Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:53:26

Project Information:

Assessed By: Zahid Ashraf (STRO001082) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 86.6m² Plot Reference: Site Reference : Hermitage Lane Plot 51

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

19.56 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 12.98 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.4 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 49.6 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.15 (max. 0.30) 0.15 (max. 0.70) OK Floor (no floor)

Roof 0.10 (max. 0.20) OK 0.10 (max. 0.35) **Openings** 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

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	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	6.1m ²	
Windows facing: South West	6.07m²	
Windows facing: North West	4.58m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Roofs U-value	0.1 W/m²K	
External Walls U-value	0.13 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		User I	Details:									
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve				001082 on: 1.0.5.9				
Property Address: Plot 51 Address:												
Overall dwelling dime	ensions:											
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)			
Ground floor			86.6	(1a) x	2	2.5	(2a) =	216.5	(3a)			
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	86.6	(4)								
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	216.5	(5)			
2. Ventilation rate:												
	main seconda heating heating	ry	other		total			m³ per hou	ır			
Number of chimneys	0 + 0	+	0] = [0	X 4	40 =	0	(6a)			
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)			
Number of intermittent fa	ns			Ī	0	x ′	10 =	0	(7a)			
Number of passive vents				Ī	0	x ²	10 =	0	(7b)			
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)			
				L								
				_			Air ch	anges per ho	our —			
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, proced			ontinuo fr	0		÷ (5) =	0	(8)			
Number of storeys in the		eu 10 (17),	otrierwise (onunue n	om (9) to ((10)		0	(9)			
Additional infiltration	3 ()					[(9)-	-1]x0.1 =	0	(10)			
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)			
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t pas): if equal user 0.35	o the grea	ter wall are	a (after								
,	floor, enter 0.2 (unsealed) or ().1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, en	ter 0.05, else enter 0							0	(13)			
-	s and doors draught stripped							0	(14)			
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)			
Infiltration rate	250 amaza dia adia adia ada		(8) + (10)					0	(16)			
•	q50, expressed in cubic metrity value, then $(18) = [(17) \div 20] +$		•	•	etre or e	envelope	area	3	(17)			
· ·	es if a pressurisation test has been do				is being u	sed		0.15	(10)			
Number of sides sheltere	ed							1	(19)			
Shelter factor			(20) = 1 -		19)] =			0.92	(20)			
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.14	(21)			
Infiltration rate modified f	- 1 		1 .			<u> </u>		1				
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1				
(22)m= 5.1 5	4.5 4.4 4.3 3.8	3.0	3.1	4	4.3	J 4.0	4.1					
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4							•				
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18					

Adjusted infiltr	ation rat	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		
Calculate effec		_	rate for t	he appli	cable ca	se							— ,
If mechanica			andiv NL (O	2h) (22a	.) Fm. (a	auation (NEN otho	muiaa (22h) (220)			0.5	(23a)
If exhaust air h) = (23a)			0.5	(23b)
If balanced with		•	•	_					.		4 (00.)	79.05	(23c)
a) If balance						- `	- ^ ` 	í `	 		- ` 	i ÷ 100] I	(24a)
(24a)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		(24a)
b) If balance	ea mech	anicai ve		without	neat rec	overy (r	 	0) m = (22)	2b)m + (236)	Ι ο	1	(24b)
(24b)m= 0			0	,			0		0		0		(240)
c) If whole h if (22b)n				•	-		on from (c) = (22k		5 × (23b	p)		1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n							on from I 0.5 + [(2		0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	iter (24a) or (24b	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. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		X k J/K
Doors		,			2	x	1.4		2.8	<u></u>			(26)
Windows Type	e 1				6.097	, x1,	/[1/(1.4)+	0.04] =	8.08	Ħ			(27)
Windows Type					6.075	= .	/[1/(1.4)+		8.05	=			(27)
Windows Type					4.579	= .	/[1/(1.4)+		6.07	=			(27)
Walls Type1	76.5	58	16.7		59.83	=	0.15		8.97	=			(29)
Walls Type2	13.9	_	2		11.98	_	0.14	╡ .¦	1.7	=			(29)
Walls Type3	12.2	_	0	_	12.22	=	0.13	=	1.61	륵 ¦			(29)
Roof	86.			=		=		=		믁 ¦		$\exists \vdash$	(30)
Total area of e		i	0		86.6	×	0.1	=	8.66				
* for windows and			ffoctivo wi	ndow I I ve	189.3		y formula 1	/F/1/LL valu	(0) 1 0 041 4	as aivan in	naraarank	. 2 2	(31)
** include the area						atou using	, ioimala i	/[(10)+0.0 -1] 6	is given in	paragrapi	1 3.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				45.95	(33)
Heat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	1955.81	(34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	ı kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assess can be used inste				constructi	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix ł	<						27.02	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								_
Total fabric he									(36) =			72.97	(37)
Ventilation hea	ı —						Ι ,			(25)m x (5)	<u> </u>	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m= 20.12	19.88	19.63	18.39	18.14	16.9	16.9	16.65	17.4	18.14	18.64	19.13		(38)
Heat transfer of						-			= (37) + (· ·		1	
(39)m= 93.09	92.84	92.59	91.36	91.11	89.87	89.87	89.62	90.36	91.11	91.6	92.1		
Stroma FSAP 201	2 Version	: 1.0.5.9 (S	AP 9.92)	http://ww	w.stroma.d	com		,	Average =	Sum(39)₁	12 /12=	91.2 9 ag€	<u> 2 o</u> f 3/2)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.07	1.07	1.07	1.05	1.05	1.04	1.04	1.03	1.04	1.05	1.06	1.06		
				ı		ı	l		Average =	Sum(40) ₁ .	12 /12=	1.05	(40)
Number of day	·	nth (Tab	le 1a)					ı	1	i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		58		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed t			se target c		0.41		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								·'					
(44)m= 110.45	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		
	ļ								Total = Su	m(44) ₁₁₂ =	= [1204.88	(44)
Energy content of	f hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62		
If instantaneous	water booti	na at naint	of upo /pr	hat water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	- L	1579.79	(45)
If instantaneous v	1		,		,.		· · ·	, , , I	1	1			(40)
(46)m= 24.57 Water storage	21.49	22.17	19.33	18.55	16.01	14.83	17.02	17.22	20.07	21.91	23.79		(46)
Storage volum) includir	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•					_					<u> </u>		()
Otherwise if n	_			_			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	factor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-								02		(51)
If community h	•			IC 2 (KVV)	ii/iiti C/GC	' y)				0.	02		(31)
Volume factor	_									1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro	om watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(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)
Primary circuit	t loss (ar	nual) fro	m Table	- 							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calcul	ated for	r oach	month (61\m -	(60) · ·	265 v (A1	/m							
(61)m= 0	0	0	0	01)111 =	00) +	0 7 (41)) 0	П	0	0	0	0	1	(61)
Total heat require				,									(50)m + (61)m	(-)
		203.1	182.37	178.94	160.2	154.16	168.	_	168.32	189.09	199.56	213.9	(39)111 + (01)111	(62)
Solar DHW input calc													i	(/
(add additional lin										COMMISC	mon to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output from wate	r heater						<u> </u>	!			Į		ı	
· — —		203.1	182.37	178.94	160.2	154.16	168.	74	168.32	189.09	199.56	213.9	I	
` '							<u> </u>	Outp	ut from wa	ater heat	_ I er (annual)₁	12	2230.63	(64)
Heat gains from v	vater he	ating.	kWh/mo	onth 0.2	8.01 ` 5	5 × (45)m	+ (6	1)m	1 + 0.8 x	: [(46)m	+ (57)m	+ (59)m	1	
		93.37	85.65	85.34	78.28	77.1	81.9	_	80.97	88.71	91.36	96.96	اً	(65)
include (57)m i	n calcula	ation o	of (65)m	only if c	vlinder	is in the o	t—— dwelli	ina (or hot w	ater is t	rom com	munity h	ı ıeating	
5. Internal gains				•	,								Julius J	
Metabolic gains (·											
		Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec	1	
(66)m= 128.81 12	28.81 12	28.81	128.81	128.81	128.81	128.81	128.	81	128.81	128.81	128.81	128.81		(66)
Lighting gains (ca	lculated	in Ap	pendix l	L, equati	on L9	or L9a), a	lso se	ee T	able 5		•	•	1	
(67)m= 20.97 1	8.63 1	15.15	11.47	8.57	7.24	7.82	10.1	16	13.64	17.32	20.22	21.55	[(67)
Appliances gains	(calcula	ated in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ole 5	•		ı	
(68)m= 232.68 2	35.1 2	29.01	216.06	199.71	184.34	174.07	171.	66	177.74	190.7	207.05	222.42	[(68)
Cooking gains (ca	alculated	d in Ap	pendix	L, equat	ion L1	or L15a), also	o se	e Table	5	•		ı	
(69)m= 35.88 3	5.88 3	35.88	35.88	35.88	35.88	35.88	35.8	38	35.88	35.88	35.88	35.88		(69)
Pumps and fans	gains (T	able 5	a)			•		•			•	•	ı	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	1	(70)
Losses e.g. evap	oration ((negati	ive valu	es) (Tab	le 5)	•		'	-		•		ı	
(71)m= -103.05 -10	03.05 -1	03.05	-103.05	-103.05	-103.05	-103.05	-103.	.05	-103.05	-103.05	-103.05	-103.05		(71)
Water heating ga	ins (Tab	ole 5)				•					•	!	ı	
(72)m= 132.64 13	30.32 1	125.5	118.95	114.7	108.72	103.63	110.	15	112.46	119.24	126.89	130.33	[(72)
Total internal ga	ins =	•			(6	6)m + (67)m	ı + (68)m +	(69)m + (70)m + (71)m + (72))m	1	
(73)m= 447.93 44	15.68 4	431.3	408.12	384.63	361.94	347.17	353.	61	365.49	388.9	415.8	435.94	1	(73)
6. Solar gains:						,	'				,			
Solar gains are calc	ulated usir	ng solar	flux from	Table 6a	and asso	ciated equa	itions t	o coi	nvert to th	e applica	ble orienta	tion.		
Orientation: Acc		ctor	Area			ux		_	g	_	FF		Gains	
1 a b	le 6d		m²		1;	able 6a		la	able 6b	'	Table 6c		(W)	_
Southeast _{0.9x}	0.77	X	6.	1	х	36.79	x		0.63	x	0.7	=	68.56	(77)
Southeast 0.9x	0.77	X	6.	1	х	62.67	x		0.63	x	0.7	=	116.78	(77)
Southeast _{0.9x}	0.77	X	6.	1	x	85.75	x [0.63	x	0.7	=	159.78	(77)
Southeast _{0.9x}	0.77	x	6.	1	х	106.25	x [0.63	x [0.7	=	197.98	(77)
Southeast _{0.9x}	0.77	X	6.	1	х	119.01	x [0.63	x	0.7	=	221.76	(77)

Southeast 0.9x	0.77				l .,		10.15	1			ا ا		_			(77)
Southeast 0.9x	0.77	x	6.		X I		18.15	X		0.63	X	0.7	_ = -		220.15	(77)
Southeast 0.9x	0.77	×			X	_	13.91	X		0.63	_ X	0.7	= =		212.25	(77)
Southeast 0.9x	0.77	x			X 		04.39	X 1		0.63	X 	0.7	╡ =		194.51	(77)
<u> </u>	0.77	×	6.		X I		2.85	X		0.63	_ × ¬	0.7	╡ =		173.01	(77)
Southeast 0.9x	0.77	×			X	—	9.27	X		0.63	_ ×	0.7	╡ -		129.07	(77)
Southeast 0.9x	0.77	×			X		4.07	X		0.63	_	0.7	_ =		82.12	(77)
Southeast 0.9x	0.77	X	6.	1	X	3	1.49	X	(0.63	_ X	0.7	_ -		58.67	(77)
Southwest _{0.9x}	0.77	X	6.0	07	X	3	6.79		(0.63	X	0.7			68.31	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	6	2.67		(0.63	X	0.7	=		116.36	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	8	35.75		(0.63	×	0.7	=	<u></u>	159.21	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	1	06.25		(0.63	X	0.7	=		197.27	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	1	19.01		(0.63	X	0.7	=		220.96	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	1	18.15		(0.63	X	0.7	=		219.36	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	1	13.91		(0.63	X	0.7	=		211.48	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	1	04.39		(0.63	X	0.7	=		193.81	(79)
Southwest _{0.9x}	0.77	X	6.0	07	x	9	2.85		(0.63	X	0.7	=		172.39	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	6	9.27		(0.63	X	0.7	=		128.6	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	4	4.07		(0.63	X	0.7	=		81.82	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	3	1.49		(0.63	x	0.7			58.46	(79)
Northwest 0.9x	0.77	X	4.	58	X	1	1.28	X	(0.63	x	0.7	=		15.79	(81)
Northwest 0.9x	0.77	X	4.	58	X	2	2.97	X	(0.63	x	0.7	=		32.14	(81)
Northwest 0.9x	0.77	X	4.	58	x	4	1.38	x	(0.63	x	0.7	_		57.91	(81)
Northwest 0.9x	0.77	X	4.	58	x	6	7.96	X	(0.63	x	0.7			95.1	(81)
Northwest 0.9x	0.77	X	4.	58	x	9	1.35	X	(0.63	x	0.7	=		127.83	(81)
Northwest 0.9x	0.77	х	4.	58	x	9	7.38	X	(0.63	x	0.7			136.28	(81)
Northwest 0.9x	0.77	X	4.	58	x	,	91.1	X	(0.63	x	0.7			127.49	(81)
Northwest 0.9x	0.77	x	4.	58	x	7	2.63	X	(0.63	x	0.7	=		101.63	(81)
Northwest 0.9x	0.77	x	4.	58	x	5	0.42	X	(0.63	x	0.7			70.56	(81)
Northwest 0.9x	0.77	х	4.	58	x	2	8.07	X	(0.63	x	0.7			39.28	(81)
Northwest 0.9x	0.77	x	4.	58	x		14.2	X	(0.63	x	0.7			19.87	(81)
Northwest _{0.9x}	0.77	x	4.	58	x	9	9.21	x	(0.63	x	0.7			12.89	(81)
					-											
Solar gains in	watts, ca	lculated	for eac	h mon	th_			(83)m	= Sun	n(74)m	.(82)m			_		
(83)m= 152.66	265.28	376.9	490.35	570.54		75.79	551.22	489	.96	415.96	296.95	183.81	130.03			(83)
Total gains – ir			<u> </u>	<u>`</u>	`		1							_		
(84)m= 600.59	710.96	808.2	898.47	955.17	7 9	37.73	898.39	843	.57	781.45	685.85	5 599.61	565.97	<u>'</u>		(84)
7. Mean inter	nal temp	erature	(heating	seaso	n)											
Temperature	during h	eating p	eriods i	n the li	ving	area	from Tab	ole 9,	Th1	(°C)					21	(85)
Utilisation fac	tor for ga	ains for	living ar	ea, h1,	m (s	ее Та	ble 9a)							_		
Jan	Feb	Mar	Apr	Ma	y	Jun	Jul	A	ug	Sep	Oct	Nov	Dec			
(86)m= 0.95	0.93	0.88	0.8	0.69		0.54	0.41	0.4	15	0.65	0.84	0.93	0.96			(86)
Mean internal	tempera	ature in	living ar	ea T1	(follo	w ste	ps 3 to 7	in T	able	9c)						
(87)m= 18.92	19.23	19.66	20.18	20.6	2	20.85	20.95	20.	93	20.75	20.21	19.47	18.86			(87)
												-		_		

