#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:32:11

Project Information:

Assessed By: John Simpson (STRO006273) Building Type: Detached House

Dwelling Details:

**NEW DWELLING DESIGN STAGE**Total Floor Area: 139.86m<sup>2</sup>

Site Reference: Maitland Park Estate Plot Reference: Grafton House

Address: Grafton House, Maitland Park Estate, London, NW3 2EH

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: Electricity

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.93 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 17.25 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 64.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 58.5 kWh/m²

OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
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 2.00 (design value)

Maximum 10.0 **OK** 

4 Heating efficiency

Main Heating system:

Heat pumps with radiators or underfloor heating - electric

Mitsubishi ECODAN 8.5kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: Measured cylinder loss: 2.00 kWh/day

Permitted by DBSCG: 2.56 kWh/day OK

Primary pipework insulated: Yes OK

# **Regulations Compliance Report**

6 Controls			
-6 Controls			
Space heating controls Hot water controls:	TTZC by plumbing and e Cylinderstat Independent timer for DH		ок ок ок
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights w Minimum	ith low-energy fittings	100.0% 75.0%	OK
8 Mechanical ventilation		7 3.0 70	OK .
Not applicable			
9 Summertime temperature	`	<b>-</b>	
Overheating risk (Thames v	alley):	Slight	OK
Based on:		A	
Overshading:		Average or unknown 5.34m²	
Windows facing: South		1.5m²	
Windows facing: South		1.86m²	
Windows facing: East		3.72m <sup>2</sup>	
Windows facing: North		1.86m²	
Windows facing: West		7.08m <sup>2</sup>	
Windows facing: South		4.5m <sup>2</sup>	
Windows facing: South		5.07m <sup>2</sup>	
Windows facing: North Windows facing: North		4.54m²	
Windows facing: North		5.31m <sup>2</sup>	
Windows facing: North		4.54m²	
Ventilation rate:		3.00	
Blinds/curtains:		None	
Dillius/Curtairis.		None	
10 Key features			
Air permeablility		2.0 m³/m²h	
Roofs U-value		0.1 W/m²K	
External Walls U-value		0.12 W/m <sup>2</sup> K	

0.12 W/m<sup>2</sup>K

Floors U-value

		User Details:					
Assessor Name: Software Name:	John Simpson Stroma FSAP 2012	Stron	na Num vare Ve			006273 n: 1.0.4.26	
Continuite Haine.		perty Address			7 01010	11. 1.0. 1.20	
Address :	Grafton House, Maitland Park	•					
1. Overall dwelling dimen	·	,	·				
		Area(m²)		Av. Height	(m)	Volume(m <sup>3</sup>	*)
Ground floor		40.01	(1a) x	2.6	(2a) =	104.03	(3a)
First floor		40.01	(1b) x	3	(2b) =	120.03	(3b)
Second floor		37.44	(1c) x	3	(2c) =	112.32	(3c)
Third floor		22.4	(1d) x	3	(2d) =	67.2	(3d)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1e)+(1n)	139.86	(4)				
Dwelling volume			(3a)+(3b	)+(3c)+(3d)+(3e	e)+(3n) =	403.58	(5)
2. Ventilation rate:							
	main secondary heating heating	other		total		m³ per hou	r
Number of chimneys		+ 0	_ = [	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	<b>=</b> [	0	x 20 =	0	(6b)
Number of intermittent fan	s			4	x 10 =	40	(7a)
Number of passive vents			Ī	0	x 10 =	0	(7b)
Number of flueless gas fire	es		Ī	0	x 40 =	0	(7c)
					Air ch	anges per ho	ur
Infiltration due to chimneys	s, flues and fans = $(6a)+(6b)+(7a)$	)+(7b)+(7c) =	Г	40	÷ (5) =	0.1	(8)
•	en carried out or is intended, proceed t		continue fi	rom (9) to (16)	` '		
Number of storeys in the	e dwelling (ns)					0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
	25 for steel or timber frame or 0		•	ruction		0	(11)
if both types of wall are pre deducting areas of opening	sent, use the value corresponding to the series of the ser	he greater wall ar	rea (after				
	oor, enter 0.2 (unsealed) or 0.1	(sealed), else	e enter 0			0	(12)
If no draught lobby, ente	, ,	, , ,				0	(13)
Percentage of windows	and doors draught stripped					0	(14)
Window infiltration		0.25 - [0.	.2 x (14) ÷ 1	100] =		0	(15)
Infiltration rate		(8) + (10	) + (11) + (	12) + (13) + (15)	) =	0	(16)
Air permeability value, q	50, expressed in cubic metres	per hour per	square m	etre of envel	ope area	2	(17)
If based on air permeabilit	y value, then $(18) = [(17) \div 20] + (8)$ ,	, otherwise (18) =	: (16)		İ	0.2	(18)
Air permeability value applies	if a pressurisation test has been done	or a degree air p	ermeability	is being used			
Number of sides sheltered	l	(00) 1	[0.07F (	40)]		1	(19)
Shelter factor			- [0.075 x (	19)] =	ļ	0.92	(20)
Infiltration rate incorporating		(21) = (1	8) x (20) =			0.18	(21)
Infiltration rate modified fo	r monthly wind speed						

Jul

Sep

Aug

Oct

Nov

Dec

Mar

Apr

May

Jun

Feb

Jan

<u> </u>	verage wi	nd s						i			ı	1	1	
22)m= 5	5.1 5		4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Vind Fact	tor (22a)m	1 = (2	22)m ÷	4										
22a)m= 1	.27 1.2	5	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted i	nfiltration	rate	(allowi	ng for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
· —	.23 0.2	_	0.23	0.2	0.2	0.17	0.17	0.17	0.18	0.2	0.21	0.22	]	
	<i>effective</i> anical ver		-	rate for t	he appli	cable ca	se	•	•	•		•		٦,,,,
	t air heat pu			endix N, (2	?3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)			0	(23
	ed with heat		0		, ,	, ,	. `	,, .	,	, (,			0	$\frac{1}{23}$
a) If bal	anced me	char	nical ve	entilation	with he	at recov	ery (MV	HR) (24a	a)m = (2:	2b)m + (	23b) × [	1 – (23c)		
24a)m=	0 0		0	0	0	0	0	0	0	0	0	0	]	(24
b) If bal	anced me	char	nical ve	ntilation	without	heat red	covery (I	MV) (24k	m = (22)	2b)m + (2	23b)		•	
24b)m=	0 0		0	0	0	0	0	0	0	0	0	0		(24
,	ole house				•	•				_				
<u> </u>	$\frac{(2b)m < 0}{0}$		(23b), t	hen (24)	$\frac{c) = (23t)}{0}$	o); other	wise (24	c) = (221)	o) m + 0 1 0	<del>- ` </del>	<del></del>	Ι ο	1	(24
'			-							0	0	0		(22
,	ural venti 2b)m = 1					•				0.5]				
24d)m= 0	.53 0.5	3	0.53	0.52	0.52	0.52	0.52	0.51	0.52	0.52	0.52	0.52		(24
Effective	e air chan	ge ra	ate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)	_			_	
25)m= 0	.53 0.5	3	0.53	0.52	0.52	0.52	0.52	0.51	0.52	0.52	0.52	0.52		(25
3. Heat l	osses and	l hea	at loss p	oaramet	er:									
LEMEI	•	iross ea (i		Openin m	igs 1 <sup>2</sup>	Net Ar A ,r		U-val W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-l		
Vindows	Type 1					5.34	х1	/[1/( 1.4 )+	0.04] =	7.08				(27
/indows	Type 2					1.5	х1	/[1/( 1.4 )+	0.04] =	1.99				(27
/indows	Туре 3					0.93	x1	/[1/( 1.4 )+	0.04] =	1.23				(27
/indows	Type 4					0.93	x1	/[1/( 1.4 )+	0.04] =	1.23				(27
/indows	Type 5					0.93	x1	/[1/( 1.4 )+	0.04] =	1.23				(27
/indows	Type 6					3.54	x1	/[1/( 1.4 )+	0.04] =	4.69				(27
/indows	• •					1.5		/[1/( 1.4 )+		1.99				(27
/indows	Type 8					1.69	x1	/[1/( 1.4 )+	0.04] =	2.24				(27
/indows	• •					4.54		/[1/( 1.4 )+		6.02	_			(27
Vindows	• •					5.31		/[1/( 1.4 )+		7.04	_			(27
Vindows '	Type 11					4.54	x1	/[1/( 1.4 )+	0.04] =	6.02	╛.			(27
loor						40.01	1 ×	0.12	=	4.8012				(28
Valls		286.63	3	45.3	2	241.3	1 X	0.12	=	28.96				(29
oof		40.01	1	0		40.01	1 x	0.1	=	4				(3

