### **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 14:53:24* 

Proiect Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 70.86m²Site Reference:Hermitage LanePlot Reference:Plot 52

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))

Target Carbon Dioxide Emission Rate (TER)

19.33 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 12.63 kg/m<sup>2</sup> **OK** 

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 55.2 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 45.2 kWh/m²

OK

2 Fabric U-values

ElementAverageHighestExternal wall0.14 (max. 0.30)0.15 (max. 0.70)OKFloor(no floor)

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK** 

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:	0.91	
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 <sup>2</sup>	
Windows facing: North West	5.11m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Roofs U-value	0.1 W/m <sup>2</sup> K	
External Walls U-value	0.13 W/m <sup>2</sup> K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		l lser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			0001082 on: 1.0.5.9	
Address :	F	Property	Address	: Plot 52					
1. Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor			70.86	(1a) x	2	2.5	(2a) =	177.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	70.86	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	177.14	(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	7 + [	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				0	x ′	10 =	0	(7a)
Number of passive vents	3			Ē	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				0		÷ (5) =	0	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otnerwise (	continue ti	rom (9) to	(16)		0	(9)
Additional infiltration	no awaiing (no)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
	resent, use the value corresponding to	o the grea	ter wall are	ea (after			'		
deducting areas of openial lf suspended wooden to	ngs);	.1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(	/,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
,	q50, expressed in cubic metre	-	•	•	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$				ia haina u	and		0.15	(18)
Number of sides sheltere	es if a pressurisation test has been do. ed	ne or a de	gree air pe	тпеавшу	is being u	sea		2	(19)
Shelter factor	-		(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	s) x (20) =				0.13	(21)
Infiltration rate modified f	for 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	]	
· / L	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	1	1		<del></del>		J	

0.16	0.16	0.16	0.14	0.14	0.12	peed) = 0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe			_	-	-	l -	0.12	0.13	0.14	0.14	0.15		
If mechanic	al ventila	tion:									[	0.5	(23
If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced wit	h heat reco	very: effic	iency in %	allowing for	or in-use fa	actor (from	n Table 4h	) =				79.05	(23
a) If balance	ed mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	)m = (22	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	ed mecha	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b	)m = (22	2b)m + (2	23b)	<del></del> 1		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r	nouse ext n < 0.5 ×			•	•				5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)	ventilation				•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25
3. Heat losse	s and ha	ot loce r	aramata	or:									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	IE	AXU		k-value	Δ	X k
LLLIVILIVI	area		m		A ,n		W/m2		(W/I	<b>&lt;</b> )	kJ/m <sup>2</sup> ·k		/K
Doors					2	X	1.4	=	2.8				(26)
Windows Type	∍ 1				6.097	<sub>7</sub> χ1,	/[1/( 1.4 )+	0.04] =	8.08				(27
Windows Type	e 2				5.107	, X1	/[1/( 1.4 )+	0.04] =	6.77				(27
Walls Type1	34.7	'3	11.2		23.53	3 x	0.15	=	3.53	<u> </u>			(29
Walls Type2	8.92	2	2		6.92	х	0.14	=	0.98			<u> </u>	(29
				<u> </u>	40.0	_							
Walls Type3	16.3	3	0		16.3	X	0.13		2.15				(29
• •	70.8		0	$\dashv$	70.86	_	0.13	= [	7.09				= '
Roof	70.8	6				x		=					(29 (30 (31
Roof Total area of e	70.8	6 , m²	0	ndow U-va	70.86	x 1	0.1	= [	7.09	as given in	paragraph	3.2	(30
Roof Total area of e * for windows and ** include the are	70.8 elements d roof windo	, m <sup>2</sup> ows, use e	0  Iffective winternal wall		70.86 130.8	x 1 ated using	0.1	= [ /[(1/U-valu	7.09	ns given in	paragraph	3.2	(30
Roof  Total area of e  * for windows and ** include the are  Fabric heat lo	70.8 elements d roof winde as on both ss, W/K =	, m²  bows, use e sides of in = S (A x	0  Iffective winternal wall		70.86 130.8	x 1 ated using	0.1	= [ /[(1/U-valu + (32) =	7.09 e)+0.04] a		[	3.2	(30)
Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity	70.8 elements d roof windd as on both ss, W/K = Cm = S(	, m <sup>2</sup> ows, use e sides of in = S (A x A x k)	0  Iffective winternal walk  U)	s and part	70.86 130.8 alue calculations	X 1 ated using	0.1	= [ /[(1/U-valu + (32) = ((28)	7.09 re)+0.04] a	2) + (32a).	[		(30)
Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass	70.8 Pelements If roof winder as on both as, W/K = Cm = S(	, m²  bws, use e sides of in a S (A x A x k)  ter (TMF	offective winternal walk	s and part	70.86 130.8 alue calculations	x 1 ated using	0.1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica	7.09  e)+0.04] a  .(30) + (32)  tive Value	2) + (32a). : Low	(32e) = [	31.4	(30)
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste	70.8 elements d roof windd as on both ss, W/K = Cm = S( s parame sments who	, m²  sides of in  S (A x A x k)  ter (TMF)	offective winternal walk U)  P = Cm ÷	s and part	70.86 130.8 alue calculations	x 1 ated using	0.1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica	7.09  e)+0.04] a  .(30) + (32)  tive Value	2) + (32a). : Low	(32e) = [	31.4 1292.2	(30)
Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses	70.8 elements d roof windo as on both ss, W/K = Cm = S( s parame sments who ead of a det	, m²  cows, use e sides of in = S (A x K)  ter (TMF)  ere the de tailed calculary	offective winternal walk U)  P = Cm ÷ tails of the ulation.	s and part - TFA) in	70.86 130.8 lue calculations kJ/m²K fon are not	x 1 ated using	0.1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica	7.09  e)+0.04] a  .(30) + (32)  tive Value	2) + (32a). : Low	(32e) = [	31.4 1292.2	(30) (31) (33) (34) (35)
Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste	70.8 elements d roof winde as on both ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L	, m²  cows, use esides of intermediate (TMF)  ere the detailed calculate (XY) calculate (SMF)	offective winternal walk U)  P = Cm ÷ tails of the ulation. culated to	s and part - TFA) ir constructi	70.86 130.8 alue calculations kJ/m²K fon are not	x 1 ated using	0.1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica	7.09  e)+0.04] a  .(30) + (32)  tive Value	2) + (32a). : Low	(32e) = [	31.4 1292.2 100	(30 (31 (33 (34 (35
Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm	70.8 elements d roof windd as on both ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L al bridging	, m²  cows, use esides of intermediate (TMF)  ere the detailed calculate (XY) calculate (SMF)	offective winternal walk U)  P = Cm ÷ tails of the ulation. culated to	s and part - TFA) ir constructi	70.86 130.8 alue calculations kJ/m²K fon are not	x 1 ated using	0.1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica	7.09  7.09  7.09  7.09  7.09  7.09  7.09  7.09  7.09	2) + (32a). : Low	(32e) = [	31.4 1292.2 100	(30 (31) (33) (34) (35)
Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste	70.8 elements d roof winde as on both ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L al bridging eat loss	, m²  sides of in  S (A x A x k)  ter (TMF)  ere the de tailed calcu x Y) calcu are not kn	offective winternal walk U)  P = Cm ÷ tails of the ulation. culated to	- TFA) in constructiusing Ap	70.86 130.8 alue calculations kJ/m²K fon are not	x 1 ated using	0.1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica e indicative	7.09  7.09  7.09  7.09  7.09  7.09  7.09  7.09  7.09	2) + (32a). : Low TMP in Ta	(32e) = [ 	31.4 1292.2 100 19.17	(30 (31) (33) (34) (35)
Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation he	70.8 elements d roof winde as on both ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L al bridging eat loss	, m²  sides of in  S (A x A x k)  ter (TMF)  ere the de tailed calcu x Y) calcu are not kn	offective winternal walk U)  P = Cm ÷ tails of the ulation. culated to	- TFA) in constructiusing Ap	70.86 130.8 alue calculations kJ/m²K fon are not	x 1 ated using	0.1 formula 1 (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica e indicative (33) +	7.09  7.09  7.09  7.09  7.09  7.09  7.09  7.09  7.09  7.09  7.09	2) + (32a). : Low TMP in Ta	(32e) = [ 	31.4 1292.2 100 19.17	(30 (31) (33) (34) (35) (36) (37)
Roof Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation he	70.8 elements d roof winde as on both ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L al bridging eat loss at loss ca	, m²  bws, use esides of interest (TMF)  ere the detailed calcut  x Y) calcut  are not known allculated	offective winternal walk U) $P = Cm \div tails of the culation. culated to the culation own (36) = 0.000 for the culation.$	s and part TFA) in constructi using Ap 0.05 x (3	70.86 130.8 alue calculations a kJ/m²K fon are not	x 1 ated using	0.1  formula 1.  (26)(30)	= [ /[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m	7.09  1.(30) + (32)	2) + (32a). : Low TMP in Ta 25)m x (5)	(32e) = [   able 1f	31.4 1292.2 100 19.17	(30
Roof  Fotal area of each of the street of th	70.8 elements d roof windo as on both ss, W/K = Cm = S( s parame sments who ead of a det es : S (L al bridging eat loss at loss ca Feb	, m²  ows, use esides of ine  S (A x A x k)  ter (TMF)  ere the detailed calculated  are not known alculated  Mar  15.25	offective winternal walk U)  P = Cm ÷ tails of the ulation. culated u own (36) =	- TFA) in constructi using Ap = 0.05 x (3	70.86 130.8 alue calculations a kJ/m²K fon are not spendix h 1) Jun	x 1 1 ated using	0.1  formula 1.  (26)(30)  ecisely the	= [ /[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m Sep 13.58	7.09  1.(30) + (32)	2) + (32a). : Low : TMP in Ta 25)m x (5) Nov 14.51	(32e) = [	31.4 1292.2 100 19.17	(30 (31) (33) (34) (35) (36) (37)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.93	0.93	0.93	0.92	0.91	0.9	0.9	0.9	0.91	0.91	0.92	0.92		
						l	l		Average =	Sum(40) <sub>1</sub>	12 /12=	0.92	(40)
Number of da	<del>.</del>	nth (Tab	le 1a)	i		i	i		· · · · ·	<del> </del>	<del></del>		
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	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occ if TFA > 13. if TFA £ 13.	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		27		(42)
Annual average Reduce the annu not more that 125	al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	` ,		se target o		67		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								· '	!				
(44)m= 101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		
									Total = Su	m(44) <sub>112</sub> =		1112.02	(44)
Energy content o	f hot water	used - cal	culated mo	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= 151.17	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81	146.4		
If in atomton acus	water beat	'na at naint	of upo (no	bot water	, ataragal	antar O in	haves (46		Total = Su	m(45) <sub>112</sub> =	- [	1458.03	(45)
If instantaneous v	1		·	1	,.		, ,	, , , <del>-</del>		1			(40)
(46)m= 22.67 Water storage	19.83	20.46	17.84	17.12	14.77	13.69	15.71	15.9	18.53	20.22	21.96		(46)
Storage volun		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	` '					_							, ,
Otherwise if n	_			-			, ,	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature											0		(49)
Energy lost fro		•	•		!4		(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufac</li><li>Hot water stor</li></ul>			-								02		(51)
If community I	•			0 2 (	.,, o, ac	• 7 /				0.	02		(01)
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fro	om watei	r 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 t	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	x H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circui	t loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circui	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	y factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	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)

Combilees	ام مغمار بمام	fo., o.o.b		(C4)	(00) . 0	CF (44)	١						
Combi loss of (61)m= 0	alculated	or each	montn (	61)m =	(60) ÷ 30	05 × (41)	)m   0	0	0	0	0	1	(61)
		<u> </u>					<u> </u>	Ļ	<u> </u>	ļ.		(F0)m + (61)m	(01)
(62)m= 206.4	<del></del>	191.71	172.44	169.41	151.98	146.54	160	159.47	178.78	188.31	201.67	(59)m + (61)m	(62)
Solar DHW inpu						<u> </u>		1		<u> </u>		l	(02)
(add addition									ii contribu	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	uwater hea	ter					<u>I</u>					ı	
(64)m= 206.4		191.71	172.44	169.41	151.98	146.54	160	159.47	178.78	188.31	201.67		
		<u> </u>				<u>!</u>	Ou	put from w	ater heate	r (annual)₁	12	2108.87	(64)
Heat gains fi	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)ı	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	 . ]	-
(65)m= 94.48	1	89.58	82.34	82.17	75.54	74.57	79.04	78.03	85.29	87.62	92.9	ĺ	(65)
include (5	7)m in cald	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	<u> </u>			•	•						,		
Metabolic ga													
Jan	T ,	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m= 113.3	4 113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34		(66)
Lighting gair	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5	•	•	•	•	
(67)m= 18.58	16.5	13.42	10.16	7.59	6.41	6.93	9.01	12.09	15.35	17.91	19.1	]	(67)
Appliances of	jains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m= 199.2	9 201.35	196.14	185.05	171.05	157.88	149.09	147.02	152.23	163.33	177.33	190.49		(68)
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a	), also s	ee Table	5				
(69)m= 34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33		(69)
Pumps and f	ans gains	(Table 5	ia)										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)							-	
(71)m= -90.6	7 -90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67		(71)
Water heatin	g gains (T	able 5)											
(72)m= 127	124.85	120.41	114.37	110.44	104.92	100.22	106.24	108.38	114.63	121.69	124.86		(72)
Total intern	al gains =	1			(66)	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)	)m		
(73)m= 401.8	6 399.71	386.97	366.58	346.08	326.21	313.24	319.27	329.7	350.31	373.94	391.45		(73)
6. Solar gai	ns:												
Solar gains are		•				•	itions to c	onvert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a	-	g_ Fable 6b	т	FF able 6c		Gains (W)	
0									_			` '	1
Southeast 0.9		X	6.	==		36.79	X	0.63		0.7	=	68.56	(77)
Southeast 0.9		X	6.			62.67	X	0.63		0.7	=	116.78	](77) ]
Southeast 0.9	<u> </u>	X	6.			35.75	X	0.63	×	0.7	=	159.78	](77) ](77)
Southeast 0.9		X	6.	==		06.25	X	0.63		0.7	=	197.98	[(77)
Southeast 0.9	0.77	X	6.	1	X 1	19.01	X	0.63	X	0.7	=	221.76	(77)

