W W	indows indows indows	double-glaze double-glaze double-glaze	d	Yes Yes Yes	Tran	
Name: SE SW NW NE Name:	<b>Gap:</b> mm 16mm o 16mm o 16mm o	r more r more e: Lo	<b>Frame Facto</b> 0 0.7 0.7 0.7 0.7	0 0.63 0.63 0.63 Orient:	<b>U-value:</b> 1.4 1.4 1.4 1.4	<b>Area:</b> 2 2.025 4.05 8.651 Width:	1 1 1 Heig	<b>f Openings:</b> ht:
SE SW NW NE		Ex Ex	orridor Wall ternal Wall ternal Wall ternal Wall	South East South West North West North East		0 0 0 0	0 0 0 0	
Overshading: Opaque Elements:		Averag	e or unknown					
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall:	Карра:
External Elements External Wall Corridor Wall Flat Roof Internal Elements Party Elements		14.73 2 0	54.07 2.35 76.9	0.15 0.15 0.1	0 0.4 0	False False		N/A N/A N/A

Thermal bridges:

## **SAP Input**

Thermal bridges:	User-defined	d (individual P	SI-values)	Y-Value = 0.1506
	Length	<b>Psi-value</b>		
	7.495	0.293	E2	Other lintels (including other steel lintels)
	26.7	0.049	E4	Jamb
	25.223	0.069	E7	Party floor between dwellings (in blocks of flats)
[Approved]	5.8	0.09	E16	Corner (normal)
FA 13	8.7	0.104	E25	Staggered party wall between dwellings
[Approved]	2.9	0.06	E18	Party wall between dwellings Exposed floor (inverted)
	1.5 9.454	0.131 0.086	E21 E24	Eaves (insulation at ceiling level - inverted)
	23.723	0.56	E15	Flat roof with parapet
	10.979	0.50	P3	Intermediate floor between dwellings (in blocks of flats)
	6.044	0.24	P4	Roof (insulation at ceiling level)
Vortilation				
Ventilation:		D.		
Pressure test:	Yes (As desi			
Ventilation:		th heat recove vet rooms: Kit	5	
		nsulation, rigid		
		istallation Sch		N
Number of chimneys:	0			
Number of open flues:	0			
Number of fans:	0			
Number of passive stacks:	0			
Number of sides sheltered:	1			
Pressure test:	3			
Main heating system:				
Main heating system:	Community	heating schen	nes	
		: Community I		
			•	t fraction 1, efficiency 94
				emp, variable flow
		ing pump : 20		
		temperature:	Unknown	
Main besting Control	Boiler interlo	ock: Yes		
Main heating Control:			<u>.</u>	
Main heating Control:			use of co	mmunity heating, programmer and at least two room
	thermostats Control code			
Cocondary booting system.	CONTROLCOOR	e: 2312		
Secondary heating system:	N			
Secondary heating system: Water heating:	None			
	Energy marking h		_	
Water heating:		neating system	n	
	Water code: Fuel :mains			
	No hot wate	0		
	Solar panel:	•		
Others:				
Electricity tariff:	Standard Ta	riff		
In Smoke Control Area:	Unknown			
Conservatory:	No conserva	itory		
Low energy lights:	100%	,		
Terrain type:	Low rise urb	an / suburbar	า	
EPC language:	English			
Wind turbine:	No			
Photovoltaics:	<u>Photovoltai</u>	<u>ic 1</u>		

## **SAP Input**

Installed Peak power: 0.99 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West No

Assess Zero Carbon Home:

			User De	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20 <sup>7</sup>	12	-		a Numi ire Ver				001082 n: 1.0.5.9	
		Pro	operty A	ddress:	Plot 35					
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor			<b>Area</b>		(1a) x	<b>Av. He</b>	<b>ight(m)</b> 2.5	(2a) =	<b>Volume(m³)</b> 201.77	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e	e)+(1n)	80	).71	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	201.77	(5)
2. Ventilation rate:										
		econdary heating	, c	other		total			m <sup>3</sup> per hou	•
Number of chimneys		0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fan	us				Ī	3	× ′	10 =	30	(7a)
Number of passive vents					Γ	0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans = (6	6a)+(6b)+(7a	)+(7b)+(7	c) =	Г	30	<u> </u>	÷ (5) =	0.15	(8)
If a pressurisation test has be	en carried out or is intend	led, proceed	to (17), ot	therwise c	ontinue fro	om (9) to (				
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	esent, use the value corre				•	uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	led) or 0.1	(sealed	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				•	x (14) ÷ 1	- C			0	(15)
Infiltration rate					+ (11) + (1				0	(16)
Air permeability value, o			•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabilit Air permeability value applies	-					s boing u	and		0.4	(18)
Number of sides sheltered		is been done	or a degr	ee all per	ineability i	s being ut	500		1	(19)
Shelter factor	-		(	20) = 1 - [	0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorporation	ng shelter factor		(	21) = (18)	x (20) =				0.37	(21)
Infiltration rate modified fo	r monthly wind spee	d								
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
<b>.</b>	0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43		
	ate effec echanica		change ation:	rate for t	he appli	cable ca	se						0	(23a)
			using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)), othe	rwise (23b	) = (23a)		l	0	(23b)
			overy: effic							, , ,			0	(23c)
a) If	balance	d mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (22	2b)m + (	23b) × [ <sup>-</sup>	ا (23c) – 1	-	(===)
, (24a)m=		0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mech	anical ve	entilation	without	heat rec	overy (N	ЛV) (24b	)m = (22	2b)m + (i	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ver	ntilation o	or positiv	ve input v	ventilatio	on from o	outside					
	if (22b)n	n < 0.5 ×	< (23b), t	hen (240	c) = (23b	); otherv	wise (24	c) = (22k	o) m + 0.	5 × (23b	) 	·		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or wh		•					0 51				
(24d)m=	<u> </u>	0.61	en (24d) 0.6	0.58	0.58	0.56	(40)m =	0.5 + [(2	20)m² x	0.5]	0.59	0.59		(24d)
			rate - er							0.00	0.00	0.00		()
(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
				I	I	1	I	I	1	1	1			. ,
			eat loss p						_			1 -1 -		
ELEN	MENT	Gros area		Openin rr		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²₊ł		A X k ⟨J/K
Doors						2	x	1	=	2				(26)
Windo	ws Type	e 1				2.025	5 x1	/[1/( 1.4 )+	0.04] =	2.68				(27)
Windo	ws Type	2				4.05	x1.	/[1/( 1.4 )+	0.04] =	5.37				(27)
Windo	ws Type	93				8.651	x1.	/[1/( 1.4 )+	0.04] =	11.47				(27)
Walls	Type1	68.	8	14.7	3	54.07	7 X	0.18	=	9.73				(29)
Walls	Type2	4.3	5	2		2.35	x	0.18	= =	0.42	ז ר		$\overline{}$	(29)
Roof		76.	9	0		76.9	x	0.13		10	ז ד		₹ <u> </u>	(30)
Total a	area of e	lements	, m²			150.0	5							(31)
			ows, use e sides of ir				ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
			= S (A x		is and part			(26)(30)	) + (32) =			[	41.68	(33)
	apacity	-		-)					((28)	(30) + (32	2) + (32a).	(32e) =	1482.04	(34)
			, eter (TMF	- = Cm +	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For des	ign assess	sments wh	ere the de	tails of the				ecisely the	e indicative	values of	TMP in Ta	able 1f		
			tailed calci . x Y) cal		usina Ar	nondiv k	(					1	04.45	(36)
	-		are not kn			-	· ·					l	21.45	(30)
	abric he			()	(.	,			(33) +	(36) =			63.13	(37)
Ventila	ation 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		
(38)m=	40.65	40.37	40.09	38.77	38.53	37.38	37.38	37.17	37.82	38.53	39.02	39.54		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	103.78	103.5	103.22	101.9	101.65	100.51	100.51	100.3	100.95	101.65	102.15	102.67		
										Average =	Sum(39)1	12 /12=	101.9	(39)