Total area of	elements	s, m²			366.6	5							(31)
* for windows and ** include the are						ated using	ı formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30)	+ (32) =				97.84	(33)
Heat capacity	Cm = S	(A x k )						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	s parame	eter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
For design asses				constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
can be used inste Thermal bridg				usina An	nendix k	<						33.07	(36)
if details of therm	•	•			•	•						33.07	
Total fabric he	eat loss							(33) +	(36) =			130.91	(37)
Ventilation he	at loss ca	alculated	monthly	у				(38)m	= 0.33 × (	25)m x (5)		ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 70.26	70.12	69.98	69.32	69.2	68.63	68.63	68.52	68.85	69.2	69.45	69.71		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m		ı	
(39)m= 201.18	201.03	200.89	200.24	200.12	199.54	199.54	199.44	199.76	200.12	200.36	200.62		_
Heat loss para	ameter (I	HLP), W	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub> (4)	12 /12=	200.24	(39)
(40)m= 1.44	1.44	1.44	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43		
Number of do	va in ma	nth /Tah	lo 1o\						Average =	Sum(40) <sub>1</sub> .	12 /12=	1.43	(40)
Number of da	Feb	Mar	<del>-                                    </del>	Mov	lup	Jul	Δυα	Con	Oct	Nov	Doo		
(41)m= 31	28	31	Apr 30	May 31	Jun 30	31	Aug 31	Sep 30	31	Nov 30	Dec 31		(41)
(11)	1	ı ~.	1 00										( )
	1	1	·	<u> </u>	<u> </u>		<u> </u>						
4 Water hea	ating ene	rav reau	irement:								k\Wh/ve	aar.	
4. Water hea			irement:								kWh/ye	ear:	
Assumed occ if TFA > 13	upancy, .9, N = 1	N			349 x (TF					2.	kWh/ye	ear:	(42)
Assumed occ if TFA > 13 if TFA £ 13	upancy, .9, N = 1 .9, N = 1	N + 1.76 x	:[1 - exp	(-0.0003	,	FA -13.9	)2)] + 0.0	) 0013 x (		2.	92	ear:	
Assumed occ if TFA > 13 if TFA £ 13. Annual average Reduce the annual	upancy, .9, N = 1 .9, N = 1 ge hot wa al average	N + 1.76 x ater usag	: [1 - exp ge in litre usage by	(-0.0003 es per da 5% if the o	ay Vd,av Iwelling is	FA -13.9 erage = designed	)2)] + 0.0 (25 x N)	0013 x ( <sup>-</sup> + 36	Γ ΓFA -13.	2.		ear:	(42)
Assumed occ if TFA > 13 if TFA £ 13 Annual avera	upancy, .9, N = 1 .9, N = 1 ge hot wa al average	N + 1.76 x ater usag	: [1 - exp ge in litre usage by	(-0.0003 es per da 5% if the o	ay Vd,av Iwelling is	FA -13.9 erage = designed	)2)] + 0.0 (25 x N)	0013 x ( <sup>-</sup> + 36	Γ ΓFA -13.	2.	92	ear:	
Assumed occ if TFA > 13 if TFA £ 13. Annual avera Reduce the annu not more that 129	upancy, .9, N = 1 9, N = 1 ge hot wa ral average 5 litres per	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	FA -13.9 erage = designed i ld)	)2)] + 0.0 (25 x N) to achieve	0013 x ( <sup>-</sup> + 36	Γ ΓFA -13.	2.	92	ear:	
Assumed occ if TFA > 13 if TFA £ 13. Annual avera Reduce the annu not more that 12s Jan Hot water usage	upancy, .9, N = 1 9, N = 1 ge hot wa ral average 5 litres per in litres per	N + 1.76 x ater usage hot water person per Mar r day for ea	ge in litre usage by r day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = far	ay Vd,av Iwelling is that and co Jun ctor from T	FA -13.9 erage = designed : id) Jul Table 1c x	)2)] + 0.0 (25 x N) to achieve Aug (43)	0013 x ( <sup>*</sup> + 36 a water us Sep	ΓFA -13. se target o	2. 9) 103	92 3.47 Dec	ear:	
Assumed occ if TFA > 13 if TFA £ 13. Annual avera Reduce the annu not more that 129	upancy, .9, N = 1 9, N = 1 ge hot wa ral average 5 litres per in litres per	N + 1.76 x ater usag hot water person per	[1 - exp ge in litre usage by day (all w Apr	es per da 5% if the d vater use, I	ay Vd,av Iwelling is hot and co	FA -13.9 erage = designed i ld)	)2)] + 0.0 (25 x N) to achieve	0013 x ( <sup>7</sup> + 36 a water us Sep	ΓFA -13. se target o  Oct  105.54	2. 9) 103 Nov	92 3.47 Dec		(43)
Assumed occ if TFA > 13 if TFA £ 13. Annual avera Reduce the annu not more that 12s Jan Hot water usage	upancy, .9, N = 1 .9, N = 1 ge hot wa al average bilitres per in litres per 109.68	N + 1.76 x ater usag hot water person per Mar r day for ea 105.54	ge in litre usage by r day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 97.27	ay Vd,av Iwelling is not and co Jun ctor from 1	FA -13.9 erage = designed id) Jul Table 1c x	(25 x N) to achieve  Aug (43)  97.27	0013 x ( <sup>7</sup> + 36 a water us Sep	TFA -13.  se target o  Oct  105.54  Total = Su	2. 9) 103 Nov 109.68 m(44) <sub>112</sub> =	92 3.47 Dec 113.82	ear: 1241.69	
Assumed occ if TFA > 13 if TFA £ 13. Annual average Reduce the annual not more that 12st Jan Hot water usage (44)m= 113.82	upancy, .9, N = 1 .9, N = 1 ge hot wa al average bilitres per in litres per 109.68	N + 1.76 x ater usag hot water person per Mar r day for ea 105.54	ge in litre usage by r day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 97.27	ay Vd,av Iwelling is not and co Jun ctor from 1	FA -13.9 erage = designed id) Jul Table 1c x	(25 x N) to achieve  Aug (43)  97.27	0013 x ( <sup>1</sup> + 36 a water us Sep	TFA -13.  se target o  Oct  105.54  Total = Su	2. 9) 103 Nov 109.68 m(44) <sub>112</sub> =	92 3.47 Dec 113.82		(43)
Assumed occ if TFA > 13 if TFA £ 13. Annual average Reduce the annual not more that 123  Jan Hot water usage (44)m= 113.82  Energy content of	upancy, .9, N = 1 9, N = 1 ge hot wa lal average litres per litres per 109.68  f hot water	N + 1.76 x ater usage hot water person per Mar r day for ear 105.54	ge in litre usage by r day (all w Apr ach month	es per da 5% if the a vater use, I May Vd,m = far 97.27	ay Vd,av lwelling is not and co Jun ctor from 7 93.13	FA -13.9 erage = designed id) Jul Table 1c x 93.13	(25 x N) to achieve Aug (43) 97.27	0013 x ( <sup>7</sup> + 36 a water us  Sep  101.4 0 kWh/mor 118.33	TFA -13.  se target o  Oct  105.54  Total = Su  th (see Ta  137.9	2. 9) 103 Nov 109.68 m(44) <sub>112</sub> = ables 1b, 1	92 3.47 Dec 113.82 c, 1d) 163.47		(43)
Assumed occ if TFA > 13 if TFA £ 13. Annual average Reduce the annual not more that 123  Jan Hot water usage (44)m= 113.82  Energy content of	upancy, .9, N = 1 9, N = 1 ge hot wa lal average for litres per lin litres per li	N + 1.76 x ater usage hot water person per Mar r day for ear 105.54 used - cal 152.34	ge in litre usage by a day (all wash month 101.4 culated me	es per da 5% if the a vater use, I  May  Vd,m = fa  97.27  onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 93.13	FA -13.9 erage = designed id) Jul Table 1c x 93.13 m x nm x E	(25 x N) to achieve Aug (43) 97.27 07m / 3600 116.93	0013 x (** + 36 a water us  Sep  101.4  0 kWh/mor  118.33	TFA -13.  se target o  Oct  105.54  Total = Su  th (see Ta  137.9	2. 9) 103 Nov 109.68 m(44) <sub>112</sub> = ables 1b, 1 150.53	92 3.47 Dec 113.82 c, 1d) 163.47	1241.69	(43)
Assumed occ if TFA > 13 if TFA £ 13.  Annual average Reduce the annual not more that 128.  Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32	upancy, .9, N = 1 9, N = 1 ge hot wa lal average filtres per lin litres per loge hot water 147.63 water heati 22.14	N + 1.76 x ater usage hot water person per Mar r day for ear 105.54 used - cal 152.34	ge in litre usage by a day (all wash month 101.4 culated me	es per da 5% if the a vater use, I  May  Vd,m = fa  97.27  onthly = 4.	ay Vd,av lwelling is not and co Jun ctor from 7 93.13	FA -13.9 erage = designed id) Jul Table 1c x 93.13 m x nm x E	(25 x N) to achieve Aug (43) 97.27 07m / 3600 116.93	0013 x (** + 36 a water us  Sep  101.4  0 kWh/mor  118.33	TFA -13.  se target o  Oct  105.54  Total = Su  th (see Ta  137.9	2. 9) 103 Nov 109.68 m(44) <sub>112</sub> = ables 1b, 1 150.53	92 3.47 Dec 113.82 c, 1d) 163.47	1241.69	(43)
Assumed occ if TFA > 13 if TFA £ 13.  Annual average Reduce the annual not more that 12s.  Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79	upancy, .9, N = 1 .9, N = 1 .9e hot was all average .5 litres per .5 litres per .5 109.68 .7	N + 1.76 x ater usage hot water person per Mar r day for ear 105.54 152.34 1g at point 22.85	ge in litre usage by r day (all wash month 101.4 culated me 132.81 for use (not 19.92	es per da 5% if the a vater use, I May Vd,m = far 97.27 onthly = 4. 127.44 o hot water 19.12	ay Vd,av lwelling is not and co Jun ctor from 7 93.13 190 x Vd,r 109.97	FA -13.9  erage = designed id)  Jul  Table 1c x  93.13  m x nm x E  101.9  enter 0 in  15.29	(25 x N) to achieve  Aug (43) 97.27  07m / 3600 116.93  boxes (46) 17.54	0013 x (7 + 36 a water us 101.4 ) kWh/mor 118.33 ) to (61) 17.75	Oct  Oct  105.54  Total = Su  137.9  Total = Su  20.69	Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53  m(45) <sub>112</sub> = 22.58	92 3.47 Dec 113.82 c, 1d) 163.47	1241.69	(43) (44) (45)
Assumed occ if TFA > 13 if TFA £ 13.  Annual average Reduce the annual not more that 123.  Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32  Water storage	upancy, .9, N = 1 9, N = 1 ge hot was all average to litres per to litre	N + 1.76 x ater usage hot water person per Mar 105.54 105.54 152.34 169 at point 22.85	ge in litre usage by a day (all we have ach month a day (all we have ach a day (all we have	es per da 5% if the day ater use, I May Vd,m = fa 97.27	ay Vd,av Iwelling is not and co Jun ctor from 7 93.13 190 x Vd,r 109.97 storage),	erage = designed and ld)  Jul Table 1c x  93.13  m x nm x E  101.9  enter 0 in  15.29  storage	(25 x N) to achieve  Aug (43)  97.27  07m / 3600  116.93  boxes (46)  17.54  within sa	0013 x (7 + 36 a water us 101.4 ) kWh/mor 118.33 ) to (61) 17.75	Oct  Oct  105.54  Total = Su  137.9  Total = Su  20.69	Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53  m(45) <sub>112</sub> = 22.58	92 3.47 Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46)
Assumed occ if TFA > 13 if TFA £ 13.  Annual average Reduce the annual not more that 12s.  Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32  Water storage Storage volum If community Otherwise if not 13 if TFA £ 13.	upancy, .9, N = 1 .9, N = 1 ge hot was al average be litres per 109.68 f hot water 147.63 water heati 22.14 e loss: ne (litres) heating a constored	N + 1.76 x ater usage hot water person per Mar r day for ear 105.54 152.34 152.34 122.85 includir and no ta	ge in litre usage by r day (all w Apr ach month 101.4  culated me 132.81  f of use (no	es per da 5% if the o vater use, I  May  Vd,m = far  97.27  onthly = 4.  127.44  o hot water  19.12  olar or W velling, e	ay Vd,av lwelling is not and co  Jun ctor from 7  93.13  190 x Vd,r  109.97  storage), 16.5  /WHRS nter 110	erage = designed id)  Jul Table 1c x  93.13  m x nm x E  101.9  enter 0 in  15.29  storage  litres in	(25 x N) to achieve  Aug (43) 97.27  07m / 3600 116.93  boxes (46) 17.54  within sa (47)	0013 x (7 + 36 a water us 101.4 118.33 117.75 ame vesi	Oct  Oct  105.54  Total = Su  137.9  Total = Su  20.69  sel	2.9) Nov 109.68 m(44) <sub>112</sub> = 22.58	92 3.47 Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46)
Assumed occ if TFA > 13 if TFA £ 13.  Annual average Reduce the annual not more that 123.  Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32  Water storage Storage volum If community Otherwise if many water storage water	upancy, .9, N = 1 .9, N = 1 ge hot wa lal average to litres per	N + 1.76 x ater usage hot water person per day for ear 105.54  105.54  105.54  105.34  105.34  105.34  105.34  105.34  105.34  105.34  105.34  105.34  105.34  105.34  105.34	ge in litre usage by a day (all we have ach month and 101.4 and 132.81 and 19.92 and any so ank in dwer (this in	es per da 5% if the a vater use, I  May Vd,m = fa  97.27  onthly = 4.  127.44  o hot water  19.12  olar or W velling, e	ay Vd,av Iwelling is not and co Jun ctor from 7 93.13 190 x Vd,r 109.97 storage), 16.5 /WHRS nter 110	erage = designed in designed i	(25 x N) to achieve  Aug (43) 97.27  07m / 3600 116.93  boxes (46) 17.54  within sa (47)	0013 x (7 + 36 a water us 101.4 118.33 117.75 ame vesi	Oct  Oct  105.54  Total = Su  137.9  Total = Su  20.69  sel	2.9) Nov 109.68 m(44) <sub>112</sub> = ables 1b, 1 150.53 m(45) <sub>112</sub> = 22.58	92 3.47 Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46) (47)
Assumed occ if TFA > 13 if TFA £ 13.  Annual average Reduce the annual not more that 12s.  Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32  Water storage Storage volum If community Otherwise if not 13 if TFA £ 13.	upancy, .9, N = 1 .9, N = 1 ge hot was al average be in litres per 109.68  I hot water 147.63  water heati 22.14 e loss: ne (litres) heating a costored e loss: sturer's de	N + 1.76 x ater usage hot water person per Mar r day for ear 105.54 used - cal 152.34 used - cal 22.85 includir and no tal hot water eclared I	ge in litre usage by day (all w Apr ach month 101.4  132.81  19.92  ang any so ank in dw er (this in	es per da 5% if the a vater use, I  May Vd,m = fa  97.27  onthly = 4.  127.44  o hot water  19.12  olar or W velling, e	ay Vd,av Iwelling is not and co Jun ctor from 7 93.13 190 x Vd,r 109.97 storage), 16.5 /WHRS nter 110	erage = designed in designed i	(25 x N) to achieve  Aug (43) 97.27  07m / 3600 116.93  boxes (46) 17.54  within sa (47)	0013 x (7 + 36 a water us 101.4 118.33 117.75 ame vesi	Oct  Oct  105.54  Total = Su  137.9  Total = Su  20.69  sel	2.9) Nov 109.68 m(44) <sub>112</sub> = ables 1b, 1 150.53 m(45) <sub>112</sub> = 22.58	92 3.47 Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46)