Southeast 0.9x										_				_
	•	X	6.	1	x	11	8.15	X	0.63	X	0.7	=	220.15	(77)
Southeast 0.9x	0.77	X	6.	1	x	11	3.91	X	0.63	X	0.7	=	212.25	(77)
Southeast 0.9x	0.77	X	6.	1	x [	10	4.39	X	0.63	X	0.7	=	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	x	92	2.85	x	0.63	X	0.7	=	173.01	(77)
Southeast 0.9x	0.77	X	6.	1	x [	69	9.27	x	0.63	x	0.7	=	129.07	(77)
Southeast 0.9x	0.77	X	6.′	1	x [	44	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)
Northwest 0.9x	0.77	x	5.1	1	x [	1	1.28	x	0.63	x	0.7		17.61	(81)
Northwest 0.9x	0.77	x	5.1	1	x [	22	2.97	x	0.63	x	0.7		35.85	(81)
Northwest 0.9x	0.77	X	5.1	1	x [	4	1.38	x	0.63	x	0.7	=	64.58	(81)
Northwest 0.9x	0.77	x	5.1	1	×	67	7.96	x	0.63	x	0.7	=	106.06	(81)
Northwest 0.9x	0.77	x	5.1	1	x [	9′	1.35	x	0.63	x	0.7	=	142.57	(81)
Northwest 0.9x	0.77	x	5.1	1	×	97	7.38	x	0.63	x	0.7		151.99	(81)
Northwest 0.9x	0.77	x	5.1	1	x [	9	1.1	x	0.63	x	0.7		142.19	(81)
Northwest 0.9x	0.77	x	5.1	1	x [	72	2.63	x	0.63	x	0.7		113.35	(81)
Northwest 0.9x	0.77	x	5.1	1	× [	50	0.42	x	0.63	×	0.7		78.69	(81)
Northwest 0.9x	0.77	x	5.1	1	x [	28	8.07	x	0.63	×	0.7		43.81	(81)
Northwest 0.9x	0.77	x	5.1	1	x [	1	4.2	x	0.63	×	0.7		22.16	(81)
Northwest 0.9x	0.77	x	5.1	1	× [	9	.21	x	0.63	×	0.7		14.38	(81)
		_			_									_
Solar gains in	າ watts. cal	culated	for each	n month	1			(83)m	ı = Sum(74)m .	(82)m				
(83)m= 86.17	<del> </del>	224.37	304.04	364.32	_	2.15	354.44	307		172.87	7 104.28	73.05		(83)
Total gains -	internal an	ıd solar	(84)m =	(73)m	+ (8	33)m ,	watts			Į.		ļ.	l	
(84)m= 488.03	3 552.34	611.34	670.62	710.41	69	8.36	667.68	627	.13 581.41	523.18	3 478.21	464.51	1	
7. Mean inte	ernal tempe	erature	heating	200000										(84)
				Season	1)							10 110 1		(84)
	Temperature during heating periods in the living area from Table 9, Th1 (°C)											10 110 1	21	
Utilisation fa	ctor for gai	• .	eriods ir	the livi	ng a			ole 9,				10.101	21	
Utilisation fa	actor for gai	• .	eriods ir	the livi	ng a					Oct	Nov	Dec	21	
	actor for gai	ins for li	eriods ir	the livi	ng a	ee Tal	ble 9a)		Th1 (°C)		Nov 0.93		21	
(86)m= 0.95	Feb 0.93	ins for li Mar	eriods ir iving are Apr 0.81	n the livi ea, h1,m May	ng a	ee Tal Jun 0.53	Jul 0.4	A:	Th1 (°C)  ug Sep  4 0.64	Oct	+	Dec	21	(85)
Jan	Feb  0.93  al temperat	ins for li Mar	eriods ir iving are Apr 0.81	n the livi ea, h1,m May	ng an (see	ee Tal Jun 0.53	Jul 0.4	A:	Th1 (°C)  ug Sep  4 0.64  Table 9c)	Oct	0.93	Dec	21	(85)
(86)m= 0.95  Mean intern (87)m= 19.25	Feb  0.93  al temperat	ins for li Mar 0.89 ture in l	eriods ir ving are Apr 0.81 iving are 20.33	n the livi ea, h1,m May 0.69 ea T1 (fo	ng an (see	Jun 0.53 w ster	ole 9a)  Jul  0.4  os 3 to 7  20.97	0.4 ' in T	Th1 (°C)  ug Sep  14 0.64  Table 9c)  96 20.81	Oct: 0.84	0.93	Dec 0.96	21	(85)
(86)m= 0.95  Mean intern (87)m= 19.25  Temperatur	Feb 0.93 al temperat 19.5 e during he	ins for li Mar 0.89 ture in l 19.87 eating pe	eriods in ving are Apr 0.81 iving are 20.33 eriods in	n the livi ea, h1,m May 0.69 ea T1 (fo 20.69	ng an (see	Jun  0.53  w step 20.9  elling	ble 9a)  Jul  0.4  DS 3 to 7  20.97  from Ta	0.4 ' in T 20.9	Th1 (°C)  ug Sep  4 0.64  Table 9c)  96 20.81  9, Th2 (°C)	Oct 0.84	0.93	Dec 0.96	21	(85) (86) (87)
(86)m= 0.95  Mean intern (87)m= 19.25  Temperatur (88)m= 20.14	Feb  0.93  al temperate 19.5  e during he 20.14	ms for li Mar 0.89 ture in l 19.87 eating pe	eriods in ving are Apr 0.81 ving are 20.33 eriods in 20.15	n the livi ea, h1,m May 0.69 ea T1 (fo 20.69 n rest of 20.16	ng and (see	Jun  0.53  w step 20.9  elling 0.17	Jul 0.4 0s 3 to 7 20.97 from Ta 20.17	Au 0.4 ' in T 20.9 ble 9	Th1 (°C)  ug Sep  4 0.64  Table 9c)  96 20.81  9, Th2 (°C)	Oct: 0.84	0.93	Dec 0.96	21	(85)
Jan   0.95	rector for gainer for	ins for li Mar 0.89 ture in l 19.87 eating per 20.14 ins for re	eriods ir ving are Apr 0.81 iving are 20.33 eriods ir 20.15	n the livi ea, h1,m May 0.69 ea T1 (fo 20.69 n rest of 20.16 welling,	ng a long	Jun  0.53  w step 0.09  elling 0.17  m (se	Jul 0.4 0.8 3 to 7 20.97 from Ta 20.17 e Table	Ai 0.4 7 in T 20.9 ble 9 20.	Th1 (°C)  ug Sep  14 0.64  Table 9c)  96 20.81  9, Th2 (°C)  17 20.16	Oct 0.84 20.35	0.93	Dec 0.96 19.21 20.15	21	(85) (86) (87) (88)
(86)m= 0.95  Mean intern (87)m= 19.25  Temperatur (88)m= 20.14	Feb  0.93  al temperate 19.5  e during he 20.14	ms for li Mar 0.89 ture in l 19.87 eating pe	eriods in ving are Apr 0.81 ving are 20.33 eriods in 20.15	n the livi ea, h1,m May 0.69 ea T1 (fo 20.69 n rest of 20.16	ng a long	Jun  0.53  w step 20.9  elling 0.17	Jul 0.4 0s 3 to 7 20.97 from Ta 20.17	Au 0.4 ' in T 20.9 ble 9	Th1 (°C)  ug Sep  14 0.64  Table 9c)  96 20.81  9, Th2 (°C)  17 20.16	Oct 0.84	0.93	Dec 0.96	21	(85) (86) (87)
Jan	actor for gainer Feb 0.93 al temperate 19.5 e during he 20.14 actor for gainer 0.92 al temperate	ins for li Mar 0.89 ture in l 19.87 eating pe 20.14 ins for r 0.87 ture in t	eriods in ving are 0.81 ving are 20.33 eriods in 20.15 est of do 0.78 he rest	n the livies, h1,m May 0.69 ea T1 (for 20.69 n rest of 20.16 welling, 0.65 of dwell	ng a (see of other section) of the section of the s	use Table 10.53 w step 10.9 elling 10.17 m (sep 10.47 T2 (fc	Jul 0.4 0.8 3 to 7 20.97 from Ta 20.17 e Table 0.33	Al 0.44 o.44 o.44 o.44 o.44 o.44 o.44 o.44	Th1 (°C)  ug Sep  4 0.64  fable 9c)  96 20.81  9, Th2 (°C)  17 20.16  7 0.59  to 7 in Table	Oct 0.84 20.35 20.16 0.81 e 9c)	0.93 19.73 20.15	Dec 0.96 19.21 20.15	21	(85) (86) (87) (88) (89)
Jan   (86)m=   0.95       Mean intern   (87)m=   19.25       Temperatur   (88)m=   20.14       Utilisation fa   (89)m=   0.94	actor for gainer Feb 0.93 al temperate 19.5 e during he 20.14 actor for gainer 0.92 al temperate	ins for li Mar 0.89 ture in l 19.87 eating per 20.14 ins for r 0.87	eriods ir ving are Apr 0.81 iving are 20.33 eriods ir 20.15 est of do	n the livies, h1,m May 0.69 ea T1 (for 20.69 n rest of 20.16 welling, 0.65	ng a (see of other section) of the section of the s	Jun  0.53  w step 0.09  elling 0.17  m (sep 0.47	Jul 0.4 0.8 3 to 7 20.97 from Ta 20.17 e Table 0.33	Ai 0.4 7 in T 20.3 ble 9 20. 9a) 0.3	Th1 (°C)  ug Sep  14 0.64  Table 9c)  96 20.81  0), Th2 (°C)  17 20.16  17 0.59  to 7 in Table  14 19.97	Oct 0.84 20.35 20.16 0.81 e 9c) 19.37	0.93 19.73 20.15 0.91	Dec 0.96 19.21 20.15 0.95		(85) (86) (87) (88) (89)
Jan	actor for gainer Feb 0.93 al temperate 19.5 e during he 20.14 actor for gainer 0.92 al temperate	ins for li Mar 0.89 ture in l 19.87 eating pe 20.14 ins for r 0.87 ture in t	eriods in ving are 0.81 ving are 20.33 eriods in 20.15 est of do 0.78 he rest	n the livies, h1,m May 0.69 ea T1 (for 20.69 n rest of 20.16 welling, 0.65 of dwell	ng a (see of other section) of the section of the s	use Table 10.53 w step 10.9 elling 10.17 m (sep 10.47 T2 (fc	Jul 0.4 0.8 3 to 7 20.97 from Ta 20.17 e Table 0.33	Al 0.44 o.44 o.44 o.44 o.44 o.44 o.44 o.44	Th1 (°C)  ug Sep  14 0.64  Table 9c)  96 20.81  0), Th2 (°C)  17 20.16  17 0.59  to 7 in Table  14 19.97	Oct 0.84 20.35 20.16 0.81 e 9c) 19.37	0.93 19.73 20.15	Dec 0.96 19.21 20.15 0.95	0.41	(85) (86) (87) (88) (89)
Jan   0.95	actor for gain Feb 0.93 al temperate 20.14 actor for gain 0.92 al temperate 18.15	ms for li Mar 0.89 ture in l 19.87 eating per 20.14 ins for r 0.87 ture in t 18.68	eriods in ving are 0.81 ving are 20.33 eriods in 20.15 est of dv 0.78 he rest 19.33	n the livies, h1,m May 0.69 ea T1 (for 20.69 n rest of 20.16 welling, 0.65 of dwell 19.8	ng a (see of other see of other	w step 20.9 elling 0.17 m (se 0.47 T2 (fc	Jul 0.4 0.8 3 to 7 20.97 from Ta 20.17 e Table 0.33 ollow ste 20.14	Al 0.4 7 in T 20 ble 9 20. 9a) 0.3 ps 3 20.	Th1 (°C)  ug Sep  14 0.64  Table 9c)  96 20.81  9, Th2 (°C)  17 20.16  17 0.59  to 7 in Table  14 19.97	Oct 0.84 20.35 20.16 0.81 e 9c) 19.37	0.93 19.73 20.15 0.91	Dec 0.96 19.21 20.15 0.95		(85) (86) (87) (88) (89)
Jan	actor for gain Feb 0.93 al temperate 20.14 actor for gain 0.92 al temperate 18.15	ms for li Mar 0.89 ture in l 19.87 eating per 20.14 ins for r 0.87 ture in t 18.68	eriods in ving are 0.81 ving are 20.33 eriods in 20.15 est of dv 0.78 he rest 19.33	n the livies, h1,m May 0.69 ea T1 (for 20.69 n rest of 20.16 welling, 0.65 of dwell 19.8	ng a (see of see	w step 20.9 elling 0.17 m (se 0.47 T2 (fc	Jul 0.4 0.8 3 to 7 20.97 from Ta 20.17 e Table 0.33 ollow ste 20.14	Al 0.4 7 in T 20 ble 9 20. 9a) 0.3 ps 3 20.	Th1 (°C)  ug Sep  4 0.64  Table 9c)  96 20.81  9, Th2 (°C)  17 20.16  10 0.59  to 7 in Table  11 19.97	Oct 0.84 20.35 20.16 0.81 e 9c) 19.37	0.93 19.73 20.15 0.91 18.5 ring area ÷ (4	Dec 0.96 19.21 20.15 0.95		(85) (86) (87) (88) (89)

				•						•	•	•	
(93)m= 18.4	18.71	19.18	19.74	20.17	20.41	20.49	20.48	20.32	19.78	19.01	18.34		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l				<u> </u>								
(94)m= 0.93	0.9	0.85	0.77	0.65	0.49	0.36	0.4	0.6	0.8	0.9	0.93		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	•								
(95)m= 451.58	495.95	520.78	515.8	459.98	343.62	240.15	248.81	348.14	417.11	428.36	433.4		(95)
Monthly average	age exte	rnal 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 rate	i e	1	<del> </del>		i	- ,	· · ·	<u> </u>				1	()
(97)m= 933.05	911.32	834.36	703.66	548.03	370.81	247.81	259.25	399	594.06	775.05	925.66		(97)
Space heatin (98)m= 358.22	<del></del>	1	1	1	I					1)m 249.61	266.25		
(98)m= 358.22	279.13	233.3	135.26	65.51	0	0	0 	0	131.65		366.25	4040.04	7(00)
							Tota	l per year	(kwh/yeai	') = Sum(9	8)15,912 =	1818.94	(98)
Space heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								25.67	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme	!							
This part is use Fraction of spa										unity sch	neme.		7(204)
·			•		-	_	(Table T	1) 0 11 11	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so									up to four	other heat	sources; t	he latter	
includes boilers, he Fraction of hea		-			rom powei	stations.	See Appei	naix C.				1	(303a)
Fraction of total			•		oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	•			•		r commı	unity hea	iting sys	tem			1	(305)
Distribution los				,	` ''		•	0 ,				1.05	(306)
Space heating		`	,		,	0 ,						kWh/yea	
Annual space	_	requiren	nent									1818.94	<u></u>
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	1909.89	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	נ												<del></del>
Annual water h		equirem	ent									2108.87	
If DHW from c	ommuni	ty schen	ne:										<b>-</b>
Water heat fro	m Comr	nunity bo	oilers					(64) x (30	03a) x (30	5) x (306) :	=	2214.31	(310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] =$								[310e)] =	41.24	(313)			
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	ed cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											I		7,000
mechanical ve	ntilation	- paland	cea, extra	act or po	sitive in	out from	outside					245.83	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	b) + (330g) =	245.83	(331)
Energy for lighting (calculated in Appendix L)			328.11	(332)
Electricity generated by PVs (Appendix M) (ne	egative quantity)		-716.31	(333)
Electricity generated by wind turbine (Append	lix M) (negative quantity)		0	(334)
12b. CO2 Emissions – Community heating so	cheme			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water h Efficiency of heat source 1 (%)	neating (not CHP)  If there is CHP using two fuels repeat (363) to	(366) for the second fue	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	947.69	(367)
Electrical energy for heat distribution	[(313) x	0.52	21.4	(372)
Total CO2 associated with community system	ns (363)(366) + (368)(372	2) =	969.09	(373)
CO2 associated with space heating (seconda	(309) x	0	0	(374)
CO2 associated with water from immersion he	eater or instantaneous heater (312) x	0.22	0	(375)
Total CO2 associated with space and water h	neating (373) + (374) + (375) =		969.09	(376)
CO2 associated with electricity for pumps and	d fans within dwelling (331)) x	0.52	127.58	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	170.29	(379)
Energy saving/generation technologies (333) Item 1	to (334) as applicable	0.52 x 0.01 =	-371.77	(380)
Total CO2, kg/year	of (376)(382) =	<del></del>	895.2	(383)
Dwelling CO2 Emission Rate (383)	÷ (4) =		12.63	(384)