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.29	1.28	1.28	1.26	1.26	1.25	1.25	1.24	1.25	1.26	1.27	1.27		
Numbe	or of day	/s in mo	nth (Tab	le 1a)				1		Average =	Sum(40) <sub>1</sub>	12 /12=	1.26	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
. ,														
4. Wa	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	349 x (TF	FA -13.9	9)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		48		(42)
Reduce	the annua	al average	hot water		5% if the a	welling is	designed	(25 x N) to achieve		se target o		.01		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	102.31	98.59	94.87	91.15	87.43	83.71	83.71	87.43	91.15	94.87	98.59	102.31		
_											m(44) <sub>112</sub> =		1116.12	(44)
Energy o			used - cal	. <u> </u>	· ·			DTm / 3600		·		c, 1d)		
(45)m=	151.72	132.7	136.93	119.38	114.55	98.85	91.6	105.11	106.36	123.96	135.31	146.94		
lf instant	aneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		1463.4	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:												
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
		•		ank in dw	•			· ,	<b>`</b>	(0) : (	47			
	ise if no storage		not wate	er (this ir	ICIUDES I	nstantar	neous co	ombi boil	ers) ente	er 'O' in (	47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b		,	• •					0		(49)
-				, kWh/ye	ear			(48) x (49)	) =			0		(50)
•				cylinder							L			. ,
		-		rom Tabl	le 2 (kW	h/litre/da	ay)					0		(51)
	-	eating s from Ta		on 4.3								0		(52)
		actor fro		2b								0		(52)
•				e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
0.		(54) in (5	•	,, <b>,</b>						,		0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	50), 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)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
		•				59)m = (	(58) ÷ 30	65 × (41)	m					
(moc	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for eac	h month	(61)m =	(60	)) ÷ 36	65 × (41)	m						
(61)m=	0	0	0	0	0		0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water l	neating	calculated	d fo	r eacl	n month	(62)m	= 0.85 ×	(45)m +	- (46)m +	(57)m +	(59)m + (61)m	
(62)m=	128.97	112.79	116.39	101.47	97.37	8	84.02	77.86	89.34	90.41	105.36	115.01	124.9	]	(62)
Solar DI	-IW input	calculated	using Ap	pendix G	or Appendix	к Н (	(negativ	ve quantity	) (enter	'0' if no sola	r contrib	ution to wate	er heating)	- )	
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	S ap	plies,	see Ap	pendix	G)					
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter												
(64)m=	128.97	112.79	116.39	101.47	97.37	8	84.02	77.86	89.34	90.41	105.36	115.01	124.9	]	
				•					Οι	tput from w	ater heat	er (annual)	112	1243.89	(64)
Heat g	ains fro	m water	heating	g, kWh/n	nonth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)n	n + (57)m	+ (59)m	n]	
(65)m=	32.24	28.2	29.1	25.37	24.34	2	21.01	19.46	22.34	22.6	26.34	28.75	31.22	]	(65)
inclu	ude (57)	m in calo	ulation	of (65)r	n only if c	vlir	nder is	s in the c	dwellin	g or hot w	vater is	from com	imunity I	neating	
		ains (see		. ,	-	,				5				Ŭ	
					~).										
Melab	Jan	ns (Table Feb	Mar	Apr	May	Γ	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m=	123.81	123.81	123.81			-	23.81	123.81	123.81		123.81	_	123.81		(66)
					L, equat									]	()
(67)m=	20.07	17.83	14.5	10.98	8.21	1	6.93	19a), a	9.73	13.06	16.58	19.35	20.63	1	(67)
												19.55	20.03	J	(07)
	<u> </u>	<u>,</u>	r						,	so see Ta		100.50	044.47	1	(69)
(68)m=	220.92	223.21	217.43				75.02	165.27	162.98		181.06	196.58	211.17	]	(68)
	<u> </u>	<u> </u>		<u> </u>		-				see Table			. <u> </u>	7	
(69)m=	35.38	35.38	35.38	35.38	35.38	3	35.38	35.38	35.38	35.38	35.38	35.38	35.38		(69)
Pumps	and fa	ns gains	(Table	5a)	-i							-		-	
(70)m=	0	0	0	0	0		0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	on (neg	ative val	ues) (Tab	ble	5)							_	
(71)m=	-99.05	-99.05	-99.05	-99.05	-99.05	-9	99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05		(71)
Water	heating	gains (T	able 5											_	
(72)m=	43.34	41.96	39.11	35.23	32.72	2	9.17	26.16	30.02	31.39	35.4	39.93	41.97	]	(72)
Total i	nterna	gains =					(66)	m + (67)m	+ (68)n	+ (69)m +	(70)m + (	(71)m + (72)	)m	-	
(73)m=	344.47	343.14	331.19	311.49	290.68	2	71.26	259.06	262.87	273.35	293.18	316.01	333.91	]	(73)
6. So	lar gain	s:								4		-		<b>.</b>	
Solar g	gains are	calculated	using so	ar flux froi	n Table 6a	and	associ	ated equa	tions to	convert to th	ne applica	able orienta	tion.		
Orienta		Access F		Are	а		Flu	х		g_		FF		Gains	
		Table 6d		m²			Tab	ole 6a		Table 6b	-	Table 6c		(W)	
Northea	ast <mark>0.9x</mark>	0.77	:	K 8	.65	x	1	1.28	x	0.63	x	0.7	=	29.83	(75)
Northea	ast <mark>0.9x</mark>	0.77		K 8	.65	x	2	2.97	x	0.63	× [	0.7	=	60.72	(75)
Northea	ast <mark>0.9x</mark>	0.77		< 8	.65	x	4	1.38	x	0.63		0.7		109.4	(75)
Northea	ast <mark>0.9x</mark>	0.77			.65	x	6	7.96	x	0.63		0.7	=	179.67	(75)
Northo	ast <mark>0.9x</mark>	0.77			.65	x		1.35	x	0.63		0.7	=	241.51	(75)

Г				-			1 1		-				_
Northeast 0.9x	0.77	×	8.65	×	9	7.38	X	0.63	×	0.7	=	257.47	(75)
Northeast 0.9x	0.77	x	8.65	×		91.1	X	0.63	×	0.7	=	240.86	(75)
Northeast 0.9x	0.77	x	8.65	×	7	2.63	X	0.63	×	0.7	=	192.02	(75)
Northeast 0.9x	0.77	x	8.65	×	5	0.42	x	0.63	×	0.7	=	133.31	(75)
Northeast 0.9x	0.77	x	8.65	×	2	8.07	x	0.63	×	0.7	=	74.21	(75)
Northeast 0.9x	0.77	x	8.65	×		14.2	x	0.63	×	0.7	=	37.53	(75)
Northeast 0.9x	0.77	x	8.65	x	9	9.21	x	0.63	×	0.7	=	24.36	(75)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	3	6.79		0.63	x	0.7	=	22.77	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	6	2.67		0.63	x	0.7	=	38.79	(79)
Southwest0.9x	0.77	x	2.03	×	8	5.75		0.63	×	0.7	=	53.07	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	1	06.25		0.63	×	0.7	=	65.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	1	19.01		0.63	×	0.7	=	73.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	1	18.15		0.63	×	0.7	=	73.12	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	1	13.91		0.63	×	0.7	=	70.49	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	1	04.39	1	0.63	×	0.7	=	64.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	g	2.85	1	0.63	×	0.7	=	57.46	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	6	9.27	İ	0.63	- ×	0.7	=	42.87	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	4	4.07	İ	0.63	×	0.7	=	27.27	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.03	×	3	1.49	1	0.63	- ×	0.7	=	19.49	(79)
Northwest 0.9x	0.77	x	4.05	×	1	1.28	x	0.63	×	0.7	=	13.97	(81)
Northwest 0.9x	0.77	x	4.05	×	2	2.97	x	0.63	- ×	0.7	=	28.43	(81)
Northwest 0.9x	0.77	x	4.05	۲ ۲	4	1.38	x	0.63	ا × آ	0.7	=	51.22	(81)
Northwest 0.9x	0.77	x	4.05	× ٦	6	7.96	x	0.63	×	0.7	=	84.11	(81)
Northwest 0.9x	0.77	x	4.05	۲ ×	9	1.35	x	0.63	- ×	0.7	=	113.06	(81)
Northwest 0.9x	0.77	x	4.05	۲×	9	7.38	x	0.63	- ×	0.7	= =	120.54	(81)
Northwest 0.9x	0.77	x	4.05	× ٦		91.1	x	0.63	×	0.7	=	112.76	(81)
Northwest 0.9x	0.77	x	4.05	۲ ×	7	2.63	x	0.63	- ×	0.7	=	89.89	(81)
Northwest 0.9x	0.77	x	4.05	۲×	5	0.42	x	0.63	ا × آ	0.7	=	62.41	(81)
Northwest 0.9x	0.77	x	4.05	۲ ×	2	8.07	x	0.63	- x	0.7	=	34.74	(81)
Northwest 0.9x	0.77	x	4.05	۲ ×		14.2	x	0.63	ا × آ	0.7	=	17.57	(81)
	0.77	x	4.05	۲×		9.21	x	0.63	- ×	0.7	=	11.4	(81)
Northwest 0.9x	0.77					_				-			` ´
Northwest 0.9x	0.77	^					1		_				
Solar gains in				 nth			<b>(83)</b>	ı = Sum(74)m	.(82)m				
	watts, ca				151.13	424.11	(83)m 346		. <mark>(82)</mark> m 151.81	82.38	55.25		(83)
Solar gains in	watts, ca 127.93	lculated 213.68	for each mo 329.53 428.	.22 4			<u> </u>			82.38	55.25	]	(83)
Solar gains in (83)m= 66.57	watts, ca 127.93	lculated 213.68	for each mo 329.53 428.	.22 4 )m + (			<u> </u>	.51 253.18		82.38 398.39	55.25 389.16	]	(83) (84)
Solar gains in (83)m= 66.57 Total gains – i	watts, ca 127.93 nternal ar 471.08	lculated 213.68 nd solar 544.87	for each mo 329.53 428. (84)m = (73) 641.02 718	.22 4 )m + ( 8.9 7	(83)m	, watts	346	.51 253.18	151.81			]	
Solar gains in (83)m= 66.57 Total gains – i (84)m= 411.04	watts, ca 127.93 nternal ar 471.08 nal tempo	lculated 213.68 nd solar 544.87 erature	for each mo 329.53 428. (84)m = (73) 641.02 718 (heating seas	.22 4 )m + ( 8.9 7 son)	(83)m 722.39	, watts 683.17	346 609	.51 253.18 .39 526.53	151.81			21	
Solar gains in (83)m= 66.57 Total gains – i (84)m= 411.04 7. Mean inter	watts, ca 127.93 nternal ar 471.08 nal tempo during he	lculated 213.68 nd solar 544.87 erature	for each mo 329.53 428. (84)m = (73) 641.02 718 (heating sease eriods in the	.22 4 )m + ( 3.9 7 son) living	(83)m 722.39 area 1	, watts 683.17 from Tat	346 609	.51 253.18 .39 526.53	151.81			21	(84)
Solar gains in (83)m= 66.57 Total gains – i (84)m= 411.04 7. Mean inter Temperature	watts, ca 127.93 nternal ar 471.08 nal tempo during he	lculated 213.68 nd solar 544.87 erature	for each mo           329.53         428.           (84)m = (73)           641.02         718           (heating sease)           eriods in the           iving area, h	.22 4 )m + ( 3.9 7 son) living	(83)m 722.39 area 1	, watts 683.17 from Tat	346 609 ble 9,	.51 253.18 .39 526.53	151.81	398.39		21	(84)
Solar gains in (83)m= 66.57 Total gains – i (84)m= 411.04 7. Mean inter Temperature Utilisation fac	watts, ca 127.93 nternal ar 471.08 nal tempo during he	Iculated 213.68 nd solar 544.87 erature eating p	for each mo           329.53         428.           (84)m = (73)           641.02         718           (heating sease)           eriods in the           iving area, h	22 4 )m + ( 3.9 7 son) living 1,m (s ay	(83)m 722.39 area t see Ta	, watts 683.17 from Tat ble 9a)	346 609 ble 9,	.51 253.18 .39 526.53 , Th1 (°C) ug Sep	445	398.39	389.16	21	(84)
Solar gains in (83)m= 66.57 Total gains – i (84)m= 411.04 7. Mean inter Temperature Utilisation fac (86)m= 1	watts, ca 127.93 nternal ar 471.08 during he tor for ga Feb 1	lculated 213.68 nd solar 544.87 erature eating p ins for l Mar 0.99	for each mo         329.53       428.         (84)m = (73)         641.02       718         (heating sear         eriods in the         iving area, hr         Apr       M         0.98       0.9	22 4 )m + ( 3.9 7 son) living 1,m (s ay 2	(83)m 722.39 area f see Ta Jun 0.77	, watts 683.17 from Tab ble 9a) Jul 0.62	346 609 ble 9, Ai	.51 253.18 .39 526.53 , Th1 (°C) ug Sep 7 0.92	151.8 <sup>4</sup> 445	398.39	389.16 Dec	21	(84)
Solar gains in (83)m= 66.57 Total gains – i (84)m= 411.04 7. Mean inter Temperature Utilisation fac	watts, ca 127.93 nternal ar 471.08 during he tor for ga Feb 1	lculated 213.68 nd solar 544.87 erature eating p ins for l Mar 0.99	for each mo         329.53       428.         (84)m = (73)         641.02       718         (heating sear         eriods in the         iving area, hr         Apr       M         0.98       0.9	22 4 )m + ( 3.9 7 son) living 1,m (s ay 2 1 (follo	(83)m 722.39 area f see Ta Jun 0.77	, watts 683.17 from Tab ble 9a) Jul 0.62	346 609 ble 9, Ai	.51 253.18 .39 526.53 , Th1 (°C) ug Sep 7 0.92 Table 9c)	151.8 <sup>4</sup> 445	398.39	389.16 Dec	21	(84)