Energy lost from water storage, kWh/year	(48) x (49) = 1.08	(50)
b) If manufacturer's declared cylinder loss factor is not known		(54)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) = 0	(54)
Enter (50) or (54) in (55)	1.08	(55)
Water storage loss calculated for each month	((56)m = (55) × (41)m	
(56)m= 33.48 30.24 33.48 32.4 33.48 32.4 33.48	33.48 32.4 33.48 32.4 33.48	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 33.48 30.24 33.48 32.4 33.48 32.4 33.48	33.48 32.4 33.48 32.4 33.48	(57)
Primary circuit loss (annual) from Table 3	0	(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div 3$		, ,
(modified by factor from Table H5 if there is solar water hea	` ,	
(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) ÷ 365 × (4	)m	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		(61)
		, ,
Total heat required for water heating calculated for each mont		
(62)m= 225.54 198.88 209.08 187.73 184.18 164.88 158.64	173.68   173.24   194.65   205.44   220.21	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quan		
(add additional lines if FGHRS and/or WWHRS applies, see A	<del>i i i i i i</del>	(62)
(63)m= 0 0 0 0 0 0 0	0 0 0 0 0	(63)
Output from water heater		
(64)m= 225.54 198.88 209.08 187.73 184.18 164.88 158.64	173.68 173.24 194.65 205.44 220.21	
	Output from water heater (annual) <sub>112</sub>	2296.15 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)	n + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 101.52 90.09 96.05 88.09 87.77 80.49 79.28	84.27 83.27 91.25 93.98 99.75	(65)
include (57)m in calculation of (65)m only if cylinder is in the	dwelling or hot water is from community heat	ing
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= 145.84 145.84 145.84 145.84 145.84 145.84 145.84	145.84 145.84 145.84 145.84 145.84	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a),	also see Table 5	
(67)m= 27.57 24.49 19.91 15.08 11.27 9.51 10.28	13.36 17.94 22.77 26.58 28.34	(67)
Appliances gains (calculated in Appendix L, equation L13 or L	l3a), also see Table 5	
(68)m= 309.25 312.46 304.38 287.16 265.43 245 231.36	228.15 236.24 253.45 275.18 295.61	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15	ı), also see Table 5	
(69)m= 37.58 37.58 37.58 37.58 37.58 37.58 37.58	37.58 37.58 37.58 37.58 37.58	(69)
Pumps and fans gains (Table 5a)		
(70)m= 0 0 0 0 0 0 0	0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)		
(71)m= -116.67 -116.67 -116.67 -116.67 -116.67 -116.67 -116.67	-116.67 -116.67 -116.67 -116.67	(71)
, , , , , , , , , , , , , , , , , , , ,	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