T		المادية				al a III a a	f T.	bla O Ti	LO (0 0)					
(88)m=	20.02	20.02	eating p	20.04	20.04	20.05	20.05	20.05	n2 (°C) 20.05	20.04	20.04	20.03		(88)
` ′			ains for						20.05	20.04	20.04	20.03		(00)
(89)m=	0.95	0.92	0.87	0.78	0.65	0.48	0.33	0.37	0.59	0.81	0.92	0.95		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 7	r 7 in Tabl	e 9c)				
(90)m=	17.24	17.69	18.31	19.04	19.59	19.92	20.02	20.01	19.8	19.09	18.05	17.17		(90)
!									f	LA = Livin	g area ÷ (4	1) =	0.34	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	_A × T1	+ (1 – fL	.A) × T2			•		
(92)m=	17.82	18.22	18.78	19.43	19.94	20.24	20.34	20.33	20.13	19.47	18.54	17.75		(92)
Apply	adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate	•			
(93)m=	17.82	18.22	18.78	19.43	19.94	20.24	20.34	20.33	20.13	19.47	18.54	17.75		(93)
•			uirement											
			ternal ter or gains			ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	:										
(94)m=	0.93	0.89	0.84	0.76	0.64	0.49	0.36	0.4	0.59	0.79	0.89	0.93		(94)
1		i — —	, W = (94											(05)
(95)m=	555.85	634.41	680.43	681.38	611.83	460.41	322.01	333.3	463.14	542.6	536.64	528.63		(95)
(96)m=	4.3	4.9	rnal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` '			an intern											, ,
(97)m=	1258.5		1136.68	962.33	750.44	506.96	335.95	351.87	544.58	808.38	1048.14	1248.05		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	h = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	522.77	404.43	339.45	202.28	103.12	0	0	0	0	197.74	368.28	535.24		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2673.31	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								30.87	(99)
9b. Ene	ergy rec	quiremer	nts – Cor	nmunity	heating	scheme								
			ace hea from se								unity sch	neme.	0	(301)
	-			-		-	_	Table 1	1, 0 11 11	OHO		<u> </u>		(302)
	-		from co	•	-				0115			[1	(302)
	-		y obtain ne s, geotherr							up to tour (otner neat	sources; tl	ne latter	
Fractio	n of hea	at from C	Commun	ity boiler	s								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem		Ī	1	(305)
Distribu	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m				ĺ	1.05	(306)
Space heating kWh/year														
Annual	space	heating	requiren	nent									2673.31	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	2806.98	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	ĺ	0	(308
												•		_ -

Space heating requirement from secon	dary/supplementary syste	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
	J. J	, , , , , , , , , , , , , , , , , , ,	` ′		」 ` ''
Water heating Annual water heating requirement			[2230.63	7
If DHW from community scheme:		<i>(</i>), <i>(</i> ,)	[」 □
Water heat from Community boilers		, , , ,	(305) x (306) =	2342.16	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307	'e) + (310a)(310e)] =	51.49	(313)
Cooling System Energy Efficiency Ration			Į	0	(314)
Space cooling (if there is a fixed cooling	,	$= (107) \div (314)$	=	0	(315)
Electricity for pumps and fans within du mechanical ventilation - balanced, extra	· ,	utside	[336.77	(330a)
warm air heating system fans			[0	(330b)
pump for solar water heating			[0	(330g)
Total electricity for the above, kWh/yea	ır	=(330a) + (330	b) + (330g) =	336.77	(331)
Energy for lighting (calculated in Apper	ndix L)		[370.34	(332)
Electricity generated by PVs (Appendix	(M) (negative quantity)		[-872.75	(333)
Electricity generated by wind turbine (A	Appendix M) (negative qua	ntity)		0	(334)
12b. CO2 Emissions – Community hea	iting scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and v		kWh/year			(367a)
•	If there is CHP using t	kWh/year	kg CO2/kWh	kg CO2/year	(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP using t	kWh/year two fuels repeat (363) to	kg CO2/kWh (366) for the second fuel	kg CO2/year	
Efficiency of heat source 1 (%) CO2 associated with heat source 1	If there is CHP using to [(307b)+(3	kWh/year two fuels repeat (363) to 10b)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 =	94 1183.21	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	If there is CHP using to [(307b)+(3) [(307	kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 =	94 1183.21 26.72	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community	If there is CHP using to [(307b)+(3 [(307b)+(3 (307b)+(3 (307b)) (3 (307b)) (3 (307b)) (3 (307b)) (3 (307b))	kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(372 (09) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0.52 = 0.52	94 1183.21 26.72 1209.93	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community a CO2 associated with space heating (see	If there is CHP using to [(307b)+(3) [(307	kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(372 (09) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 =	94 1183.21 26.72 1209.93	(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 of the community	If there is CHP using to [(307b)+(3 [(307b)+(3)[(307b)+(3 [(307b)+(3)[(307b)+	kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(372) (09) x (us heater (312) x (73) + (374) + (375) =	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 =	94 1183.21 26.72 1209.93 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 of the community	If there is CHP using to [(307b)+(3 [(307b)+(3)[(307b)+(3 [(307b)+(3)[(307b)+(3 [(307b)+(3)[(307b)+	kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(372) (09) x (us heater (312) x (73) + (374) + (375) =	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0.52 = 0.52 = 0.22	94 1183.21 26.72 1209.93 0 1209.93	(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 of the community	If there is CHP using to [(307b)+(3) [(307	kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(372 (09) x (us heater (312) x (73) + (374) + (375) = (3 (331)) x (32))) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 = 0.52 =	94 1183.21 26.72 1209.93 0 1209.93 174.78	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community of the community of the community of the community of the control of th	If there is CHP using to [(307b)+(3) [(307	kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(372) (09) x (us heater (312) x (73) + (374) + (375) = (3 (331)) x (32))) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 = 0.52 = 0.52 =	94 1183.21 26.72 1209.93 0 1209.93 174.78 192.2	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community of the community of the community of the community of the control of th	If there is CHP using to [(307b)+(3)] [(307	kWh/year two fuels repeat (363) to (10b)] x 100 ÷ (367b) x (313) x (63)(366) + (368)(372) (09) x (us heater (312) x (73) + (374) + (375) = (3 (331)) x (32))) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 = 0.52 = 0.52 =	94 1183.21 26.72 1209.93 0 1209.93 174.78 192.2	(367) (372) (373) (374) (375) (376) (378) (379)

SAP 2012 Overheating Assessment

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

Property Details: Plot 51

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: North East

Overshading: Average or unknown

None

Thermal mass parameter: Indicative Value Low

False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach):6 (Windows fully open)

Overheating Details:

Summer ventilation heat loss coefficient: 428.67 (P1)

Transmission heat loss coefficient: 73

Summer heat loss coefficient: 501.64 (P2)

Overhangs:

Overhangs:

Night ventilation:

Orientation:	Ratio:	Z_overhangs :
South East (SE)	0	1
South West (SW)	0	1
North West (NW)	0	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South East (SE)	1	0.9	1	0.9	(P8)
South West (SW)	1	0.9	1	0.9	(P8)
North West (NW)	1	0.9	1	0.9	(P8)

Solar gains:

Orientation		Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains	
South East (SE)	0.9 x	6.1	119.92	0.63	0.7	0.9	261.18	
South West (SW)	0.9 x	6.07	119.92	0.63	0.7	0.9	260.24	
North West (NW)	0.9 x	4.58	98.85	0.63	0.7	0.9	161.68	
						Total	683.09	(P3/P4)

Internal gains:

	June	July	August
Internal gains	506.5	487.55	496.32
Total summer gains	1228.4	1170.64	1115.01 (P5)
Summer gain/loss ratio	2.45	2.33	2.22 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	19.75	21.53	21.32 (P7)
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight

		User_[Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 51					
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor			ea(m²)	l(10) v	Av. He		_	Volume(m ³	<u>-</u>
	\ \(\lambda \ \lambda \ \lambda \ \ \\ \\ \ \ \ \ \\ \\ \\ \ \\ \\ \\			(1a) x		2.5	(2a) =	216.5	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	86.6	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	216.5	(5)
2. Ventilation rate:			41					2	
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0)	(40 =	0	(6a)
Number of open flues	0 + 0	+	0	=	0	>	(20 =	0	(6b)
Number of intermittent fa	ins				3	>	(10 =	30	(7a)
Number of passive vents	;			F	0	,	c 10 =	0	(7b)
Number of flueless gas fi	ires			F	0		< 40 =	0	(7c)
J 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				L				<u> </u>	(* *)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.14	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise (continue fi	rom (9) to	(16)			
Number of storeys in the Additional infiltration	he dwelling (ns)					1/0	N 41-0 4	0	(9)
	.25 for steel or timber frame of	vr 0 35 fc	or maconi	rv coneti	ruction	[(8	9)-1]x0.1 =	0	(10)
	resent, use the value corresponding			•	dellon			0	(11)
deducting areas of openii									_
·	floor, enter 0.2 (unsealed) or t	J.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	s and doors draught stripped							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelop	e area	3	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20]$ +	(8), otherw	vise (18) =	(16)				0.29	(18)
	es if a pressurisation test has been de	one or a de	egree air pe	rmeability	is being u	sed			-
Number of sides sheltere Shelter factor	ed .		(20) = 1 -	[0.075 x (19)] =			0.92	(19) (20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	`	<i>"</i>			0.92	(21)
Infiltration rate modified f	•							0.21	(=.)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7			•			•	•	
$(22)m = \begin{bmatrix} 5.1 & 5 \end{bmatrix}$	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (24	2)m : 4	•	•	•	•	•	•	•	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1 1	1.08	1.12	1.18	1	
(220)1117 1.21 1.20	1.20 1.11 1.00 0.95	1 0.00	1 0.02		L	112	10	J	

ajustea iniiti	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	_		_	•		
0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31			
<i>alculate effe</i> If mechanic		•	rate for t	пе арри	саріе са	se							0	\(\frac{1}{2}\)
If exhaust air h			endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)				0	
If balanced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =					0	= `(2
a) If balance	ed mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (2:	2b)m + (23b) × [1 – (23c)			`
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0			(
b) If balance	ed mech	anical ve	entilation	without	heat rec	covery (N	л ЛV) (24b)m = (22	2b)m + (23b)	<u>Į</u>	l		
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(
c) If whole h	nouse ex	tract ver	ntilation o	or positiv	re input v	ventilatio	on from c	utside	!	!	1	ı		
,	n < 0.5 ×				•				.5 × (23b	o)				
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(
d) If natural				•	•									
	m = 1, the	<u> </u>	<u> </u>		<u> </u>		 	_			T	I		
4d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(
Effective air			<u> </u>	<u> </u>		ŕ	r	`			T	ı		
5)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(
. Heat losse	es and he	eat loss _l	oaramete	er:										
LEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·l		A) kJ/	
oors					2	х	1.4	=	2.8					(
indows Typ	e 1				6.097	₇ χ1,	/[1/(1.4)+	0.04] =	8.08					
indows Typ	e 2				6.075	x1.	/[1/(1.4)+	0.04] =	8.05					
indows Typ	e 3				4.579	x1	/[1/(1.4)+	0.04] =	6.07	=				(
alls Type1	76.5	i8	16.7	5	59.83	3 x	0.15	□ = i	8.97	<u> </u>		\neg		
alls Type2	13.9)8	2		11.98	3 x	0.14	=	1.7	Ħ i		Ŧ i		一
alls Type3	12.2		0		12.22	=	0.13	=	1.61	=		=		=
oof	86.0		0	=	86.6	x	0.1	=	8.66	=		≓		۲,
otal area of					189.3	=	<u> </u>		0.00					
or windows and			effective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	n paragraph	3.2		•
include the are									, ,	Ü	, ,			
bric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				45	.95	
eat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a)	(32e) =	195	5.81	
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		1	00	
r design asses n be used inste				construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f			
nermal bridg				usina An	pendix k	<						27	.02	7
letails of therm	•	,			•	•						21	.02	' لــــ
otal fabric he			, ,	,	,			(33) +	(36) =			72	.97	
entilation he	at loss ca	alculated	monthly	<u>/</u>				(38)m	= 0.33 × ((25)m x (5)			_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
39.86	39.7	39.54	38.8	38.66	38.02	38.02	37.9	38.27	38.66	38.94	39.24			(
										00)				
eat transfer	coefficier	nt, VV/K						(39)m	= (37) + (37)	38)m				

Heat loss para	meter (l	-II P) W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.3	1.3	1.3	1.29	1.29	1.28	1.28	1.28	1.28	1.29	1.29	1.3		
									<u> </u>	Sum(40) ₁ .		1.29	(40)
Number of day	s in mo	nth (Tabl	e 1a)							(),			`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
										•			
4 \\/_											1-10/1- /		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13		58		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the a	welling is	designed t			se target o		0.41		(43)
			- '		_		_	_		1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in		r day for ea	cn montn	va,m = ra	ctor from	able 1c x	(43)		1				
(44)m= 110.45	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		_
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D)Tm / 3600			ım(44) ₁₁₂ = ables 1b, 1		1204.88	(44)
(45)m= 163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62		
						ı		-	Total = Su	ım(45) ₁₁₂ =	=	1579.79	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 ₎) to (61)			•		
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage	loss:									.			
Storage volum	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	r (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufact			-										
Hot water stora	•			e 2 (kW	h/litre/da	ıy)					0		(51)
If community h Volume factor	_		on 4.3										(50)
Temperature fa			2h							_	0		(52)
•								(==)	>		0		(53)
Energy lost fro		•	, kVVh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(54)
Enter (50) or (,									0		(55)
Water storage	loss cal	culated f	or each	month		_	((56)m = (55) × (41)ı	m 	_			
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit				•	•	. ,	, ,						
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combiles s	الممامانيما	for oo ab		(C1)	(00) . 20	CE (44)	\						
Combi loss ca	liculated 0	for each	month	(61)m =	(60) ÷ 30	05 × (41))m 0	T 0	0	0	0	1	(61)
									<u> </u>		<u> </u>] · (59)m + (61)m	(01)
(62)m= 139.22	121.76	125.65	109.54	105.11	90.7	84.05	96.45		113.74	124.16	134.83	(59)111 + (61)111	(62)
Solar DHW input		l		<u> </u>]	(02)
(add additiona									ii contribu	ion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter		<u>I</u>		<u> </u>		Į.			<u> </u>	1	
(64)m= 139.22	121.76	125.65	109.54	105.11	90.7	84.05	96.45	97.6	113.74	124.16	134.83]	
	Į	ļ	ļ.	<u> </u>	<u>I</u>	l	Oı	utput from w	ater heate	r (annual)	112	1342.82	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	 n]	-
(65)m= 34.81	30.44	31.41	27.39	26.28	22.68	21.01	24.11	1	28.44	31.04	33.71	1	(65)
include (57)	m in cald	culation (of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):	•								
Metabolic gair	ns (Table	5), Wat	ts	,									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.8°	128.81	128.81	128.81	128.81	1	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5		-	-	-	
(67)m= 20.97	18.63	15.15	11.47	8.57	7.24	7.82	10.16	13.64	17.32	20.22	21.55]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5	-	_	-	
(68)m= 232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	3 177.74	190.7	207.05	222.42]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	-	-	-	
(69)m= 35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88]	(69)
Pumps and fa	ns gains	(Table 5	ōa)									_	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.0	-103.05	-103.05	-103.05	-103.05]	(71)
Water heating	gains (T	able 5)										_	
(72)m= 46.78	45.3	42.22	38.04	35.32	31.49	28.24	32.41	33.89	38.22	43.11	45.31]	(72)
Total internal	gains =				(66))m + (67)m	n + (68)n	n + (69)m +	(70)m + (7	'1)m + (72))m	_	
(73)m= 362.08	360.66	348.02	327.21	305.24	284.71	271.78	275.88	3 286.92	307.88	332.02	350.92		(73)
6. Solar gain													
Solar gains are		-					itions to		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
-				. 1			, –				_		7,
Southeast 0.9x	0.77	X	6.		-	36.79)	0.63		0.7	=	68.56	[(77)
Southeast 0.9x	0.77	X	6.		-	62.67] X	0.63		0.7	=	116.78	[(77)
Southeast 0.9x	0.77	X	6.			35.75)	0.63		0.7	=	159.78](77)
Southeast 0.9x	0.77	X	6.		-	06.25]	0.63		0.7	=	197.98	[(77)
Southeast 0.9x	0.77	X	6.	1	x 1	19.01	X	0.63	x	0.7	=	221.76	(77)