Temp	erature	during h	eating p	periods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	19.85	19.85	19.86	19.87	19.87	19.88	19.88	19.89	19.88	19.87	19.87	19.86		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)			•			
(89)m=	1	1	0.99	0.97	0.88	0.68	0.47	0.56	0.86	0.98	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.49	18.63	18.9	19.3	19.64	19.84	19.88	19.87	19.73	19.3	18.83	18.47		(90)
									f	LA = Livin	g area ÷ (	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	llina) = fl	A 🗙 T1	+ (1 – fl	A) x T2					
(92)m=	18.83	18.98	19.25	19.65	20	20.2	20.25	20.24	20.08	19.64	19.18	18.82		(92)
	adjustn	nent to t	he mear	n internal	tempera	ature fro	n Table	4e, whe	ere appro	priate				
(93)m=	18.83	18.98	19.25	19.65	20	20.2	20.25	20.24	20.08	19.64	19.18	18.82		(93)
8. Spa	ace hea	ting requ	uiremen	t				1			1			
Set Ti	i to the r	mean int	ernal te	mperatui		ed at ste	ep 11 of	Table 9I	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut		r	<u> </u>	using Ta		lun	11	A	Con	Oct	Nev			
Litilion	Jan	Feb tor for g	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	1		0.99	0.96	0.88	0.71	0.52	0.6	0.88	0.98	1	1		(94)
	-			1 0.00 4)m x (84		0.71	0.02	0.0	0.00	0.00	1			(01)
(95)m=	410.28	469.32	, VV – (9 539.4	618.08	634.5	512.6	357.76	367.93	461.25	437.13	396.99	388.61		(95)
· · ·				perature			007.70	007.00	401.20	407.10	000.00	000.01		(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)
		-									7.1	4.2		(00)
		1456.73		1095	843.3		=[(39)m. 367.1	385.47		-	1000.6	1500.86		(97)
(97)m=						563.08			603.92	918.78	1233.6	1500.86		(97)
-		<u> </u>	1	or each n	nonth, KN	/Vh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=				0 40 00	455 04					050.05	000 00			
(00)	816.77	663.54	577.74	343.39	155.34	0	0	0	0	358.35	602.36	827.51		
(00)	816.77	663.54	577.74	343.39	155.34	0	0		0 Il per year				4344.98	(98)
		1	1	343.39 kWh/m²		0	0						4344.98 53.83	(98) (99)
Space	e heatin	1	ement in	ı kWh/m²		0	0							
Space 8c. Sp	e heatin bace co	ı g require oling rec	ement in Juiremer	ı kWh/m²	/year		0							
Space 8c. Sp	e heatin bace co	ı g require oling rec	ement in Juiremer	ו kWh/m² וt	/year		Jul							
Space 8c. Sp Calcu	e heatin bace co lated fo Jan	g require oling rec r June, Feb	ement in luiremer July and Mar	n kWh/m² nt August. Apr	/year See Tal May	ole 10b Jun	Jul	Tota	l per year	(kWh/year Oct	r) = Sum(9 Nov	8)15,912 =		
Space 8c. Sp Calcu	e heatin bace co lated fo Jan	g require oling rec r June, Feb	ement in luiremer July and Mar	n kWh/m² nt August. Apr	/year See Tal May	ole 10b Jun	Jul	Tota	l per year	(kWh/year Oct	r) = Sum(9 Nov	8)15,912 =		
Space 8c. Sp Calcu Heat I (100)m=	e heatin bace co lated fo Jan loss rate	g require oling red r June, Feb e Lm (ca	ement in juiremer July and Mar Iculated 0	ht August. Apr using 25	?/year See Tal May 5°C inter	ole 10b Jun nal temp	Jul	Tota Aug and exte	l per year Sep ernal ten	(kWh/year Oct	) = Sum(9 Nov e from 1	<sup>8</sup> ) <sub>15,912</sub> = Dec able 10)		(99)
Space 8c. Sp Calcu Heat I (100)m=	e heatin bace co lated fo Jan loss rate	g require oling rec r June, c Feb e Lm (ca	ement in juiremer July and Mar Iculated 0	ht KWh/m² August. Apr using 25	?/year See Tal May 5°C inter	ole 10b Jun nal temp	Jul	Tota Aug and exte	l per year Sep ernal ten	(kWh/year Oct	) = Sum(9 Nov e from 1	<sup>8</sup> ) <sub>15,912</sub> = Dec able 10)		(99)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m=	e heatin bace co lated fo Jan loss rate 0 ation fac	g require oling rec r June, c Feb e Lm (ca 0 ctor for lo	ement in July and Mar Iculated 0 oss hm 0	h kWh/m² August. Apr using 25 0	2/year See Tab May 5°C inter 0	ole 10b Jun nal temp 944.78 0.82	Jul perature 743.76	Tota Aug and exte 762.25	I per year of Sep ernal tem 0	(kWh/year Oct nperatur 0	) = Sum(9 Nov e from 1 0	B)15,912 = Dec able 10)		(100)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m=	e heatin bace co lated fo Jan loss rate 0 ation fac	g require oling rec r June, c Feb e Lm (ca 0 ctor for lo	ement in July and Mar Iculated 0 oss hm 0	t kWh/m² August. Apr using 25 0	2/year See Tab May 5°C inter 0	ole 10b Jun nal temp 944.78 0.82	Jul perature 743.76	Tota Aug and exte 762.25	I per year of Sep ernal tem 0	(kWh/year Oct nperatur 0	) = Sum(9 Nov e from 1 0	B)15,912 = Dec able 10)		(100)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m=	e heatin Dace coo lated fo Jan loss rate 0 ation fac 0 I loss, h 0	g require oling rec r June, c Feb e Lm (ca 0 ctor for lc 0 mLm (V 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0	t kWh/m² August. Apr using 25 0 (100)m x	2/year See Tab May 5°C inter 0 0 (101)m 0	ole 10b Jun nal temp 944.78 0.82 776.24	Jul perature 743.76 0.89 661.87	Tota Aug and exto 762.25 0.85 645.49	Sep ernal ten 0	(kWh/year Oct nperatur 0	) = Sum(9 Nov e from 7 0	8)15,912 = Dec able 10) 0		(100) (101)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m=	e heatin Dace coo lated fo Jan loss rate 0 ation fac 0 I loss, h 0	g require oling rec r June, c Feb e Lm (ca 0 ctor for lc 0 mLm (V 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0	t kWh/m² August. Apr using 25 0 (100)m x 0	2/year See Tab May 5°C inter 0 0 (101)m 0	ole 10b Jun nal temp 944.78 0.82 776.24	Jul perature 743.76 0.89 661.87	Tota Aug and exto 762.25 0.85 645.49	Sep ernal ten 0	(kWh/year Oct nperatur 0	) = Sum(9 Nov e from 7 0	8)15,912 = Dec able 10) 0		(100) (101)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin Dace cool lated fo Jan loss rate 0 ation fac 0 I loss, h 0 s (solar g 0	g require oling rec r June, c Feb e Lm (ca 0 ctor for lc 0 mLm (V 0 gains ca 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0	kWh/m² August. Apr using 25 0 (100)m x 0 for appli	2/year See Tab May 5°C inter 0 (101)m 0 cable we 0	0le 10b Jun nal temp 944.78 0.82 776.24 eather re 936.86	Jul perature 743.76 0.89 661.87 egion, se 889.12	Tota Aug and exte 762.25 0.85 645.49 ee Table 804.47	Sep ernal ten 0 10) 0	(kWh/year Oct nperatur 0 0 0	) = Sum(9 Nov e from 7 0 0	8)15,912 = Dec able 10) 0	53.83	(100) (101) (102)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin bace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar s 0 e cooling	g require oling red r June, c Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require	ement in July and Mar Iculated 0 Sss hm 0 Vatts) = 0 Iculated 0 ement for	kWh/m² August. Apr using 25 0 (100)m x 0 for appli	2/year See Tab May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c	0le 10b Jun nal temp 944.78 0.82 776.24 eather re 936.86	Jul perature 743.76 0.89 661.87 egion, se 889.12	Tota Aug and exte 762.25 0.85 645.49 ee Table 804.47	Sep ernal ten 0 10) 0	(kWh/year Oct nperatur 0 0 0	) = Sum(9 Nov e from 7 0 0	8)15.912 = Dec Table 10) 0 0	53.83	(100) (101) (102)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin bace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar s 0 e cooling	g require oling red r June, c Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require	ement in July and Mar Iculated 0 Sss hm 0 Vatts) = 0 Iculated 0 ement for	kWh/m² August. Apr using 25 0 (100)m x (100)m x for appli 0 r month,	2/year See Tab May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c	0le 10b Jun nal temp 944.78 0.82 776.24 eather re 936.86	Jul perature 743.76 0.89 661.87 egion, se 889.12	Tota Aug and exte 762.25 0.85 645.49 ee Table 804.47	Sep ernal ten 0 10) 0	(kWh/year Oct nperatur 0 0 0	) = Sum(9 Nov e from 7 0 0	8)15.912 = Dec Table 10) 0 0	53.83	(100) (101) (102)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin bace cooling lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar g 0 e cooling 0 04)m to 0	g require oling red r June, C Feb e Lm (ca 0 ttor for lo 0 mLm (V 0 gains ca 0 g require 2 zero if ( 0	ement in July and Mar Iculated 0 oss hm 0 /atts) = 0 Iculated 0 lculated 0 ement fo 104)m <	kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 (100)m x 0 for appli 0 r month, < 3 × (98	2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m	ole 10b Jun nal temp 944.78 0.82 776.24 eather re 936.86	Jul perature 743.76 0.89 661.87 egion, se 889.12 continue	Tota Aug and extr 762.25 0.85 645.49 ee Table 804.47 ous ( kW	Sep           ernal ten           0           10)           0           10)           0           10)           0           10)           0           Total	(kWh/year Oct nperatur 0 0 0 24 x [(10 0 = Sum(	$\frac{Nov}{e \text{ from } 1}$	8)15,912         Box         able 10)         0         0         0         102)m]>         0         =	53.83	(100) (101) (102) (103)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec	e heatin pace coo lated fo Jan loss rate 0 ation fac 0 il loss, h 0 is (solar g 0 e cooling 04)m to 0 1 fraction	g require oling rec r June, Feb e Lm (ca 0 ctor for lc 0 mLm (V 0 gains ca 0 g require 2 zero if ( 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement fc 104)m < 0	kWh/m²         August.         Apr         using 25         0         (100)m ×         0         for appli         0         or month,         3 × (98)         0	2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m	ole 10b Jun nal temp 944.78 0.82 776.24 eather re 936.86	Jul perature 743.76 0.89 661.87 egion, se 889.12 continue	Tota Aug and extr 762.25 0.85 645.49 ee Table 804.47 ous ( kW	Sep           ernal ten           0           10)           0           10)           0           10)           0           10)           0           Total	(kWh/year Oct nperatur 0 0 24 x [(10 0	$\frac{Nov}{e \text{ from } 1}$	8)15,912         B)15,912         able 10)         0         0         0         102)m]>         0         =	53.83	(100) (101) (102) (103)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect Intermi	e heatin bace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il loss, h 0 is (solar g 0 e cooling 0 04)m to 0 1 fraction	g require oling red r June, C Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require 2 zero if ( 0 n actor (Ta	ement in Juiremen July and Mar Iculated 0 Sss hm 0 Vatts) = 0 Iculated 0 Sement for 104)m < 0	kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, < 3 x (98 0	2/year See Tab May 5°C inter 0 (101)m 0 cable we 0 whole c )m 0	ole 10b Jun nal temp 944.78 0.82 776.24 eather re 936.86 <i>welling,</i> 115.65	Jul perature 743.76 0.89 661.87 egion, se 889.12 continue 169.07	Tota Aug and exte 762.25 0.85 645.49 ee Table 804.47 ous ( kW 118.28	Sep           ernal tem           0           10)           0           10)           0           10)           0           10)           0           10)           0           10)           0           10)           0           10)           0           10)           0           10)           0           10)           0           10)           0           10)	(kWh/year Oct nperatur 0 0 24 x [(10 0 = Sum( cooled a	Sum(9) = Sum(9)   Sum(9)	$ \begin{array}{c}         Dec \\         -able 10) \\         0 \\         0 \\         0 \\         $	53.83 ( (41)m 403	(100) (101) (102) (103)
Space 8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec	e heatin pace coo lated fo Jan loss rate 0 ation fac 0 il loss, h 0 is (solar g 0 e cooling 04)m to 0 1 fraction	g require oling rec r June, C Feb e Lm (ca 0 ctor for lc 0 mLm (V 0 gains ca 0 g require 2 zero if ( 0	ement in July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement fc 104)m < 0	kWh/m²         August.         Apr         using 25         0         (100)m ×         0         for appli         0         or month,         3 × (98)         0	2/year See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c m	ole 10b Jun nal temp 944.78 0.82 776.24 eather re 936.86	Jul perature 743.76 0.89 661.87 egion, se 889.12 continue	Tota Aug and extr 762.25 0.85 645.49 ee Table 804.47 ous ( kW	Sep           ernal tem           0           Total           f C =           0	(kWh/year Oct nperatur 0 0 0 24 x [(10 0 = Sum( cooled a 0	$\frac{Nov}{e \text{ from } 1} = \text{Sum(9)}$	8)15,912         B)15,912         able 10)         0         0         0         102)m]>         0         =	53.83 ( (41)m 403	(100) (101) (102) (103) (104) (105)
Space 8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolecc Intermi (106)m=	e heatin bace co lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il loss, h 0 is (solar g 0 be cooling 04)m to 0 1 fraction ttency fa 0	g require oling red r June, C Feb e Lm (ca o tor for lo o tor for lo o mLm (V 0 gains ca o g require o zero if ( 0 n actor (Ta 0	ement in July and Mar Iculated 0 sss hm 0 Vatts) = 0 Iculated 0 ement fo 104)m < 0	kWh/m <sup>2</sup> August. Apr using 25 0 (100)m x 0 for appli 0 r month, < 3 x (98 0	2/year See Tab May 5°C inter 0 (101)m 0 cable we 0 whole c )m 0	0.82 0.82 0.82 776.24 eather re 936.86 <i>welling,</i> 115.65	Jul perature 743.76 0.89 661.87 egion, se 889.12 continue 169.07	Tota Aug and exte 762.25 0.85 645.49 ee Table 804.47 ous ( kW 118.28	Sep           ernal tem           0           Total           f C =           0	(kWh/year Oct nperatur 0 0 24 x [(10 0 = Sum( cooled a	$\frac{Nov}{e \text{ from } 1} = \text{Sum(9)}$	$ \begin{array}{c}         Dec \\         -able 10) \\         0 \\         0 \\         0 \\         $	53.83 ( (41)m 403	(100) (101) (102) (103) (104) (105) (106)

Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n	-	-	-	_	_	
(107)m= 0 0 0 0 0 28.91 42.27 29.57 0 0 0 0 0														
-		Total = Sum(10.7) = $100.75$												(107)
													(108)	
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric	Energ	y Efficier	псу						(99)	+ (108) =	=		55.08	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								63.35	(109)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Stroma	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP	2012		Softwa	are Ver	sion:		Versio	n: 1.0.5.9	
		Р	roperty /	Address:	Plot 35					
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor				<b>a(m²)</b> 0.71	(1a) x	<b>Av. He</b> i	<b>ight(m)</b> 2.5	(2a) =	<b>Volume(m<sup>3</sup>)</b> 201.77	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)-	+(1e)+(1r	n) <u> </u>	0.71	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	201.77	(5)
2. Ventilation rate:										
	main heating	seconda heating	у	other		total			m <sup>3</sup> per hou	•
Number of chimneys			+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues		0	 +	0	i = [	0	× 2	20 =	0	(6b)
Number of intermittent far	IS					0	x	10 =	0	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
					L					
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans	= (6a)+(6b)+(7	/a)+(7b)+(7	7c) =		0	· .	÷ (5) =	0	(8)
If a pressurisation test has be		tended, procee	d to (17), c	otherwise o	continue fro	om (9) to (	(16)			_
Number of storeys in th Additional infiltration	e dwelling (ns)						[(0)	11-0-1	0	(9)
Structural infiltration: 0.2	25 for steel or tim	her frame or	0 35 for	masonr	v constr	uction	[(9)-	1]x0.1 =	0	(10) (11)
if both types of wall are pre deducting areas of opening	esent, use the value c								0	](,,)
If suspended wooden fl	oor, enter 0.2 (un	sealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else ente	r 0							0	(13)
Percentage of windows	and doors draug	nt stripped							0	(14)
Window infiltration				0.25 - [0.2			(		0	(15)
Infiltration rate				(8) + (10) ·					0	(16)
Air permeability value, o			•	•	•	etre of e	nvelope	area	3	(17)
If based on air permeabilit Air permeability value applies	•					is boing us	od		0.15	(18)
Number of sides sheltered		st has been dor	ie ol a deg	nee an per	πεασπιτγ ι	is being us	seu		1	(19)
Shelter factor	-			(20) = 1 - [	[0.075 x (1	9)] =			0.92	(20)
Infiltration rate incorporati	ng shelter factor			(21) = (18)	) x (20) =				0.14	(21)
Infiltration rate modified for	r monthly wind sp	beed						ľ		
Jan Feb I	Var Apr M	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.	3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 4									
	.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18		
· · · · ·	I	•							1	