El rating (section 14)

(385)

89.65

### **SAP 2012 Overheating Assessment**

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

#### Property Details: Plot 52

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: South West

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: 350.74 (P1)

Transmission heat loss coefficient: 50.6

Summer heat loss coefficient: 401.31 (P2)

#### Overhangs:

Overhangs:

Night ventilation:

Orientation: Ra	atio: $Z_{-}$	overhangs:
-----------------	---------------	------------

South East (SE) 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)
North West (NW)	1	0.9	1	0.9	(P8)

#### Solar gains:

Orientation		Area	Flux	<b>g</b> _	FF	Shading	Gains
South East (SE)	0.9 x	6.1	119.92	0.63	0.7	0.9	261.18
North West (NW)	0.9 x	5.11	98.85	0.63	0.7	0.9	180.32
						Total	441.5 <b>(P3/P4)</b>

#### Internal gains.

	June	July	August
Internal gains	452.8	436.27	444.39
Total summer gains	921.64	877.77	835.56 <b>(P5)</b>
Summer gain/loss ratio	2.3	2.19	2.08 <b>(P6)</b>
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	19.6	21.39	21.18 <b>(P7)</b>
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	
		roperty	Address	: Plot 52	!				
Address :									
1. Overall dwelling dime	ensions:	Λ να	a(m2)		۸۰، ۵۰	ia b4/m	\	Valuma/m³	81
Ground floor			ea(m²) 70.86	(1a) x		ight(m) 2.5	) (2a) =	Volume(m <sup>3</sup>	(3a)
Total floor area TFA – (1	a)+(1b)+(1c)+(1d)+(1e)+(1		70.86	(4)				.,,,,,,	(227)
	a)1(10)1(10)1(10)1(10)1(1	''/	70.00	J	)+(3c)+(3c	4) 1 (30) 1	(2n) -		<b>7</b>
Dwelling volume				(3a)+(3b	)+(30)+(30	J)+(3e)+	(311) =	177.14	(5)
2. Ventilation rate:	main seconda	ırv	other		total			m³ per hou	ır
Number of alligners	heating heating			- 		<del></del>	(40 =	-	_
Number of chimneys		_	0	_	0			0	(6a)
Number of open flues	0 + 0	+	0	_ = [	0	×	(20 =	0	(6b)
Number of intermittent fa	ins				3	Х	(10 =	30	(7a)
Number of passive vents	3				0	×	(10 =	0	(7b)
Number of flueless gas f	ires				0	×	40 =	0	(7c)
							Air ch	anges per he	NIIP.
lafituation due to altique	fl and fana. (60).(6b).	(7a) . (7b) .	(70)	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+ neen carried out or is intended, proce			continue fi	30	(16)	÷ (5) =	0.17	(8)
Number of storeys in t		ou to (11),	Oli IOI WIGO	oonanao n	0111 (0) 10 (	(10)		0	(9)
Additional infiltration						[(9	9)-1]x0.1 =	0	(10)
	.25 for steel or timber frame of			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding	to the grea	iter wall are	a (after					
=	floor, enter 0.2 (unsealed) or (	).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate					12) + (13)			0	(16)
	q50, expressed in cubic metr lity value, then $(18) = [(17) \div 20] +$	•	•	•	etre of e	envelop	e area	3	(17)
•	es if a pressurisation test has been do				is being u	sed		0.32	(18)
Number of sides sheltered			,	,	Ü			2	(19)
Shelter factor			(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	s) x (20) =				0.27	(21)
Infiltration rate modified f	<del></del>	1	1	•	•			1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	<del> </del>	1	_			1	1	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(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		
<del></del>								-	

0.35		<u> </u>				<del>`                                    </del>	r <del>`</del>	(22a)m	0.00	0.04	0.00	1	
Calculate effe	0.34 ctive air	0.33 Change i	0.3 rate for t	0.29 he appli	<sup>0.26</sup> cable ca	0.26 S <b>e</b>	0.25	0.27	0.29	0.31	0.32	]	
If mechanic	al ventila	tion:										0	(23
If exhaust air h	eat pump (	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , other	rwise (23b	) = (23a)			0	(23
If balanced wit	h heat reco	very: effici	iency in %	allowing f	or in-use f	actor (from	Table 4h	) =				0	(23
a) If balance	ed mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance							/IV) (24b	m = (22)	2b)m + (2	23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r	nouse ex n < 0.5 ×			-	-				5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural	ventilation								0.51		<u>.                                    </u>	1	
(24d)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	]	(24
Effective air	change	rate - en	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				•	
(25)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55	]	(25
3. Heat losse	e and he	ot loce r	aramoto	or:								•	
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	IE	AXU		k-value	2	ΑXk
	area	_	m		A ,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²-l		kJ/K
Doors					2	Х	1.4	=	2.8				(26
Windows Type	e 1				6.097	x1,	/[1/( 1.4 )+	0.04] =	8.08				(27
Windows Type	e 2				5.107	x1,	/[1/( 1.4 )+	0.04] =	6.77				(27
Walls Type1	34.7	'3	11.2		23.53	3 x	0.15	— ī	3.53	<del>-</del> п			
							0.10	=	0.00				(29
Walls Type2	8.92	2	2		6.92	x	0.14	= [ = [	0.98	<b>=</b>			(29
Walls Type2 Walls Type3	8.92 16.3		0		6.92	x x		=					
Walls Type3		3				×	0.14	= [	0.98				(29
Walls Type3 Roof	70.8	3 66	0		16.3	x x	0.14	= [ = [	0.98 2.15				(29
• •	16.3 70.8 elements	3 6 , m <sup>2</sup>	0	ndow U-ve	16.3 70.86 130.8	x x x	0.14 0.13 0.1	= [	0.98 2.15 7.09	as given in	paragraph	13.2	(29)
Walls Type3 Roof Total area of 6 * for windows and ** include the are	70.8 Plements of roof winder as on both	3 66 , m² pws, use e sides of in	0 0 ffective winternal walk		16.3 70.86 130.8	x x 1 ated using	0.14 0.13 0.1	= [ = [ = [ /[(1/U-valu	0.98 2.15 7.09	as given in	paragraph	13.2	(29)
Walls Type3 Roof Total area of 6 * for windows and ** include the are Fabric heat lo	16.3 70.8 Pelements A roof winder as on both sss, W/K =	3 6 , m² cows, use e sides of in = S (A x	0 0 ffective winternal walk		16.3 70.86 130.8	x x 1 ated using	0.14 0.13 0.1	= [ = [ - = [ /[(1/U-value) + (32) =	0.98 2.15 7.09 re)+0.04] a			13.2	(29) (30) (31)
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat look Heat capacity	16.3 70.8 elements d roof winde as on both ss, W/K = Cm = S(	m <sup>2</sup> sides of int S (A x A x k)	0 0 ffective winternal walk	ls and part	16.3 70.86 130.8 alue calculations	x x x 1 1 ated using	0.14 0.13 0.1	= [ = [ = [ /[(1/U-value) + (32) = ((28)	0.98 2.15 7.09 e)+0.04] a	2) + (32a).			(29 (29 (30 (31 4 (33 2.2 (34
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat loo Heat capacity Thermal mass	16.3 70.8 Pelements A roof winder as on both ss, W/K = Cm = S(	m <sup>2</sup> ows, use e sides of in S (A x A x k) ter (TMF	0 0 ffective winternal walk U) $P = Cm \div$	's and part - TFA) ir	16.3 70.86 130.8 alue calculatitions	X X X 1	0.14 0.13 0.1 1 formula 1. (26)(30)	= [ = [ ] = [ /[(1/U-valu + (32) = ((28)	0.98 2.15 7.09 re)+0.04] a .(30) + (32 tive Value	2) + (32a). : Low	(32e) =	31.	(29 (29 (30 (31 4 (33 2.2 (34
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat loo Heat capacity Thermal mass For design asses	16.3 70.8 elements d roof winde as on both ss, W/K = Cm = S( s parame sments wh	m <sup>2</sup> ows, use e sides of in a S (A x A x k)  ter (TMF ere the decomposition)	offective winternal walk U)  P = Cm ÷	's and part - TFA) ir	16.3 70.86 130.8 alue calculatitions	X X X 1	0.14 0.13 0.1 1 formula 1. (26)(30)	= [ = [ ] = [ /[(1/U-valu + (32) = ((28)	0.98 2.15 7.09 re)+0.04] a .(30) + (32 tive Value	2) + (32a). : Low	(32e) =	31. 1292	(29 (29 (30 (31 4 (33 2.2 (34
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat look Heat capacity	16.3 70.8 elements d roof winder as on both ss, W/K = Cm = S( s parame sments whead of a dec	m <sup>2</sup> sides of in = S (A x A x k) ter (TMF ere the detailed calculations)	o  ffective winternal walk  U)  P = Cm ÷  tails of the ulation.	s and pari - TFA) ir constructi	16.3 70.86 130.8 alue calculations kJ/m²K	x x 1 ated using	0.14 0.13 0.1 1 formula 1. (26)(30)	= [ = [ ] = [ /[(1/U-valu + (32) = ((28)	0.98 2.15 7.09 re)+0.04] a .(30) + (32 tive Value	2) + (32a). : Low	(32e) =	31. 1292	(29 (29 (30 (31 4 (33 2.2 (34 ) (35
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat loo Heat capacity Thermal mass For design asses can be used inste	16.3 70.8 elements d roof winde as on both ss, W/K = Cm = S( s parame sments wh ead of a dei es : S (L	m <sup>2</sup> ows, use e sides of in a sides of in the sides of in the sides of in the sides of the side	offective winternal walk  ternal walk  offective winternal walk  offec	s and part - TFA) ir constructi	16.3 70.86 130.8 alue calculations kJ/m²K ion are not	x x 1 ated using	0.14 0.13 0.1 1 formula 1. (26)(30)	= [ = [ ] = [ /[(1/U-valu + (32) = ((28)	0.98 2.15 7.09 re)+0.04] a .(30) + (32 tive Value	2) + (32a). : Low	(32e) =	31. 1292 100	(29 (29 (30 (31 4 (33 2.2 (34 )) (35
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat loo Heat capacity Thermal mass For design asses can be used inste	16.3 70.8 elements d roof winder as on both ss, W/K = Cm = S( s parame sments where ad of a decrease is S (L al bridging	m <sup>2</sup> ows, use e sides of in a sides of in the sides of in the sides of in the sides of the side	offective winternal walk  ternal walk  offective winternal walk  offec	s and part - TFA) ir constructi	16.3 70.86 130.8 alue calculations kJ/m²K ion are not	x x 1 ated using	0.14 0.13 0.1 1 formula 1. (26)(30)	= [ = [ ] = [ /[(1/U-valu + (32) = ((28) Indica	0.98 2.15 7.09 re)+0.04] a .(30) + (32 tive Value	2) + (32a). : Low	(32e) =	31. 1292 100	(29 (29 (30 (31 4 (33 2.2 (34 ) (35
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat loo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he	16.3 70.8 elements d roof winder as on both ss, W/K = Cm = S( s parame sments where and of a deceed in the second	m <sup>2</sup> ows, use e sides of in a sides (A x A x k ) ter (TMF) ere the detailed calculation (X Y) calculate (A x k )	offective winternal walk U)  P = Cm ÷ tails of the ulation. culated to own (36) =	- TFA) ir constructi using Ap	16.3 70.86 130.8 alue calculations kJ/m²K ion are not	x x 1 ated using	0.14 0.13 0.1 1 formula 1. (26)(30)	= [ = [ ] = [ /[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m	0.98 2.15 7.09 e)+0.04] a .(30) + (32 tive Value e values of	2) + (32a). : Low TMP in Ta	(32e) = able 1f	31. 1292 100	(29 (29 (30 (31 4 (33 2.2 (34 ) (35
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat loo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation he	16.3 70.8 elements d roof winder as on both ess, W/K = Cm = S( es parame essments whe ead of a dece es : S (L eal bridging eat loss at loss ca	m <sup>2</sup> ows, use e sides of in a sides of in the sides of interest of in	offective winternal walk U)  P = Cm ÷ tails of the ulation. culated to own (36) =	- TFA) ir constructi using Ap = 0.05 x (3	16.3 70.86 130.8 alue calculations kJ/m²K fon are not spendix k	x 1 1 ated using	0.14 0.13 0.1 formula 1. (26)(30) ecisely the	= [	0.98 2.15 7.09 e)+0.04] a  .(30) + (32 tive Value values of  (36) = = 0.33 × (  Oct	2) + (32a). : Low TMP in Ta	(32e) = able 1f	31. 1292 100	(29 (29 (30 (31 4 (33 2.2 (34 2) (35 7 (36 57 (37
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat loo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation he	16.3 70.8 Pelements If roof winder as on both as on both as, W/K = Cm = S( as parame and of a deceler and bridging at loss at loss ca	m <sup>2</sup> ows, use e sides of in = S (A x A x k) ter (TMF ere the detailed calculated are not known alculated	offective winternal walk U)  P = Cm = tails of the ulation. culated to own (36) =	- TFA) ir constructi using Ap	16.3 70.86 130.8 alue calculations a kJ/m²K ion are not	x x 1 ated using	0.14 0.13 0.1 formula 1. (26)(30)	= [ = [ ] = [ /[(1/U-valu + (32) = ((28) Indica e indicative (33) + (38)m	0.98 2.15 7.09 1.(30) + (32 1.(	2) + (32a). : Low TMP in Ta 25)m x (5)	(32e) = able 1f	31. 1292 100	(29 (29 (30 (31 4 (33 2.2 (34 ) (35
Walls Type3 Roof Total area of e * for windows and ** include the are Fabric heat loo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation he	16.3 70.8 elements d roof winder as on both ess, W/K = Cm = S( esparame esments where es : S (L al bridging eat loss at loss ca Feb 32.59	me sides of interest the declarate of known alculated Mar 32.46	offective winternal walk  offective winternal walk  offective winternal walk  offective winternal walk  ternal walk  tails of the winternal walk  culated the winternal walk  own (36) =	- TFA) ir constructi using Ap = 0.05 x (3	16.3 70.86 130.8 alue calculations kJ/m²K fon are not spendix k	x 1 1 ated using	0.14 0.13 0.1 formula 1. (26)(30) ecisely the	= [ = [ = [ - [ - [ - [ - [ - []]]]]]]]]]]]]]]]]]	0.98 2.15 7.09 e)+0.04] a  .(30) + (32 tive Value values of  (36) = = 0.33 × (  Oct	2) + (32a). : Low : TMP in Ta 25)m x (5) Nov 31.95	(32e) = able 1f  Dec	31. 1292 100	(29 (29 (30 (31 4 (33 2.2 (34 2) (35 7 (36 57 (37