Southeast 0.9x	0.77	x	C.4	1 ,	440.4	- 1	l	0.00		0.7		000.45	(77)
Southeast 0.9x	0.77	=	6.1	」× 1、	118.1		X	0.63	_ X	0.7	_	220.15	(77)
Southeast 0.9x	0.77	×	6.1	」 × 1	113.9		X	0.63	_ X	0.7		212.25	(77)
Southeast 0.9x	0.77	×	6.1	」× 1、	104.3		X	0.63	×	0.7	_ =	194.51	(77)
Southeast 0.9x	0.77	x	6.1] X]	92.8		X	0.63	x	0.7	_ =	173.01	╡`′
Southeast 0.9x	0.77	X	6.1] X]	69.2		X 	0.63	X	0.7	_ =	129.07	(77)
<u> </u>	0.77	X	6.1	\	44.0		X	0.63	X	0.7	=	82.12	(77)
Southwests a	0.77	X	6.1	J X 7	31.4		X	0.63	X	0.7	=	58.67	(77)
Southweste s	0.77	X	6.07	」 X ¬	36.7			0.63	X	0.7	=	68.31	(79)
Southwesto.9x	0.77	X	6.07	J X T	62.6			0.63	×	0.7	=	116.36	(79)
Southwesto.9x	0.77	X	6.07	」 X ¬	85.7			0.63	X	0.7	=	159.21	(79)
Southwest _{0.9x}	0.77	X	6.07	X	106.2			0.63	X	0.7	=	197.27	(79)
Southwest _{0.9x}	0.77	X	6.07	X	119.0)1		0.63	X	0.7	=	220.96	(79)
Southwest _{0.9x}	0.77	X	6.07	X	118.1	5		0.63	X	0.7	=	219.36	(79)
Southwest _{0.9x}	0.77	X	6.07	X	113.9)1		0.63	X	0.7	=	211.48	(79)
Southwest _{0.9x}	0.77	X	6.07	X	104.3	9		0.63	X	0.7	=	193.81	(79)
Southwest _{0.9x}	0.77	X	6.07	X	92.8	5		0.63	X	0.7	=	172.39	(79)
Southwest _{0.9x}	0.77	X	6.07	X	69.2	7		0.63	X	0.7	=	128.6	(79)
Southwest _{0.9x}	0.77	X	6.07	X	44.0	7		0.63	X	0.7	=	81.82	(79)
Southwest _{0.9x}	0.77	X	6.07	X	31.4	9		0.63	X	0.7	=	58.46	(79)
Northwest _{0.9x}	0.77	X	4.58	X	11.2	8	X	0.63	X	0.7	=	15.79	(81)
Northwest 0.9x	0.77	X	4.58	X	22.9	7	X	0.63	X	0.7	=	32.14	(81)
Northwest 0.9x	0.77	X	4.58	X	41.3	3	X	0.63	X	0.7	=	57.91	(81)
Northwest 0.9x	0.77	X	4.58	X	67.9	6	X	0.63	X	0.7	=	95.1	(81)
Northwest 0.9x	0.77	X	4.58	X	91.3	5	X	0.63	X	0.7	=	127.83	(81)
Northwest _{0.9x}	0.77	X	4.58	X	97.3	3	x	0.63	X	0.7	=	136.28	(81)
Northwest _{0.9x}	0.77	X	4.58	X	91.1		X	0.63	X	0.7	=	127.49	(81)
Northwest 0.9x	0.77	X	4.58	X	72.6	3	x	0.63	X	0.7	=	101.63	(81)
Northwest 0.9x	0.77	X	4.58	X	50.4	2	x	0.63	X	0.7	=	70.56	(81)
Northwest _{0.9x}	0.77	X	4.58	X	28.0	7	x	0.63	X	0.7	=	39.28	(81)
Northwest 0.9x	0.77	Х	4.58	X	14.2	:	x	0.63	X	0.7	=	19.87	(81)
Northwest _{0.9x}	0.77	X	4.58	X	9.21		x	0.63	X	0.7	=	12.89	(81)
				_									
Solar gains in w	atts, cal	culated	for each mon	th			(83)m	n = Sum(74)m	ı(82)m			•	
` '	265.28	376.9	490.35 570.5			51.22	489	.96 415.96	296.9	5 183.81	130.03		(83)
Total gains – int	ternal an	nd solar	` 	<u> </u>	83)m , w	atts					1	ı	
(84)m= 514.74	625.94	724.92	817.55 875.7	8 8	360.5	323	765	.83 702.88	604.8	3 515.83	480.94		(84)
7. Mean intern	al tempe	erature (heating seas	on)									
Temperature d	luring he	eating pe	eriods in the li	ving	area fror	n Tab	ole 9	, Th1 (°C)				21	(85)
Utilisation factor	or for gai	ins for li	ving area, h1	,m (s	ee Table	9a)						•	
Jan	Feb	Mar	Apr Ma	у	Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.97	0.95	0.92	0.86 0.77		0.64 ().51	0.5	0.74	0.89	0.95	0.97		(86)
Mean internal	tempera	ture in l	iving area T1	(follo	w steps	3 to 7	in T	able 9c)					
(87)m= 18.28	18.61	19.1	19.72 20.28	3 2	20.68 2	0.87	20.	83 20.51	19.78	18.91	18.22		(87)
												-	

Tomo	oroturo	durina h	ooting n	oriodo ir	root of	dwalling	from To	hla O. T	h2 (°C)					
(88)m=	19.84	19.84	neating p	19.85	19.85	19.86	19.86	19.86	19.85	19.85	19.85	19.84		(88)
			<u> </u>					<u> </u>	19.00	19.00	19.00	19.04		(00)
			ains for i			· ` ·								(00)
(89)m=	0.96	0.94	0.9	0.83	0.72	0.56	0.4	0.45	0.68	0.87	0.94	0.97		(89)
Mean	interna	temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to	7 in Tabl	le 9c)				
(90)m=	17.37	17.69	18.18	18.78	19.3	19.66	19.8	19.78	19.53	18.85	18	17.31		(90)
•								=	f	fLA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temner	ature (fo	r the wh	ole dwel	lling) – fl	Δ ν Τ1	⊥ (1 _ fl	Δ) v T2					_
(92)m=	17.69	18.01	18.5	19.1	19.64	20.01	20.17	20.14	19.87	19.17	18.31	17.62		(92)
			he mean								10.01	17.02		()
(93)m=	17.69	18.01	18.5	19.1	19.64	20.01	20.17	20.14	19.87	19.17	18.31	17.62		(93)
					19.04	20.01	20.17	20.14	19.07	19.17	10.51	17.02		(33)
			uirement				44 4	Table O		4 T: /:	70\			
			ernal ter or gains	•		ed at ste	ер 11 от	rable 9i	o, so tna	it 11,m=(76)m an	a re-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
l Itilies			ains, hm	•	iviay	Juli	Jui	Aug	Оер	CCI	1407	Dec		
(94)m=	0.95	0.92	0.88	0.82	0.71	0.57	0.44	0.48	0.68	0.85	0.93	0.96		(94)
` ′			l			0.57	0.44	0.40	0.00	0.00	0.55	0.50		(0.1)
	489.06	578.39	, W = (9 ⁴ 640.61	666.5	624.6	494.63	358.5	366.62	475.36	513.01	479.16	460.08		(95)
(95)m=							336.5	300.02	475.36	513.01	479.16	460.08		(93)
	_		rnal tem	•			40.0	40.4		40.0	7.4	4.0		(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern	·				-``	<u> </u>					(0-)
(97)m=	1510.48	1476.9	1349.96	1140.6	886.2	600.7	395.81	414.9	641.36	956.31	1254.77	1506.06		(97)
			ement fo							 	·			
(98)m=	759.94	603.8	527.76	341.35	194.63	0	0	0	0	329.82	558.44	778.21		_
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	4093.95	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								47.27	(99)
8c Sr	nace co	olina rec	quiremen	ıt										
		- J	July and		See Tal	ale 10h								
Oalcu	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I			lculated											
(100)m=		0	0	0	0	1043.28	821.3	842.59	0	0	0	0		(100)
` ′		tor for lo	l	-										, ,
(101)m=	0	0	0	0	0	0.73	0.79	0.76	0	0	0	0		(101)
` ′			Vatts) = (00	00				Ū		, ,
(102)m=	0	0	0	0	0	760.52	650.98	644.56	0	0	0	0		(102)
												Ü		(102)
(103)m=	0 (SOIAI (0 0	lculated 0	0 appii	0		1056.45		0	0	0	0		(103)
													- (44)	(103)
•			<i>ement fo</i> (104)m <			iweiiing,	continue	ous (KVV	(n) = 0.0	24 X [(10)3)m – (102)m])	K (41)M	
(104)m=	0	0	0	0	0	246.07	301.66	257.94	0	0	0	0		
	ŭ			Ū	, and the second		001.00		l	l = Sum(l	=	805.68	(104)
(101)										,	,			(104)
` '	l fraction	า							11.=	COMEC	area – 12	+) = '	1	
Cooled	I fraction		able 10h)					10=	cooled	area ÷ (4	+) =	1	(100)
Cooled			able 10b	0	0	0.25	0.25	0.25	0	o cooled	o (2	+) = 0	1	(100)
Cooled	ttency f	actor (Ta			0	0.25	0.25	0.25	0		0	, l	0	(106)

Space cooling requirement for month = (104)m × (105) × (106)m													
(107)m= 0	0	0	0	0	61.52	75.42	64.49	0	0	0	0		
								Total	= Sum(107)	=	201.42	(107)
Space cooling requirement in kWh/m²/year) ÷ (4) =			2.33	(108)
8f. Fabric Ene	rgy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabric Energy Efficiency									+ (108) =	=		49.6	(109)

SAP Input

Property Details: Plot 51

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 08 July 2020
Date of certificate: 28 October 2020

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

Water use <= 125 litres/person/day: False

PCDF Version: 466

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 86.6 m² 2.5 m

Living area: 29.75 m² (fraction 0.344)

Front of dwelling faces: North East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
NE	Manufacturer	Solid			
SE	Manufacturer	Windows	double-glazed	Yes	
SW	Manufacturer	Windows	double-glazed	Yes	
NW	Manufacturer	Windows	double-glazed	Yes	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
NE	mm	0	0	1.4	2	1
SE	16mm or more	0.7	0.63	1.4	6.097	1
SW	16mm or more	0.7	0.63	1.4	6.075	1
NW	16mm or more	0.7	0.63	1.4	4.579	1

Name: NE	Type-Name:	Location: Corridor Wall	Orient: North East	Width: 0	Height: 0
SE		External Wall	South East	0	0
SW		External Wall	South West	0	0
NW		External Wall	North West	0	0

Overshading: Average or unknown

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>S</u>						
External Wall	76.584	16.75	59.83	0.15	0	False	N/A
Corridor Wall	13.979	2	11.98	0.15	0.4	False	N/A
Stairwell Wall	12.217	0	12.22	0.15	0.9	False	N/A
Flat Roof	86.6	0	86.6	0.1	0		N/A

Internal Elements

Party Elements

Thermal bridges:

SAP Input

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1426

	Length	Psi-value		
	8.395	0.294	E2	Other lintels (including other steel lintels)
	31.2	0.049	E4	Jamb
	38.785	0.067	E7	Party floor between dwellings (in blocks of flats)
[Approved]	5.45	0.09	E16	Corner (normal)
	2.725	-0.072	E17	Corner (inverted internal area greater than external area)
	5.45	0.055	E18	Party wall between dwellings
	5.45	0.109	E25	Staggered party wall between dwellings
	9.885	0.062	E14	Flat roof
	28.9	0.56	E15	Flat roof with parapet
	10.144	0	Р3	Intermediate floor between dwellings (in blocks of flats)
	10.144	0.24	P4	Roof (insulation at ceiling level)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen $+\ 2$

Ductwork: Insulation, rigid

Approved Installation Scheme: True

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 schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 94 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later Design flow temperature: Unknown

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and at least two room

thermostats

Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False

Others:

Electricity tariff: Standard Tariff
In Smoke Control Area: Unknown
Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

SAP Input

Installed Peak power: 1.06

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		User_[Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom					0001082 on: 1.0.5.9	
		Property	Address	: Plot 51					
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor			a(m²)	1(40) 4	Av. He		_	Volume(m ³	<u>-</u>
	\			(1a) x		2.5	(2a) =	216.5	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	86.6	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	216.5	(5)
2. Ventilation rate:								2 1	
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0)	(40 =	0	(6a)
Number of open flues	0 + 0	+	0	=	0	,	(20 =	0	(6b)
Number of intermittent fa	ins				3	,	(10 =	30	(7a)
Number of passive vents	;			Ī	0	,	(10 =	0	(7b)
Number of flueless gas fi	ires			F	0		< 40 =	0	(7c)
J. 11. 11. 11. 11. 11. 11. 11. 11. 11. 1				L					(* *)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.14	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise (continue fi	rom (9) to	(16)			
Number of storeys in the Additional infiltration	he dwelling (ns)						N 41-0 4	0	(9)
	.25 for steel or timber frame of	vr 0 35 fc	ır masonı	rv coneti	ruction	[(8	9)-1]x0.1 =	0	(10)
	resent, use the value corresponding			•	detion			0	(11)
deducting areas of openii									_
·	floor, enter 0.2 (unsealed) or (J.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	s and doors draught stripped							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelop	e area	5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20] +$	(8), otherw	vise (18) =	(16)				0.39	(18)
	es if a pressurisation test has been do	one or a de	gree air pe	ermeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed .		(20) = 1 -	[0.075 x (19)] =			0.92	(19) (20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	•	/,1			0.92	(21)
Infiltration rate modified f	•		, , ,	, , ,				0.30	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1	1	<u>, </u>					ı	
(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 (00c) · · · (0	2)	1	1	•	•		1	ı	
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18]	
(22a)m= 1.27 1.25	1.20 1.1 1.00 0.95	0.95	1 0.92		1.00	1.12	1.10	J	