Water	heating	gains (T	able 5)												
(72)m=	136.45	134.06	129.1	122.35	117.97	111.8	106.55	113.27	115.66	122.64	130.53	134.07		(72)	
Total i	nternal	gains =			-	(66)	)m + (67)m	ı + (68)m	+ (69)m + (	(70)m + (7	71)m + (72)	m	-		
(73)m=	540.02	537.76	520.14	491.34	461.42	433.07	414.95	421.54	436.58	465.62	499.05	524.77		(73)	
6. Sol	ar gains	S:													
Solar g	ains are c	alculated i	using sola	r flux from	Table 6a	and assoc	iated equa	tions to	convert to th	e applica	ble orientat	ion.			
Orienta	ation: A	Access F	actor	Area		Flu	IX		g_		FF		Gains		
	Ţ	able 6d		m²		Tal	ble 6a		Table 6b	Т	able 6c		(W)		
North	0.9x	0.77	х	0.9	93	x 1	0.63	х	0.4	х	0.8	=	8.77	(74)	
NI	F		===					i =		<b>≒</b> F		=i		=	

North	۰.۰.۲		1		l		1		l		1		7(74)
	0.9x	0.77	X	0.93	X	41.52	X	0.4	X	0.8	=	34.25	(74)
North	0.9x	0.77	X	1.69	X	41.52	X	0.4	X	0.8	] = 1	46.68	(74)
North	0.9x	0.77	X	4.54	X	41.52	X	0.4	X	0.8	] = 1	41.8	(74)
North	0.9x	0.77	X	4.54	X	41.52	X	0.4	X	0.8	] = 1	41.8	(74)
North	0.9x	0.77	X	0.93	X	24.19	X	0.4	X	0.8	=	19.96	<b>(74)</b>
North	0.9x	0.77	X	1.69	X	24.19	X	0.4	X	0.8	=	27.2	(74)
North	0.9x	0.77	X	4.54	X	24.19	X	0.4	X	0.8	=	24.35	(74)
North	0.9x	0.77	X	4.54	X	24.19	X	0.4	X	0.8	=	24.35	(74)
North	0.9x	0.77	X	0.93	X	13.12	X	0.4	X	0.8	=	10.82	(74)
North	0.9x	0.77	X	1.69	X	13.12	X	0.4	X	0.8	=	14.75	(74)
North	0.9x	0.77	X	4.54	X	13.12	X	0.4	X	0.8	=	13.21	(74)
North	0.9x	0.77	X	4.54	X	13.12	X	0.4	X	0.8	=	13.21	(74)
North	0.9x	0.77	X	0.93	X	8.86	X	0.4	X	0.8	=	7.31	(74)
North	0.9x	0.77	X	1.69	X	8.86	X	0.4	X	0.8	=	9.97	(74)
North	0.9x	0.77	X	4.54	X	8.86	X	0.4	X	0.8	=	8.92	(74)
North	0.9x	0.77	X	4.54	X	8.86	X	0.4	X	0.8	=	8.92	(74)
East	0.9x	0.77	X	0.93	X	19.64	X	0.4	X	0.8	=	8.1	(76)
East	0.9x	0.77	X	0.93	X	38.42	X	0.4	X	0.8	=	15.85	(76)
East	0.9x	0.77	X	0.93	X	63.27	X	0.4	X	0.8	=	26.1	(76)
East	0.9x	0.77	X	0.93	X	92.28	X	0.4	X	0.8	=	38.06	(76)
East	0.9x	0.77	X	0.93	X	113.09	X	0.4	X	0.8	=	46.65	(76)
East	0.9x	0.77	x	0.93	x	115.77	x	0.4	x	0.8	=	47.75	(76)
East	0.9x	0.77	x	0.93	x	110.22	x	0.4	x	0.8	=	45.46	(76)
East	0.9x	0.77	x	0.93	x	94.68	X	0.4	x	0.8	=	39.05	(76)
East	0.9x	0.77	x	0.93	x	73.59	x	0.4	x	0.8	=	30.35	(76)
East	0.9x	0.77	x	0.93	x	45.59	X	0.4	x	0.8	=	18.8	(76)
East	0.9x	0.77	X	0.93	X	24.49	X	0.4	X	0.8	=	10.1	(76)
East	0.9x	0.77	x	0.93	x	16.15	X	0.4	x	0.8	=	6.66	(76)
South	0.9x	0.77	x	5.34	x	46.75	x	0.4	x	0.8	=	55.36	(78)
South	0.9x	0.77	x	1.5	x	46.75	X	0.4	x	0.8	=	15.55	(78)
South	0.9x	0.77	x	3.54	x	46.75	X	0.4	x	0.8	=	73.4	(78)
South	0.9x	0.77	X	1.5	X	46.75	X	0.4	X	0.8	=	46.65	(78)
South	0.9x	0.77	X	5.31	X	46.75	X	0.4	X	0.8	=	55.05	(78)
South	0.9x	0.77	x	5.34	x	76.57	X	0.4	x	0.8	=	90.67	(78)
South	0.9x	0.77	x	1.5	x	76.57	X	0.4	x	0.8	=	25.47	(78)
South	0.9x	0.77	x	3.54	x	76.57	x	0.4	x	0.8	=	120.22	(78)
South	0.9x	0.77	x	1.5	x	76.57	x	0.4	x	0.8	=	76.41	(78)
South	0.9x	0.77	x	5.31	x	76.57	x	0.4	x	0.8	=	90.16	(78)
South	0.9x	0.77	x	5.34	x	97.53	x	0.4	x	0.8	=	115.5	(78)
South	0.9x	0.77	x	1.5	x	97.53	x	0.4	x	0.8	=	32.44	(78)
South	0.9x	0.77	x	3.54	x	97.53	X	0.4	x	0.8	] =	153.13	(78)

	_		_		_						_		_
South	0.9x	0.77	X	1.5	X	97.53	X	0.4	X	0.8	=	97.33	(78)
South	0.9x	0.77	X	5.31	x	97.53	X	0.4	X	0.8	=	114.85	(78)
South	0.9x	0.77	X	5.34	x	110.23	X	0.4	X	0.8	=	130.54	(78)
South	0.9x	0.77	X	1.5	x	110.23	X	0.4	x	0.8	=	36.67	(78)
South	0.9x	0.77	X	3.54	X	110.23	X	0.4	X	0.8	=	173.07	(78)
South	0.9x	0.77	X	1.5	X	110.23	x	0.4	x	0.8	=	110.01	(78)
South	0.9x	0.77	X	5.31	X	110.23	x	0.4	x	0.8	=	129.81	(78)
South	0.9x	0.77	X	5.34	X	114.87	X	0.4	x	0.8	=	136.03	(78)
South	0.9x	0.77	X	1.5	X	114.87	X	0.4	x	0.8	=	38.21	(78)
South	0.9x	0.77	X	3.54	X	114.87	x	0.4	x	0.8	=	180.35	(78)
South	0.9x	0.77	X	1.5	X	114.87	X	0.4	X	0.8	=	114.63	(78)
South	0.9x	0.77	X	5.31	X	114.87	x	0.4	x	0.8	=	135.27	(78)
South	0.9x	0.77	X	5.34	x	110.55	x	0.4	x	0.8	=	130.91	(78)
South	0.9x	0.77	X	1.5	X	110.55	x	0.4	x	0.8	=	36.77	(78)
South	0.9x	0.77	X	3.54	X	110.55	X	0.4	x	0.8	=	173.57	(78)
South	0.9x	0.77	X	1.5	x	110.55	x	0.4	x	0.8	=	110.32	(78)
South	0.9x	0.77	X	5.31	X	110.55	X	0.4	x	0.8	=	130.18	(78)
South	0.9x	0.77	X	5.34	X	108.01	X	0.4	x	0.8	] =	127.91	(78)
South	0.9x	0.77	X	1.5	x	108.01	x	0.4	x	0.8	=	35.93	(78)
South	0.9x	0.77	X	3.54	x	108.01	X	0.4	x	0.8	] =	169.59	(78)
South	0.9x	0.77	X	1.5	X	108.01	X	0.4	x	0.8	] =	107.79	(78)
South	0.9x	0.77	X	5.31	x	108.01	x	0.4	x	0.8	=	127.19	(78)
South	0.9x	0.77	X	5.34	x	104.89	x	0.4	x	0.8	=	124.22	(78)
South	0.9x	0.77	X	1.5	X	104.89	X	0.4	x	0.8	] =	34.89	(78)
South	0.9x	0.77	X	3.54	x	104.89	x	0.4	x	0.8	=	164.69	(78)
South	0.9x	0.77	X	1.5	x	104.89	x	0.4	x	0.8	] =	104.68	(78)
South	0.9x	0.77	X	5.31	x	104.89	x	0.4	x	0.8	] =	123.52	(78)
South	0.9x	0.77	X	5.34	x	101.89	x	0.4	x	0.8	=	120.65	(78)
South	0.9x	0.77	X	1.5	x	101.89	x	0.4	x	0.8	=	33.89	(78)
South	0.9x	0.77	X	3.54	x	101.89	x	0.4	x	0.8	=	159.97	(78)
South	0.9x	0.77	X	1.5	x	101.89	x	0.4	x	0.8	=	101.67	(78)
South	0.9x	0.77	X	5.31	x	101.89	x	0.4	x	0.8	=	119.97	(78)
South	0.9x	0.77	X	5.34	x	82.59	x	0.4	x	0.8	=	97.8	(78)
South	0.9x	0.77	X	1.5	х	82.59	x	0.4	x	0.8	=	27.47	(78)
South	0.9x	0.77	X	3.54	x	82.59	x	0.4	x	0.8	] =	129.66	(78)
South	0.9x	0.77	x	1.5	x	82.59	x	0.4	x	0.8	] =	82.41	(78)
South	0.9x	0.77	x	5.31	x	82.59	x	0.4	x	0.8	] =	97.25	(78)
South	0.9x	0.77	x	5.34	x	55.42	x	0.4	x	0.8	j =	65.62	(78)
South	0.9x	0.77	x	1.5	x	55.42	x	0.4	x	0.8	j =	18.43	(78)
South	0.9x	0.77	x	3.54	x	55.42	x	0.4	x	0.8	j =	87.01	(78)
South	0.9x	0.77	x	1.5	x	55.42	x	0.4	X	0.8	=	55.3	(78)
	_												