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
0)m= 1.18	1.17	1.17	1.16	1.16	1.15	1.15	1.15	1.16	1.16	1.16	1.17		
umber of day	s in moi	nth (Tahl	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.16	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
4. Water heat	ing enei	rgy requi	rement:								kWh/ye	ar:	
ssumed 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.		27		(42
nnual averag educe the annua of more that 125	e hot wa Il average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.67		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir								l Gob					
4)m= 101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		
nergy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd.r	n x nm x E	)Tm / 3600			m(44) <sub>112</sub> =	<u> </u>	1112.02	(44
5)m= 151.17	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81	146.4		
′									I Total = Su	m(45) <sub>112</sub> =		1458.03	(4
instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 <sub>)</sub>	) to (61)					
6)m= 0 /ater storage	0 loss:	0	0	0	0	0	0	0	0	0	0		(4)
torage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47
community h	eating a	ınd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
therwise if no		hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
/ater storage  i) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/dav):					0		(4
emperature fa					•	, , ,					0		(49
nergy lost fro				ear			(48) x (49)	) =			0		(50
) If manufact			-										
ot water stora community h	•			e 2 (kW	h/litre/da	ay)					0		(5
olume factor	_		311 4.5								0		(5:
emperature fa	actor fro	m Table	2b							-	0		(5:
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(5
Inter (50) or (	54) in (5	55)									0		(5
/ater storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
6)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
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 Appendix	×Н	
7)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
rimary circuit	loss (ar	nnual) fro	m Table	3							0		(58
rimary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
				_		. –	_	. –		. –	. 1		(5

Combis loss calculated for each month (61)m = (60) + 365 x (41)m (61)m    (61)m    0
Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m (62
Column   128.49   112.38   115.97   101.1   97.01   83.71   77.57   89.01   90.08   104.98   114.59   124.44   (62)
Colar DHW linput calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)
(add additional lines if FGHRS and/or WHRS applies, see Appendix G)  (63)ms  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Cotyput from water heater  (64)me   128.49   112.38   115.97   101.1   97.01   83.71   77.57   89.01   90.08   104.98   114.59   124.44      128.49   112.38   115.97   101.1   97.01   83.71   77.57   89.01   90.08   104.98   114.59   124.44     128.49   112.38   115.97   101.1   97.01   83.71   77.57   89.01   90.08   104.98   114.59   124.44     128.49   112.38   115.97   101.1   97.01   83.71   77.57   89.01   90.08   104.98   114.59   124.44     128.49   112.38   115.97   101.1   97.01   83.71   77.57   89.01   90.08   104.98   114.59   124.44     128.49   128.49   128.49   128.49   128.33   (64)     128.59   128.49   128.49   128.49   128.33   (64)     128.50   128.50   128.50   128.50   128.33   (64)     128.50   128.50   128.50   128.50   128.50   128.33   (64)     128.50   128.
Output from water heater  (64)m=   128.49   112.38   115.97   101.1   97.01   83.71   77.57   89.01   90.08   104.98   114.59   124.44    Heat gains from water heating, kWh/month 0.25 '[0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]    (65)m=   32.12   28.09   28.99   25.28   24.25   20.93   19.39   22.25   22.52   26.24   28.65   31.11    (65)miclude (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (Table 5), Watts  Metabolic gains (Table 5), Watts    48
Column   128.49   112.38   115.97   101.1   97.01   83.71   77.57   89.01   90.08   104.98   114.59   124.44
Couput from water heater (annual)
Heat gains from water heating, kWh/month 0.25 ' [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m = 32.12   28.09   28.99   25.28   24.25   20.93   19.39   22.25   22.52   26.24   28.65   31.11   (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m = 113.34   113.3
(65)m= 32.12
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         113.34
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
(66)m=
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5  (67)m= 18.58
(67)m=
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 199.29 201.35 196.14 185.05 171.05 157.88 149.09 147.02 152.23 163.33 177.33 190.49  Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.33 (69)  Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(68)m= 199.29 201.35 196.14 185.05 171.05 157.88 149.09 147.02 152.23 163.33 177.33 190.49 (68)  Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 34.33 (69)  Pumps and fans gains (Table 5a)  (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 34.33 3
(69)m= 34.33
Pumps and fans gains (Table 5a)  (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(71)m=
(71)m=
(72)m= 43.18 41.81 38.97 35.1 32.6 29.07 26.07 29.91 31.28 35.27 39.79 41.81  Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m  (73)m= 318.04 316.67 305.53 287.31 268.24 250.36 239.08 242.94 252.6 270.95 292.03 308.4 (73)  6. Solar gains:  Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(72)m= 43.18 41.81 38.97 35.1 32.6 29.07 26.07 29.91 31.28 35.27 39.79 41.81  Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m  (73)m= 318.04 316.67 305.53 287.31 268.24 250.36 239.08 242.94 252.6 270.95 292.03 308.4 (73)  6. Solar gains:  Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(73)m= 318.04 316.67 305.53 287.31 268.24 250.36 239.08 242.94 252.6 270.95 292.03 308.4 (73)  6. Solar gains:  Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(73)m= 318.04 316.67 305.53 287.31 268.24 250.36 239.08 242.94 252.6 270.95 292.03 308.4 (73)  6. Solar gains:  Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux a FF Gains
<u> </u>
Table 6d m² Table 6a Table 6b Table 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 85.75 x 0.63 x 0.7 = 159.78 (77)
Southeast 0.9x 0.77 x 6.1 x 106.25 x 0.63 x 0.7 = 197.98 (77)

<u>-</u>		_			_		_						_
Southeast <sub>0.9x</sub>	0.77	X	6.	1	x	118.15	X	0.63	X	0.7	=	220.15	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	x	113.91	x	0.63	X	0.7	=	212.25	(77)
Southeast 0.9x	0.77	X	6.	1	X	104.39	X	0.63	X	0.7	=	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	x	92.85	X	0.63	X	0.7	=	173.01	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	x	69.27	x	0.63	X	0.7	=	129.07	(77)
Southeast <sub>0.9x</sub>	0.77	×	6.	1	x	44.07	x	0.63	X	0.7	=	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	x	31.49	x	0.63	X	0.7	=	58.67	(77)
Northwest <sub>0.9x</sub>	0.77	×	5.1	1	x	11.28	x	0.63	X	0.7	=	17.61	(81)
Northwest <sub>0.9x</sub>	0.77	×	5.1	1	x	22.97	x	0.63	X	0.7	=	35.85	(81)
Northwest 0.9x	0.77	×	5.1	1	x	41.38	X	0.63	X	0.7	=	64.58	(81)
Northwest <sub>0.9x</sub>	0.77	×	5.1	1	x	67.96	x	0.63	x	0.7		106.06	(81)
Northwest <sub>0.9x</sub>	0.77	×	5.1	1	x	91.35	X	0.63	х	0.7	=	142.57	(81)
Northwest 0.9x	0.77	×	5.1	1	x	97.38	X	0.63	x	0.7	=	151.99	(81)
Northwest 0.9x	0.77	×	5.1	1	x	91.1	X	0.63	x	0.7	=	142.19	(81)
Northwest 0.9x	0.77	×	5.1	1	x	72.63	X	0.63	x	0.7	=	113.35	(81)
Northwest 0.9x	0.77	×	5.1	1	x	50.42	Īx	0.63	X	0.7		78.69	(81)
Northwest 0.9x	0.77	×	5.1	1	x	28.07	Īx	0.63	X	0.7		43.81	(81)
Northwest 0.9x	0.77	×	5.1	1	x	14.2	X	0.63	x	0.7	=	22.16	(81)
Northwest 0.9x	0.77	×	5.1	1	x	9.21	Īx	0.63	X	0.7		14.38	(81)
Color going in	watta aalau	ulatad	for cool	h manth			(02)~	Cum/74\m	(00)				
Solar gains in 86.17		24.37	304.04	364.32	372.	5 354.44	307	.87 251.71	172.8	7 104.28	73.05		(83)
Total gains – i							1 00.	1 20		1 10 1120	1 0.00		, ,
(84)m= 404.21		29.9	591.36	632.56	622.		550	.81 504.31	443.8	2 396.31	381.46		(84)
7. Mean inter	nal tompore	oturo /	(hooting	coacon	\								
Temperature	•		`		,	a from Ta	hle 9	Th1 (°C)				21	(85)
Utilisation fac	ŭ	٠.			•			, 1111 ( 0)				21	(00)
Jan		Mar	Apr	May	Ju	<del></del>	ТА	ug Sep	Oct	Nov	Dec		
(86)m= 0.97	<del>                                     </del>	0.93	0.88	0.79	0.66	+	0.5	<del></del>	0.9	0.96	0.97		(86)
` '	<u> </u>	!			<u> </u>	<u> </u> Į			ļ		ļ		
Mean interna (87)m= 18.5	<del> </del>	9.22	19.8	20.33	20.7	i i	20.		19.86	19.07	18.45		(87)
	ļ	!				ļ		<u> </u>	10.00	10.07	10.40		(=-)
Temperature				1	1	<u> </u>	_		10.05	10.05	40.05	1	(00)
(88)m= 19.94	19.94 19	9.94	19.95	19.95	19.9	6 19.96	19.	96 19.95	19.95	19.95	19.95		(88)
Utilisation fac		- 1			1	` 1	9a)				1	Ī	
(89)m= 0.97	0.95 0	).92	0.85	0.75	0.59	0.43	0.4	18 0.7	0.88	0.95	0.97		(89)
Mean_interna	l temperatu	re in t	he rest	of dwell	ng T2	(follow ste	eps 3	to 7 in Tab	le 9c)				
(90)m= 17.66	17.93	8.37	18.93	19.43	19.7	8 19.9	19.	89 19.64	19	18.23	17.61		(90)
									fLA = Liv	ving area ÷ (	4) =	0.41	(91)
Mean interna	l temperatu	re (fo	r the wh	ole dwe	lling)	= fLA × T1	+ (1	– fLA) × T2					
(92)m= 18.01	<del></del>	8.72	19.29	19.8	20.1	1	20.	<del></del>	19.36	18.58	17.96		(92)
Apply adjustr	nent to the	mean	internal	temper	ature	from Table	e 4e,	where appr	opriate		•	•	

(93)m= 18.01 18.28 18.72 19.29 19.8 20.16 20.31 20.29 20.02 19.36 18.58 17.96	(93)
8. Space heating requirement	(00)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	
the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	
(94)m= 0.95 0.93 0.9 0.84 0.74 0.6 0.46 0.51 0.71 0.87 0.94 0.96	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 385.76 438.57 477.4 496.07 468.45 374.98 274.99 280.3 357.01 385.05 371.09 366.14	(95)
Monthly average external temperature from Table 8	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]	
(97)m= 1141.97 1112.49 1014.6 856.29 666.82 454.82 303.31 317.3 484.8 720.56 947.5 1138.55	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
(98)m= 562.62 452.87 399.67 259.35 147.59 0 0 0 0 249.62 415.01 574.67	
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> = 3061.41	(98)
Space heating requirement in kWh/m²/year 43.21	(99)
	``
8c. Space cooling requirement	
Calculated for June, July and August. See Table 10b  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)	
(100)m= 0 0 0 0 0 768.37 604.89 620.47 0 0 0 0	(100)
Utilisation factor for loss hm	(100)
(101)m= 0 0 0 0 0 0.74 0.81 0.78 0 0 0 0	(101)
Useful loss, hmLm (Watts) = (100)m x (101)m	· /
(102)m= 0 0 0 0 0 570.31 487.37 482.55 0 0 0 0	(102)
Gains (solar gains calculated for applicable weather region, see Table 10)	` ,
(103)m= 0 0 0 0 0 811.92 776.39 727.91 0 0 0 0	(103)
Space cooling requirement for month, whole dwelling, continuous ( $kWh$ ) = 0.024 $x$ [(103) $m$ – (102) $m$ ] $x$ (41) $m$	
set (104)m to zero if (104)m $< 3 \times (98)$ m	
(104)m= 0 0 0 0 0 173.96 215.03 182.54 0 0 0 0	
Total = Sum(1.04) = $571.53$	(104)
Cooled fraction $f C = cooled area \div (4) = 1$	(105)
Intermittency factor (Table 10b)	<u></u>
(106)m= 0 0 0 0 0 0.25 0.25 0 0 0 0	
Total = Sum(1Q4) = 0	(106)
Space cooling requirement for month = (104)m × (105) × (106)m	
(107)m= 0 0 0 0 0 43.49 53.76 45.64 0 0 0 0	
Total = Sum(107) = 142.88	(107)
Space cooling requirement in kWh/m²/year $(107) \div (4) = 2.02$	(108)
8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)	
Fabric Energy Efficiency $(99) + (108) = 45.22$	(109)

### **SAP Input**

Property Details: Plot 52

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  $70.856 \text{ m}^2$  2.5 m

Living area: 29.384 m<sup>2</sup> (fraction 0.415)

Front of dwelling faces: South West

Opening types:

Name: Source: Type: Glazing: Argon: Frame:

SW Manufacturer Solid

SE Manufacturer Windows double-glazed Yes NW Manufacturer Windows double-glazed Yes

**U-value:** No. of Openings: Name: Gap: Frame Factor: g-value: Area: SW 0 1.4 mm SF 0.7 0.63 1.4 6.097 1 16mm or more

NW 16mm or more 0.7 0.63 1.4 5.107 1

Name: Type-Name: Location: Orient: Width: Height:

SWCorridor WallSouth West00SEExternal WallSouth East00NWExternal WallNorth West00