Adjusted infiltr	0.45	0.44	0.4	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42			
Calculate effe		_	rate for t		1	l					ļ ·			
If mechanica												()	(2
If exhaust air h		0		, ,	,	. ,	,, .	,) = (23a)			()	(2
If balanced with		-	-	_)	(2
a) If balance						- ` ` 		ŕ	 	- 	1 ` ´	÷ 100]		(0
24a)m= 0	0		0	0	0	0	0	0	0	0	0			(2
b) If balance	d mech	anical ve	entilation 0	without	neat red	overy (N	VIV) (24b	0 m = (22)	2b)m + ()	23b) 0		1		(2
,											0			(2
c) If whole h if (22b)n				-	-				.5 × (23b	o)				
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft						
if (22b)n		`	· ·		<u> </u>		 		0.5]		_	ı		
24d)m= 0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59			(2
Effective air			<u> </u>	,	``	ŕ	r	``		T	1	I		(6
25)m= 0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59			(2
3. Heat losse	s and he	eat loss p	oaramete	er:										
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-ł		A) kJ/	
oors (arca	(111)	"		2	x	1	.ix =	2		10/111 -1	`	NO/	(2
Vindows Type	· 1				6.097	=	/[1/(1.4)+	!	8.08	=				(2
Vindows Type					6.075	=	/[1/(1.4)+		8.05	\exists				(2
Vindows Type					4.579	= ,	/[1/(1.4)+		6.07	=				(2
Valls Type1	76.5	; <u>e</u>	16.7		59.83	_	0.18		10.77	╡ ,		¬ г		\ \(2
Valls Type2	13.9		2		11.98	=	0.18	=	2.16	북 ¦		북 남		(2
Valls Type3	12.2		0	_		=			2.10	믁 ¦		╡╞		\\^2
Roof				=	12.22	=	0.18	_		륵 ¦		- -		=
otal area of e	lements		0		86.6	×	0.13	=	11.26			L		(3
for windows and			effective wi	ndow I I-va	189.3		ı formula 1	/[(1/ -val	ıe)±0 041 a	as aiven in	naragranh	32		(3
* include the area						atou uomg	, romaia r	, [(i, o vaic	10) 10.0 1] 0	io givoii iii	paragrapi	0.2		
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				50	.59	(3
leat capacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	195	5.81	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		25	50	(3
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f			
hermal bridge				usina Ac	pendix ł	<						23	.79	(3
details of therma	•	,			•									``
otal fabric he	at loss							(33) +	(36) =			74	.38	(3
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5))			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
38)m= 43.22	42.93	42.65	41.31	41.06	39.89	39.89	39.67	40.34	41.06	41.56	42.09			(3
								(2.5)	(07) . (00)				
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m				

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.36	1.35	1.35	1.34	1.33	1.32	1.32	1.32	1.32	1.33	1.34	1.34		
()										Sum(40) ₁		1.34	(40)
Number of day	s in mo	nth (Tabl	e 1a)						3	()			` ′
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
						<u> </u>		<u> </u>	<u>. </u>	!			
4 10/2/2012 201	•										1.30/1./		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		58		(42)
Annual average Reduce the annual	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.39		(43)
not more that 125	litres per	person per	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	ı litres per	r day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)	-	•	-			
(44)m= 104.92	101.11	97.29	93.48	89.66	85.85	85.85	89.66	93.48	97.29	101.11	104.92		
		!						-	Total = Su	m(44) ₁₁₂ =	=	1144.64	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 155.6	136.09	140.43	122.43	117.48	101.37	93.94	107.79	109.08	127.12	138.77	150.69		
									Total = Su	m(45) ₁₁₂ =	=	1500.8	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 ₎) to (61)					
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage									•				
Storage volum	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		oolorod l	ana fant	or io kno	(Id\A/k	2/dox4).							(40)
a) If manufact				or is kno	wn (kvvi	ı/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro		_	-		:-		(48) x (49)) =			0		(50)
b) If manufacteHot water stora			-								0		(51)
If community h	•			C Z (KVV)	11/11110/02	·y)					0		(31)
Volume factor	_										0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (•	,, ,				`		,		0		(55)
Water storage	, ,	,	or each	month			((56)m = (55) × (41):	m		-		
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains			-								-	ix H	(30)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	loss cal	culated f	or each	month (59)m = ((58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	e H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Cambi lasa sa	المعاديما	fo., o.o.b		(C4)	(00) . 0	CE (44)	١								
Combi loss ca	o loculated	or each	montn (61)m =	(60) ÷ 3	05 × (41))m o	T 0	0	0	0	1	(61)		
(*)		<u> </u>					<u> </u>	_!	<u> </u>	ļ.		(F0)m + (61)m	(01)		
(62)m= 132.26	·	119.37	104.07	99.85	86.17	79.85	91.63	92.72	108.06	117.95	128.09	(59)m + (61)m	(62)		
Solar DHW input												l	(02)		
(add additiona									ii contribu	ion to wate	or ricating)				
(63)m= 0	0	0	0	0	0	0	0		0	0	0]	(63)		
Output from w	vater hea	ter					Į	_ !				ı			
(64)m= 132.26	1	119.37	104.07	99.85	86.17	79.85	91.63	92.72	108.06	117.95	128.09				
	1	<u> </u>				l	Ou	tput from w	ater heate	r (annual)₁	12	1275.68	(64)		
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	 .]	-		
(65)m= 33.07	28.92	29.84	26.02	24.96	21.54	19.96	22.91	23.18	27.01	29.49	32.02	ĺ	(65)		
include (57)	m in cal	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	g or hot w	ater is f	rom com	munity h	ı neating			
` '	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= 128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81		(66)		
Lighting gains	(calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5	•	•	•	•			
(67)m= 20.97	18.63	15.15	11.47	8.57	7.24	7.82	10.16	13.64	17.32	20.22	21.55]	(67)		
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5	•	•	•			
(68)m= 232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	177.74	190.7	207.05	222.42]	(68)		
Cooking gains	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also s	see Table	5	•	•	•			
(69)m= 35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88		(69)		
Pumps and fa	ıns gains	(Table 5	ia)			•									
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)		
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-	-	-				
(71)m= -103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05		(71)		
Water heating	g gains (T	able 5)				-	-	-	-	-	-				
(72)m= 44.44	43.03	40.11	36.13	33.55	29.92	26.83	30.79	32.19	36.31	40.96	43.04		(72)		
Total interna	l gains =	:		-	(66)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m				
(73)m= 359.74	358.4	345.91	325.3	303.48	283.14	270.37	274.26	285.22	305.97	329.86	348.65		(73)		
6. Solar gain	s:														
Solar gains are		•	r flux from	Table 6a		•	itions to d	convert to th	ne applical		tion.				
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF		Gains			
•	Table 60				Га	Die ba	, –	Table 6b	_ '	able 6c		(W)	,		
Southeast 0.9x	0.77	X	6.	1	x ;	36.79	X	0.63	X	0.7	=	68.56	(77)		
Southeast 0.9x	0.77	X	6.	1	X (62.67	X	0.63	X	0.7	=	116.78	(77)		
Southeast _{0.9x}	0.77	X	6.	1	X 8	35.75	×	0.63	X	0.7	=	159.78	(77)		
Southeast 0.9x	0.77	X	6.	1	x 1	06.25	×	0.63	x	0.7	=	197.98	(77)		
Southeast 0.9x	0.77	X	6.	1	x 1	19.01	X	0.63	X	0.7	=	221.76	(77)		

Southeast 9, 6, 7, 7	Southeast 0.9x					l .,		10.15	1		0.00	ا ا	0.7	_	г	200.45	7(77)
Southeast 0.9s	<u>L</u>	0.77	x			X I	_		X 1		0.63	×	0.7	\dashv	F	220.15	(77)
Southeast 0.9*	<u>L</u>)]			1			╡		=	F		╡゛゛
Southeast 0.9s	<u>L</u>					! !]]			╡╏		=	F		╡゛゛
Southwest 0.9 x	Ļ		X	6.	1	X			X			X		ᆗ ᠄	<u> </u>		╡゛゛
Southwestq 9x	<u>L</u>	0.77	X			X	6	9.27	X		0.63	X		╡ :	= <u> </u>	129.07	╡゛゛
Southwesto as	<u>_</u>	0.77	X	6.	1	X	4	4.07	X		0.63	X	0.7		- L	82.12	 (77)
Southwesto, at	<u>L</u>	0.77	X	6.	1	X	3	1.49	X		0.63	X	0.7	•	= <u> </u>	58.67	(77)
Southwesto 9x	<u>L</u>	0.77	Х	6.0)7	X	3	6.79	ļ		0.63	X	0.7	•	= <u> </u>	68.31	(79)
Southwesto 8x	<u>_</u>	0.77	Х	6.0)7	X	6	2.67	ļ		0.63	X	0.7	•	- <u> </u>	116.36	(79)
Southwesto 9x		0.77	X	6.0)7	X	8	5.75	_		0.63	X	0.7	=	- <u>[</u>	159.21	(79)
Southwesto 9x	Ļ	0.77	X	6.0)7	X	10	06.25	_		0.63	X	0.7	=	= <u>[</u>	197.27	(79)
Southwesto.9x	<u>L</u>	0.77	X	6.0)7	X	1	19.01]		0.63	X	0.7	=	- <u>L</u>	220.96	(79)
Southwesto.9x	Southwest _{0.9x}	0.77	X	6.0)7	X	1	18.15			0.63	X	0.7	=	= [219.36	(79)
Southwesto, 9x	Southwest _{0.9x}	0.77	X	6.0)7	X	1	13.91			0.63	X	0.7	=	= [211.48	(79)
Southwesto.9x	Southwest _{0.9x}	0.77	X	6.0)7	X	10	04.39]		0.63	x	0.7		- [193.81	(79)
Southwest0.9x	Southwest _{0.9x}	0.77	X	6.0)7	x	9	2.85			0.63	x	0.7	=	- [172.39	(79)
Southwesto,9x	Southwest _{0.9x}	0.77	Х	6.0)7	x	6	9.27			0.63	x	0.7		- [128.6	(79)
Northwest 0.9x	Southwest _{0.9x}	0.77	Х	6.0)7	x	4	4.07	1		0.63	x	0.7	╗.	- Ī	81.82	(79)
Northwest 0.9x	Southwest _{0.9x}	0.77	X	6.0)7	x	3	1.49	ĺ		0.63	x	0.7	一:	- Ī	58.46	(79)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	4.5	58	x	1	1.28	х		0.63	x	0.7	=	- Ī	15.79	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	4.5	58	x	2	2.97	x		0.63	×	0.7	一 .	- [32.14	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	4.5	58	x	4	1.38	x		0.63	×	0.7		- Ī	57.91	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	Х	4.5	58	x	6	7.96	x		0.63	x	0.7	╡:	- Ī	95.1	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	4.5	58	x	9	1.35	x		0.63	×	0.7	一 :	- [127.83	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	4.5	58	x	9	7.38	x		0.63	×	0.7	╡ =	- Ī	136.28	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	Х	4.5	58	x	9	91.1	x		0.63	x	0.7	╡:	- Ī	127.49	(81)
Northwest 0.9x	Northwest _{0.9x}	0.77	х	4.5	58	x	7	2.63	x		0.63	×	0.7	一 :	- Ī	101.63	(81)
Northwest 0.9x	Northwest 0.9x	0.77	x	4.5	58	x	5	0.42	x		0.63	i x	0.7	一.	- Ī	70.56	(81)
Northwest 0.9x	Northwest 0.9x	0.77	x	4.5	58	x	2	8.07	X		0.63	×	0.7	〓.	- Ī	39.28	(81)
Northwest 0.9x	Northwest 0.9x	0.77	х	4.5	58	X	<u> </u>	14.2	X		0.63	×	0.7		<u> </u>	19.87	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 152.66 265.28 376.9 490.35 570.54 575.79 551.22 489.96 415.96 296.95 183.81 130.03 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 512.4 623.68 722.81 815.65 874.02 858.93 821.59 764.21 701.18 602.92 513.67 478.68 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m 1 0.99 0.99 0.96 0.89 0.75 0.58 0.64 0.86 0.98 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Northwest _{0.9x}		x			l L]] _X			- x		╡.	₌ ┟		╡╵╵
(83)m= 152.66 265.28 376.9 490.35 570.54 575.79 551.22 489.96 415.96 296.95 183.81 130.03 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 512.4 623.68 722.81 815.65 874.02 858.93 821.59 764.21 701.18 602.92 513.67 478.68 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.99 0.96 0.89 0.75 0.58 0.64 0.86 0.98 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	L					l			J		0.00	_	· · ·		L		
(83)m= 152.66 265.28 376.9 490.35 570.54 575.79 551.22 489.96 415.96 296.95 183.81 130.03 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 512.4 623.68 722.81 815.65 874.02 858.93 821.59 764.21 701.18 602.92 513.67 478.68 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.99 0.96 0.89 0.75 0.58 0.64 0.86 0.98 1 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Solar gains in	watts ca	alculated	l for eac	h mont	th			(83)m	n = Su	m(74)m	(82)m					
(84)m= 512.4 623.68 722.81 815.65 874.02 858.93 821.59 764.21 701.18 602.92 513.67 478.68 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.99 0.96 0.89 0.75 0.58 0.64 0.86 0.98 1 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	T	1			i –	$\overline{}$	75.79	551.22	`	_	``	. ,	183.81	130.0	3		(83)
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.99 0.96 0.89 0.75 0.58 0.64 0.86 0.98 1 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Total gains – i	nternal a	nd solar	(84)m =	= (73)n	า + (83)m	, watts		1	!				_		
Temperature during heating periods in the living area from Table 9, Th1 (°C) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 1 0.99 0.99 0.96 0.89 0.75 0.58 0.64 0.86 0.98 1 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	(84)m= 512.4	623.68	722.81	815.65	874.02	2 8	58.93	821.59	764	.21	701.18	602.92	513.67	478.6	8		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	7. Mean inter	nal temp	erature	(heating	seaso	n)											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Temperature	during h	eating p	eriods i	n the li	ving	area f	from Tal	ole 9	, Th1	(°C)				Γ	21	(85)
(86)m= 1 0.99 0.99 0.96 0.89 0.75 0.58 0.64 0.86 0.98 1 1 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Utilisation fac	tor for g	ains for I	living are	ea, h1,	m (s	ee Ta	ble 9a)							_		_
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	Jan	Feb	Mar	Apr	Ma	<u> </u>	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	С		
	(86)m= 1	0.99	0.99	0.96	0.89		0.75	0.58	0.6	64	0.86	0.98	1	1			(86)
	Mean interna	l temper	ature in	living ar	ea T1	(follo	w ste	ps 3 to 7	7 in T	able	9c)				_		
										$\overline{}$		20.36	19.85	19.45	5		(87)
	<u> </u>				•								1		_		