South	0.9x	0.77	x	5.3	31	X	55.42	2	x	0.4	x	0.8	=	65.26	(78)
South	0.9x	0.77	x	5.3	34	X	40.4		x	0.4	×	0.8	<del>=</del>	47.84	(78)
South	0.9x	0.77	x	1.	5	x	40.4		x	0.4	x	0.8	=	13.44	(78)
South	0.9x	0.77	X	3.5	54	X	40.4		x	0.4	×	0.8	=	63.43	(78)
South	0.9x	0.77	x	1.	5	x	40.4		x	0.4	×	0.8		40.31	(78)
South	0.9x	0.77	X	5.3	31	X	40.4		x	0.4	x	0.8	=	47.57	(78)
West	0.9x	0.77	X	0.9	93	X	19.64	1	x	0.4	x	0.8	=	8.1	(80)
West	0.9x	0.77	X	0.9	93	X	38.42	2	x	0.4	x	0.8	=	15.85	(80)
West	0.9x	0.77	X	0.9	93	X	63.27	7	x	0.4	X	0.8	=	26.1	(80)
West	0.9x	0.77	X	0.9	93	X	92.28	3	x	0.4	X	0.8	=	38.06	(80)
West	0.9x	0.77	X	0.9	93	X	113.0	9	x	0.4	X	0.8	=	46.65	(80)
West	0.9x	0.77	X	0.9	93	X	115.7	7	x	0.4	X	0.8	=	47.75	(80)
West	0.9x	0.77	X	0.9	93	X	110.2	2	x	0.4	X	0.8	=	45.46	(80)
West	0.9x	0.77	X	0.9	93	X	94.68	3	x	0.4	X	0.8	=	39.05	(80)
West	0.9x	0.77	X	0.9	93	X	73.59	9	x	0.4	X	0.8	=	30.35	(80)
West	0.9x	0.77	X	0.9	93	X	45.59	9	x	0.4	X	0.8	=	18.8	(80)
West	0.9x	0.77	X	0.9	93	X	24.49	9	x	0.4	X	0.8	=	10.1	(80)
West	0.9x	0.77	X	0.9	93	X	16.15	5	x	0.4	X	0.8	=	6.66	(80)
Solar g	ains in	watts, ca	lculated	for eac	h month	1		(8	83)m	= Sum(74)m .	(82)m			7	
(83)m=			702.29	876.02	993.88				864.	88 761.39	568.0	6 363.81	261.04		(83)
		nternal a			<u> </u>	·	<u> </u>		1000	40 4407.07	4000	000 00	705.04	1	(84)
(84)m=	844.39	1052.91	1222.43	1367.35	1455.29	וי וי	27.28 13	370.2	1286	.42 1197.97	1033.6	862.86	785.81		(04)
7 Ma											<u> </u>		<u> </u>	J	
		nal temp		`			•					Į.			
Temp	erature	during h	eating p	eriods ir	n the livi	ing			e 9,	Th1 (°C)				21	(85)
Temp	erature ation fac	during h	eating p	eriods ir	n the livi	ing n (s	ee Table	9a)		· , ,				21	
Temp Utilisa	erature ation fac Jan	during hetor for ga	eating p ains for l Mar	eriods ir iving are Apr	n the livi ea, h1,n May	ing n (s	ee Table Jun	9a) Jul	Αι	ıg Sep	Oct	Nov	Dec	21	(85)
Temp	erature ation fac	during h	eating p	eriods ir	n the livi	ing n (s	ee Table Jun	9a)		ıg Sep	Oct		Dec 1	21	
Temp Utilisa (86)m= Mean	erature ation fac Jan 1 interna	during heter for garage Feb 0.99	eating p ains for l Mar 0.99	eriods ir iving are Apr 0.96	n the living the high	ing n (s	ee Table Jun  0.76  w steps 3	9a) Jul 0.6 3 to 7	0.6 0.7	g Sep 5 0.86 able 9c)	0.97	Nov 1	1	21	(85)
Temp Utilisa (86)m=	erature ation fac Jan	during heter for ga	eating p ains for I Mar 0.99	eriods ir iving are Apr 0.96	n the livi ea, h1,n May	ing n (s	ee Table Jun  0.76  w steps 3	9a) Jul <sup>0.6</sup>	Au 0.6	g Sep 5 0.86 able 9c)	<del></del>	Nov	-	21	(85)
Temp Utilisa (86)m= Mean (87)m=	erature ation fac Jan 1 interna	during heter for gase Feb 0.99	eating p ains for I Mar 0.99 ature in I	eriods ir iving are Apr 0.96 living are	n the living the living the many of the ma	ing n (sa	ee Table Jun  0.76  w steps (	9a) Jul 0.6 3 to 7 i	0.6 in Ta	g Sep 5 0.86 able 9c)	0.97	Nov 1	1	21	(85)
Temp Utilisa (86)m= Mean (87)m=	erature ation fac Jan 1 interna	during heter for gase Feb 0.99	eating p ains for I Mar 0.99 ature in I	eriods ir iving are Apr 0.96 living are	n the living the living the many of the ma	ing n (so collo	Jun 0.76 (0.	9a) Jul 0.6 3 to 7 i	0.6 in Ta	g Sep 5 0.86 able 9c) 21 , Th2 (°C)	0.97	Nov 1 21	1	21	(85)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	Jan 1 interna 21 perature 19.73	during heter for gase Feb 0.99 It tempera 21 during h	eating p ains for I Mar 0.99 ature in 1 21 eating p 19.74	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74	n the living the living the man of the living the livin	ing (solid)	un steps 3 21 elling fro 9.74 19	9a) Jul  0.6 3 to 7 21 m Tab 9.74	Au 0.69 in Ta 21 ole 9	g Sep 5 0.86 able 9c) 21 , Th2 (°C)	0.97	Nov 1 21	21	21	(85)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	Jan 1 interna 21 perature 19.73	during heter for gase Feb 0.99 lt tempera 21 during h	eating p ains for I Mar 0.99 ature in 1 21 eating p 19.74	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74	n the living the living the man of the living the livin	ing (so color of the color of t	Jun 20.76 (0) w steps 3 21 (2) elling fro 9.74 (1) m (see T	9a) Jul  0.6 3 to 7 21 m Tab 9.74	Au 0.69 in Ta 21 ole 9	Ig Sep 5 0.86  able 9c) 21  , Th2 (°C) 4 19.74	0.97	Nov 1 21	21		(85)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	perature ation factor Jan 1 interna 21 perature 19.73 ation factor	during heter for gase section for gase section for gase section during heter for gase section for gase secti	eating p ains for I Mar 0.99 ature in I 21 eating p 19.74 ains for r 0.98	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of d 0.94	m the living the hand of the living the hand of the ha	ing (see ) (see	w steps 3 21 elling fro 9.74 19 0.66 0	9a) Jul 0.6 3 to 7 i 21 m Tab 9.74 Table 9	Au 0.66 in T2 21 ble 9 19.7 9a)	Ig Sep 5 0.86  able 9c) 21  , Th2 (°C) 4 19.74	0.97 21 19.74 0.96	Nov 1 21 19.74	21	21	(85) (86) (87) (88)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	perature ation factor Jan 1 interna 21 perature 19.73 ation factor	during heter for gase section for gase section for gase section during heter for gase section for gase secti	eating p ains for I Mar 0.99 ature in I 21 eating p 19.74 ains for r 0.98	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of d 0.94	m the living the hand of the living the hand of the ha	ing  (sollo  follo  h2,  ling	w steps 3 21 elling fro 9.74 19 m (see T 0.66 0 T2 (follor	9a) Jul 0.6 3 to 7 i 21 m Tab 9.74 Table 9	Au 0.66 in T2 21 ble 9 19.7 9a)	g Sep 5 0.86 able 9c) 21 , Th2 (°C) 4 19.74  0.78  to 7 in Table	0.97 21 19.74 0.96	Nov 1 1 21 19.74 0.99	21	21 ]	(85) (86) (87) (88)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	erature Jan 1 interna 21 erature 19.73 ation fac	during heter for gase set of gase set of for gase set of gase	eating p ains for I Mar 0.99 ature in 21 eating p 19.74 ains for r 0.98 ature in	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of de 0.94 the rest	n the living the livin	ing  (sollo  follo  h2,  ling	w steps 3 21 elling fro 9.74 19 m (see T 0.66 0 T2 (follo	9a) Jul Jul Jo.6 3 to 7 i 21 m Tab 9.74 Table 9 1.45 w step	Au 0.60 iin Ta 21 21 19.7 9a) 0.5	1g Sep 5 0.86  able 9c) 21  , Th2 (°C) 4 19.74  to 7 in Table 19.74	0.97 21 19.74 0.96 e 9c)	Nov 1 1 21 19.74 0.99	1 21 19.74 1	21	(85) (86) (87) (88) (89)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	erature ation fac  Jan  1 interna 21 erature 19.73 ation fac 1 interna 19.73	during heter for gase of the second s	eating p ains for I Mar 0.99 ature in I 21 eating p 19.74 ains for r 0.98 ature in 1	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of d 0.94 the rest 19.74	n the living the sean of the living the sean of the se	ing (see ) (see	ee Table  Jun	9a) Jul D.6 3 to 7 i 21 m Tab 9.74 Table 9 0.45 w step 9.74	Au 0.60 iin Ta 21 19.7 19.7 0.5 3 19.7	Ig Sep 5 0.86  able 9c) 21  , Th2 (°C) 4 19.74  0.78  to 7 in Table 4 19.74	0.97 21 19.74 0.96 e 9c)	Nov 1 21 19.74 0.99	1 21 19.74 1		(85) (86) (87) (88) (89)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	erature ation fac  Jan  1 interna 21 erature 19.73 ation fac 1 interna 19.73	during heter for gase of the second s	eating p ains for I Mar 0.99 ature in I 21 eating p 19.74 ains for r 0.98 ature in 1	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of d 0.94 the rest 19.74	n the living the sean of the living the sean of the se	follo h2,	ee Table  Jun	9a) Jul D.6 3 to 7 i 21 m Tab 9.74 Table 9 0.45 w step 9.74	Au 0.60 iin Ta 21 19.7 19.7 0.5 3 19.7	g Sep 0.86 able 9c) 21 , Th2 (°C) 4 19.74  0.78 to 7 in Table 4 19.74	0.97 21 19.74 0.96 e 9c)	Nov 1 21 19.74 0.99 19.74 ving area ÷ (-	1 21 19.74 1		(85) (86) (87) (88) (89)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	erature ation fac  Jan  1 interna 21 erature 19.73 ation fac 1 interna 19.73 interna 19.88	during heter for gase of the second s	eating p ains for I Mar 0.99 ature in I 21 eating p 19.74 ains for r 0.98 ature in I 19.74 ature (fo	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of d 0.94 the rest 19.74 r the wh	n the living the living the living of the li	ing  n (second or collowing)  f dw  h2,  ling  1	ee Table  Jun  0.76  w steps 3  21  elling fro  9.74  15  m (see T  0.66  0  T2 (follo  9.74  15  9.89  15	9a) Jul  0.6  3 to 7 i 21  m Tab 9.74  Table 9 0.45  w step 9.74  × T1 +	Au 0.60 in Ta 21 19.7 19.8 0.5 3 19.7 - (1 -	g Sep 0.86 able 9c) 21 , Th2 (°C) 4 19.74  0.78 to 7 in Table 4 19.74	0.97 21 19.74 0.96 e 9c) 19.74 19.88	Nov 1 21 19.74 0.99 19.74 ving area ÷ (	1 21 19.74 1 19.74 4) =		(85) (86) (87) (88) (89) (90) (91)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	erature ation fac  Jan  1 interna 21 erature 19.73 ation fac 1 interna 19.73 interna 19.88	during heter for gase of the second s	eating p ains for I Mar 0.99 ature in I 21 eating p 19.74 ains for r 0.98 ature in I 19.74 ature (fo	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of d 0.94 the rest 19.74 r the wh	n the living the living the living of the li	ing (second second seco	ee Table  Jun	9a) Jul  0.6  3 to 7 i 21  m Tab 9.74  Table 9 0.45  w step 9.74  × T1 +	Au 0.60 in Ta 21 19.7 19.8 0.5 3 19.7 - (1 -	Ig Sep 0.86  able 9c) 21  , Th2 (°C) 4 19.74  0.78  to 7 in Table 4 19.74  - fLA) × T2 9 19.88  where approximation in the properties of t	0.97 21 19.74 0.96 e 9c) 19.74 19.88	Nov 1 21 19.74 0.99 19.74 ving area ÷ (	1 21 19.74 1 19.74 4) =		(85) (86) (87) (88) (89) (90) (91)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=  Mean (92)m= Apply (93)m=	erature ation fact Jan 1 interna 21 erature 19.73 ation fact 1 interna 19.73 interna 19.88 adjustr 19.88	during heter for gase store for gase	eating p ains for I Mar 0.99 ature in I 21 eating p 19.74 ains for r 0.98 ature in I 19.74 ature (fo 19.88 ne mean 19.88	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of d 0.94 the rest 19.74 r the wh 19.88 internal	n the living the living the living of the li	ing (second second seco	ee Table  Jun	9a) Jul	Au 0.6 in Ta 21 ble 9 19.7 0.5 0.5 19.7 19.8 44e, v	Ig Sep 0.86  able 9c) 21  , Th2 (°C) 4 19.74  0.78  to 7 in Table 4 19.74  - fLA) × T2 9 19.88  where approximation in the properties of t	0.97  21  19.74  0.96  e 9c)  19.74  19.88  ppriate	Nov 1 21 19.74 0.99 19.74 ving area ÷ (	1 21 19.74 1 19.74 4) =		(85) (86) (87) (88) (89) (90) (91)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=  Mean (92)m= Apply (93)m= 8. Spa	perature ation factor f	during heter for gase store for gase	eating p ains for I Mar 0.99 ature in I 21 eating p 19.74 ains for r 0.98 ature in 1 19.74 ature (fo 19.88 ature mean 19.88 aturement ernal ter	eriods ir iving are Apr 0.96 living are 21 eriods ir 19.74 rest of d 0.94 the rest 19.74 r the wh 19.88 internal 19.88	n the living the high may not be a T1 (for 21 not 19.74 not be a T1 (for 19.74 not be a T1 (for 19.85 not be a T1	ing (second)	ee Table  Jun	9a) Jul	Au 0.6 in Ta 21 ble 9 19.7 0.5 0s 3 19.7 19.8	Ig Sep 0.86  able 9c) 21  , Th2 (°C) 4 19.74  0.78  to 7 in Table 4 19.74  - fLA) × T2 9 19.88  where approximation in the properties of t	0.97 21 19.74 0.96 e 9c) 19.74 fLA = Li <sup>4</sup> 19.88	Nov 1 21 19.74 0.99 19.74 ving area ÷ (	1 21 19.74 1 19.74 4) =	0.11	(85) (86) (87) (88) (89) (90) (91)