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	34.734	11.2	23.53	0.15	0	False	N/A
Corridor Wall	8.917	2	6.92	0.15	0.4	False	N/A
Stairwell Wall	16.303	0	16.3	0.15	0.9	False	N/A
Flat Roof	70.856	0	70.86	0.1	0		N/A

Internal Elements

Party Elements

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1465

Length Psi-value

5.93 0.291 E2 Other lintels (including other steel lintels)

#### **SAP Input**

17.7	0.048	E4	Jamb
34.001	0.062	E7	Party floor between dwellings (in blocks of flats)
2.725	0.074	E16	Corner (normal)
5.45	-0.072	E17	Corner (inverted internal area greater than external area)
8.525	0.057	E18	Party wall between dwellings
8.175	0.113	E25	Staggered party wall between dwellings
10.447	0.062	E14	Flat roof
13.107	0.56	E15	Flat roof with parapet
43.978	0	P3	Intermediate floor between dwellings (in blocks of flats)
21.989	0.24	P4	Roof (insulation at ceiling level)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

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: 2
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

Installed Peak power: 0.87 Tilt of collector: 30°

Overshading: None or very little

## **SAP Input**

Collector Orientation: South West

Assess Zero Carbon Home:

Nο

		User_l	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 52					
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor		_	ea(m²)	l(10) v	Av. He	• • •	_	Volume(m <sup>3</sup>	<u>`</u>
	\ \( \lambda \)			(1a) x		2.5	(2a) =	177.14	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	70.86	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	177.14	(5)
2. Ventilation rate:			41						
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0	Х	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	<b>;</b>			F	0	<u> </u>	10 =	0	(7b)
Number of flueless gas fi	ires			L F	0		40 =	0	(7c)
				L					(, o)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.17	(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	[(9	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 meti	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), otherv	vise (18) =	(16)				0.42	(18)
	es if a pressurisation test has been de	one or a de	egree air pe	rmeability	is being u	sed			<b>-</b>
Number of sides sheltere Shelter factor	ed .		(20) = 1 -	[0.075 x ( <sup>-</sup>	19)1 =			0.85	(19) (20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	`	/,1			0.36	(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>			1		J	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
	2)	1	1	1	•	•	1	ı	
Wind Factor (22a)m = (2.32)m $= (2.32)$ m	<del></del>	1 0 05	0.00		1 4 00	1 4 40	1 4 40	1	
(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	J	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.45	0.45	0.44	0.39	0.38	0.34	0.34	0.33	0.36	0.38	0.4	0.42		
Calculate effe		•	rate for t	he appli	cable ca	se	•		•	•			
If exhaust air h			endix N (2	3h) = (23a	a) × Fmv (e	equation (1	NS)) other	rwise (23h	) = (23a)			0	(23
If balanced with									) = (23a)			0	(23
		-	-	_					Ob\m . (	22h) [	1 (220)	0	(23
a) If balance (24a)m= 0		o o	0	o with nea	0		1K) (248	$\frac{1}{0} = \frac{2}{2}$	0	230) × [	$\frac{1 - (230)}{1}$	+ 100j	(24
b) If balance													(= .
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h													•
,				•	•		c) = (22k)		.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft				l	
,							0.5 + [(2		0.5]			-	
(24d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(24
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(25
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros	_	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	9	ΑΧk
	area		' m		A ,r	n²	W/m2		(W/I	K)	kJ/m²-l		kJ/K
Doors					2	Х	1	=	2				(26
Windows Type	e 1				6.097	7 x1	/[1/( 1.4 )+	0.04] =	8.08				(27
Windows Type	e 2				5.107	7 <u>x</u> 1.	/[1/( 1.4 )+	0.04] =	6.77				(27
Walls Type1	34.7	<b>'</b> 3	11.2		23.53	3 x	0.18	=	4.24				(29
Walls Type2	8.9	2	2		6.92	х	0.18	=	1.25				(29
Walls Type3	16.	3	0		16.3	X	0.18	<del>-</del>	2.93			7 F	(29
Roof	70.8	36	0		70.86	x	0.13	₹ - i	9.21	Ħ i		<b>i</b> i	(30
Total area of e	elements	, m²			130.8	1							(31
* for windows and	l roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
** include the area				ls and pan	titions								
Fabric heat los		•	U)				(26)(30)					34.48	(33
Heat capacity								((28).	(30) + (32	2) + (32a).	(32e) =	1292.2	(34
Thermal mass	•	`		,					tive Value			250	(35
For design asses: can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridg				ısina An	pendix I	<						15.13	(36
if details of therma	,	,			•	•						13.13	(00
Total fabric he			( )	,	,			(33) +	(36) =			49.61	(37
Ventilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (	[25)m x (5]	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 35.27	35.03	34.8	33.72	33.52	32.58	32.58	32.41	32.94	33.52	33.93	34.36		(38
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m= 84.88	84.64	84.41	83.33	83.13	82.19	82.19	82.02	82.55	83.13	83.54	83.97		
	•	•			•	•	•		Average =	Sum(39) <sub>1</sub>	12 /12=	83.33	(39)

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)	-		
))m= 1.2	1.19	1.19	1.18	1.17	1.16	1.16	1.16	1.17	1.17	1.18	1.19		
ımber of day	e in moi	nth (Tahl	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.18	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
				•	•		•			•			
. Water heat	ing enei	rgy requi	rement:								kWh/yea	ar:	
sumed occu											27		(4
if TFA > 13.9 if TFA £ 13.9	-	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.	.9)			
nual averag	e hot wa										.03		(4
duce the annua t more that 125	-		• .		-	-	to achieve	a water us	se target o	f			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage ir	litres per				ctor from T			! '		ļ.			
)m= 96.84	93.32	89.8	86.27	82.75	79.23	79.23	82.75	86.27	89.8	93.32	96.84		
ergy content of	hot water	used - cal	culated m	onthly – 4	190 v Vd r	т v nm v Г	Tm / 3600			m(44) <sub>112</sub> =		1056.42	(4
)m= 143.61	125.6	129.61	113	108.42	93.56	86.7	99.49	100.67	117.33	128.07	139.08		
140.01	120.0	123.01	110	100.42	33.30	00.7	00.40			m(45) <sub>112</sub> =	<u> </u>	1385.13	(4
nstantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			,	L		
i)m= 0	0	0	0	0	0	0	0	0	0	0	0		(4
ater storage orage volum		includin	na anv si	alar or M	/\//HRS	etorana	within es	ama vas	امء		150		(4
community h	` ,		•			Ū		arrio voo	001		150		(-
herwise if no	_			-			' '	ers) ente	er '0' in (	47)			
ater storage					- /1.14/1	. / .1							
If manufact				or is kno	wn (kvvr	n/day):					0		(4
mperature fa							(40) ~ (40)	<b>.</b>			0		(4
ergy lost fro If manufact		-	-		or is not		(48) x (49)	) =			0		(5
ot water stora	age loss	factor fr	om Tabl								0		(5
community h	_		on 4.3										
lume factor			2h							-	0		(5
mperature fa								> .	>		0		(5
ergy lost fro nter (50) or (		-	, KVVh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(5
` , ,	, ,	,	or oach	month			((56)m - (	55) × (41)	m		0		(5
ater storage					i	ı	· · · · · · · · · · · · · · · · · · ·	1	ı	1	<del></del>		
)m= 0 ylinder contains	0 dedicate	0 d solar sto	0 rage, (57)	m = (56)m	0 x [(50) – (	0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (	0 H11) is fro	0 m Appendix	Н	(5
)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
mary circuit	loss (ar	nual) fro	m Table	3							0		(5
,	•	•											
mary circuit	loss cal	culated f	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
mary circuit (modified by				,	•	. ,	, ,		r thermo	stat)			

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	alculated 0	or each	montn (	61)m = 0	(60) ÷ 3	05 × (41)	)m l o	T 0	0	0	0		(61)
(* )							<u> </u>	_!	<u> </u>	<u> </u>	<u> </u>	(F0)m + (G1)m	(01)
(62)m= 122.07	<u> </u>	110.17	96.05	92.16	79.53	73.69	84.56	85.57	99.73	108.86	118.22	(59)m + (61)m	(62)
Solar DHW input													(02)
(add addition									ii continbu	lion to wate	er neating)		
(63)m= 0	0	0	0	0	0	0	0	T 0	0	0	0	]	(63)
Output from v	vater hea	L ter					ļ	1		ļ			
(64)m= 122.07	1	110.17	96.05	92.16	79.53	73.69	84.56	85.57	99.73	108.86	118.22		
	1						Οι	tput from w	ater heate	er (annual)	l12	1177.36	(64)
Heat gains fro	om water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 30.52	26.69	27.54	24.01	23.04	19.88	18.42	21.14	21.39	24.93	27.22	29.55	]	(65)
include (57	m in calc	culation o	of (65)m	only if c	vlinder i	s in the	dwellin	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal of	•			-	,						,	<u> </u>	
Metabolic gai	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5	•		•	ı	
(67)m= 18.58	16.5	13.42	10.16	7.59	6.41	6.93	9.01	12.09	15.35	17.91	19.1		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5		•	•	
(68)m= 199.29	201.35	196.14	185.05	171.05	157.88	149.09	147.02	152.23	163.33	177.33	190.49		(68)
Cooking gain	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a	), also	see Table	5	•	•	•	
(69)m= 34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33		(69)
Pumps and fa	ans 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= -90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67		(71)
Water heating	g gains (T	able 5)				-	-	-	-	-	-		
(72)m= 41.02	39.72	37.02	33.35	30.97	27.61	24.76	28.42	29.71	33.51	37.8	39.72		(72)
Total interna	ıl gains =	:			(66	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72)	)m		
(73)m= 315.88	314.57	303.58	285.56	266.61	248.91	237.78	241.44	251.03	269.19	290.04	306.31		(73)
6. Solar gair	ns:												
Solar gains are		Ü	flux from	Table 6a		•	tions to	convert to th	ne applica		tion.		
Orientation:	Access F Table 6d	actor	Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF		Gains	
					Га	Die ba	. –	Table 6b	_ '	able 6c		(W)	,
Southeast 0.9x		X	6.	1	x ;	36.79	×	0.63	X	0.7	=	68.56	(77)
Southeast 0.9x	• • • • • • • • • • • • • • • • • • • •	X	6.	1	X (	62.67	x	0.63	X	0.7	=	116.78	(77)
Southeast 0.9x		X	6.	1	X 8	35.75	×	0.63	x	0.7	=	159.78	(77)
Southeast 0.9x		X	6.	1	x 1	06.25	x	0.63	x	0.7	=	197.98	(77)
Southeast 0.9x	0.77	X	6.	1	x 1	19.01	X	0.63	Х	0.7	=	221.76	(77)