remu	oroturo	during b	ootina n	oriodo ir	root of	ممنالمييام	from To	bla O T	h2 (0C)					
	19.8	19.8	neating p	19.81	19.82	19.83	19.83	19.83	19.82	19.82	19.81	19.81		(88)
(88)m=		<u> </u>	<u> </u>					<u> </u>	19.02	19.02	19.01	19.01		(00)
			ains for i			· ` ·	i							(00)
(89)m=	1	0.99	0.98	0.94	0.84	0.65	0.44	0.5	0.79	0.96	0.99	1		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m=	18.43	18.62	18.91	19.3	19.61	19.78	19.82	19.82	19.71	19.31	18.8	18.4		(90)
									1	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwel	llina) = fl	A × T1	+ (1 – fl	A) x T2			!		
(92)m=	18.79	18.98	19.28	19.66	19.98	20.17	20.22	20.21	20.09	19.67	19.16	18.76		(92)
			he mean									10110		, ,
(93)m=	18.79	18.98	19.28	19.66	19.98	20.17	20.22	20.21	20.09	19.67	19.16	18.76		(93)
		l	uirement											
			ernal ter		re ohtain	ed at ste	an 11 of	Tahla 0l	h so tha	t Ti m-(76)m an	d re-calc	ulate	
			or gains	•		ica at st	SP 11 01	Table 5	o, 30 tria	(11,111–(r O)III air	a re care	diate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	<u> </u>	,									
(94)m=	1	0.99	0.98	0.94	0.85	0.68	0.49	0.55	0.81	0.96	0.99	1		(94)
Usefu	∟ ul gains,	hmGm	, W = (94	4)m x (84	4)m			ı						
(95)m=	510.6	618.4	707.56	768.38	744.48	583.55	403.8	419.33	567.64	580.14	509.91	477.43		(95)
Mont	hly aver	age exte	rnal tem	perature	from Ta	able 8		<u> </u>	!	ļ		<u> </u>		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	-[(39)m :	x [(93)m	– (96)m	1		<u> </u>		
(97)m=			1495.31	1244.73	955.64	636.28	413.29	434.68	686.98	1046.89	1398.26	1696.15		(97)
Spac	e heatin	a requir	omont fo	b	I - I - I	A // /			l					
•		y icyani	ennem no	r each n	ionin, Ki	/Vh/moni	th = 0.0≥	24 x I(97)m – (95)m] x (4 ⁻	1)m			
(98)m =	887.79	694.49	586.08	342.97	157.1	/Vh/mont 0	$\ln = 0.02$	24 x [(97])m – (95 0)m] x (4 ² 347.26	1)m 639.61	906.72		
(98)m=								0	0	347.26	639.61	ļ	4562.04	(98)
	887.79	694.49	586.08	342.97	157.1			0	0		639.61	ļ		(98)
	887.79	694.49		342.97	157.1			0	0	347.26	639.61	ļ	4562.04 52.68	(98) (99)
Spac	887.79 e heatin	694.49	586.08	342.97 kWh/m²	157.1			0	0	347.26	639.61	ļ		╡``
Spac 8c. S	e heatin	694.49 g require	586.08 ement in uiremen July and	342.97 kWh/m² nt August.	157.1 ² /year See Tal	0 ble 10b	0	0 Tota	0 Il per year	347.26 (kWh/year	639.61) = Sum(9	8)15,912 =		╡``
Spac 8c. S Calcu	e heatin pace co plated fo Jan	g require	586.08 ement in uiremen July and Mar	kWh/m² t August. Apr	157.1 Pyear See Tab May	0 ble 10b Jun	Jul	0 Tota	0 li per year	347.26 (kWh/year	639.61) = Sum(9 Nov	8) _{15,912} =		╡``
Spac 8c. S Calcu	e heatin pace co plated fo Jan loss rate	g require oling rec r June, Feb	ement in uiremen July and Mar Ilculated	kWh/m² t August. Apr using 28	157.1 2/year See Tab May 5°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug and exte	0 ll per year Sep	347.26 (kWh/year	639.61) = Sum(9 Nov e from T	8) _{15,912} = Dec able 10)		(99)
Spac 8c. S Calcu Heat (100)m=	e heatin pace co llated fo Jan loss rate	g require coling rec r June, c Feb e Lm (ca	ement in uirement July and Mar lculated	kWh/m² t August. Apr	157.1 Pyear See Tab May	0 ble 10b Jun	Jul perature	0 Tota	0 li per year	347.26 (kWh/year	639.61) = Sum(9 Nov	8) _{15,912} =		╡``
Spac 8c. S Calcu Heat (100)m= Utilisa	e heatin pace co plated fo Jan loss rate o ation face	g require oling rec r June, Feb e Lm (ca	ement in uirement July and Mar Uculated 0 pss hm	kWh/m² t August. Apr using 25	157.1 See Tab May 5°C inter	0 ble 10b Jun nal temp 1074.09	Jul perature 845.56	O Total Aug and exte	0 on the second of the second	347.26 (kWh/year Oct nperatur 0	639.61) = Sum(9 Nov e from T 0	8) _{15,912} = Dec able 10)		(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m=	e heatin pace co plated fo Jan loss rate 0 ation face	g require r June, c Feb e Lm (ca	ement in quirement July and Mar loulated 0 pss hm 0	kWh/m² it August. Apr using 25	157.1 See Tal May 5°C inter 0	0 Die 10b Jun rnal temp 1074.09	Jul perature	0 Tota Aug and exte	0 ll per year Sep	347.26 (kWh/year	639.61) = Sum(9 Nov e from T	8) _{15,912} = Dec able 10)		(99)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu	e heatin pace co plated fo Jan loss rate o ation face	g require coling rec r June, c Feb e Lm (ca 0 ctor for lo	ement in July and Mar Ilculated 0 pss hm 0	kWh/m² t August. Apr using 25 0 100)m x	See Tab May 5°C inter 0	0 ble 10b Jun nal temp 1074.09	Jul perature 845.56	O Total Aug and extel 866.77	0 on the second of the second	Oct nperatur 0	639.61) = Sum(9 Nov e from T 0	8) _{15,912} = Dec Table 10) 0		(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin pace co llated fo Jan loss rate 0 ation face ul loss, h	g require r June, . Feb e Lm (ca 0 ctor for lo	ement in quirement July and Mar July and 0 pss hm 0 Vatts) = (kWh/m² kWh/m² t August. Apr using 25 0 (100)m x	See Tate May 5°C inter 0 0 (101)m 0	0 Die 10b Jun nal temp 1074.09 0.83	Jul perature 845.56 0.9	0 Tota Aug and exte 866.77	Sep ernal ten 0	347.26 (kWh/year Oct nperatur 0	639.61) = Sum(9 Nov e from T 0	8) _{15,912} = Dec able 10)		(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	e heatin pace co llated fo Jan loss rate 0 ation face 1 0 ation face 1 0 ation face 2 0 ation face 3 0 ation face 4 0 ation face 5 0 ation face 6 0 ation face 6 0 ation face 7 0 ation face 8 0 ation face 9 0 ation face 1 0 ation face 9 0 ation face 1 0 ation face 9 0 ation face	g require coling rec r June, Feb e Lm (ca 0 ctor for lo mLm (V 0 gains ca	ement in July and Mar Iculated 0 oss hm 0 Vatts) = (0	kWh/m² August. Apr using 25 0 100)m x 0 for appli	See Tab May 5°C inter 0 (101)m 0 cable we	0 Dle 10b Jun nal temp 1074.09 0.83 889.71 eather re	Jul perature 845.56 0.9 757.71 egion, se	Aug and exte 866.77 0.87	Sep ernal ten 0 0 10)	Oct nperatur 0	639.61) = Sum(9 Nov e from T 0	8) _{15,912} = Dec able 10) 0		(100) (101) (102)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin pace co llated fo Jan loss rate 0 ation face ul loss, heating of the color of th	g require r June, v Feb e Lm (ca 0 ctor for lo mLm (V 0 gains ca	ement in Guirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0	kWh/m² kWh/m² August. Apr using 28 0 (100)m x 0 for appli	See Tate May 5°C inter 0 0 (101)m 0 cable we	0 Die 10b Jun 1074.09 0.83 889.71 eather re	Jul perature 845.56 0.9 757.71 egion, se 1055.03	0 Tota Aug and exte 866.77 0.87 752.74 ee Table 989.64	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	Nov Nov O O O O	B) _{15,912} = Dec Table 10) 0	52.68	(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace co pare de la lated for loss rate or loss rate or loss, had loss, ha	g require coling rec r June, v Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require	ement in July and Mar July and Oss hm Ovatts) = (Oss Included Oss Included I	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month,	See Tak May 5°C inter 0 (101)m 0 cable we	0 Die 10b Jun 1074.09 0.83 889.71 eather re	Jul perature 845.56 0.9 757.71 egion, se 1055.03	0 Tota Aug and exte 866.77 0.87 752.74 ee Table 989.64	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	Nov Nov O O O O	B) _{15,912} = Dec Table 10) 0	52.68	(100) (101) (102)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	e heatin pace co llated fo Jan loss rate 0 ation face 1 0 lloss, h 0 s (solar g e cooling 04)m to	g require coling recovery r June, very Feb e Lm (ca 0 etor for lo 0 emLm (W 0 gains ca 0 g require zero if (ement in puirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement for 104)m <	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month,	See Take May 5°C inter 0 0 (101)m 0 cable we 0 whole comm	ole 10b Jun Inal temp 1074.09 0.83 889.71 eather re 1100.7	Jul perature 845.56 0.9 757.71 egion, se 1055.03 continue	0 Tota Aug and exte 866.77 0.87 752.74 ee Table 989.64 ous (kW	0 10 0 0 0 0 0 0 0 0	347.26 (kWh/year Oct nperatur 0 0 24 x [(10	Nov e from T 0 0 0 03)m - (8) _{15,912} = Dec Table 10) 0 0 102)m];	52.68	(100) (101) (102)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace co llated fo Jan loss rate 0 ation face 1 0 lloss, h 0 s (solar g e cooling 04)m to	g require coling rec r June, v Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require	ement in July and Mar July and Oss hm Ovatts) = (Oss Included Oss Included I	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month,	See Tak May 5°C inter 0 (101)m 0 cable we	0 Die 10b Jun 1074.09 0.83 889.71 eather re	Jul perature 845.56 0.9 757.71 egion, se 1055.03	0 Tota Aug and exte 866.77 0.87 752.74 ee Table 989.64	0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Nov e from T 0 0 0 0 03)m - (8) _{15,912} = Dec able 10) 0 0 102)m] :	52.68 x (41)m	(100) (101) (102) (103)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face (solar grade) e cooling (04)m to	g require r June, Feb e Lm (ca 0 etor for lo mLm (V 0 gains ca 0 g require zero if (ement in puirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement for 104)m <	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month,	See Take May 5°C inter 0 0 (101)m 0 cable we 0 whole comm	ole 10b Jun Inal temp 1074.09 0.83 889.71 eather re 1100.7	Jul perature 845.56 0.9 757.71 egion, se 1055.03 continue	0 Tota Aug and exte 866.77 0.87 752.74 ee Table 989.64 ous (kW	0 1 10 0 10 0 10 0 10	347.26 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(639.61) = Sum(9 Nov e from T 0 0 0 0 10.4)	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	52.68 × (41)m	(100) (101) (102) (103)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Spac set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face 0 ul loss, h 0 s (solar (0 e cooling 04)m to d fraction	g require r June, v Feb e Lm (ca 0 etor for lo 0 mLm (W 0 gains ca 0 g require zero if (ement in quirement Mar Mar October Mar October Mar October Mar October Mar October Mar October Mar Mar October Mar Mar October Mar Mar October Mar Mar Mar Mar Mar Mar Mar Mar Mar Ma	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98	See Take May 5°C inter 0 0 (101)m 0 cable we 0 whole comm	ole 10b Jun Inal temp 1074.09 0.83 889.71 eather re 1100.7	Jul perature 845.56 0.9 757.71 egion, se 1055.03 continue	0 Tota Aug and exte 866.77 0.87 752.74 ee Table 989.64 ous (kW	0 1 10 0 10 0 10 0 10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	639.61) = Sum(9 Nov e from T 0 0 0 0 10.4)	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	52.68 x (41)m	(100) (101) (102) (103)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Spac set (1 (104)m= Cooled Interm	e heatin pace co lated fo Jan loss rate 0 ation face 1 0 ation face cooling 04)m to d fraction ittency f	g require r June, v Feb e Lm (ca 0 etor for lo 0 mLm (W 0 gains ca 0 g require zero if (ement in puirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement for 104)m <	kWh/m² kWh/m² August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98	See Take May 5°C inter 0 0 (101)m 0 cable we 0 whole comm	ole 10b Jun Inal temp 1074.09 0.83 889.71 eather re 1100.7	Jul perature 845.56 0.9 757.71 egion, se 1055.03 continue	0 Tota Aug and exte 866.77 0.87 752.74 ee Table 989.64 ous (kW	0 1 10 0 10 0 10 0 10	347.26 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(639.61) = Sum(9 Nov e from T 0 0 0 0 10.4)	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	52.68 × (41)m	(100) (101) (102) (103)
Spac 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Spac set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 0 ation face cooling 04)m to d fraction ittency f	g require coling rec r June, v Feb e Lm (ca 0 enter for le 0 enter	sement in July and Mar Iculated 0 oss hm 0 Vatts) = (0 lculated 0 oment for 104)m < 0 oss blee 10b	kWh/m² kWh/m² August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98) 0	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole com	0 ole 10b Jun nal temp 1074.09 0.83 889.71 eather residently 1100.7 dwelling, 151.91	Jul perature 845.56 0.9 757.71 egion, se 1055.03 continue	0 Tota Aug and exte 866.77 0.87 752.74 ee Table 989.64 ous (kW	0 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Nov e from T 0 0 0 0 0 1,0,4) area ÷ (4	8) _{15,912} = Dec able 10) 0 0 102)m] :	52.68 × (41)m	(100) (101) (102) (103)

Space	cooling	requirer	ment for	month =	: (104)m	× (105)	× (106)r	n					_	
(107)m=	0	0	0	0	0	37.98	55.3	44.06	0	0	0	0		
·	Total = Sum(107) = Space cooling requirement in kW/h/m²//cor. (107) : (1) =													(107)
Space	Space cooling requirement in kWh/m²/year (107) ÷ (4) =												1.59	(108)
8f. Fab	ric Ene	rgy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabrio	Energ	y Efficie	ncy						(99)	+ (108) =	=		54.27	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								62.41	(109)