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-	-			
	0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
		<i>ctive air (</i> al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othei	rwise (23b	) = (23a)			0.5	(23b)
								n Table 4h		, , ,			79.05	(23c)
			-	-	-			HR) (24a		2b)m + ()	23b) x [	1 – (23c)		(200)
(24a)m=		0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(24a)
b) If	balance	d mecha	anical ve	ntilation	without	heat rec	covery (N	MV) (24b	)m = (22	1 2b)m + (2	23b)		1	
, (24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ver	tilation o	or positiv	ve input v	ventilatio	on from c	outside				1	
,	if (22b)n	n < 0.5 ×	: (23b), t	hen (240	c) = (23b	); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b	)		_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•			on from I						
	<u> </u>		, ,	,	·	, i	<u> </u>	0.5 + [(2	,				1	(244)
(24d)m=		0	0	0	0	0	0	0	0	0	0	0		(24d)
				· · ·		r i	, <u>,</u>	d) in boy	· ,	0.05	0.00	0.07	1	(25)
(25)m=	0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(25)
3. He	at losse	s and he	eat loss p	paramete	er:									
ELEN	IENT	Gros area	-	Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²⋅l		X k I/K
Doors						2	x	1.4	=	2.8				(26)
Windo	ws Type	e 1				2.025	5 x1	/[1/( 1.4 )+	0.04] =	2.68				(27)
Windo	ws Type	2				4.05	x1	/[1/( 1.4 )+	0.04] =	5.37				(27)
Windo	ws Type	93				8.651	x1	/[1/( 1.4 )+	0.04] =	11.47	=			(27)
Walls <sup>-</sup>	Type1	68.8	3	14.73	3	54.07	, х	0.15	] = [	8.11	Ξ r			(29)
Walls <sup>-</sup>	Type2	4.3	5	2		2.35	x	0.14	= [	0.33	i F		$\exists$	(29)
Roof		76.9	Э	0		76.9	×	0.1		7.69			$\exists$	(30)
Total a	area of e	lements	, m²			150.0	5		เ		L			(31)
		roof winde					ated using	g formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2	
		s, W/K =			,			(26)(30)	+ (32) =				38.46	(33)
		Cm = S(	•	,					((28)	(30) + (32	2) + (32a).	(32e) =	1482.04	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
	0	ments wh ad of a dei			construct	ion are not	t known pr	recisely the	indicative	e values of	TMP in T	able 1f	L	
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						22.59	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			61.05	(37)
Ventila	ation hea	at loss ca	alculated	monthly	/			1	(38)m	= 0.33 × (	25)m x (5		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	18.75	18.52	18.29	17.14	16.91	15.75	15.75	15.52	16.21	16.91	17.37	17.83		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	79.8	79.57	79.34	78.18	77.95	76.8	76.8	76.57	77.26	77.95	78.42	78.88		_
										Average =	Sum(39)1	12 /12=	78.13	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.99	0.99	0.98	0.97	0.97	0.95	0.95	0.95	0.96	0.97	0.97	0.98		
Numb	er of day		nth (Tab	le 12)	I			!		Average =	Sum(40)1.	.12 /12=	0.97	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13		48		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		7.9		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	107.7	103.78	99.86	95.95	92.03	88.11	88.11	92.03	95.95	99.86	103.78	107.7		<b>-</b>
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x [	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1174.86	(44)
(45)m=	159.71	139.68	144.14	125.66	120.58	104.05	96.42	110.64	111.96	130.48	142.43	154.67		
lf instan	taneous w	ater heati	na at point	t of use (no	hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		1540.42	(45)
(46)m=	23.96	20.95	21.62	18.85	18.09	15.61	14.46	16.6	16.79	19.57	21.36	23.2		(46)
· · ·	storage		_											
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel	(	0		(47)
	•	•		ank in dw	•			· ·	ara) ant	or (0) in (	47)			
	storage		not wate	er (uns n	iciuues i	nstantai	ieous cu	ombi boil	ers) erne		47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):				(	C		(48)
Tempe	erature fa	actor fro	m Table	2b							(	C		(49)
			-	e, kWh/ye				(48) x (49)	) =		11	10		(50)
,				cylinder l rom Tabl							0.	02		(51)
		-	ee secti			1,1110,00	<b>xy</b> )				0.	02		(01)
	-	from Ta									1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
	. , .	(54) in (5	,					((===))			1.	03		(55)
			culated 1	for each	month	·	1	((56)m = (	55) × (41)i I	m I	1			
(56)m= If cylinde	32.01 er contains	28.92 s dedicate	32.01 d solar sto	30.98 orage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01 m Append	ix H	(56)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Drimor		loss (ar	l nual) fro	I m Table								 C		(58)
Primar	y circuit	loss cal	culated		month (		. ,	65 × (41)				~		()
•		-	· · · · · ·	r	1	1		ng and a	· ·	i	, 			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for each	n month	(61)m =	(60) ÷ 3	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat rec	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × 0	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	214.99	189.61	199.42	179.16	175.86	157.54	151.69	165.92	165.46	185.76	195.92	209.95		(62)
Solar DH	-IW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	applies	, see Ap	pendix (	G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	vater hea	ter											
(64)m=	214.99	189.61	199.42	179.16	175.86	157.54	151.69	165.92	165.46	185.76	195.92	209.95		
		-		-	-			Out	out from w	ater heate	r (annual)₁	12	2191.26	(64)
Heat g	ains fro	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m=	97.32	86.39	92.15	84.58	84.31	77.39	76.28	81.01	80.02	87.61	90.15	95.65		(65)
inclu	ide (57)	)m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Int	ernal d	ains (see	e Table :	5 and 5a	):	-		-				-	-	
	Ŭ	ns (Table			, 									
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m=	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57	148.57		(66)
Liahtin	a aains	; (calcula	ted in A	ppendix	L. equat	on L9 o	r L9a). a	lso see '	Table 5			1	1	
(67)m=	50.18	44.57	36.25	27.44	20.51	17.32	18.71	24.32	32.65	41.45	48.38	51.58	1	(67)
Applia	nces da	ains (calc	ulated in	n Appen	dix L. ea	uation L	13 or L1	i 3a), also	) see Ta	ble 5	1	ļ	1	
(68)m=	329.73	<u> </u>	324.53	306.17	283	261.22	246.68	243.25	251.88	270.23	293.4	315.18	]	(68)
		s (calcula	L Ited in A		L equat	ion I 15		) also se	i ee Table		I		1	
(69)m=	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	52.33	1	(69)
		I Ins gains											1	
(70)m=					0	0	0	0	0	0	0	0	1	(70)
		vaporatic	-					-				-	l	. ,
(71)m=			-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	-99.05	1	(71)
		gains (1		00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00	00.00	l	()
(72)m=	130.81	128.55	123.85	117.47	113.32	107.49	102.53	108.88	111.14	117.75	125.21	128.56	1	(72)
				117.47	113.32						(1)m + (72)		J	(12)
	612.58	l gains = 608.13	586.49	552.94	518.7	487.89	469.77	478.32	497.52	531.29	568.85	597.17	1	(73)
(73)m=	lar gain		560.49	552.94	516.7	407.09	409.77	476.32	497.52	531.29	506.65	597.17		(13)
		s. calculated	using sola	ar flux from	Table 6a a	and assoc	iated equa	tions to co	onvert to th	e applical	ole orientat	ion		
		Access F	0	Area		Flu	•		g_		FF		Gains	
Onona		Table 6d		m²			ble 6a	Т	able 6b	Т	able 6c		(W)	
Northea	ast <mark>0.9x</mark>	0.77	x	8.0	35	x 1	1.28	x	0.63	ר × ר	0.7	=	29.83	(75)
Northea		0.77	^				22.97		0.63		0.7		60.72	(75)
Northea		0.77					1.38		0.63		0.7		109.4	(75)
Northea		0.77	^				67.96		0.63		0.7		179.67	](75) ](75)
Northea		0.77					91.35		0.63		0.7		241.51	(75)
11011100	0.3	0.77	^	0.0	55	<u>^  </u> ະ	11.35	<b>^</b>	0.63		0.7	-	241.51	(73)

					_									-	_
Northeast 0.9x	0.77	x	8.6	5	×	9	7.38	x		0.63	x	0.7	=	257.47	(75)
Northeast 0.9x	0.77	x	8.6	5	×	ç	91.1	x		0.63	x	0.7	=	240.86	(75)
Northeast 0.9x	0.77	X	8.6	5	×	7	2.63	x		0.63	x	0.7	=	192.02	(75)
Northeast 0.9x	0.77	x	8.6	5	×	5	0.42	x		0.63	x	0.7	=	133.31	(75)
Northeast 0.9x	0.77	x	8.6	5	×	2	8.07	x		0.63	x	0.7	=	74.21	(75)
Northeast 0.9x	0.77	x	8.6	5	x	1	4.2	x		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	x	8.6	5	×	ç	9.21	x		0.63	x	0.7	=	24.36	(75)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	×	3	6.79			0.63	x	0.7	=	22.77	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	x	6	2.67			0.63	x	0.7	=	38.79	(79)
Southwest0.9x	0.77	x	2.0	3	×	8	5.75			0.63	x	0.7	=	53.07	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	x	1(	06.25			0.63	x	0.7	=	65.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	×	11	19.01			0.63	x	0.7	=	73.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	×	11	18.15			0.63	x	0.7	=	73.12	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	x	11	13.91			0.63	x	0.7	=	70.49	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	×	1(	)4.39			0.63	x	0.7	=	64.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	×	9	2.85			0.63	x	0.7	=	57.46	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	×	6	9.27			0.63	x	0.7	=	42.87	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	×	4	4.07			0.63	x	0.7	=	27.27	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	3	×	3	1.49			0.63	×	0.7	=	19.49	(79)
Northwest 0.9x	0.77	x	4.0	5	×	1	1.28	x		0.63	x	0.7	=	13.97	(81)
Northwest 0.9x	0.77	x	4.0	5	×	2	2.97	x		0.63	×	0.7	=	28.43	(81)
Northwest 0.9x	0.77	x	4.0	5	×	4	1.38	x		0.63	×	0.7	=	51.22	(81)
Northwest 0.9x	0.77	x	4.0	5	×	6	7.96	x		0.63	x	0.7	=	84.11	(81)
Northwest 0.9x	0.77	x	4.0	5	×	9	1.35	x		0.63	×	0.7	=	113.06	(81)
Northwest 0.9x	0.77	x	4.0	5	×	9	7.38	x		0.63	×	0.7	=	120.54	(81)
Northwest 0.9x	0.77	x	4.0	5	×	ç	91.1	x		0.63	x	0.7	=	112.76	(81)
Northwest 0.9x	0.77	x	4.0	5	×	7	2.63	x		0.63	x	0.7	=	89.89	(81)
Northwest 0.9x	0.77	x	4.0	5	×	5	0.42	x		0.63	x	0.7	=	62.41	(81)
Northwest 0.9x	0.77	x	4.0	5	×	2	8.07	x		0.63	x	0.7	=	34.74	(81)
Northwest 0.9x	0.77	x	4.0	5	×	1	4.2	x		0.63	x	0.7	=	17.57	(81)
Northwest 0.9x	0.77	x	4.0	5	×	ç	9.21	x		0.63	x	0.7	=	11.4	(81)
-					-										_
Solar <u>g</u> ains in	watts, ca	lculated	for each	n month	۱ <u> </u>			(83)m	n = Sur	m(74)m .	(82)m				
(83)m= 66.57	127.93	213.68	329.53	428.22		1.13	424.11	346	.51	253.18	151.81	82.38	55.25		(83)
Total gains – i	nternal a	nd solar	(84)m =	: (73)m	+ (8	3)m ,	, watts					1		1	
(84)m= 679.15	736.06	800.17	882.47	946.92	93	9.01	893.89	824	.83	750.7	683.11	651.23	652.43		(84)
7. Mean inter	rnal temp	erature	(heating	seasor	า)										
Temperature	during h	eating p	eriods in	the livi	ing a	area f	rom Tab	ole 9,	, Th1	(°C)				21	(85)
Utilisation fac	ctor for ga	ains for I	iving are	a, h1,m	n (se	e Ta	ble 9a)						-		_
		Mar	Apr	May	J	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Jan	Feb	Iviai													
(86)m= 0.92	0.9	0.86	0.77	0.64	0.	.48	0.36	0.4	11	0.61	0.8	0.9	0.93		(86)
	0.9	0.86	0.77								0.8	0.9	0.93		(86)
(86)m= 0.92	0.9	0.86	0.77		ollov				able		0.8 20.38		0.93 19.31	]	(86)

Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.09	20.1	20.1	20.11	20.11	20.12	20.12	20.13	20.12	20.11	20.11	20.1		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.91	0.89	0.84	0.74	0.6	0.43	0.3	0.34	0.55	0.77	0.88	0.92		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	17.9	18.19	18.7	19.34	19.8	20.04	20.1	20.1	19.94	19.38	18.57	17.85		(90)
									f	LA = Livin	ig area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	18.39	18.66	19.11	19.69	20.11	20.34	20.4	20.39	20.24	19.72	18.99	18.35		(92)
Apply	adjustr	nent to t	he mear	n interna	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.39	18.66	19.11	19.69	20.11	20.34	20.4	20.39	20.24	19.72	18.99	18.35		(93)
			uirement											
				mperatui using Ta		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calo	ulate	
the ut	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	· ·	Iviay	Jun	Jui	Aug		001		Dee		
(94)m=	0.89	0.87	0.82	0.73	0.6	0.44	0.32	0.36	0.56	0.76	0.86	0.9		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (84	4)m	1		1	1		1			
(95)m=	605.54	638.1	655.25	641.98	565.26	414.21	284.5	295.19	420.1	518.75	559.41	587.06		(95)
Month	nly aver	age exte	ernal terr	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
				al tempe				<u> </u>	r í í			i	I	
(97)m=		1094.58			655.74	440.74	291.86	305.66	474.46	710.93	932.28	1116		(97)
-	e heatin 386.15	- · ·	1	or each m		í –	1		1		r.	202.52	l	
(98)m=	386.15	306.75	257.11	145.36	67.32	0	0	0	0	142.98	268.47	393.53	1067.67	
					.,			Tota	al per year	(kvvn/year	r) = Sum(9	8)15,912 =	1967.67	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								24.38	(99)
9b. En	ergy red	quiremer	nts – Coi	mmunity	heating	scheme	•							
		•		ting, spa condary/		-		• •	•		unity scł	neme.	0	(301)
						-	-		1) 0 11 11	Une			0	4
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30′	1) =						1	(302)
				eat from se mal and wa						up to four	other heat	sources; t	he latter	
			-	ity boiler			318110113.	See Appel	nuix C.				1	(303a)
				r m Comn		oilers				(3	02) x (303	a) =	1	(304a)
		·		method			r commi	inity hea	atina svs		- , (	- /	1	(305)
				12c) for c		,			aning by b					(306)
				120) 101 0	Johnnan	ity neatin	iy syste						1.05	
-	heating space	-	requiren	nent									<b>kWh/year</b> 1967.67	7
	•	-	' munity b						(98) x (30	04a) x (30	5) x (306) :	=	2066.06	 (307a)
•			•	mentary	heating	system	in % (fro	om Table					0	(308
		- senadi	,		licaling	5,500				FPOIGN	_,		U U	

Space heating requirement from second	dary/supplementary system	(98) x (301) x 10	00 ÷ (308) =		0	(309)
Water heating Annual water heating requirement				Γ	2191.26	]
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (	(305) x (306) =		2300.83	_ (310a)
Electricity used for heat distribution	0.0	01 × [(307a)(307e	e) + (310a)(310e	e)] =	43.67	(313)
Cooling System Energy Efficiency Ratio	)				0	(314)
Space cooling (if there is a fixed cooling	system, if not enter 0)	= (107) ÷ (314) :	=		0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra		e			313.86	(330a)
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b	) + (330g) =		313.86	(331)
Energy for lighting (calculated in Append	dix L)				354.49	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)				-815.12	(333)
Electricity generated by wind turbine (Ap	opendix M) (negative quantity)				0	(334)
10b. Fuel costs – Community heating s	scheme					-
	<b>Fuel</b> kWh/year		l <b>Price</b> ble 12)		<b>Fuel Cost</b> £/year	
Space heating from CHP	(307a) x		4.24 x 0.0	)1 =	87.6	(340a)
Water heating from CHP	(310a) x		4.24 × 0.0	)1 =	97.56	(342a)
		Fuel	Price			-
Pumps and fans	(331)		13.19 × 0.0	)1 =	41.4	(349)
Energy for lighting	(332)		13.19 × 0.0	)1 =	46.76	(350)
Additional standing charges (Table 12)					120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (345)(354) =			Г	393.31	(355)
11b. SAP rating - Community heating s					393.31	](555)
				_		
Energy cost deflator (Table 12) Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =				0.42	(356)
SAP rating (section12)					1.31 81.67	(357)
12b. CO2 Emissions – Community heat	ing scheme				01.07	
	Er	nergy Vh/year	Emission fac kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)						
	If there is CHP using two fue	els repeat (363) to (	366) for the secon	d fuel	94	(367a)
CO2 associated with heat source 1	If there is CHP using two fue [(307b)+(310b)] >		366) for the secon	d fuel =	94 1003.45	(367a) (367)

Total CO2 associated with community systems	(363)(366) + (368)(372	<b>!)</b>	= 1026.12	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantan	eous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		1026.12	(376)
CO2 associated with electricity for pumps and fans within dwel	ling (331)) x	0.52	= 162.89	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= 183.98	(379)
Energy saving/generation technologies (333) to (334) as applic Item 1		0.52 x 0.01 =	-423.05	(380)
Total CO2, kg/year sum of (376)(382) =			949.95	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			11.77	(384)
El rating (section 14)			89.87	(385)
13b. Primary Energy – Community heating scheme				
	Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and water heating (not CH Efficiency of heat source 1 (%) If there is CHP usin	I <b>P)</b> ng two fuels repeat (363) to (	(366) for the second fu	el 94	(367a)
Efficiency of heat source 1 (%) If there is CHP usin		· · ·	el 94 = 5667.66	(367a) (367)
Efficiency of heat source 1 (%) If there is CHP usin	ng two fuels repeat (363) to (	1.22	34	
Efficiency of heat source 1 (%)If there is CHP usinEnergy associated with heat source 1[(307b)	ng two fuels repeat (363) to ( +(310b)] x 100 ÷ (367b) x	1.22	= 5667.66	(367)
Efficiency of heat source 1 (%)If there is CHP usinEnergy associated with heat source 1[(307b)Electrical energy for heat distribution[(307b)	ng two fuels repeat (363) to ( +(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372	1.22 	= <u>5667.66</u> = <u>134.06</u>	(367)
Efficiency of heat source 1 (%)If there is CHP usinEnergy associated with heat source 1[(307b)Electrical energy for heat distributionTotal Energy associated with community systems	ng two fuels repeat (363) to ( +(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372	1.22 	= <u>5667.66</u> = <u>134.06</u> = <u>5801.72</u>	(367) (372) (373)
Efficiency of heat source 1 (%) If there is CHP usin Energy associated with heat source 1 [(307b) Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified otherwise,</i>	ng two fuels repeat (363) to ( +(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C, (309) x	1.22 	= <u>5667.66</u> = <u>134.06</u> = <u>5801.72</u> <u>5801.72</u>	(367) (372) (373) (373)
Efficiency of heat source 1 (%)If there is CHP usinEnergy associated with heat source 1[(307b)Electrical energy for heat distributionTotal Energy associated with community systemsif it is negative set (373) to zero (unless specified otherwise,Energy associated with space heating (secondary)	ng two fuels repeat (363) to ( +(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C, (309) x	1.22 	= 5667.66 $= 134.06$ $= 5801.72$ $= 0$	(367) (372) (373) (373) (373) (374)
Efficiency of heat source 1 (%)If there is CHP usinEnergy associated with heat source 1[(307b)Electrical energy for heat distributionTotal Energy associated with community systems <i>if it is negative set (373) to zero (unless specified otherwise,</i> Energy associated with space heating (secondary)Energy associated with water from immersion heater or instant	ng two fuels repeat (363) to ( +(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C, (309) x aneous heater(312) x	1.22 	$= \frac{5667.66}{134.06}$ $= \frac{134.06}{5801.72}$ $= 0$ $= 0$	(367) (372) (373) (373) (373) (374) (375)
Efficiency of heat source 1 (%)If there is CHP usinEnergy associated with heat source 1[(307b)Electrical energy for heat distributionTotal Energy associated with community systemsif it is negative set (373) to zero (unless specified otherwise,Energy associated with space heating (secondary)Energy associated with water from immersion heater or instantTotal Energy associated with space and water heating	ng two fuels repeat (363) to ( +(310b)] x 100 $\div$ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C, (309) x aneous heater(312) x (373) + (374) + (375) = (315) x	1.22 	$= \frac{5667.66}{134.06}$ $= \frac{134.06}{5801.72}$ $= 0$ $= 0$ $= 0$ $5801.72$	(367) (372) (373) (373) (373) (374) (375) (376)
Efficiency of heat source 1 (%) If there is CHP usin Energy associated with heat source 1 [(307b) Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified otherwise,</i> Energy associated with space heating (secondary) Energy associated with water from immersion heater or instant Total Energy associated with space and water heating Energy associated with space cooling	ng two fuels repeat (363) to ( +(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C, (309) x aneous heater(312) x (373) + (374) + (375) = (315) x	1.22       0       1.22       3.07       3.07	$= \frac{34}{5667.66}$ $= \frac{134.06}{5801.72}$ $= 0$ $= 0$ $= 0$ $5801.72$ $= 0$	(367) (372) (373) (373) (373) (374) (375) (376) (377)
Efficiency of heat source 1 (%) If there is CHP usin Energy associated with heat source 1 [(307b) Electrical energy for heat distribution Total Energy associated with community systems <i>if it is negative set (373) to zero (unless specified otherwise,</i> Energy associated with space heating (secondary) Energy associated with water from immersion heater or instant Total Energy associated with space and water heating Energy associated with space cooling Energy associated with electricity for pumps and fans within dw	ng two fuels repeat (363) to ( +(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 see C7 in Appendix C, (309) x aneous heater(312) x (373) + (374) + (375) = (315) x velling (331)) x (332))) x	1.22       0       1.22       3.07       3.07	$= \frac{34}{5667.66}$ $= \frac{134.06}{5801.72}$ $= \frac{0}{0}$ $= 0$ $= 0$ $= 0$ $= 0$ $= 0$ $= 963.55$ $= 1088.3$	(367) (372) (373) (373) (373) (374) (375) (376) (377) (377) (378)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 2	2012		Softwa	are Ver	sion:		Versio	n: 1.0.5.9	
		Pi	roperty /	Address:	Plot 35					
Address :										
1. Overall dwelling dimer	nsions:									
One was all file and				a(m²)	<i></i>	<b></b>	ight(m)	1	Volume(m <sup>3</sup>	
Ground floor				0.71	(1a) x	2	2.5	(2a) =	201.77	(3a)
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)+	(1e)+(1n	) 8	0.71	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	l)+(3e)+	.(3n) =	201.77	(5)
2. Ventilation rate:				_						
	main heating	secondar heating	У	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0 +	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	ī + [	0	-   = [	0	x	20 =	0	(6b)
Number of intermittent far	IS IS	L				3	x ′	10 =	30	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
ramon of hadrood gad in						0			0	
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans =	(6a)+(6b)+(7	a)+(7b)+(7	7c) =		30	. [	÷ (5) =	0.15	(8)
If a pressurisation test has be	een carried out or is inte	ended, proceed	d to (17), c	otherwise o	continue fr	om (9) to (	(16)			
Number of storeys in th	e dwelling (ns)								0	(9)
Additional infiltration						_	[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.					•	uction			0	(11)
if both types of wall are pro deducting areas of openin		rresponding to	lile great	er wan are	a (allel					
If suspended wooden fl	oor, enter 0.2 (uns	ealed) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter	0							0	(13)
Percentage of windows	and doors draugh	t stripped							0	(14)
Window infiltration				0.25 - [0.2		-			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value, o			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabili	-					:			0.4	(18)
Air permeability value applies Number of sides sheltered		nas been don	e or a deg	free all pei	meability	is being u	sea		4	(19)
Shelter factor	4			(20) = 1 -	[0.075 x (1	9)] =			1 0.92	(10)
Infiltration rate incorporati	ng shelter factor			(21) = (18)	) x (20) =				0.37	(21)
Infiltration rate modified for	or monthly wind spe	eed								
Jan Feb	Mar Apr Ma	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (20-) (22										
Wind Factor (22a)m = (22 (22a)m= 1.27 1.25 1	2)m ÷ 4 .23 1.1 1.08	3 0.95	0.95	0.92	1	1.08	1.12	1.18		
(22a)III- 1.21 1.23	.2.5 1.1 1.00	0.95	0.90	0.92		1.00	1.12	1.10		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m	-	-	-	_	
~ ' '	0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.41	0.43		
		c <i>tive air</i> al ventila	-	rate for t	he appli	cable ca	ISE						0	(23a)
				endix N. (2	3b) = (23a	a) × Fmv (e	equation (1	N5)) . othei	rwise (23b	) = (23a)			0	(23b)
lf bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =	, , ,			0	(23c)
			-	-	-					2b)m + (	23b) x [ <sup>-</sup>	1 – (23c)	-	(200)
(24a)m=	r	0	0	0	0	0	0	0	0	0	0	0	]	(24a)
b) If	balance	d mech	anical ve	entilation	without	heat rec	covery (N	и ЛV) (24b	)m = (22	1 2b)m + (2	23b)		1	
, (24b)m=	r	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If	whole h	ouse ex	tract ver	tilation of	or positiv	ve input v	ventilatio	n from c	outside			<b>!</b>		
i	if (22b)n	n < 0.5 ×	(23b), t	hen (240	c) = (23b	); otherv	wise (24	c) = (22b	o) m + 0.	5 × (23b	)	-	_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
						ve input				1				
	r í	r	<u>,                                     </u>	<u>`</u>	, 	erwise (2	<u> </u>	<u>-``</u>	, <u> </u>	<u> </u>	0.50	0.50	1	(24d)
(24d)m=		0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59	J	(240)
	Ctive air	cnange 0.61	rate - er	0.58	) or (24t	o) or (24 0.56	c) or (24	d) in box	0.57	0.58	0.59	0.59	1	(25)
(25)m=	0.01	0.01	0.0	0.56	0.56	0.56	0.56	0.56	0.57	0.56	0.59	0.59	J	(23)
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN	<b>IENT</b>	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²₊l		∖Xk J/K
Doors						2	x	1	=	2				(26)
Windo	ws Type	e 1				2.025	5 x1	/[1/( 1.4 )+	0.04] =	2.68				(27)
Windo	ws Type	e 2				4.05		/[1/( 1.4 )+	0.04] =	5.37				(27)
Windo	ws Type	e 3				8.651		/[1/( 1.4 )+	0.04] =	11.47				(27)
Walls <sup>-</sup>	Type1	68.	8	14.73	3	54.07	7 X	0.18	= [	9.73				(29)
Walls <sup>-</sup>	Type2	4.3	5	2		2.35	x	0.18	= [	0.42	ה ה		$\exists$	(29)
Roof		76.	9	0		76.9	×	0.13		10	= i		$\dashv$	(30)
Total a	area of e	lements			]	150.0		L	(		L			(31)
* for win	ndows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	h 3.2	
				nternal wal	ls and par	titions								
		ss, W/K :		U)				(26)(30)					41.68	(33)
		Cm = S(	. ,							(30) + (32		(32e) =	1482.04	(34)
		•				n kJ/m²K				tive Value			250	(35)
	•	sments wh ad of a de			construct	ion are not	t known pr	ecisely the	e indicative	values of	IMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	K						21.45	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			63.13	(37)
Ventila		r	r	d monthly		1	1	1	· · ·	= 0.33 × (	1	1	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	(0-1)
(38)m=	40.65	40.37	40.09	38.77	38.53	37.38	37.38	37.17	37.82	38.53	39.02	39.54	J	(38)
		coefficie	· · · · · · · · · · · · · · · · · · ·						- · ·	= (37) + (3	-	r	1	
(39)m=	103.78	103.5	103.22	101.9	101.65	100.51	100.51	100.3	100.95	101.65	102.15	102.67		
										Average =	Sum(39)1	12 /12=	101.9	(39)