-					_		_						_
Southeast <sub>0.9x</sub>	0.77	X	6.	1	X	118.15	X	0.63	X	0.7	=	220.15	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	x	113.91	x	0.63	X	0.7	=	212.25	(77)
Southeast 0.9x	0.77	X	6.	1	X	104.39	x	0.63	X	0.7	=	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	x	92.85	x	0.63	X	0.7	=	173.01	(77)
Southeast <sub>0.9x</sub>	0.77	x	6.	1	x	69.27	x	0.63	x	0.7	=	129.07	(77)
Southeast <sub>0.9x</sub>	0.77	x	6.	1	x	44.07	x	0.63	X	0.7	=	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	x	31.49	x	0.63	x	0.7	=	58.67	(77)
Northwest <sub>0.9x</sub>	0.77	x	5.1	1	x	11.28	×	0.63	x	0.7	=	17.61	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.1	1	x	22.97	x	0.63	x	0.7	=	35.85	(81)
Northwest 0.9x	0.77	X	5.1	1	x	41.38	×	0.63	x	0.7	=	64.58	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.1	1	x	67.96	Īx	0.63	x	0.7	=	106.06	(81)
Northwest 0.9x	0.77	x	5.1	1	x	91.35	T x	0.63	x	0.7	=	142.57	(81)
Northwest 0.9x	0.77	×	5.1	1	x	97.38	Īx	0.63	x	0.7	=	151.99	(81)
Northwest 0.9x	0.77	×	5.1	1	x	91.1	T x	0.63	x	0.7	=	142.19	(81)
Northwest 0.9x	0.77	x	5.1	1	x	72.63	×	0.63	x	0.7	=	113.35	(81)
Northwest 0.9x	0.77	×	5.1	1	x	50.42	×	0.63	x	0.7	=	78.69	(81)
Northwest 0.9x	0.77	x	5.1	1	x	28.07	×	0.63	x	0.7	=	43.81	(81)
Northwest 0.9x	0.77	x	5.1	1	x	14.2	×	0.63	x	0.7	=	22.16	(81)
Northwest 0.9x	0.77	×	5.1	1	x $\lceil$	9.21	×	0.63	x	0.7	=	14.38	(81)
Solar gains in (83)m= 86.17	· · ·	ulated 24.37	for eacl	n month 364.32	372	2.15 354.44	(83)m	s = Sum(74)m . .87   251.71	( <mark>82</mark> )m	7 104.28	73.05		(83)
Total gains – i	nternal and	solar	(84)m =	(73)m ·	+ (83	3)m , watts	•	•	•	•			
(84)m= 402.05	467.2 52	27.95	589.6	630.93	621	.05 592.22	549	.31 502.74	442.06	394.32	379.37		(84)
7. Mean inter	nal temper	ature (	(heating	season	)								
Temperature	during hea	ting p	eriods ir	the livii	ng ai	rea from Ta	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gain	s for l	iving are	ea, h1,m	(see	e Table 9a)							
Jan	Feb	Mar	Apr	May	Jı	un Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 1	1 (	0.99	0.97	0.9	0.7	76 0.59	0.6	5 0.88	0.98	1	1		(86)
Mean interna	ıl temperatu	ıre in l	iving are	ea T1 (fo	ıllow	stans 3 to		-		-			
(87)m= 19.66	<del>' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' </del>		-			SICPS 5 IU	7 in T	able 9c)					(07)
	19.82 2	0.08	20.42	20.73	20.	i	7 in T		20.43	19.99	19.64		(87)
Temperature	<u> </u>	!		20.73	20.	93 20.98	20.	97 20.83	20.43	19.99	19.64		(87)
Temperature (88)m= 19.92	during hea	!		20.73	20.	93 20.98 Iling from T	20.	97 20.83 9, Th2 (°C)	20.43		19.64		(88)
(88)m= 19.92	during hea	ting p	eriods ir 19.94	20.73 rest of 19.94	20. dwe 19.	93 20.98 Iling from T 95 19.95	20.9 able 9	97 20.83 9, Th2 (°C)	1				` '
(88)m= 19.92 Utilisation fac	during hea	ting possible size of the second	eriods ir 19.94 est of d	20.73 n rest of 19.94 welling,	20. dwe 19. h2,m	93 20.98 Iling from T 95 19.95	20.9 able 9 19.9	97 20.83 9, Th2 (°C) 95 19.95	19.94	19.94	19.93		(88)
(88)m= 19.92  Utilisation factors (89)m= 1	during hea	ting positions of the second s	eriods ir 19.94 est of dv 0.96	20.73 n rest of 19.94 welling, 0.86	20. dwe 19. h2,m	93 20.98  Iling from T 95 19.95  n (see Table 67 0.46	20.9 able 9 19.9 20.5	97 20.83 9, Th2 (°C) 95 19.95	19.94				` '
Utilisation factors (89)m= 1  Mean internal	during heat 19.92 1 ctor for gain 1 (all temperature)	ting positions of the second s	eriods ir 19.94 est of d 0.96 the rest	20.73 n rest of 19.94 welling, 0.86 of dwelli	20. dwe 19. h2,m	93 20.98  Iling from T 95 19.95  n (see Table 67 0.46  2 (follow st	20.4 able 9 19.4 e 9a) 0.5 eps 3	97 20.83 9, Th2 (°C) 95 19.95 12 0.82 to 7 in Table	19.94 0.97 le 9c)	19.94	19.93		(88)
(88)m= 19.92  Utilisation factors (89)m= 1	during heat 19.92 1 ctor for gain 1 (all temperature)	ting positions of the second s	eriods ir 19.94 est of dv 0.96	20.73 n rest of 19.94 welling, 0.86	20. dwe 19. h2,m	93 20.98  Iling from T 95 19.95  n (see Table 67 0.46  2 (follow st	20.9 able 9 19.9 20.5	97 20.83 9, Th2 (°C) 95 19.95 12 0.82 to 7 in Tables 19.85	19.94 0.97 le 9c) 19.48	19.94	19.93	0.44	(88) (89) (90)
(88)m= 19.92  Utilisation fact (89)m= 1  Mean internation (90)m= 18.71	during head 19.92 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ting p 9.93 s for r 0.99 ure in t 9.12	eriods ir 19.94 est of do 0.96 the rest 19.47	20.73 n rest of 19.94 welling, 0.86 of dwelli 19.76	20. dwe 19. h2,m 0.6 ng T	93 20.98  Illing from T 95 19.95  n (see Table 67 0.46  T2 (follow st 19.95	20 able § 19 e 9a) 0.5 eps 3	97 20.83 9, Th2 (°C) 95 19.95 62 0.82 to 7 in Tabl 95 19.85	19.94 0.97 le 9c) 19.48	19.94	19.93	0.41	(88)
Utilisation fact (89)m= 1  Mean internation [90)m= 18.71  Mean internation [18.71]	during head 19.92 1 ctor for gain 1 (all temperature) 18.86 1	s for r 0.99 ure in t 9.12	eriods in 19.94 est of do 0.96 the rest 19.47 r the wh	20.73 n rest of 19.94 welling, 0.86 of dwelli 19.76	20. dwe 19. h2,m 0.6 ng T 19.	93   20.98 Iling from T 95   19.95 In (see Table 67   0.46 T2 (follow st 92   19.95 In (see Table 19.95	20.4 able \$ 19.5 eps 3 19.5 + (1	97 20.83 9, Th2 (°C) 95 19.95 10.82 to 7 in Table 95 19.85 - fLA) × T2	19.94 0.97 le 9c) 19.48 fLA = Liv	19.94 1 19.04 ring area ÷ (4	19.93 1 18.69 4) =	0.41	(88) (89) (90) (91)
(88)m= 19.92  Utilisation fact (89)m= 1  Mean internation (90)m= 18.71	during head 19.92 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ting p 9.93 s for r 0.99 ure in t 9.12	eriods ir 19.94 est of do 0.96 the rest 19.47 r the wh	20.73 n rest of 19.94 welling, 0.86 of dwelli 19.76 ole dwe 20.16	20.0 dwe 19.0 h2,m 0.6 19.0 llling) 20.0	93   20.98 Illing from T 95   19.95 In (see Table 67   0.46 T2 (follow st 92   19.95 I = fLA × T1 34   20.38	20 able 9 19 e 9a) 0.5 eps 3 19 + (1 20	97   20.83 9, Th2 (°C) 95   19.95 12   0.82 15   19.85 16   19.85 17   19.85 18   19.85 19   19.85 19   19.85 19   19.85 10   19.85 11   19.85 12   19.85 13   19.85 14   19.85 15   19.85 16   19.85 17   19.85 18   19.85 19   19.85 19   19.85 19   19.85 10   1	19.94  0.97  le 9c)  19.48  19.88	19.94 1 19.04 ring area ÷ (4	19.93	0.41	(88) (89) (90)

(93)m=	19.1	19.26	19.52	19.87	20.16	20.34	20.38	20.37	20.26	19.88	19.43	19.09		(93)
` ′			uirement											
					re obtair	ed at ste	ep 11 of	Table 9b	o, so tha	t Ti.m=(	76)m an	d re-calc	ulate	
				using Ta					,	, (	. 0,	u . o ou. o		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	:									l	
(94)m=	1	0.99	0.99	0.96	0.87	0.7	0.51	0.57	0.84	0.97	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m			•					l.	
(95)m=	400.98	464.47	520.21	563.62	551.2	435.93	304.45	315.62	420.9	429.57	392.17	378.6		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8							l	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]	•			
(97)m=	1256.54	1215.51	1098.9	913.8	703.42	471.44	310.46	325.79	508.38	771.22	1030.31	1249.87		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	/Vh/mon	h = 0.02	24 x [(97)	m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	636.53	504.7	430.54	252.13	113.25	0	0	0	0	254.18	459.47	648.22		
•					•	•		Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	3299.02	(98)
Space	e heatin	a reauire	ement in	kWh/m²	<sup>2</sup> /vear								46.56	(99)
·		• •			.,,								.0.00	
			luiremer		O T-1	-1- 40-								
Calcu	Jan	r June, c Feb	Mar	August.	See Tai		lul	Διια	Sep	Oct	Nov	Dec		
∐oot I				Apr	<u> </u>	Jun	Jul	Aug and exte						
(100)m=	055 Tale	0 LIII (Ca	0	0	0	772.61	608.22	623.34	0	o 0	0	0		(100)
	-	tor for lo	L	Ü		772.01	000.22	023.54	Ū	0	ı	Ü		(100)
(101)m=		0	0	0	0	0.85	0.92	0.89	0	0	0	0		(101)
				 (100)m x			0.02	0.00	Ů	•	Ŭ	Ŭ		(101)
(102)m=	0	0	0	0	0	658.54	557.25	554.83	0	0	0	0		(102)
					<u> </u>	<u> </u>		e Table			Ŭ	Ů		(10-)
(103)m=	0	0	0	0 appii	0	810.47	775.08	726.41	0	0	0	0		(103)
			l		l	l		ous ( kW					v (41)m	( /
				3 × (98		wennig,	oonina	545 ( NV	11) = 0.02	24 X [( 10	,0),,,, (	102)111 ] 2	(41)111	
(104)m=	0	0	0	0	0	109.39	162.07	127.66	0	0	0	0		
I			<u> </u>		<u> </u>	<u> </u>			Total	= Sum(	104)	=	399.11	(104)
Cooled	fraction	า							f C =	cooled	area ÷ (4	1) =	1	(105)
	<u> </u>	actor (Ta	able 10b	)	•	•					•		·	_
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	= Sum(	(104)	=	0	(106)
		requirer	ment for	month =	(104)m	<del>`</del>	× (106)r	n				· · · · · · · · ·		
(107)m=	0	0	0	0	0	27.35	40.52	31.91	0	0	0	0		_
									Total	= Sum(	107)	=	99.78	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	/ear				(107)	÷ (4) =			1.41	(108)
8f. Fab	ric Ener	gy Effic	iency (ca	alcula <u>ted</u>	l only un	der spec	cial cond	litions, se	ee se <u>ctic</u>	on 11)				
		/ Efficier								+ (108) =	=		47.97	(109)
	-		•	ency (TF	EE)				. ,	, ,			55.16	(109)
9		g	,	- , (	<del>-</del> ,								33.10	` _′

		Hee	r Details:						
Access Name:	Zahid Ashraf	USE		a Mirros	<b>b</b> a v .		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012	)	Strom Softwa					001082 on: 1.0.5.9	
			ty Address:						
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(1a) x		<b>ight(m)</b> 2.5	(2a) =	Volume(m <sup>3</sup>	(3a)
	a) (1b) (1a) (1d) (1a)				4	2.5	(2a) –	177.14	(Ja)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(111)	70.86	(4)	) . (2-) . (2-	1) . (2-) .	(2-)		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3h) =	177.14	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
Number of chimneys	heating he	eating		1 <sub>=</sub> [			40 =		_
·			0	]	0		20 =	0	(6a)
Number of open flues		0 +	0	」 <sup>-</sup>	0			0	(6b)
Number of intermittent fa				L	0		10 =	0	(7a)
Number of passive vents				Ļ	0		10 =	0	(7b)
Number of flueless gas f	ires			L	0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)	)+(6b)+(7a)+(7l	o)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has b	peen carried out or is intended	d, proceed to (1	7), otherwise o	ontinue fr			` ′		`` <i>`</i>
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	OF for oto all or timber for		<b>f</b> or <b>m</b> oon.			[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber from the research as the value corresponds to the value corresponds to the research as the research a			•	uction			0	(11)
deducting areas of opening	ngs); if equal user 0.35						•		_
•	floor, enter 0.2 (unseale	ed) or 0.1 (se	aled), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
· ·	s and doors draught stri	ipped	0.05 (0.0	(4.4)4	001			0	(14)
Window infiltration			0.25 - [0.2			. (45)		0	(15)
Infiltration rate	-50		(8) + (10)					0	(16)
If based on air permeabil	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)
·	es if a pressurisation test has				is heina u	sed		0.15	(18)
Number of sides sheltere			aog.coapo		.o 2011.g u	-		2	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	x (20) =				0.13	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed 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								
Wind Factor (22a)m = (22a)m = 1.27	2)m ÷ 4 1.23 1.1 1.08	0.95 0.9	5 0.92	1	1.08	1.12	1.18		
,,	-	3.33	1 0.02	•				I	

0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe	tive air	change i	rate for t	he appli	cable ca	ise	<u> </u>	<u> </u>		<u> </u>			
If mechanica	al ventila	ition:										0.5	(23
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				79.05	(23
a) If balance						<del>, ``</del>	<del></del>	<del>^ `</del>	<del></del>	(23b) × [	<del>``</del>	÷ 100]	
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance	i	ı			1	i	ЛV) (24b	i i	2b)m + (	i	_	I	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•				F (00)	- \			
<u>`</u>	n < 0.5 x	(230), t	nen (240	<u> </u>	o); other	· ` `	<del>É `</del>	ŕ	· ·	ŕ	Ι ο	Ī	(24
	<u> </u>			0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r					ve input erwise (2				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)		<u> </u>	ļ		
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
					I	I			<u> </u>		l		
3. Heat losse					NI a t A a		11 -1		A 3/ 1 1		1 -1		A 3/ I
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·l		۹Xk ۸J/K
Doors		` ,			2	x	1.4	=	2.8	<u></u>			(2
Vindows Type	e 1				6.097	7 x1,	/[1/( 1.4 )+	0.04] =	8.08	=			(2
Vindows Type					5.107		/[1/( 1.4 )+	0.04] =	6.77	=			(2
Valls Type1	34.7	<b>'</b> 3	11.2		23.53	=	0.15		3.53	=			(29
Valls Type2	8.9	_	2	_	6.92	=	0.14	_	0.98	<b>-</b>		╡ ├─	\`
Walls Type3	16.3		0	=	16.3	=	0.13	_	2.15	륵 ¦			(29
Roof	70.8		0	=	70.86	=	0.13	= -	7.09	<b>-</b>			(30
Total area of e			0			=	0.1		7.09				(3 <sup>,</sup>
for windows and			effective wi	ndow H-v	130.8 alue calcul		ı formula 1	/[(1/Ll-valı	ıe)+0 041 :	as given ir	n naradranh	132	(3
* include the area						atou uomg	, romaia r	III II O Vale	10) 10.0 1] (	ao givoirii	, paragrapi	. 0.2	
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				31.4	(3:
leat capacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	1292.2	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	e: Low		100	(3
or design assess				construct	ion are no	t known pr	ecisely the	indicative	values o	f TMP in T	able 1f		
an be used inste				icina An	nondiy l	/							
hermal bridger details of thermal	•	,			-	N.						19.17	(3
otal fabric he		are not kii	OWII (30) -	- 0.00 X (3	'')			(33) +	(36) =			50.57	(3
entilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 ×	(25)m x (5	)		`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 15.63	15.44	15.25	14.32	14.14	13.2	13.2	13.02	13.58	14.14	14.51	14.88		(3
ـــــــــا leat transfer d	coefficie	nt. W/K			!	!	!	(39)m	= (37) + (	(38)m		1	
	66.01	65.82	64.89	64.7	63.77	63.77	63.59	64.15	64.7	65.08	65.45		
39)m= 66.2	00.01												