		He	er Details:											
Assessor Name:	Zahid Ashraf	030	Stroma	a Nium	hori		STD∪	001082						
Software Name:	Stroma FSAP 2012	2	Softwa	-				on: 1.0.5.9						
			rty Address:											
Address :														
1. Overall dwelling dime	ensions:													
Ground floor		, 	Area(m²) 86.6	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)					
Total floor area TFA = (1	2)+(1b)+(1c)+(1d)+(1c)	 ⊥ (1n) [(4)			(20)	210.5						
	a)+(10)+(10)+(10)+(1e)	+(111 <i>)</i>	86.6)T(3C)T(3C	d)+(3e)+	(3n) -		7,5					
Dwelling volume				(3a)+(3b))+(30)+(30	1)+(3e)+	.(311) =	216.5	(5)					
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r					
Number of chimneys Number of open flues														
•		<u> </u>		<u> </u>		x	20 =	0	(6a)					
Number of intermittent fa				J L			10 =	0	(6b) (7a)					
				L	0		10 =	0	= ' '					
Number of flueless are fi				Ļ	0		40 =	0	(7b)					
Number of flueless gas fi	ires				0	x '	+0 =	0	(7c)					
							Air ch	anges per ho	our					
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7	'b)+(7c) =	Γ	0		÷ (5) =	0	(8)					
	peen carried out or is intended	d, proceed to (1	17), otherwise o	ontinue fr	om (9) to	(16)			-					
Number of storeys in the Additional infiltration	he dwelling (ns)					[(0)	410.4	0	(9)					
	.25 for steel or timber fi	rame or 0.35	5 for masonr	v constr	uction	[(9)	-1]x0.1 =	0	(10)					
if both types of wall are p	resent, use the value corresp			•										
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unseale	ed) or 0.1 (se	ealed) else	enter ()			İ	0	(12)					
If no draught lobby, en	•	ou) or o. 1 (or	caica), cioc	critor o				0	(13)					
• ,	s and doors draught str	ipped						0	(14)					
Window infiltration			0.25 - [0.2	, ,	_			0	(15)					
Infiltration rate			(8) + (10)	, , ,	, , ,	, ,		0	(16)					
Air permeability value, If based on air permeabil	q50, expressed in cubi	-	•	•	etre of e	envelope	area	3	$= \begin{pmatrix} (17) \\ (49) \end{pmatrix}$					
	es if a pressurisation test has				is being u	sed		0.15	(18)					
Number of sides sheltered	ed							1	(19)					
Shelter factor			(20) = 1 -		9)] =			0.92	(20)					
Infiltration rate incorporat	_		(21) = (18)	x (20) =				0.14	(21)					
Infiltration rate modified f	Mar Apr May	Jun Ju	ul Aug	Sep	Oct	Nov	Dec]						
Monthly average wind sp		Juli J	ai Aug	ОСР	1 001	1400	Dec	_						
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.	8 3.7	4	4.3	4.5	4.7							
	-)		ı		1	1		I						
Wind Factor (22a)m = (2.23) m = (2.23)	 	0.05	NE 0.00	4	4.00	1 4 4 0	1 40	1						
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95 0.9	0.92	1	1.08	1.12	1.18							

Adjusted infiltration rate (allowing for shelter a	nd wind sneed) – (21a) v	(22a)m					
0.18 0.17 0.17 0.15 0.15	0.13 0.13	<u> </u>	0.14	0.15	0.16	0.16		
Calculate effective air change rate for the appl	licable case							
If mechanical ventilation:							0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23	sa) x Fmv (equatio	n (N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing	for in-use factor (f	rom Table 4h	ı) =				79.05	(23c)
a) If balanced mechanical ventilation with he	eat recovery (M	IVHR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)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		(24a)
b) If balanced mechanical ventilation withou	t heat recovery	/ (MV) (24k	o)m = (22	2b)m + (23b)			
(24b)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positi if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$	•			.5 × (23b	o)			
(24c)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24c)
d) If natural ventilation or whole house posit if (22b)m = 1, then (24d)m = (22b)m oth	•			0.5]			•	
(24d)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24	b) or (24c) or (24d) in bo	x (25)				1	
(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)
2. Heat leases and heat less never meters		1						
3. Heat losses and heat loss parameter: ELEMENT Gross Openings area (m²) m²	Net Area A ,m²	U-val W/m2		A X U (W/		k-value kJ/m²·l		X k /K
Doors	2	x 1.4		2.8		10/111 -1	K KO	(26)
Windows Type 1		x1/[1/(1.4)+	!		=			. ,
Windows Type 2	6.097	x1/[1/(1.4)+	l.	8.08	=			(27)
••	6.075		· !	8.05	ᆗ			(27)
Windows Type 3	4.579	x1/[1/(1.4)+	0.04] = [6.07	ᆗ ,			(27)
Walls Type1 76.58 16.75	59.83	x 0.15	=	8.97	닠 !			(29)
Walls Type2 13.98 2	11.98	× 0.14	=	1.7	ᆜ ᆝ			(29)
Walls Type3 12.22 0	12.22	× 0.13	= [1.61	_			(29)
Roof 86.6 0	86.6	x 0.1	=	8.66				(30)
Total area of elements, m ²	189.38							(31)
* for windows and roof windows, use effective window U-v		sing formula 1	1/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	3.2	
** include the areas on both sides of internal walls and pa Fabric heat loss, W/K = S (A x U)	ruuoris	(26)(30) + (32) =				45.05	(33)
Heat capacity $Cm = S(A \times k)$		(=0)(00		(30) + (3)	2) + (32a).	(32e) -	45.95 1955.81	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) i	n k.l/m²K		., ,	tive Value	, , ,	(020) =	100	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.		n precisely the				able 1f	100	(00)
Thermal bridges : S (L x Y) calculated using A	ppendix K						27.02	(36)
if details of thermal bridging are not known (36) = $0.05 \times (0.05)$							27.02	()
Total fabric heat loss			(33) +	(36) =			72.97	(37)
Ventilation heat loss calculated monthly			(38)m	= 0.33 × ((25)m x (5))		
Jan Feb Mar Apr May	Jun Ju	Aug	Sep	Oct	Nov	Dec		
(38)m= 20.12 19.88 19.63 18.39 18.14	16.9 16.9	16.65	17.4	18.14	18.64	19.13		(38)
Heat transfer coefficient, W/K			(39)m	= (37) + (38)m			
(39)m= 93.09 92.84 92.59 91.36 91.11	89.87 89.8	7 89.62	90.36	91.11	91.6	92.1		
Stroma FSAP 2012 Version: 1.0.5.9 (SAP 9.92) - http://ww	ww.stroma.com	•		Average =	Sum(39) ₁	12 /12=	91.2 ⊝ age	2 0(389)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.07	1.07	1.07	1.05	1.05	1.04	1.04	1.03	1.04	1.05	1.06	1.06		
				ı		l	l		Average =	Sum(40) ₁ .	12 /12=	1.05	(40)
Number of day	·	nth (Tab	le 1a)					ı	1	i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		58		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed t			se target c		0.41		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								· '					
(44)m= 110.45	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		
	ļ								Total = Su	m(44) ₁₁₂ =	= [1204.88	(44)
Energy content of	f hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62		
If instantaneous	water booti	na at naint	of upo /pr	hat water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	- L	1579.79	(45)
If instantaneous v	1		,		,.		· · ·	, , , I	1	1			(40)
(46)m= 24.57 Water storage	21.49	22.17	19.33	18.55	16.01	14.83	17.02	17.22	20.07	21.91	23.79		(46)
Storage volum) includir	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•					_					<u> </u>		()
Otherwise if n	_			_			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	factor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-								02		(51)
If community h	•			IC 2 (KVV)	ii/iiti C/GC	' y)				0.	02		(31)
Volume factor	_									1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro	om watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(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)
Primary circuit	t loss (ar	nual) fro	m Table	- 							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by				,	•	` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss ca	lculated	for each	month (′61)m =	(60) ÷ :	365 × (41)m							
(61)m= 0	0	0	0	0	0	0)		0	0	0	0]	(61)
	uired for	water he	eating ca	alculated	l for ea	 ch month	(62)	 m =	0.85 × ((45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 219.07	193.18	203.1	182.37	178.94	160.2	154.16	168	_	168.32	189.09	199.56	213.9]	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	: H (nega	tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	.	
(add additiona												•		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0		(63)
Output from w	ater hea	ter				•	•					•	•	
(64)m= 219.07	193.18	203.1	182.37	178.94	160.2	154.16	168	.74	168.32	189.09	199.56	213.9]	
								Outp	out from wa	ater heate	er (annual)	112	2230.63	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	n]	
(65)m= 98.68	87.57	93.37	85.65	85.34	78.28	77.1	81.	95	80.97	88.71	91.36	96.96]	(65)
include (57)	m in calc	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts														
Metabolic gains (Table 5), Watts														
Jan	Feb	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
(66)m= 154.58	154.58	154.58	154.58	154.58	154.58	154.58	154	.58	154.58	154.58	154.58	154.58		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				_	
(67)m= 52.42	46.56	37.87	28.67	21.43	18.09	19.55	25.	41	34.11	43.31	50.54	53.88]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a),	also	see Tal	ble 5		_	_	
(68)m= 347.29	350.89	341.81	322.48	298.07	275.13	259.81	256	.21	265.29	284.62	309.03	331.96		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a), als	o se	e Table	5	-	-	-	
(69)m= 53.03	53.03	53.03	53.03	53.03	53.03	53.03	53.	03	53.03	53.03	53.03	53.03]	(69)
Pumps and fa	ns gains	(Table 5	ōa)			•							-	
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)	•				•	•	•	-	
(71)m= -103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103	.05	-103.05	-103.05	-103.05	-103.05]	(71)
Water heating	gains (T	able 5)				-					-		-	
(72)m= 132.64	130.32	125.5	118.95	114.7	108.72	103.63	110	.15	112.46	119.24	126.89	130.33		(72)
Total internal	gains =				(6	6)m + (67)n	n + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m	•	
(73)m= 636.91	632.33	609.74	574.66	538.76	506.5	487.55	496	.32	516.42	551.73	591.02	620.73]	(73)
6. Solar gain	s:					_					•			
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica	ble orienta	tion.		
Orientation:		actor	Area			lux		_	g_ 	_	FF		Gains	
_	Table 6d		m²			able 6a	_		able 6b	_ '	able 6c		(W)	_
Southeast _{0.9x}	0.77	X	6.	1	X	36.79	X		0.63	X	0.7	=	68.56	(77)
Southeast 0.9x	0.77	X	6.	1	x	62.67	x		0.63	×	0.7	=	116.78	(77)
Southeast 0.9x	0.77	X	6.	1	x	85.75	X		0.63	x	0.7	=	159.78	(77)
Southeast 0.9x	0.77	Х	6.	1	х	106.25	x		0.63	x [0.7	=	197.98	(77)
Southeast 0.9x	0.77	X	6.	1	x	119.01	x		0.63	X	0.7	=	221.76	(77)

Southeast 0.9x	0.77			. 1	.,		40.45	1		0.00	٦.,	0.7	_	г	000.45	7(77)
Southeast 0.9x	0.77	X	6.		Χ		18.15	X		0.63	x	0.7	_	F	220.15	」 (77)
Southeast 0.9x	0.77	×	6.		X		13.91	X		0.63	X	0.7	=	- - -	212.25	」 (77)
Southeast 0.9x	0.77	x	6.		Χ		04.39	X 1		0.63	X	0.7	╡	늗	194.51	」 (77)
<u> </u>	0.77	×	6.		X		2.85	X		0.63	_ ×	0.7	╡ ‐	F	173.01	」 (77)
Southeast 0.9x	0.77	X	6.		X		9.27	X		0.63	→ ×	0.7	=	*	129.07	<u> </u> (77)
Southeast 0.9x	0.77	×	6.		X		4.07	X		0.63	×	0.7	_ •	Ļ	82.12	<u> </u> (77)
Southeast 0.9x	0.77	×	6.	1	X	3	1.49	X		0.63	X	0.7	_ •	Ļ	58.67](77)
Southwest _{0.9x}	0.77	X	6.0	7	X	3	6.79			0.63	X	0.7	=	Ļ	68.31	<u> </u> (79)
Southwest _{0.9x}	0.77	Х	6.0	7	X	6	2.67			0.63	×	0.7	=	• <u> </u>	116.36	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	8	5.75			0.63	X	0.7	-	• <u> </u>	159.21	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	10	06.25			0.63	X	0.7	•	• <u>L</u>	197.27	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	1	19.01			0.63	X	0.7	=	• <u>L</u>	220.96	(79)
Southwest _{0.9x}	0.77	Х	6.0	7	X	1	18.15			0.63	X	0.7	=	- <u>L</u>	219.36	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	1	13.91			0.63	X	0.7		= [211.48	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	10	04.39			0.63	X	0.7	=	= [193.81	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	9	2.85			0.63	X	0.7	=	= [172.39	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	6	9.27			0.63	X	0.7	=	= [128.6	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	4	4.07			0.63	X	0.7	=	= [81.82	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	3	1.49			0.63	X	0.7	=	- [58.46	(79)
Northwest 0.9x	0.77	X	4.5	8	X	1	1.28	X		0.63	X	0.7		- [15.79	(81)
Northwest 0.9x	0.77	X	4.5	8	x	2	2.97	X		0.63	X	0.7	=	- [32.14	(81)
Northwest 0.9x	0.77	X	4.5	8	x	4	1.38	X		0.63	x	0.7	-	<u> </u>	57.91	(81)
Northwest 0.9x	0.77	х	4.5	8	x	6	7.96	X		0.63	x	0.7	=	<u> </u>	95.1	(81)
Northwest 0.9x	0.77	х	4.5	8	x	9	1.35	X		0.63	x	0.7	=	<u> </u>	127.83	(81)
Northwest 0.9x	0.77	x	4.5	8	x	9	7.38	x		0.63	x	0.7		• [136.28	(81)
Northwest 0.9x	0.77	x	4.5	8	x	9	91.1	x		0.63	x	0.7		• [127.49	(81)
Northwest 0.9x	0.77	x	4.5	8	x	7	2.63	x		0.63	×	0.7		• [101.63	(81)
Northwest 0.9x	0.77	x	4.5	8	x	5	0.42	x		0.63	×	0.7	╗ -	- ┌	70.56	(81)
Northwest 0.9x	0.77	x	4.5	8	x	2	8.07	x		0.63	×	0.7	╡ =	- ┌	39.28	(81)
Northwest 0.9x	0.77	x	4.5	8	x		14.2	x		0.63	×	0.7	╡ =	- ┌	19.87	(81)
Northwest _{0.9x}	0.77	x	4.5	8	x	9	9.21	X		0.63	×	0.7	╡:	- [12.89	(81)
_											_			_		
Solar gains in y	watts, ca	lculated	for eacl	n mont	h_			(83)m	n = Su	m(74)m	(82)m					
(83)m= 152.66	265.28	376.9	490.35	570.54		75.79	551.22	489	.96	415.96	296.9	183.81	130.03	3		(83)
Total gains – ir	nternal ar	nd solar	(84)m =	: (73)m	+ (83)m	, watts							_		
(84)m= 789.57	897.61	986.63	1065	1109.3	10	82.29	1038.77	986	.28	932.38	848.67	7 774.83	750.70	6		(84)
7. Mean interr	nal temp	erature	(heating	seaso	n)											
Temperature	during he	eating p	eriods ir	the liv	/ing	area f	from Tab	ole 9,	, Th1	(°C)				Γ	21	(85)
Utilisation fact	tor for ga	ins for l	iving are	a, h1,ı	m (s	ee Ta	ble 9a)									_
Jan	Feb	Mar	Apr	May	<u>/ </u>	Jun	Jul	A۱	ug	Sep	Oct	Nov	Dec			
(86)m= 0.92	0.88	0.83	0.75	0.63		0.48	0.36	0.4	4	0.58	0.77	0.88	0.92			(86)
Mean internal	tempera	ature in	living are	ea T1 (follo	w ste	ps 3 to 7	in T	able	9c)						
(87)m= 19.24	19.51	19.89	20.34	20.68	_	20.89	20.96	20.		20.81	20.38	19.74	19.18	3		(87)
								•					•			