Jul

Aug

Sep

Oct

Nov

Dec

Page 8 of 10

Stroma FSAP 2012 Version

Mar

Utilis	ation fac	tor for a	ains, hm	·										
(94)m=	1	0.99	0.98	0.94	0.85	0.67	0.47	0.52	0.79	0.96	0.99	1		(94)
	∟ ul gains.	hmGm	, W = (9 <sup>2</sup>		4)m			l .	<u> </u>	<u> </u>				
(95)m=	841.95		1198.12	<u> </u>	1242.08	958.89	640.38	670.91	951.62	993.53	857.11	784.13		(95)
Montl	hly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
			2687.83			1054.75		695.3		1857.68	2561.02	3145.9		(97)
		<del></del>	ement fo						<u> </u>	<del></del>				
(98)m=	1705.23	1321.46	1108.35	653.19	294.24	0	0	0	0	642.92	1226.82			٦
								Tota	ıl per year	(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	8709.35	(98)
Spac	e heatin	g require	ement in	kWh/m²	?/year								62.27	(99)
9a. En	ergy red	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	_										,		_
Fract	ion of sp	ace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fract	ion of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of i	main spa	ace heat	ing syste	em 1								389.44	(206)
Efficie	ency of	seconda	ry/supple	ementar	y heating	g system	າ, %					ĺ	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Spac	e heatin	g require	ement (c	alculate	d above)									
	1705.23	1321.46	1108.35	653.19	294.24	0	0	0	0	642.92	1226.82	1757.15		
(211)m	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	437.87	339.32	284.6	167.72	75.55	0	0	0	0	165.09	315.02	451.2		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	2236.37	(211)
Spac	e heatin	g fuel (s	econdar	y), kWh/	month									
			00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	0 Tata	0	0	0	0		7,
								rota	ıı (KVVN/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
	heating	•	tor (colo	ulotod ol	hava)									
Output	225.54	198.88	ter (calc 209.08	187.73	184.18	164.88	158.64	173.68	173.24	194.65	205.44	220.21		
Efficie	ncy of w	ater hea	ıter						ļ				119.34	(216)
(217)m=	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34	119.34		<b>⊿</b> (217)
Fuel fo	r water	Leating,	kWh/mo	onth				<u> </u>	<u> </u>	<u> </u>	ļ			
(219)m	$\gamma = (64)$	m x 100	) ÷ (217)	m										
(219)m=	188.99	166.65	175.2	157.3	154.33	138.16	132.94	145.53	145.17	163.1	172.15	184.52		_
_								Tota	ıl = Sum(2			l	1924.04	(219)
	al totals		ed, main	evetem	1					k'	Wh/year	· 	2236.37	٦
•	_			System	1							[		
	•	fuel use										l	1924.04	
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								

Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	0 (231)
Electricity for lighting			486.9 (232)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.519 =	1160.68 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.519 =	998.58 (264)
Space and water heating	(261) + (262) + (263) + (264) =		2159.26 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	0 (267)
Electricity for lighting	(232) x	0.519 =	252.7 (268)
Total CO2, kg/year	sum	n of (265)(271) =	2411.95 (272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =	17.25 (273)

El rating (section 14)

(274)

		User Details:				
Assessor Name: Software Name:	John Simpson Stroma FSAP 2012	Stroma Nu Software \			006273 n: 1.0.4.26	
	Pro	operty Address: Graf	fton House			
Address :	Grafton House, Maitland Park	k Estate, London, NV	N3 2EH			
1. Overall dwelling dime	ensions:					_
O		Area(m²)	Av. Height	<u> </u>	Volume(m <sup>3</sup>	<u> </u>
Ground floor		40.01 (1a)	X 2.6	(2a) =	104.03	(3a)
First floor		40.01 (1b)	х 3	(2b) =	120.03	(3b)
Second floor		37.44 (1c)	х 3	(2c) =	112.32	(3c)
Third floor		22.4 (1d)	х 3	(2d) =	67.2	(3d)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	139.86 (4)				
Dwelling volume		(3a)+	-(3b)+(3c)+(3d)+(3d	e)+(3n) =	403.58	(5)
2. Ventilation rate:				L		
	main secondary	other	total		m³ per hou	r
Number of chimneys	heating heating  0 + 0	+ 0 =	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0 =	0	x 20 =	0	(6b)
Number of intermittent fa	ans		4	x 10 =	40	(7a)
Number of passive vents	3		0	x 10 =	0	(7b)
Number of flueless gas f	ires		0	x 40 =	0	(7c)
				Air ch	anges per ho	our —
	eys, flues and fans = $(6a)+(6b)+(7a)$		40	÷ (5) =	0.1	(8)
Number of storeys in t	been carried out or is intended, proceed he dwelling (ns)	to (17), otherwise continu	ie from (9) to (16)	Γ		(9)
Additional infiltration	ne aweiling (ns)			[(9)-1]x0.1 =	0	(10)
	0.25 for steel or timber frame or 0	0.35 for masonry cor	nstruction	(c) There	0	(11)
	present, use the value corresponding to t	•		Į.		` /
If suspended wooden	floor, enter 0.2 (unsealed) or 0.1	(sealed), else enter	r <b>0</b>		0	(12)
If no draught lobby, er	nter 0.05, else enter 0			Ì	0	(13)
Percentage of window	s and doors draught stripped			Ī	0	(14)
Window infiltration		0.25 - [0.2 x (14)	) ÷ 100] =	Ī	0	(15)
Infiltration rate		(8) + (10) + (11)	+ (12) + (13) + (15	) =	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per square	e metre of enve	lope area	5	(17)
If based on air permeabi	lity value, then $(18) = [(17) \div 20] + (8)$	, otherwise $(18) = (16)$			0.35	(18)
	es if a pressurisation test has been done	or a degree air permeab	ility is being used			_
Number of sides sheltere	ed	(20) = 4 [0.075	v (10)1 –		1	(19)
Shelter factor	the make altern for the co	(20) = 1 - [0.075]		ļ	0.92	(20)
Infiltration rate incorpora		$(21) = (18) \times (20)$	) =	l	0.32	(21)
Infiltration rate modified	for monthly wind speed					

Jul

Sep

Aug

Oct

Nov

Dec

Mar

Apr

May

Jun

Feb

Jan

Monthly avera	ge wind	speed fr	om Tab	e 7									
(22)m= 5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		()								Į			
Wind Factor (2	<del></del>	<del>`</del>	r —	4.00	0.05	0.05			1 4 00	4.40	1 40	I	
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltr	ation rat	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.41	0.4	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38		
Calculate effe		•	rate for t	ne appli	cable ca	se						0	(23a)
If exhaust air h			endix N, (2	3b) = (23a	ı) × Fmv (e	equation (I	N5)) , othe	rwise (23b	o) = (23a)			0	(23b)
If balanced with	h heat reco	overy: effic	iency in %	allowing for	or in-use f	actor (fron	n Table 4h	) =				0	(23c)
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2)	2b)m + (	23b) × [	1 – (23c)	-	`` ′
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mech	anical ve	entilation	without	heat rec	overy (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•	•								
	T .	· /·	· ` `	<del></del>			<del>´`</del>	<del>ŕ –</del>	.5 × (23b	<del></del>		1	(5.4.)
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r	ventilation $n = 1$ , the			•	•				0.51				
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)	•			l	
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
3. Heat losse	es and he	at loss i	naramet	or.									
ELEMENT	Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value	9	AXk
	area		m		A ,r		W/m2		(W/I	<b>K</b> )	kJ/m²·ł		kJ/K
Windows Type	e 1				4.12	х1	/[1/( 1.4 )+	0.04] =	5.46				(27)
Windows Type	e 2				1.16	х1	/[1/( 1.4 )+	0.04] =	1.54				(27)
Windows Type	e 3				0.72	х1	/[1/( 1.4 )+	0.04] =	0.95				(27)
Windows Type	e 4				0.72	х1	/[1/( 1.4 )+	0.04] =	0.95				(27)
Windows Type	e 5				0.72	х1	/[1/( 1.4 )+	0.04] =	0.95				(27)
Windows Type	e 6				2.73	x1	/[1/( 1.4 )+	0.04] =	3.62				(27)
Windows Type	e 7				1.16	x1	/[1/( 1.4 )+		1.54				(27)
Windows Type Windows Type							/[1/( 1.4 )+ /[1/( 1.4 )+	0.04] =					(27) (27)
• •	e 8				1.16	x1		0.04] =	1.54				
Windows Type	e 8 e 9				1.16	x1 x1	/[1/( 1.4 )+	[0.04] = [0.04] = [0.04] = [0.04] = [0.04]	1.54				(27)
Windows Type	e 8 e 9 e 10				1.16 1.3 3.5	x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = $0.04$ ] = $0.04$ ] = $0.04$ ] = $0.04$ ] =	1.54 1.72 4.64				(27) (27)
Windows Type Windows Type Windows Type	e 8 e 9 e 10				1.16 1.3 3.5 4.1	x1 x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = $0.04$ ] = $0.04$ ] = $0.04$ ] = $0.04$ ] =	1.54 1.72 4.64 5.44				(27) (27) (27)
Windows Type Windows Type Windows Type	e 8 e 9 e 10	63	34.9	3	1.16 1.3 3.5 4.1 3.5	x1 x1 x1 x1 x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	1.54 1.72 4.64 5.44 4.64				(27) (27) (27) (27)