Heat loss para	meter (I	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.93	0.93	0.93	0.92	0.91	0.9	0.9	0.9	0.91	0.91	0.92	0.92		
Number of dev	ro in mo	nth (Tob	lo 10)			!		,	Average =	Sum(40) <sub>1</sub> .	12 /12=	0.92	(40)
Number of day 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)
		!				Į.	Į.						
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		27		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the a	lwelling is	designed t			se target c		.67		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x							
(44)m= 101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			ım(44) <sub>112</sub> = ables 1b, 1		1112.02	(44)
(45)m= 151.17	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81	146.4		
									Total = Su	ım(45) <sub>112</sub> =		1458.03	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					
(46)m= 22.67	19.83	20.46	17.84	17.12	14.77	13.69	15.71	15.9	18.53	20.22	21.96		(46)
Water storage Storage volum		) includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` '		-			•					<u> </u>		(,
Otherwise if no	•			•			` '	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro		_	-				(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-							0	02		(51)
If community h	-			- (		7,				<u> </u>	<u> </u>		(- /
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m 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)ı	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 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= 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	•	•									0		(58)
Primary circuit				•	•	. ,	, ,		41	-4-1\			
(modified by							<u> </u>		ı —	<del>-                                    </del>	00.00		(EO)
(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 os	laulatad	for oach	month	(61)m –	(60) · 2(	SE (41	\m						
Combi loss ca	0 0	0	0	0	00) + 3	05 × (41)	0	T 0	0	0	0	]	(61)
											<u> </u>	J · (59)m + (61)m	` ,
(62)m= 206.44	182.14	191.71	172.44	169.41	151.98	146.54	160	159.47	178.78	188.31	201.67	]	(62)
Solar DHW input		l		<u> </u>		<u> </u>							` ,
(add additiona											ooag)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from w	ater hea	ter		Į.		ļ.					•		
(64)m= 206.44	182.14	191.71	172.44	169.41	151.98	146.54	160	159.47	178.78	188.31	201.67	1	
				ı			Ot	utput from w	ater heate	r (annual)	112	2108.87	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	 n ]	
(65)m= 94.48	83.9	89.58	82.34	82.17	75.54	74.57	79.04		85.29	87.62	92.9	]	(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= 136	136	136	136	136	136	136	136	136	136	136	136		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	e Table 5				_	
(67)m= 46.45	41.25	33.55	25.4	18.99	16.03	17.32	22.51	30.22	38.37	44.78	47.74	]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5	-	_	_	
(68)m= 297.44	300.53	292.75	276.19	255.29	235.65	222.52	219.44	227.21	243.77	264.67	284.32		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5		-	-	
(69)m= 50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	]	(69)
Pumps and fa	ns gains	(Table 5	<del></del>								-	_	
(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= -90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	]	(71)
Water heating	gains (T	able 5)	-	-		-		-	-	-	-	_	
(72)m= 127	124.85	120.41	114.37	110.44	104.92	100.22	106.24	1 108.38	114.63	121.69	124.86	]	(72)
Total internal	gains =			•	(66)	)m + (67)m	n + (68)n	n + (69)m +	(70)m + (7	71)m + (72)	)m	-	
(73)m= 567.09	562.84	542.91	512.16	480.92	452.8	436.27	444.39	462.01	492.97	527.35	553.12	]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to	convert to th	ne applical	ole orienta	tion.		
Orientation:			Area		Flu			g_ Table 6b	_	FF		Gains	
-	Table 6d		m²		Ta	ble 6a	. –	Table 6b	_ '	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.	1	x 6	62.67	X	0.63	x	0.7	=	116.78	(77)
Southeast 0.9x	0.77	X	6.	1	X 8	35.75	x	0.63	x	0.7	=	159.78	(77)
Southeast 0.9x	0.77	X	6.	1	x 1	06.25	X	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 <sub>0.9x</sub>	0.77	X	6.	1	X	118.15	X	0.63	X	0.7	=	220.15	(77)
Southeast 0.9x	0.77	X	6.	1	X	113.91	X	0.63	X	0.7	=	212.25	(77)
Southeast 0.9x	0.77	X	6.	1	X	104.39	X	0.63	X	0.7	=	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	X	92.85	X	0.63	X	0.7	=	173.01	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	x	69.27	X	0.63	X	0.7	=	129.07	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	x	44.07	X	0.63	X	0.7	=	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	x	31.49	X	0.63	X	0.7	=	58.67	(77)
Northwest <sub>0.9x</sub>	0.77	X	5.1	1	x	11.28	X	0.63	x	0.7	=	17.61	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.1	1	x	22.97	X	0.63	x	0.7	=	35.85	(81)
Northwest 0.9x	0.77	X	5.1	1	x	41.38	X	0.63	x	0.7	=	64.58	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.1	1	x	67.96	X	0.63	x	0.7		106.06	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.1	1	х	91.35	X	0.63	х	0.7	=	142.57	(81)
Northwest 0.9x	0.77	x	5.1	1	х	97.38	X	0.63	x	0.7	=	151.99	(81)
Northwest 0.9x	0.77	x	5.1	1	х	91.1	X	0.63	x	0.7		142.19	(81)
Northwest 0.9x	0.77	x	5.1	1	х	72.63	X	0.63	x	0.7	=	113.35	(81)
Northwest 0.9x	0.77	x	5.1	1	х	50.42	X	0.63	x	0.7	=	78.69	(81)
Northwest 0.9x	0.77	x	5.1	1	х	28.07	X	0.63	x	0.7	=	43.81	(81)
Northwest 0.9x	0.77	x	5.1	1	х	14.2	X	0.63	x	0.7	=	22.16	(81)
Northwest 0.9x	0.77	X	5.1	1	x	9.21	x	0.63	x	0.7	<u> </u>	14.38	(81)
-							_						_
Solar gains in	watts, cal	culated	for eacl	h month			(83)m	n = Sum(74)m	(82)m				
(83)m= 86.17		224.37	304.04	364.32	372.15	354.44	307		172.87	7 104.28	73.05		(83)
Total gains – i	nternal an	d solar	(84)m =	= (73)m	+ (83)m	, watts		•		•	•		
(84)m= 653.26	715.47	767.28	816.2	845.25	824.94	790.7	752	.26 713.72	665.8	631.63	626.18		(84)
7. Mean inter	nal tempe	rature (	(heating	season	)								
Temperature			`		<i></i>	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisation fac	tor for gai	ns for li	iving are	ea. h1.m	(see T	able 9a)		, ,					
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.9	0.87	0.82	0.74	0.61	0.46	0.35	0.3	38 0.56	0.76	0.87	0.91		(86)
Mean interna	l temnerat	ture in I	iving ar	 ⊇a T1 (fo	ollow st	ens 3 to 3	7 in T	ahle 9c)			l		
(87)m= 19.59	19.81	20.12	20.5	20.77	20.93	20.98	20.		20.53	20.02	19.55		(87)
	during ho	oting n	oriodo ir	root of	dwallin	a from Ta	abla (			ļ			
Temperature (88)m= 20.14		20.14	20.15	20.16	20.17	20.17	20.	<del>' ' '</del>	20.16	20.15	20.15		(88)
	<u>                                     </u>					!	-	20.10	20.10	20.10	20.10		(00)
Utilisation fac	, <u> </u>	- 1			T `	ì	T	. 1	T	1	I	Ī	(00)
(89)m= 0.89	0.86	0.81	0.71	0.57	0.41	0.28	0.3	31 0.5	0.72	0.85	0.9		(89)
Mean interna	I temperat	ture in t	he rest	of dwell	ing T2 (	follow ste	eps 3	to 7 in Tab	le 9c)	_		•	
(90)m= 18.28	18.58	19.02	19.54	19.9	20.1	20.15	20.		19.61	18.9	18.23		(90)
									fLA = Liv	ring area ÷ (	4) =	0.41	(91)
Mean interna	l temperat	ture (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1	– fLA) × T2					
(92)m= 18.82	19.09	19.48	19.94	20.26	20.45	20.5	20.	49 20.39	19.99	19.36	18.78		(92)
A													
Apply adjustr	nent to the	e mean	internal	temper	ature fr	om Table	e 4e,	where appr	opriate	· I	•		

												-	
(93)m= 18.82	19.09	19.48	19.94	20.26	20.45	20.5	20.49	20.39	19.99	19.36	18.78		(93)
8. Space hea	ting req	uirement											
Set Ti to the r					ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	culate	
the utilisation  Jan	Feb	Mar	<u> </u>		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac			Apr	May	Juli	Jui	Aug	Seb	Oct	INOV	Dec		
(94)m= 0.87	0.84	0.79	0.7	0.58	0.43	0.31	0.34	0.52	0.72	0.83	0.88		(94)
Useful gains,	hmGm	, W = (94	1 4)m x (8	1 4)m	l .	ļ	ļ				<u> </u>	I	
(95)m= 569.05	600.7	604.84	571.62	489.13	354.05	243.43	253.45	368.99	476.98	524.8	551.65		(95)
Monthly avera	age exte	rnal tem	perature	from T	able 8		l			l		ı	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	for me	an intern	al tempe	erature,	Lm , W :	=[(39)m :	x [(93)m	– (96)m	]			•	
(97)m= 961.44	936.52	854.26	716.23	554.15	372.82	248.42	260.11	403.2	607.63	797.96	954.02		(97)
Space heating	<u> </u>	1	1	1	Wh/mon	th = 0.02	24 x [(97	)m – (95	<del>i</del>	r e		Ī	
(98)m= 291.94	225.67	185.57	104.11	48.37	0	0	0	0	97.2	196.68	299.36		_
							Tota	l per year	(kWh/yea	r) = Sum(9	08)15,912 =	1448.9	(98)
Space heating	g requir	ement in	kWh/m²	<sup>2</sup> /year								20.45	(99)
9b. Energy rec	quiremer	nts – Cor	mmunity	heating	scheme	;							
This part is use	•		The state of the s	Ĭ			ting prov	rided by	a comm	unity scl	neme.		
Fraction of spa	ace heat	from se	condary	/supplen	nentary	heating (	(Table 1	1) '0' if n	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and t	up to four	other heat	sources; ti	he latter	
includes boilers, h		-			rom powe	r stations.	See Appe	ndix C.					_
Fraction of hea	at from (	Commun	ity boile	'S								1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	sa) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribution los	s factor	(Table 1	2c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space heating	מ										ļ	kWh/yea	 r
Annual space	-	requiren	nent									1448.9	
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306)	=	1521.35	(307a)
Efficiency of se		•		heating	evetem	in % (fro	m Table					0	(308
•			•	•	•	,				,			Ⅎ`
Space heating	require	ment fro	m secon	dary/su	opiemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating											ı		_
Annual water h	neating i	equirem	ent									2108.87	
If DHW from co								(0.4)	aa ) (aa	<b>5</b> ) (000)	ı		7,040
Water heat fro		-						(64) x (30	J3a) x (30	5) x (306)	=	2214.31	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)	(310e)] =	37.36	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	umns a	nd fans v	within dv	vellina (	Table 4f)	):							
mechanical ve							outside					245.83	(330a)
											l		

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330b) + (330g) =	245.83	(331)
Energy for lighting (calculated in Appe	ndix L)		328.11	(332)
Electricity generated by PVs (Appendi	x M) (negative quantity)		-716.31	(333)
Electricity generated by wind turbine (	Appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heating	scheme			
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	İ
Space heating from CHP	(307a) x	4.24 x 0	0.01 = 64.51	(340a)
Water heating from CHP	(310a) x	4.24 x 0	0.01 = 93.89	(342a)
		Fuel Price		
Pumps and fans	(331)	13.13	0.01 = 32.42	(349)
Energy for lighting	(332)	13.19 × 0	0.01 = 43.28	(350)
Additional standing charges (Table 12			120	(351)
Energy saving/generation technologies  Total energy cost	s = (340a)(342e) + (345)(354) =		354.09	(355)
11b. SAP rating - Community heating	scheme			
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =		1.28	(357)
SAP rating (section12)			82.09	(358)
12b. CO2 Emissions – Community hea	ating scheme			
		ergy Emission fa h/year kg CO2/kWl	ictor Emissions h kg CO2/year	
CO2 from other sources of space and		, ca		
Efficiency of heat source 1 (%)		repeat (363) to (366) for the second	ond fuel 94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 1	100 ÷ (367b) x 0.22	= 858.41	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 19.39	(372)
Total CO2 associated with community				
	systems (363)(36	66) + (368)(372)	= 877.8	(373)
CO2 associated with space heating (s		66) + (368)(372)	= 877.8	(373)
CO2 associated with space heating (s	econdary) (309) x	0	7	=
,	econdary) (309) x rsion heater or instantaneous hea	0	= 0	(374)
CO2 associated with water from imme	econdary) (309) x rsion heater or instantaneous hea water heating (373) + (373)	0 ater (312) x 0.22 74) + (375) =	= 0	(374)
CO2 associated with water from imme Total CO2 associated with space and	econdary) (309) x rsion heater or instantaneous hea water heating (373) + (373) nps and fans within dwelling (331)	0 ater (312) x 0.22 74) + (375) =	= 0 = 0 877.8	(374) (375) (376)
CO2 associated with water from immediate Total CO2 associated with space and CO2 associated with electricity for pure CO2 associated with electricity for light Energy saving/generation technologies	econdary) (309) x rsion heater or instantaneous hea water heating (373) + (373) nps and fans within dwelling (331) ting (332))) x	0 0.22 74) + (375) = 0.52 0.52	= 0 = 0 877.8 = 127.58 = 170.29	(374) (375) (376) (378) (379)
CO2 associated with water from immediate Total CO2 associated with space and CO2 associated with electricity for pure CO2 associated with electricity for light	econdary) (309) x rsion heater or instantaneous hea water heating (373) + (373) nps and fans within dwelling (331) ting (332))) x	0 ater (312) x 0.22 74) + (375) = 0.52 0.52	= 0 = 0 877.8 = 127.58	(374) (375) (376) (378)

Dwelling CO2 Emission Rate (383) ÷ (4) =			11.35	(384)
El rating (section 14)			90.7	(385)
13b. Primary Energy – Community heating scheme				
	Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and water heating (not C Efficiency of heat source 1 (%)  If there is CHP us	HP) sing two fuels repeat (363) to	(366) for the second	fuel 94	(367a)
Energy associated with heat source 1 [(307)	b)+(310b)] x 100 ÷ (367b) x	1.22	= 4848.41	(367)
Electrical energy for heat distribution	[(313) x		= 114.68	(372)
Total Energy associated with community systems	(363)(366) + (368)(37	2)	= 4963.1	(373)
if it is negative set (373) to zero (unless specified otherwise	, see C7 in Appendix C	<b>(</b> )	4963.1	(373)
Energy associated with space heating (secondary)	(309) x	0	= 0	(374)
Energy associated with water from immersion heater or instal	ntaneous heater(312) x	1.22	= 0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =		4963.1	(376)
Energy associated with space cooling	(315) x	3.07	= 0	(377)
Energy associated with electricity for pumps and fans within o	lwelling (331)) x	3.07	= 754.69	(378)
Energy associated with electricity for lighting	(332))) x	3.07	= 1007.3	(379)
Energy saving/generation technologies Item 1		3.07 × 0.01	-2199.08	(380)
Total Primary Energy, kWh/year sum of (376	5)(382) =		4526	(383)

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			0001082 on: 1.0.5.9	
Address :	F	Property	Address	: Plot 52					
1. Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor			70.86	(1a) x	2	2.5	(2a) =	177.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	70.86	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	177.14	(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	7 + [	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				3	x ′	10 =	30	(7a)
Number of passive vents	;			Ē	0	x '	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				30		÷ (5) =	0.17	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otnerwise (	continue ti	om (9) to	(16)		0	(9)
Additional infiltration	no awaming (no)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
	resent, use the value corresponding t	o the grea	ter wall are	ea (after					
deducting areas of openial lf suspended wooden to	ngs);	.1 (seal	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(000	/,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
,	q50, expressed in cubic metro	•	•	•	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$				io hoina	and		0.42	(18)
Number of sides sheltere	es if a pressurisation test has been do ed	ne or a de	gree air pe	тпеавшу	is being u	seu		2	(19)
Shelter factor	~~		(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	s) 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	]	
` '	1 1 2		1	1		L		J	