Heat lo	oss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.29	1.28	1.28	1.26	1.26	1.25	1.25	1.24	1.25	1.26	1.27	1.27		
Numbe	er of day	ı ıs in mo	nth (Tab	ı le 1a)		<u> </u>		1	,	Average =	Sum(40)1.	12 /12=	1.26	(40)
Turno	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,												0.		( )
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				(1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13		48		(42)
Reduce	the annua	al average	hot water		5% if the c	lwelling is	designed	(25 x N) to achieve		se target o		.01		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					L	
(44)m=	102.31	98.59	94.87	91.15	87.43	83.71	83.71	87.43	91.15	94.87	98.59	102.31		
Energy	content of	hot water	used - cal	lculated m	onthly = 4.	190 x Vd,r	m x nm x [	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1116.12	(44)
(45)m=	151.72	132.7	136.93	119.38	114.55	98.85	91.6	105.11	106.36	123.96	135.31	146.94		
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1463.4	(45)
(46)m=	22.76	19.9	20.54	17.91	17.18	14.83	13.74	15.77	15.95	18.59	20.3	22.04		(46)
	storage	loss:									l			
Storag	e volum	e (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	-		ank in dw	-			. ,	o	or (0) in (	47)			
	storage		not wate	er (unis ir	iciudes i	nstantar	ieous cu	ombi boil	ers) ente	er u in (	47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
			m Table				• •					54		(49)
Energy	/ lost fro	m wate	r storage	e, kWh/ye	ear			(48) x (49)	) =		0.	75		(50)
				cylinder										
		-		rom Tabl	le 2 (kW	h/litre/da	ay)					0		(51)
	-	from Ta	see secti ble 2a	on 4.3								0	l	(52)
			m Table	2b								0		(52)
•				e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
		(54) in (8	-	,,	Jul				( (- / (			0 75		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
· · ·								i0), else (5					ix H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primar	v circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss ca	culated	for each	month (	,	• •	65 × (41)					I	
		1	1	ı —	· · · · · ·	1		ng and a	-	i	, 	00.00		
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	ch i	month (	(61)m =	(60	)) ÷ 36	65 × (41)	m								
(61)m=	0	0	0		0	0		0	0	0		0	0	0	0			(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r eacl	n month	(62)m	ı = 0.	85 × (	(45)m +	- (46)m +	· (57)r	n +	(59)m + (61)m	
(62)m=	198.32	174.78	183.53	3	164.47	161.14	14	43.94	138.19	151.7	7 1	51.46	170.55	180.4	193.	.53		(62)
Solar DH	-IW input	calculated	using Ap	ope	ndix G or	Appendix	с Н (	(negati	ve quantity	) (ente	r '0' if r	no solai	r contrib	ution to wat	er heat	ting)	•	
(add a	dditiona	al lines if	FGHR	S a	and/or V	WWHRS	ap	plies	, see Ap	pendix	kG)							
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0			(63)
Output	from w	ater hea	ter											-				
(64)m=	198.32	174.78	183.53	3	164.47	161.14	14	43.94	138.19	151.7	7 1	51.46	170.55	180.4	193.	.53		
			•							0	utput	from wa	ater heat	er (annual)	112		2012.02	(64)
Heat g	ains fro	m water	heatin	g, l	kWh/ma	onth 0.2	5 ´	[0.85	× (45)m	+ (61	)m] +	⊦ 0.8 x	(46)n	n + (57)m	n + (59	9)m	]	
(65)m=	87.72	77.79	82.81	T	75.77	75.36	6	8.94	67.73	72.22	2 7	71.44	78.49	81.06	86.	13	Ī	(65)
inclu	ude (57)	m in calo	ulatior	י ו סו	f (65)m	only if c	vlir:	nder i	s in the c	dwellir	ng or	hot w	ater is	from corr	nmuni	ty h	eating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):																		
	Ŭ	ns (Table			,													
Melabo	Jan	Feb	Mar		Apr	May		Jun	Jul	Au		Sep	Oct	Nov	D	ec	l	
(66)m=	123.81	123.81	123.81	+	123.81	123.81	-	23.81	123.81	123.8	_	23.81	123.81	_	123.			(66)
		(calcula															i	
(67)m=	20.07	17.83	14.5		10.98	2, equal 8.21	<b></b>	6.93	∟9a), a 7.49	9.73	- 1	13.06	16.58	19.35	20.6	63	1	(67)
														10.00	20.0		l	(0.)
		ins (calc	r	-			r –			,	-			400.50	011	47	1	(68)
(68)m=	220.92	223.21	217.43	_	205.14	189.61		75.02	165.27	162.9		68.76	181.06	196.58	211.	.17	i	(00)
	<u> </u>	s (calcula		<u> </u>		· ·	-		· · · · · · · · · · · · · · · · · · ·						1		1	(00)
(69)m=	35.38	35.38	35.38		35.38	35.38	3	5.38	35.38	35.38	3 3	35.38	35.38	35.38	35.3	38	l	(69)
-		ns gains	· · · · ·	• 5a	-										-i		1	
(70)m=	3	3	3		3	3		3	3	3		3	3	3	3		İ	(70)
Losses	s e.g. ev	/aporatic	on (neg	ati	ve valu	es) (Tab	le	5)										
(71)m=	-99.05	-99.05	-99.05	5	-99.05	-99.05	-9	99.05	-99.05	-99.0	5 -9	99.05	-99.05	-99.05	-99.	05		(71)
Water	heating	gains (T	able 5	)													_	
(72)m=	117.91	115.76	111.3		105.23	101.3	9	5.75	91.04	97.08	3 9	99.22	105.5	112.59	115.	.77		(72)
Total i	nterna	gains =						(66)	m + (67)m	+ (68)	m + (6	i9)m + (	(70)m + (	71)m + (72	!)m			
(73)m=	422.04	419.94	406.37	7	384.49	362.25	34	40.84	326.94	332.9	3 3	44.18	366.28	391.66	410.	.71		(73)
6. Sol	lar gain	s:																
Solar g	ains are	calculated	using so	lar	flux from	Table 6a	and	assoc	ated equa	tions to	conve	ert to th	e applica	able orienta	ition.			
Orienta		Access F			Area			Flu			<u>g</u>			FF			Gains	
	_	Table 6d		_	m²			Tat	ole 6a		Tab	le 6b		Table 6c			(W)	_
Northea	ast <mark>0.9x</mark>	0.77		x	8.6	65	x	1	1.28	x	0	.63	×	0.7		=	29.83	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.6	65	x	2	2.97	x	0	.63	x	0.7		=	60.72	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.6	65	x	4	1.38	x	0	.63	x	0.7		=	109.4	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.6	5	x	6	7.96	x	0	.63	×	0.7		=	179.67	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.6	65	x	9	1.35	x	0	.63	x	0.7		=	241.51	(75)