T		المادية				al a III a a	f T.	bla O Ti	LO (0 0)					
(88)m=	20.02	20.02	eating p	20.04	20.04	20.05	20.05	20.05	n2 (°C) 20.05	20.04	20.04	20.03		(88)
` '			ains for						20.05	20.04	20.04	20.03		(00)
(89)m=	0.9	0.87	0.81	0.72	0.58	0.42	0.29	0.32	0.52	0.74	0.86	0.91		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 7	r 7 in Tabl	e 9c)				
(90)m=	17.7	18.08	18.62	19.24	19.69	19.95	20.03	20.02	19.87	19.31	18.43	17.63		(90)
		l	<u> </u>			<u> </u>	<u> </u>		f	LA = Livin	g area ÷ (4	1) =	0.34	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	llina) = fl	LA × T1	+ (1 – fL	A) x T2					_
(92)m=	18.23	18.58	19.06	19.62	20.03	20.28	20.35	20.34	20.19	19.68	18.88	18.16		(92)
Apply	adjustn	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.23	18.58	19.06	19.62	20.03	20.28	20.35	20.34	20.19	19.68	18.88	18.16		(93)
8. Spa	ace hea	ting requ	uirement											
			ternal ter or gains			ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	:										
(94)m=	0.88	0.84	0.79	0.7	0.58	0.44	0.31	0.34	0.53	0.72	0.84	0.89		(94)
1		i — —	, W = (94		4)m					1	1			
(95)m=	694.55	756.78	778.51	747.91	648.44	474.84	326.91	340.07	490.12	614.88	651.34	668.28		(95)
		<u> </u>	rnal tem											(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			an intern		759.15	510.09	336.95	353.28	550.74	827.06	1079.1	1285.9		(97)
` ′		l	ement fo							l		1200.0		(01)
(98)m=	447.78	344.63	286.09	166.64	82.37	0	0	0	0	157.86	307.99	459.52		
		<u> </u>	<u> </u>				<u> </u>	Tota	l per year	ı (kWh/year) = Sum(9	8) _{15,912} =	2252.88	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								26.01	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme								
			ace hea								unity sch	neme.	0	(301)
	-			-		-	_	Table 1	1) 0 11 11	Onc				(302)
	•		from co	•	•	,	•		0110			[1	(302)
	-		y optain ne s, geotherr							up to tour (otner neat	sources; tl	ne latter	
Fractio	n of hea	at from C	Commun	ity boiler	'S								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribu	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	g											kWh/yea	r_
Annual	space	heating	requiren	nent									2252.88	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [2365.52	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308

					_
Space heating requirement from second	ondary/supplementary system	(98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2230.63	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a)	x (305) x (306) =	2342.16	(310a)
Electricity used for heat distribution	(0.01 × [(307a)(30	07e) + (310a)(310e)] =	47.08	(313)
Cooling System Energy Efficiency Ra	tio			0	(314)
Space cooling (if there is a fixed cooli	ng system, if not enter 0)	= (107) ÷ (314	1) =	0	(315)
Electricity for pumps and fans within on mechanical ventilation - balanced, ex	. ,	de		336.77	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/ye	ear	=(330a) + (33	0b) + (330g) =	336.77	(331)
Energy for lighting (calculated in Appe	endix L)			370.34	(332)
Electricity generated by PVs (Append	ix M) (negative quantity)			-872.75	(333)
Electricity generated by wind turbine	(Appendix M) (negative quantity	')		0	(334)
10b. Fuel costs – Community heatin	g scheme				
	Fuel kWh/year		el Price able 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x		4.24 x 0.01 =	100.3	(340a)
Water heating from CHP	(310a) x		4.24 x 0.01 =	99.31	(342a)
		Fu	el Price		_
Pumps and fans	(331)		0.04		
•	, ,		13.19 × 0.01 =	44.42	(349)
Energy for lighting	(332)		13.19	44.42 48.85	(349) (350)
•	(332)		13.19		
Energy for lighting	(332)		13.19	48.85	(350)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies	(332) 2) es = (340a)(342e) + (345)(354) =		13.19	48.85 120	(350)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost	(332) 2) es = (340a)(342e) + (345)(354) =		13.19	48.85 120	(350)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin	(332) 2) es = (340a)(342e) + (345)(354) =		13.19	48.85 120 412.87	(350) (351) (355)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme		13.19	48.85 120 412.87	(350) (351) (355) (356)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heating Energy cost deflator (Table 12) Energy cost factor (ECF)	(332) Pes = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = Peating scheme		13.19 x 0.01 =	48.85 120 412.87 0.42 1.32 81.62	(350) (351) (355) (356) (357)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heating Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Energy kWh/year	13.19 x 0.01 =	48.85 120 412.87 0.42 1.32 81.62	(350) (351) (355) (356) (357)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heating Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Energy kWh/year	13.19 × 0.01 = Emission factor kg CO2/kWh	48.85 120 412.87 0.42 1.32 81.62 Emissions kg CO2/year	(350) (351) (355) (356) (357)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community heating	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme I water heating (not CHP) If there is CHP using two f	Energy kWh/year	13.19 × 0.01 = Emission factor kg CO2/kWh	48.85 120 412.87 0.42 1.32 81.62 Emissions kg CO2/year	(350) (351) (355) (356) (357) (358)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community heatin CO2 from other sources of space and Efficiency of heat source 1 (%)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme I water heating (not CHP) If there is CHP using two f	Energy kWh/year uels repeat (363) to] x 100 ÷ (367b) x	Emission factor kg CO2/kWh	48.85 120 412.87 0.42 1.32 81.62 Emissions kg CO2/year 94 1081.76	(350) (351) (355) (356) (357) (358) (367a)

Total CO2 associated with community	systems	(363)(366) + (368)(372	2)	= 1106.2	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	= 0	(374)
CO2 associated with water from imme	rsion heater or instanta	neous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =		1106.2	(376)
CO2 associated with electricity for pur	nps and fans within dwe	elling (331)) x	0.52	= 174.78	(378)
CO2 associated with electricity for light	ting	(332))) x	0.52	= 192.2	(379)
Energy saving/generation technologies Item 1	s (333) to (334) as appl	licable	0.52 x 0.01 =	-452.96	(380)
Total CO2, kg/year	sum of (376)(382) =			1020.23	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			11.78	(384)
El rating (section 14)				89.61	(385)
13b. Primary Energy – Community hea	ating scheme				
		Energy	Primary	P.Energy	
		kWh/year	factor	kWh/year	
		-			
Energy from other sources of space ar Efficiency of heat source 1 (%)		HP) sing two fuels repeat (363) to	(366) for the second fu	el 94	(367a)
	If there is CHP us			el 94 = 6109.97	(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP us	sing two fuels repeat (363) to	1.22		
Efficiency of heat source 1 (%) Energy associated with heat source 1	If there is CHP us	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x	1.22	= 6109.97	(367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution	If there is CHP us [(307b	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372	1.22	= 6109.97 = 144.53	(367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communication	If there is CHP us [(307th ity systems ess specified otherwise	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372	1.22	= 6109.97 = 144.53 = 6254.49	(367) (372) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communities if it is negative set (373) to zero (unle	If there is CHP us [(307th ity systems ess specified otherwise (secondary)	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 b, see C7 in Appendix C (309) x	1.22	= 6109.97 = 144.53 = 6254.49	(367) (372) (373) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communitif it is negative set (373) to zero (unlike) Energy associated with space heating	If there is CHP us [(307th ity systems ess specified otherwise (secondary) mersion heater or instan	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 b, see C7 in Appendix C (309) x	1.22	= 6109.97 = 144.53 = 6254.49 6254.49 = 0	(367) (372) (373) (373) (374)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communitif it is negative set (373) to zero (unlike) Energy associated with space heating Energy associated with water from imm	If there is CHP us [(307th ity systems ess specified otherwise (secondary) mersion heater or instan	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 b, see C7 in Appendix C (309) x Intaneous heater(312) x	1.22 (2) (3) (1.22	= 6109.97 = 144.53 = 6254.49 6254.49 = 0	(367) (372) (373) (373) (374) (375)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communitie it is negative set (373) to zero (unlike) Energy associated with space heating Energy associated with water from immortal Energy associated with space and	If there is CHP us [(307th ity systems ess specified otherwise (secondary) mersion heater or instantal and water heating	sing two fuels repeat (363) to p)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) p, see C7 in Appendix C (309) x ntaneous heater(312) x (373) + (374) + (375) = (315) x	1.22 2) 0 1.22 3.07	= 6109.97 = 144.53 = 6254.49 6254.49 = 0 = 0	(367) (372) (373) (373) (374) (375) (376)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communitie it is negative set (373) to zero (unlike) Energy associated with space heating Energy associated with water from immortal Energy associated with space and Energy associated with space cooling	ity systems ess specified otherwise (secondary) mersion heater or instant ad water heating umps and fans within o	sing two fuels repeat (363) to p)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) p, see C7 in Appendix C (309) x ntaneous heater(312) x (373) + (374) + (375) = (315) x	1.22 2) 0 1.22 3.07 3.07	= 6109.97 = 144.53 = 6254.49 6254.49 = 0 = 0 6254.49 = 0	(367) (372) (373) (373) (374) (375) (376) (377)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communitif it is negative set (373) to zero (unlike) Energy associated with space heating Energy associated with water from immore than the second	If there is CHP us [(307th ity systems ess specified otherwise (secondary) mersion heater or instant and water heating umps and fans within of ghting	sing two fuels repeat (363) to p)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372) e, see C7 in Appendix C (309) x ntaneous heater(312) x (373) + (374) + (375) = (315) x dwelling (331)) x	1.22 2) 0 1.22 3.07 3.07	= 6109.97 = 144.53 = 6254.49	(367) (372) (373) (373) (373) (374) (375) (376) (377) (378)

sum of (376)...(382) =

Total Primary Energy, kWh/year

5745.95

(383)

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	- 036 FL	Strom Softwa					0001082 on: 1.0.5.9	
	F	Property	Address	Plot 51					
Address :									
Overall dwelling dime	ensions:	Δro	a(m²)		Δν Ηο	ight(m)		Volume(m	3)
Ground floor				(1a) x		2.5	(2a) =	216.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	86.6	(4)]		
Dwelling volume	-, (-, (-, (-, (-,	′ <u> </u>	00.0)+(3c)+(3c	d)+(3e)+	.(3n) =	216.5	(5)
				(==) - (==	, (00)	., (,		210.5	(3)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating beauting heating	- + -	0] = [0	x	40 =	0	(6a)
Number of open flues		╣ - -	0]	0	x 2	20 =	0	(6b)
Number of intermittent fa				J L	3	x	10 =		(7a)
Number of passive vents				Ļ			10 =	30	= ' '
·				Ļ	0		40 =	0	(7b)
Number of flueless gas f	ires				0	^.	+0 =	0	(7c)
							Air ch	nanges per he	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.14	(8)
	peen carried out or is intended, procee	ed to (17),	otherwise o	continue fr	rom (9) to	(16)			_
Number of storeys in t Additional infiltration	he dwelling (ns)					[(0)	410.4	0	(9)
	.25 for steel or timber frame o	r 0 35 fo	r masoni	v constr	ruction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value corresponding t			•	Gottori			<u> </u>	(\.,
deducting areas of openi	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	1 (222)	مط/ مامم	antar O					— (40)
If no draught lobby, en	,	. i (Seal	eu), eise	enter o				0	(12)
• • • • • • • • • • • • • • • • • • • •	s and doors draught stripped							0	(14)
Window infiltration	3 11		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] + (18) = [(17$							0.39	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has been do ad	ne or a de	gree air pe	rmeability	is being u	sed		4	(19)
Shelter factor	,u		(20) = 1 -	[0.0 75 x (1	19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.36	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
(22a)m = 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
·						<u> </u>		J	

Adjusted infiltra	0.45	0.44	0.4	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42			
Calculate effec		_	rate for t		1	l								
If mechanica												()	(2
If exhaust air he		0		, ,	,	. ,	,, .	`) = (23a)			()	(2
If balanced with		•	-	_								()	(2:
a) If balance						- ` ` - 		ŕ	 		' 	÷ 100]		(0
24a)m= 0	0		0	0	0	0	0	0	0	0	0			(2
b) If balance	d mech	anical ve	entilation 0	without	neat red	overy (I	VIV) (24b	0) m = (22)	2b)m + (2 0	23b) 0				(2
,	-			-						0	0			(2
c) If whole h if (22b)n				-	-				.5 × (23b	o)				
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft						
if (22b)n		<u> </u>	<u> </u>	_	<u> </u>		 		0.5]	ı		ı		
24d)m= 0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59			(2
Effective air			<u> </u>	` `	``	ŕ	r 	`			T 1			(0
25)m= 0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59			(2
3. Heat losse	s and he	at loss p	paramete	er:										
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	«)	k-value kJ/m².ł		A > kJ/	
oors	aica	(111)	"		2	x	1		2		KO/III -I	`	KO/	(2
Vindows Type	: 1				6.097	╡,	<u> </u>	!	8.08	╡				(2
Vindows Type					6.075	╡,	/[1/(1.4)+	l l	8.05	╡				(2
Vindows Type					4.579	╡,	/[1/(1.4)+	l.	6.07	᠆				(2
Valls Type1	76.5	iΩ	16.79		59.83		0.18		10.77	╡ ,		- г		\ \(2
Valls Type2			2		11.98	=		╡┇	2.16	᠆		╡╞		(² (2
Valls Type3	13.9	_	0			=	0.18		2.10	믁 ¦		- - - </td <td></td> <td>(²</td>		(²
Roof				=	12.22	=	0.18	- 		믁 ¦		- - - </td <td></td> <td>(2 (3</td>		(2 (3
otal area of e	86.0		0		86.6	×	0.13		11.26					_
for windows and			effective wi	ndow H-va	189.3		ı formula 1	/[(1/Ll-valu	ıe)+0 041 a	ns aiven in	naragraph	32		(3
* include the area						atou uomg	, romana n	I I I I I I I I I I I I I I I I I I I	10) 10.0 13 0	io givoii iii	paragrapii	0.2		
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				50.	59	(3
leat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	195	5.81	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		25	0	(3
or design assess an be used inste				constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f			
hermal bridge				ısina An	pendix k	<						23.	79	(3
details of therma	•	,			•							20.		
otal fabric he			, ,	·	•			(33) +	(36) =			74.	38	(3
entilation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5))			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
38)m= 43.22	42.93	42.65	41.31	41.06	39.89	39.89	39.67	40.34	41.06	41.56	42.09			(3
								(20)	(27) . (9	20/~				
leat transfer o	coefficier	nt, VV/K						(39)m	= (37) + (37)	30)111				