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.45 Calculate effec	0.45	0.44 Change	0.39 rate for t	0.38 he appli	0.34 Cable ca	0.34 Se	0.33	0.36	0.38	0.4	0.42		
If mechanica		_	410 707 1	по арри	oubro ou							0	(23a)
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(23c)
a) If balance	d mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance							<u> </u>	<u> </u>	<del>- ` `</del>	<del>-                                    </del>	ı	1	(0.41.)
(24b)m= 0	0	0	0	0		0	0	0	0	0	0		(24b)
c) If whole h if (22b)n									5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural if (22b)n									0.5]	•		•	
(24d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	]	(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			!	•	
(25)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(25)
3. Heat losse	s and he	eat loss r	paramete	ėt.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	re	AXU		k-value	9	AXk
	area	(m²)	· m		A ,r	m²	W/m2	K	(W/I	K)	kJ/m²-l	K	kJ/K
Doors					2	Х	1	=	2				(26)
Windows Type	1				6.097	x1.	/[1/( 1.4 )+	0.04] =	8.08				(27)
Windows Type	2				5.107	x1.	/[1/( 1.4 )+	0.04] =	6.77				(27)
Walls Type1	34.7	'3	11.2		23.53	3 ×	0.18	= [	4.24				(29)
Walls Type2	8.9	2	2		6.92	х	0.18	= [	1.25				(29)
Walls Type3	16.	3	0		16.3	Х	0.18	=	2.93				(29)
Roof	70.8	36	0		70.86	x	0.13	= [	9.21				(30)
Total area of e	lements	, m²			130.8	1							(31)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
Fabric heat los				s and pan	itions		(26)(30)	+ (32) =				34.48	(33)
Heat capacity		•	- /					((28)	.(30) + (32	2) + (32a).	(32e) =	1292.2	
Thermal mass		,	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		`
can be used instead Thermal bridge				icina An	nondiy k							45.40	(20)
if details of therma						`						15.13	(36)
Total fabric he		are not kin	own (30) -	- 0.00 x (0	1)			(33) +	(36) =			49.61	(37)
Ventilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (	25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 35.27	35.03	34.8	33.72	33.52	32.58	32.58	32.41	32.94	33.52	33.93	34.36	]	(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m= 84.88	84.64	84.41	83.33	83.13	82.19	82.19	82.02	82.55	83.13	83.54	83.97		
									Average =	Sum(39) <sub>1</sub>	12 /12=	83.33	(39)

Heat loss para	meter (l	-II D) \///	m²K					(40)m	= (39)m ÷	. (4)			
(40)m= 1.2	1.19	1.19	1.18	1.17	1.16	1.16	1.16	1.17	1.17	1.18	1.19		
(40)1112	1.10	1.10	1.10	1.17	1.10	1.10	1.10			Sum(40) <sub>1</sub> .		1.18	(40)
Number of day	s in mo	nth (Tab	le 1a)					•	Wordgo –	Carri (10)	127.12—		(``
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu											27		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9)	)2)] + 0.(	0013 x (¯	ΓFA -13.	.9)			
Annual average											.03		(43)
Reduce the annua not more that 125	-				-	-	o achieve	a water us	se target o	f			
					_			_		l	1		
Jan Hot water usage ir	Feb	Mar Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	·						, ,	ı		1			
(44)m= 96.84	93.32	89.8	86.27	82.75	79.23	79.23	82.75	86.27	89.8	93.32	96.84		<b></b>
Energy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd.r	n x nm x D	Tm / 3600			m(44) <sub>112</sub> = ables 1b. 1	L	1056.42	(44)
(45)m= 143.61	125.6	129.61	113	108.42	93.56	86.7	99.49	100.67	117.33	128.07	139.08		
( )										m(45) <sub>112</sub> =		1385.13	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(12/112	L		` ′
(46)m= 21.54	18.84	19.44	16.95	16.26	14.03	13	14.92	15.1	17.6	19.21	20.86		(46)
Water storage	loss:		<u> </u>						<u> </u>				
Storage volume	e (litres)	) includin	ig 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	ıcludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage			ft-	ممامات	/1.\\//	·/da\.							(40)
a) If manufacti				or is kno	wn (kvvr	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost fro		_	-		:_		(48) x (49)	) =		0.	75		(50)
<ul><li>b) If manufacte</li><li>Hot water stora</li></ul>			-										(51)
If community h	•			C Z (KVVI	i/iiti G/uc	iy <i>)</i>					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 (		_	,				. , . ,		,	-	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains												ix H	(00)
(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	nual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = (	(58) ÷ 36	55 × (41)	m					
(modified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	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 calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0	0	0	0 0	00) + 30	05 x (41)	0	0	0	0	0	1	(61)
							<u> </u>		<u> </u>			J · (59)m + (61)m	` ,
(62)m= 190.2	167.69	176.2	158.09	155.02	138.65	133.29	146.08		163.92	173.16	185.67	]	(62)
` '		<u> </u>		<u> </u>		<u> </u>						J	` ,
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)  (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from water heater													
(64)m= 190.2	167.69	176.2	158.09	155.02	138.65	133.29	146.08	145.77	163.92	173.16	185.67	]	
				ı			Ou	tput from w	ater heate	r (annual)	12	1933.75	(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	1]	_
(65)m= 85.03	75.43	80.37	73.64	73.33	67.18	66.1	70.36	69.55	76.29	78.66	83.52	]	(65)
include (57)	m in cald	culation (	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a	):									
<ul><li>5. Internal gains (see Table 5 and 5a):</li><li>Metabolic gains (Table 5), Watts</li></ul>													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m= 113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	]	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 18.58	16.5	13.42	10.16	7.59	6.41	6.93	9.01	12.09	15.35	17.91	19.1	]	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m= 199.29	201.35	196.14	185.05	171.05	157.88	149.09	147.02	152.23	163.33	177.33	190.49	]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	, also s	see Table	5			-	
(69)m= 34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	]	(69)
Pumps and fa	ns gains	(Table 5	<del></del>									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)		=	-	-	-			
(71)m= -90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	]	(71)
Water heating	gains (T	able 5)	-	-		-	-	-	-	-	-	-	
(72)m= 114.28	112.25	108.03	102.28	98.56	93.31	88.85	94.56	96.59	102.54	109.25	112.26	]	(72)
Total internal	gains =	:			(66)	)m + (67)m	ı + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)	)m		
(73)m= 392.15	390.11	377.59	357.49	337.2	317.6	304.87	310.59	320.92	341.21	364.49	381.85	]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to d	convert to th	ne applical	ole orientat	tion.		
Orientation:			Area		Flu			g_ Tabla 6b	-	FF		Gains	
_	Table 6d		m²		Tai	ble 6a	. –	Table 6b	_ '	able 6c		(W)	7
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.	1	x 6	62.67	X	0.63	X	0.7	=	116.78	(77)
Southeast 0.9x	0.77	X	6.	1	x8	35.75	x	0.63	X	0.7	=	159.78	(77)
Southeast 0.9x	0.77	Х	6.	1	x 1	06.25	х	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 <sub>0.9x</sub>	0.77	X	6.	1	X	118.15	X	0.63	X	0.7	=	220.15	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	X	113.91	X	0.63	X	0.7	=	212.25	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	x	104.39	X	0.63	X	0.7	=	194.51	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	X	92.85	X	0.63	X	0.7		173.01	(77)
Southeast <sub>0.9x</sub>	0.77	X	6.	1	X	69.27	x	0.63	X	0.7	=	129.07	(77)
Southeast 0.9x	0.77	X	6.	1	x	44.07	X	0.63	X	0.7	=	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	x	31.49	x	0.63	X	0.7	=	58.67	(77)
Northwest <sub>0.9x</sub>	0.77	X	5.1	1	x	11.28	x	0.63	X	0.7		17.61	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.1	1	x	22.97	x	0.63	X	0.7	=	35.85	(81)
Northwest 0.9x	0.77	x	5.1	1	x	41.38	x	0.63	X	0.7	=	64.58	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.1	1	x	67.96	x	0.63	x	0.7		106.06	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.1	1	x	91.35	x	0.63	x	0.7	_	142.57	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.1	1	x	97.38	x	0.63	x	0.7	=	151.99	(81)
Northwest <sub>0.9x</sub>	0.77	×	5.1	1	x	91.1	x	0.63	x	0.7		142.19	(81)
Northwest <sub>0.9x</sub>	0.77	×	5.1	1	x	72.63	x	0.63	x	0.7		113.35	(81)
Northwest 0.9x	0.77	X	5.1	1	x	50.42	х	0.63	x	0.7	=	78.69	(81)
Northwest 0.9x	0.77	X	5.1	1	x	28.07	х	0.63	x	0.7	=	43.81	(81)
Northwest 0.9x	0.77	x	5.1	1	x	14.2	х	0.63	x	0.7	=	22.16	(81)
Northwest 0.9x	0.77	X	5.1	1	x	9.21	x	0.63	x	0.7		14.38	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m= 86.17		4.37	304.04	364.32	372.15	354.44	307	.87 251.71	172.8	7 104.28	73.05		(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m ·	+ (83)n	n , watts						•	
(84)m= 478.32	542.73 60	1.96	661.54	701.52	689.75	659.3	618	.46 572.62	514.09	9 468.77	454.9		(84)
7. Mean inter	nal tempera	ture (	(heating	season	)								
Temperature	during heat	ing p	eriods ir	the livi	ng area	a from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	for l	iving are	ea, h1,m	(see T	able 9a)							
Jan	Feb N	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99 0	.98	0.95	0.87	0.7	0.54	0.5	0.83	0.97	0.99	1		(86)
Mean interna	l temperatui	re in I	iving are	ea T1 (fo	ollow st	eps 3 to 7	7 in T	able 9c)					
(87)m= 19.76	<del> </del>	).17	20.5	20.78	20.95	-i	20.9		20.52	20.08	19.74		(87)
Temperature	during heat	ina p	eriods ir	rest of	dwellir	a from Ta	able 9	). Th2 (°C)		-			
(88)m= 19.92		9.93	19.94	19.94	19.95	<u> </u>	19.9	<u> </u>	19.94	19.94	19.93		(88)
Utilisation fac	tor for gains	for r	ast of d	walling	h2 m (s	see Table	(02)				<u> </u>		
(89)m= 1		.98	0.94	0.82	0.61	0.41	0.4	7 0.75	0.95	0.99	1		(89)
	<u> </u>	!						<u> </u>			<u> </u>		` '
Mean interna	<del> </del>			1		`	ri —			10.76	10.00		(90)
(90)m= 18.29	18.51 18	3.88	19.36	19.73	19.92	19.95	19.9		19.39	18.76 ving area ÷ (4	18.26	0.44	(91)
									_, ,,	g aroa ? (-	•, =	0.41	(31)
Mean interna	<del></del>	<del>`</del>			<del></del>	1	1 ·					1	/==:
Mean interna (92)m= 18.9  Apply adjustr	19.09 19	9.41	19.83	20.17	20.34	20.38	20.3	38 20.28	19.85		18.87		(92)

(93)m=	18.9	19.09	19.41	19.83	20.17	20.34	20.38	20.38	20.28	19.85	19.31	18.87		(93)
` / _			uirement		20.17	20.54	20.30	20.30	20.20	19.05	19.51	10.07		(00)
				mperatur	e obtain	ed at ste	en 11 of	Table 9	o, so tha	t Ti.m=(	76)m an	d re-calc	ulate	
				using Ta			эр о.		, ooa				·	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisat	tion fact	or for g	ains, hm	1:										
(94)m=	0.99	0.99	0.97	0.93	0.83	0.65	0.47	0.52	0.78	0.95	0.99	1		(94)
Г			· `	4)m x (84								I	1	
` ′	475.44	536.49	586.68	617.64	584.56	447.08	306.78	319.72	447.1	488.54	463.21	452.73		(95)
Г				perature			40.0	40.4		40.0		4.0		(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	I	(96)
		1201.44	an Intern 1090.04	al tempe 911.03	703.99	LM , VV = 472.12	=[(39)m 310.67	x [(93)m 326.15	- (96)m 509.79	769.35	1020.03	1232.03		(97)
` ' L												1232.03	ı	(91)
· -	568.19	446.84	374.5	r each m 211.24	88.85	0	0.02	0	0 0	208.92	400.91	579.8		
(90)111=	300.19	440.04	374.3	211.24	00.00	U					r) = Sum(9	l	2879.25	(98)
_								Tota	i per year	(KVVII/yeai	) = Sum(9	O)15,912 =	2079.23	╡ .
Space	heating	g require	∍ment in	kWh/m²	/year								40.64	(99)
9a. Ene	rgy req	uiremen	ıts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	HP)					
-	heatin	•										1		_
Fractio	on of sp	ace hea	it from se	econdary	y/supple	mentary	-						0	(201)
Fractio	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$									1	(204)				
Efficiency of main space heating system 1										93.5	(206)			
Efficier	ncy of s	econda	ry/supple	ementar	y heating	g system	າ, %						0	(208)
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	⊐ ar
Space	heating	require	ement (c	alculated	•	)							•	
	568.19	446.84	374.5	211.24	88.85	0	0	0	0	208.92	400.91	579.8		
(211)m	= {[(98)	m x (20	4)] } x 1	00 ÷ (20	)6)						•			(211)
` ´ _	607.69	477.91	400.54	225.92	95.03	0	0	0	0	223.45	428.78	620.1		
								Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	3079.41	(211)
Space	heating	g fuel (se	econdar	y), kWh/	month									_
•	•	,	00 ÷ (20	• , .										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>		0	(215)
Water h	neating											•		
Output_f				ulated al	oove)						1	1	1	
	190.2	167.69	176.2	158.09	155.02	138.65	133.29	146.08	145.77	163.92	173.16	185.67		_
Efficiend	cy of wa	ater hea	ter	_								•	79.8	(216)
(217)m=	87.56	87.31	86.78	85.59	83.39	79.8	79.8	79.8	79.8	85.46	86.98	87.65	I	(217)
		-	kWh/mo											
(219)m=		n x 100 192.07	) ÷ (217) 203.05	m 184.71	185.89	173.75	167.03	183.06	182.66	191.81	199.08	211.83		
(= :0):11=	,,	.02.01	200.00	.54.71	.50.00		1		I = Sum(2		1 .00.00		2292.18	(219)
Annual	totale							. 510	(-		Wh/year		kWh/year	<b>_</b>
										L/	• • • • y <del>c</del> al		rviii y <del>c</del> ai	
		fuel use	ed, main	system	1						_		3079.41	

Water heating fuel used	2292.18												
Electricity for pumps, fans and electric keep-hot													
central heating pump:	]	(230c)											
boiler with a fan-assisted flue	]	(230e)											
Total electricity for the above, kWh/year		75	(231)										
Electricity for lighting		328.11	(232)										
12a. CO2 emissions – Individual heating systems including micro-CHP													
	<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea									
Space heating (main system 1)	(211) x	0.216	=	665.15	(261)								
Space heating (secondary)	(215) x	0.519	=	0	(263)								
Water heating	(219) x	0.216	=	495.11	(264)								
Space and water heating	(261) + (262) + (263) +	(264) =		1160.26	(265)								
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)								
Electricity for lighting	(232) x	0.519	=	170.29	(268)								
Total CO2, kg/year		sum of (265)(271) =		1369.48	(272)								

TER =

(273)

19.33