								,			_				_
Northeast 0.9x	0.77	x	8.6	65	x	9	97.38	x		0.63	×	0.7	=	257.47	(75)
Northeast 0.9x	0.77	x	8.6	65	x		91.1	x		0.63	x	0.7	=	240.86	(75)
Northeast 0.9x	0.77	x	8.6	65	x	7	2.63	x		0.63	x	0.7	=	192.02	(75)
Northeast 0.9x	0.77	x	8.6	65	x	5	50.42	x		0.63	x	0.7	=	133.31	(75)
Northeast 0.9x	0.77	x	8.6	65	x	2	28.07	x		0.63	x	0.7	=	74.21	(75)
Northeast 0.9x	0.77	x	8.6	65	x		14.2	x		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	x	8.6	65	x		9.21	x		0.63	x	0.7	=	24.36	(75)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	x	3	86.79	]		0.63	x	0.7	=	22.77	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	03	x	6	62.67	]		0.63	x	0.7	=	38.79	(79)
Southwest0.9x	0.77	x	2.0	03	x	8	35.75	]		0.63	x	0.7	=	53.07	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	x	1	06.25	]		0.63	x	0.7	=	65.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	x	1	19.01	]		0.63	x	0.7	=	73.65	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	03	x	1	18.15	]		0.63	x	0.7	=	73.12	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	x	1	13.91	ĺ		0.63	x	0.7	=	70.49	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	03	x	1	04.39	1		0.63	x	0.7	=	64.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	x	9	92.85	ĺ		0.63	×	0.7	=	57.46	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	03	x	6	9.27	ĺ		0.63	x	0.7	=	42.87	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	03	x	4	4.07	1		0.63	x	0.7	=	27.27	(79)
Southwest <sub>0.9x</sub>	0.77	x	2.0	)3	x	3	31.49	i		0.63	×	0.7	=	19.49	(79)
Northwest 0.9x	0.77	x	4.(	)5	x	1	1.28	x		0.63	×	0.7	=	13.97	(81)
Northwest 0.9x	0.77	×	4.(	)5	x	2	2.97	x		0.63	×	0.7	=	28.43	(81)
Northwest 0.9x	0.77	×	4.(	)5	x	4	1.38	x		0.63	×	0.7	=	51.22	(81)
Northwest 0.9x	0.77	x	4.(	)5	x	6	67.96	x		0.63	×	0.7	=	84.11	(81)
Northwest 0.9x	0.77	×	4.(	)5	x	9	91.35	x		0.63	×	0.7	=	113.06	(81)
Northwest 0.9x	0.77	x	4.0	)5	x	9	97.38	x		0.63	×	0.7	=	120.54	(81)
Northwest 0.9x	0.77	x	4.0	)5	x		91.1	x		0.63	x	0.7	=	112.76	(81)
Northwest 0.9x	0.77	x	4.0	)5	x	7	2.63	x		0.63	x	0.7	=	89.89	(81)
Northwest 0.9x	0.77	x	4.0	)5	x	5	50.42	x		0.63	×	0.7	=	62.41	(81)
Northwest 0.9x	0.77	x	4.0	)5	x	2	28.07	x		0.63	x	0.7	=	34.74	(81)
Northwest 0.9x	0.77	x	4.0	)5	x		14.2	x		0.63	x	0.7	=	17.57	(81)
Northwest 0.9x	0.77	x	4.0	)5	x		9.21	x		0.63	x	0.7	=	11.4	(81)
-								•							
Solar gains in	watts, ca	alculated	for eac	h mont	h		-	(83)m	า = Sเ	um(74)m .	(82)m		-	_	
(83)m= 66.57	127.93	213.68	329.53	428.22		51.13	424.11	346	5.51	253.18	151.81	82.38	55.25		(83)
Total gains – i	nternal a	nd sola	r (84)m =	= (73)m	ı + (	83)m	, watts				-		-		
(84)m= 488.61	547.88	620.06	714.02	790.47	7	91.97	751.05	679	.44	597.36	518.09	9 474.04	465.97		(84)
7. Mean inter	nal temp	erature	(heating	seaso	n)										
Temperature	during h	eating p	periods in	n the liv	ving	area	from Tab	ole 9	, Th′	1 (°C)				21	(85)
Utilisation fac	ctor for ga	ains for	living are	ea, h1,r	n (s	ее Та	ble 9a)						-		
Jan	Feb	Mar	Apr	Мау	′	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.97	0.89		0.73	0.57	0.6	64	0.88	0.98	1	1		(86)
Mean interna	l tempera	ature in	living ar	ea T1 (	follo	ow ste	ps 3 to 7	7 in T	Table	e 9c)					
(87)m= 19.59	19.73	20	20.38	20.72	-	20.93	20.98	20.	- 1	, 20.81	20.37	19.92	19.57		(87)
L	!		•	•			•							•	

Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	19.85	19.85	19.86	19.87	19.87	19.88	19.88	19.89	19.88	19.87	19.87	19.86		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.99	0.95	0.84	0.63	0.43	0.5	0.81	0.97	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.98	18.19	18.58	19.14	19.6	19.83	19.88	19.87	19.72	19.14	18.48	17.96		(90)
			•	•		•			f	iLA = Livin	g area ÷ (4	ł) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	_A x T1	+ (1 – fL	A) x T2			L.		-
(92)m=	18.53	18.71	19.06	19.56	19.98	20.21	20.25	20.25	20.09	19.56	18.97	18.51		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.53	18.71	19.06	19.56	19.98	20.21	20.25	20.25	20.09	19.56	18.97	18.51		(93)
8. Sp	ace hea	ting requ	uirement											
						ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	Jan	Feb	Mar	using Ta Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm	· ·	ividy	Uun	UUI	/ lug	Ocp	000	1101	Dee		
(94)m=	1	0.99	0.98	0.95	0.85	0.66	0.48	0.55	0.83	0.97	0.99	1		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	486.59	543.8	609.18	675.99	670.93	525.47	360.8	373.94	495.54	501.45	470.39	464.42		(95)
Month	nly aver	age exte	ernal tem	perature	e from Ta	able 8		-						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	r			· · ·		Lm , W =	- ,	x [(93)m	– (96)m	]				
(97)m=		1429.51	1296.77	1086.5	841.98	563.56	367.33	385.92	604.62	910.89	1212.57	1468.89		(97)
-	r		1	1		1		24 x [(97)			· · · · · ·			
(98)m=	736.51	595.2	511.57	295.57	127.26	0	0	0	0	304.63	534.37	747.33		
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	3852.43	(98)
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								47.73	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
	e heatii	•										r		
	-			econdar		mentary	-		(004)				0	(201)
	•			nain syst	( )			(202) = 1 -					1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above)	)								
	736.51	595.2	511.57	295.57	127.26	0	0	0	0	304.63	534.37	747.33		
(211)m	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	)6)	-		-	-	-				(211)
	787.71	636.58	547.13	316.12	136.11	0	0	0	0	325.81	571.52	799.28		_
								Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	=	4120.25	(211)
•				y), kWh/	month							-		
·	í – È	/= -	00 ÷ (20	<u>,</u>		<b> </b>								
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Iota	ii (KWN/yea	ar) = Sum(2)	215) <sub>15,1012</sub>	=	0	(215)

#### Water heating

Water neuting									
Output from water heater (calculated above)									
198.32         174.78         183.53         164.47         161.14	143.94	138.19	151.7	151.46	170.55	180.4	193.53		_
Efficiency of water heater								79.8	(216)
(217)m= 88 87.83 87.41 86.36 84.19	79.8	79.8	79.8	79.8	86.34	87.54	88.07		(217)
Fuel for water heating, kWh/month									
$(219)m = (64)m \times 100 \div (217)m$								I	
(219)m= 225.37 199.01 209.97 190.45 191.4	180.37	173.17	190.1	189.79 I = Sum(2	197.52	206.08	219.74		_
	2373	(219)							
Annual totals					k	Wh/yea	r	kWh/yea	r
Space heating fuel used, main system 1								4120.25	
Water heating fuel used								2373	7
Electricity for pumps, fans and electric keep-hot									_
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								354.49	(232)
12a. CO2 emissions – Individual heating system	na inalu	idina mi		)					
12a. CO2 emissions – mulvidual heating system		iaing mi							
	Emissions	5							
	kW	h/year			kg CO	2/kWh		kg CO2/ye	ar
Space heating (main system 1)	(211	) x			0.2	16	=	889.97	(261)
Space heating (secondary)	(215	i) x			0.5	19	=	0	(263)
Water heating	(219	) x			0.2	16	=	512.57	(264)
Space and water heating	(261	) + (262) -	+ (263) + (	(264) =				1402.54	(265)
Electricity for pumps, fans and electric keep-hot	(231	) x			0.5	19	=	38.93	(267)
	(000	!) x			0.5	10	=	183.98	(268)
Electricity for lighting	(232	., x			0.5	19		100.00	(=00)
Electricity for lighting Total CO2, kg/year	(232	., .		sum o	o.3 (265)(2	-		1625.45	(272)
	(232	<i>,</i> , , , , , , , , , , , , , , , , , , ,		sum o		-			

TER =

20.14 (273)