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.36	1.35	1.35	1.34	1.33	1.32	1.32	1.32	1.32	1.33	1.34	1.34		
()									<u> </u>	Sum(40) ₁ .		1.34	(40)
Number of day	s in mo	nth (Tabl	le 1a)							(),			` ` ′
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					<u> </u>	<u> </u>	<u> </u>	l	<u> </u>	<u>. </u>			
4 10/2/2012 201	•										1.10/1./		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		58		(42)
Annual average Reduce the annual									se target o		.39		(43)
not more that 125	litres per	person per	day (all w	ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	r day for ea		<u></u>	ctor from	Table 1c x							
(44)m= 104.92	101.11	97.29	93.48	89.66	85.85	85.85	89.66	93.48	97.29	101.11	104.92		
()								L	<u> </u>	m(44) ₁₁₂ =	l	1144.64	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600			` '			` ′
(45)m= 155.6	136.09	140.43	122.43	117.48	101.37	93.94	107.79	109.08	127.12	138.77	150.69		
` '		<u> </u>		l	l	l	l	_	<u>l</u> Total = Su	<u>I</u> m(45) ₁₁₂ =	<u> </u>	1500.8	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(/2	1		``
(46)m= 23.34	20.41	21.06	18.36	17.62	15.21	14.09	16.17	16.36	19.07	20.81	22.6		(46)
Water storage	loss:									<u> </u>			
Storage volume	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage	loss:												
a) If manufacti	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufacti			-										
Hot water stora	•			e 2 (kW	h/litre/da	ıy)					0		(51)
If community h	_		on 4.3										(50)
Temperature fa			2h							—	0		(52) (53)
•							(47) (54)	(FO) (50)		0		, ,
Energy lost from Enter (50) or (_	, KVVN/ye	ear			(47) X (51)) x (52) x (53) =		0		(54)
` , ,	, ,	,					((50) (EE) (44)		0.	75		(55)
Water storage	ioss cai	culated f	or each	montn			((56)m = (55) × (41)ı	m 				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 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)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by					ı —	ı —			ı —	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
					<u> </u>	· ` `	<u> </u>	1 0	Ι ,	Ι ,	Ι ο	1	(61)
(61)m= 0	0	0	0	0	0	0	(2.2)	0	0	0	0	<u> </u>	(61)
							`		` ´	ì ´	`´	(59)m + (61)m 1	(00)
(62)m= 202.2	178.18	187.03	167.52	164.07	146.47	140.53	154.39		173.72	183.86	197.29	J	(62)
Solar DHW input									r contribut	tion to wate	er heating)		
(add additiona (63)m= 0	o lines ii	rGHKS 0	and/or v	0	applies 0	, see Ap	pendix 0	T 0	0	T 0	0	1	(63)
			0	0	0							J	(00)
Output from w $(64)m = 202.2$	178.18	ter 187.03	167.52	164.07	146.47	140.53	154.39	154.17	173.72	183.86	197.29	1	
(04)111= 202.2	170.10	107.03	107.32	104.07	140.47	140.55	ļ	itput from w				2049.42	(64)
Hoot going fro	m water	hooting	k\A/b/m	anth 0 2	= ′ [U 0E	v (4E)m](0.)
Heat gains fro	78.92	83.97	76.78	76.34	69.78	68.51	73.12	1	79.54	82.21	87.38	'	(65)
` '						ļ		_					(00)
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 gair					1	1	A		0-4	Nan		1	
(66)m= 128.81	Feb 128.81	Mar 128.81	Apr 128.81	May 128.81	Jun 128.81	Jul 128.81	128.81	+	Oct 128.81	Nov 128.81	Dec 128.81	ł	(66)
` '						l	l		120.01	120.01	120.01	J	(00)
Lighting gains (67)m= 20.97	18.63	15.15	11.47	L, equat 8.57	7.24	7.82			17.32	20.22	04.55	1	(67)
						Į	10.16		ļ.	20.22	21.55	J	(07)
Appliances ga	· `					1	- 			007.05	T 000 40	1	(68)
(68)m= 232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	_ <u> </u>	190.7	207.05	222.42	J	(00)
Cooking gains	`	i								05.00	05.00	1	(60)
(69)m= 35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	J	(69)
Pumps and fa						T .	<u> </u>		<u> </u>	1		1	(70)
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	J	(70)
Losses e.g. ev	 	<u> </u>				l						1	(74)
(71)m= -103.05		-103.05	-103.05	-103.05	-103.05	-103.05	-103.0	-103.05	-103.05	-103.05	-103.05	J	(71)
Water heating								1		1	l	1	(70)
(72)m= 119.64	117.44	112.86	106.64	102.6	96.92	92.08	98.28	100.48	106.91	114.18	117.45		(72)
Total internal	-							n + (69)m +	· · · · · ·	•		1	(70)
(73)m= 437.94	435.8	421.67	398.81	375.53	353.14	338.62	344.74	356.51	379.58	406.09	426.06		(73)
6. Solar gains Solar gains are		ueina eolai	r flux from	Table 6a	and accor	iated equa	ations to	convert to th	a annlical	nle orientat	tion		
Orientation: /		_	Area		Flu		1110115 10	g_	іе арріісаі	FF	uon.	Gains	
	Table 6d	actor	m ²			ble 6a		Table 6b	Т	able 6c		(W)	
Southeast 0.9x	0.77	x	6.	1	x 3	36.79] _x [0.63	x [0.7		68.56	(77)
Southeast 0.9x	0.77	X	6.		—	62.67]	0.63		0.7	= =	116.78](77)
Southeast 0.9x	0.77	×	6.			35.75	」^∟ 1 x 「	0.63	^	0.7		159.78](77)
Southeast 0.9x	0.77	×	6.		<u> </u>	06.25	」^ <u> </u>	0.63	^	0.7		197.98](77)
Southeast 0.9x	0.77	×	6.		-	19.01] ^ <u> </u>] x [0.63	^	0.7		221.76] ₍₇₇₎
V.U.	0.17		L	·	'		」 ̄	5.55	— □ □ ∟	0.1			J ' ' '

о и .								,			_				_
Southeast 0.9x	0.77	X	6.	1	X	1	18.15	X		0.63	X	0.7	=	220.15	(77)
Southeast _{0.9x}	0.77	X	6.	1	X	1	13.91	X		0.63	X	0.7	=	212.25	(77)
Southeast _{0.9x}	0.77	X	6.	1	X	1	04.39	X		0.63	X	0.7	=	194.51	(77)
Southeast _{0.9x}	0.77	X	6.	1	X	9	2.85	X		0.63	X	0.7	=	173.01	(77)
Southeast 0.9x	0.77	X	6.	1	X	6	9.27	X		0.63	X	0.7	=	129.07	(77)
Southeast 0.9x	0.77	X	6.	1	X	4	4.07	X		0.63	X	0.7	=	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	X	3	1.49	X		0.63	X	0.7	=	58.67	(77)
Southwest _{0.9x}	0.77	X	6.0	17	X	3	6.79]		0.63	X	0.7	=	68.31	(79)
Southwest _{0.9x}	0.77	X	6.0	17	X	6	2.67]		0.63	X	0.7	=	116.36	(79)
Southwest _{0.9x}	0.77	X	6.0	7	X	8	5.75]		0.63	X	0.7	=	159.21	(79)
Southwest _{0.9x}	0.77	X	6.0	7	x	1	06.25			0.63	X	0.7	=	197.27	(79)
Southwest _{0.9x}	0.77	X	6.0	17	x	1	19.01			0.63	x	0.7	=	220.96	(79)
Southwest _{0.9x}	0.77	X	6.0	17	x	1	18.15			0.63	x	0.7	=	219.36	(79)
Southwest _{0.9x}	0.77	X	6.0	17	x	1	13.91]		0.63	x	0.7	=	211.48	(79)
Southwest _{0.9x}	0.77	X	6.0	7	x	1	04.39	Ī		0.63	x	0.7	=	193.81	(79)
Southwest _{0.9x}	0.77	x	6.0	17	x	9	2.85	Ī		0.63	×	0.7	=	172.39	(79)
Southwest _{0.9x}	0.77	X	6.0	17	x	6	9.27	Ī		0.63	x	0.7	=	128.6	(79)
Southwest _{0.9x}	0.77	X	6.0	17	x	4	4.07	j		0.63	x	0.7	=	81.82	(79)
Southwest _{0.9x}	0.77	X	6.0	17	x	3	31.49	j		0.63	×	0.7	=	58.46	(79)
Northwest _{0.9x}	0.77	X	4.5	i8	x	1	1.28	x		0.63	x	0.7	=	15.79	(81)
Northwest 0.9x	0.77	x	4.5	i8	x	2	2.97	x		0.63	x	0.7	=	32.14	(81)
Northwest _{0.9x}	0.77	X	4.5	i8	x	4	1.38	j x		0.63	×	0.7	=	57.91	(81)
Northwest _{0.9x}	0.77	X	4.5	i8	X	6	57.96	X		0.63	x	0.7		95.1	(81)
Northwest _{0.9x}	0.77	X	4.5	i8	x	9	1.35	j x		0.63	x	0.7	=	127.83	(81)
Northwest _{0.9x}	0.77	x	4.5	i8	X	9	7.38	X		0.63	×	0.7		136.28	(81)
Northwest _{0.9x}	0.77	X	4.5	i8	X		91.1	X		0.63	x	0.7	=	127.49	(81)
Northwest _{0.9x}	0.77	X	4.5	i8	X	_	2.63	X		0.63	x	0.7		101.63	(81)
Northwest _{0.9x}	0.77	x	4.5	i8	X	5	0.42	X		0.63	x	0.7		70.56	(81)
Northwest _{0.9x}	0.77	X	4.5	i8	X	2	28.07	X		0.63	x	0.7	=	39.28	(81)
Northwest 0.9x	0.77	X	4.5	i8	X		14.2	X		0.63	x	0.7		19.87	(81)
Northwest _{0.9x}	0.77	x	4.5	i8	X		9.21	X		0.63	×	0.7		12.89	(81)
_								_							
Solar gains in v	watts, ca	alculated	for eac	n mont	h			(83)m	n = Si	um(74)m	(82)m				
(83)m= 152.66	265.28	376.9	490.35	570.54	5	75.79	551.22	489	.96	415.96	296.95	183.81	130.03		(83)
Total gains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts					-		_	
(84)m= 590.6	701.08	798.56	889.16	946.07	9	28.93	889.84	834	1.7	772.47	676.52	589.9	556.09		(84)
7. Mean interr	nal temp	erature	(heating	seaso	n)										
Temperature						area	from Tal	ble 9	, Th	1 (°C)				21	(85)
Utilisation fact	tor for ga	ains for I	iving are	ea, h1,ı	า (s	ee Ta	ble 9a)								
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.95	0.86		0.71	0.55	0.	6	0.83	0.96	0.99	1		(86)
Mean internal	temper	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	ahle	= 9c)			•	-	
(87)m= 19.56	19.75	20.04	20.42	20.73	_	20.92	20.98	20.		20.84	20.43	19.92	19.53		(87)
	!						!		!	I		-1		_	

T		-l				ali a 115-a as	. f T.	O T	LO (0 0)					
•			neating p				1	i	· · ·	10.00	10.01	1001		(00)
(88)m=	19.8	19.8	19.8	19.81	19.82	19.83	19.83	19.83	19.82	19.82	19.81	19.81		(88)
(89)m=	ation fac	0.99	ains for	0.93	0.81	n∠,m (se 0.61	0.41	9a) 0.46	0.75	0.95	0.99	1		(89)
	interna	ıl temper	ature in	the rest	of dwell	ina T2 (f	ollow ste	ens 3 to 7	L 7 in Tabl	e 9c)				
(90)m=	17.91	18.18	18.61	19.14	19.56	19.78	19.82	19.82	19.7	19.17	18.44	17.87		(90)
,			<u> </u>			<u> </u>	<u> </u>		<u>I</u> f	<u>L</u> LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	ıl tampaı	ature (fo	r the wh	olo dwo	lling) – f	ΙΛ ν Τ1	⊥ /1 _ fl					0.0.	
(92)m=	18.48	18.72	19.1	19.58	19.96	20.17	20.22	20.21	20.09	19.6	18.95	18.44		(92)
		l .	he mear							l .	10.00	10.11		(- /
(93)m=	18.48	18.72	19.1	19.58	19.96	20.17	20.22	20.21	20.09	19.6	18.95	18.44		(93)
		L	uirement											, ,
					re obtair	ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	ctor for g	ains, hm	:										
(94)m=	0.99	0.99	0.97	0.92	0.82	0.64	0.46	0.51	0.77	0.94	0.99	0.99		(94)
Usefu	ıl gains,	hmGm	W = (94)	4)m x (84	4)m									
(95)m=	586.65	691.18	773.42	820.37	776.27	594.9	406.39	423.69	592.63	638.2	582.06	553.2		(95)
Month	nly aver	age exte	ernal tem	perature	from T	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rat	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1667.05	1621.57	1474.64	1235.31	953.61	636.53	413.48	434.98	687.19	1038.68	1374.21	1658.46		(97)
Space	e heatin	g requir	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	803.82	625.22	521.71	298.76	131.94	0	0	0	0	297.96	570.34	822.31		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	4072.07	(98)
Space	e heatin	g requir	ement in	kWh/m²	² /year								47.02	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
-	e heati	_			,									–
	_		at from s			mentary	-					ļ	0	(201)
Fracti	on of s	pace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heatin	g require	ement (c	alculate	d above)								
	803.82	625.22	521.71	298.76	131.94	0	0	0	0	297.96	570.34	822.31		
(211)m	n = {[(98	3)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
` ,	859.7	668.69	557.98	319.53	141.12	0	0	0	0	318.67	609.99	879.48		
								Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	<u> </u>	4355.15	(211)
Space	e heatin	ıg fuel (s	econdar	y), kWh/	month						.,.	l		 `
= {[(98)m x (20	01)] } x 1	00 ÷ (20	8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	I (kWh/yea	ar) =Sum(2	215)	<u></u>	0	(215)
01	-0 A D 00	10 \/===:	. 1 0 5 0 /9	'A D O OC'	h. 44.m / /								D	— 6 of 7

Water heating								
Output from water heater (calculated above) 202.2 178.18 187.03 167.52 164.07 1	46.47 140.53	154.39	154.17	173.72	183.86	197.29]	
Efficiency of water heater	10111	1 .000		1	100.00	101.20	79.8	(216)
(217)m= 88.13 87.89 87.41 86.34 84.24	79.8 79.8	79.8	79.8	86.24	87.64	88.21		」 (217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m							•	
` '	83.54 176.11	193.47	193.2	201.43	209.8	223.65		_
		Total	I = Sum(2	19a) ₁₁₂ =			2416.14	(219)
Annual totals				k'	Wh/year	•	kWh/year	7
Space heating fuel used, main system 1	4355.15	_						
Water heating fuel used							2416.14	_
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							370.34	(232)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	940.71	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	521.89	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =				1462.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	192.2	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1693.73	(272)

TER =

(273)

19.56