Total area of	alomonte	m²			000.0								(24)
* for windows and	d roof wind	ows, use e					formula 1	/[(1/U-valu	re)+0.04] a	ns given in	paragraph	3.2	(31)
** include the are				ls and pan	titions		(26)(30)	(22) -			ı		<b>_</b>
Fabric heat lo		•	U)				(20)(30)	,	(00) : (00	2) . (00-)	(00-)	102.07	(33)
Heat capacity		,		TE 4) :	1 1/ 014				` ' '	2) + (32a).	(32e) =	0	(34)
Thermal mass	•	`		,					tive Value:			250	(35)
For design asses				construct	ion are noi	t known pr	ecisely the	ndicative	values of	IMP in Ta	able 1f		
Thermal bridg				using Ap	pendix I	<						17.51	(36)
if details of therm	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric he	eat loss							(33) +	(36) =			119.58	(37)
Ventilation he	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (	25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 77.88	77.44	77.01	74.99	74.62	72.86	72.86	72.53	73.53	74.62	75.38	76.18		(38)
Heat transfer	coefficier	nt, W/K					_	(39)m	= (37) + (3	38)m			
(39)m= 197.46	197.02	196.59	194.57	194.2	192.44	192.44	192.11	193.11	194.2	194.96	195.76		
Heat loss para	ameter (H	HLP). W/	′m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	194.57	(39)
(40)m= 1.41	1.41	1.41	1.39	1.39	1.38	1.38	1.37	1.38	1.39	1.39	1.4		
	<u>!</u>	<u> </u>							Average =	Sum(40) <sub>1</sub> .	12 /12=	1.39	(40)
Number of da	ys in moi	nth (Tab	le 1a)		_	-	_						
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
						l	l			l			
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occ	upancy, I	N									kWh/ye	ear:	(42)
Assumed occ if TFA > 13.	upancy, l 9, N = 1	N + 1.76 x		(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		Í	ear:	(42)
Assumed occ	upancy, l 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	`	•		, , -	,	ΓFA -13.	9)	Í	ear:	(42)
Assumed occ if TFA > 13. if TFA £ 13. Annual averag Reduce the annu	upancy, l 9, N = 1 9, N = 1 ge hot wa al average	N + 1.76 x ater usag hot water	[1 - exp ge in litre usage by s	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9)	92	ear:	
Assumed occ if TFA > 13. if TFA £ 13. Annual average	upancy, l 9, N = 1 9, N = 1 ge hot wa al average	N + 1.76 x ater usag hot water	[1 - exp ge in litre usage by s	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36 a water us		9)	92	ear:	
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average 5 litres per l	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by s day (all w Apr	es per da 5% if the d rater use, I	ay Vd,av dwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9)	92	ear:	
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage	upancy, I 9, N = 1 9, N = 1 ge hot wa al average 5 litres per l Feb in litres per	N + 1.76 x ater usag hot water person per Mar day for ea	[1 - exp ge in litre usage by a day (all w Apr ach month	es per da 5% if the d rater use, I May Vd,m = fa	ay Vd,av Iwelling is thot and co Jun ctor from T	erage = designed to designed to designed to designed to designed to design desi	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	Se target o	9) 103 Nov	92 3.47 Dec	ear:	
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125	upancy, I 9, N = 1 9, N = 1 ge hot wa al average 5 litres per l	N + 1.76 x ater usag hot water person per Mar	[1 - exp ge in litre usage by s day (all w Apr	es per da 5% if the d rater use, I	ay Vd,av dwelling is hot and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us Sep	Oct	9) 100 Nov 109.68	92 3.47 Dec 113.82		(43)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 113.82	upancy, I 9, N = 1 9, N = 1 ge hot wa al average 5 litres per I Feb in litres per	N + 1.76 x ater usage hot water person per Mar r day for ea 105.54	[1 - exp ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 97.27	ay Vd,av fwelling is that and co Jun ctor from 7	erage = designed in designed i	(25 x N) to achieve  Aug (43)  97.27	+ 36 a water us  Sep	Oct  105.54  Total = Sur	9) Nov 109.68 m(44) <sub>112</sub> =	92 3.47 Dec 113.82	1241.69	
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125. Jan Hot water usage	upancy, I 9, N = 1 9, N = 1 ge hot wa al average 5 litres per I Feb in litres per	N + 1.76 x ater usage hot water person per Mar r day for ea 105.54	[1 - exp ge in litre usage by s day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fa 97.27	ay Vd,av fwelling is that and co Jun ctor from 7	erage = designed in designed i	(25 x N) to achieve  Aug (43)  97.27	+ 36 a water us  Sep	Oct  105.54  Total = Sur	9) Nov 109.68 m(44) <sub>112</sub> =	92 3.47 Dec 113.82		(43)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128  Jan Hot water usage  (44)m= 113.82  Energy content of	upancy, I 9, N = 1 9, N = 1 ge hot wa al average be litres per p Feb in litres per 109.68  f hot water	N + 1.76 x ater usage hot water person per Mar day for ear 105.54 used - calculated and the control of the cont	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4	es per da 5% if the da vater use, I May Vd,m = fa 97.27 ponthly = 4	ay Vd,av Iwelling is that and co Jun ctor from 7 93.13	erage = designed in designed i	(25 x N) to achieve  Aug (43)  97.27	+ 36 a water us  Sep  101.4 0 kWh/mor 118.33	Oct  105.54  Total = Sunth (see Tail 137.9	Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53	92 3.47 Dec 113.82 c, 1d)		(43)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128  Jan Hot water usage  (44)m= 113.82  Energy content of	upancy, I 9, N = 1 9, N = 1 ge hot wa al average to litres per I 109.68 f hot water 147.63	H + 1.76 x  ater usage hot water person per  Mar  day for each 105.54  used - calconding 152.34	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4  culated mo	es per da 5% if the da 5% if th	ay Vd,av Iwelling is that and co Jun ctor from 7 93.13	erage = designed to designed t	(25 x N) to achieve  Aug (43)  97.27  97.7  97.7  97.7	+ 36 a water us  Sep  101.4 0 kWh/mor  118.33	Oct  105.54  Total = Sunth (see Tail 137.9	Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1	92 3.47 Dec 113.82 c, 1d)	1241.69	(43)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 125 Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32	upancy, I 9, N = 1 9, N = 1 ge hot wa al average to litres per I 109.68 f hot water 147.63 water heatil	H + 1.76 x  ater usage hot water person per  Mar  day for each 105.54  used - calconding 152.34	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4  culated mo	es per da 5% if the da 5% if th	ay Vd,av Iwelling is that and co Jun ctor from 7 93.13	erage = designed to designed t	(25 x N) to achieve  Aug (43)  97.27  97.7  97.7  97.7	+ 36 a water us  Sep  101.4 0 kWh/mor  118.33	Oct  105.54  Total = Sunth (see Tail 137.9	Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53	92 3.47 Dec 113.82 c, 1d)	1241.69	(43)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32  Water storage	upancy, I 9, N = 1 9, N = 1 ge hot wa al average be litres per p 109.68 f hot water 147.63 water heatif 22.14	N + 1.76 x ater usage hot water person per Mar 105.54 used - calculated at point 22.85	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4  culated mo 132.81  of use (no	es per da 5% if the da 5% if th	ay Vd,av Iwelling is hot and co Jun ctor from 7 93.13 190 x Vd,r 109.97	erage = designed to designed t	(25 x N) to achieve  Aug (43) 97.27  07m / 3600 116.93  boxes (46) 17.54	+ 36 a water us  Sep  101.4  0 kWh/mor  118.33  0 to (61)  17.75	Oct  105.54  Total = Sunth (see Tail 137.9)  Total = Sunth (20.69)	9)  Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53  m(45) <sub>112</sub> = 22.58	92 3.47  Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32  Water storage Storage volume	upancy, I 9, N = 1 9, N = 1 ge hot wa al average blitres per l 109.68 f hot water 147.63 water heatil 22.14 closs: ne (litres)	N + 1.76 x ater usage hot water person per Mar 105.54 used - calculated at point 22.85	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4  culated mo 132.81  of use (no 19.92	es per da 5% if the coater use, I  May  Vd,m = fa  97.27  onthly = 4.  127.44  o hot water  19.12	ay Vd,av Iwelling is that and co Jun ctor from 7 93.13 190 x Vd,r 109.97 r storage), 16.5	erage = designed to ld)  Jul Fable 1c x  93.13  m x nm x E  101.9  enter 0 in  15.29	(25 x N) to achieve  Aug (43)  97.27  07m / 3600  116.93  boxes (46)  17.54  within sa	+ 36 a water us  Sep  101.4  0 kWh/mor  118.33  0 to (61)  17.75	Oct  105.54  Total = Sunth (see Tail 137.9)  Total = Sunth (20.69)	9)  Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53  m(45) <sub>112</sub> = 22.58	92 3.47 Dec 113.82 c, 1d) 163.47	1241.69	(43)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32  Water storage	upancy, I 9, N = 1 9, N = 1 ge hot wa al average be litres per l 109.68  f hot water 147.63  water heatin 22.14  closs: ne (litres)	N + 1.76 x ater usage hot water person per Mar 105.54 used - calculated 152.34 ng at point 22.85 including and no talculated 154.34	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4  132.81  of use (not 19.92  ag any so ank in dw	es per da 5% if the of rater use, I  May  Vd,m = fa  97.27  onthly = 4.  127.44  o hot water  19.12  olar or W  velling, e	ay Vd,av liwelling is hot and co  Jun ctor from 7  93.13  190 x Vd,r  109.97  r storage),  16.5  /WHRS	erage = designed to designed t	(25 x N) to achieve  Aug (43)  97.27  77m / 3600  116.93  boxes (46)  17.54  within sa (47)	+ 36 a water us  Sep  101.4  0 kWh/mor  118.33  0 to (61)  17.75  ame ves	Oct  105.54  Total = Sunth (see Tail 137.9)  Total = Sunth 20.69  sel	Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53  m(45) <sub>112</sub> = 22.58	92 3.47  Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous (46)m= 25.32  Water storage Storage volum If community I	upancy, I 9, N = 1 9, N = 1 ge hot wa al average be litres per l 109.68 f hot water 147.63 vater heatin 22.14 c loss: ne (litres) neating a o stored	N + 1.76 x ater usage hot water person per Mar 105.54 used - calculated 152.34 ng at point 22.85 including and no talculated 154.34	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4  132.81  of use (not 19.92  ag any so ank in dw	es per da 5% if the of rater use, I  May  Vd,m = fa  97.27  onthly = 4.  127.44  o hot water  19.12  olar or W  velling, e	ay Vd,av liwelling is hot and co  Jun ctor from 7  93.13  190 x Vd,r  109.97  r storage),  16.5  /WHRS	erage = designed to designed t	(25 x N) to achieve  Aug (43)  97.27  77m / 3600  116.93  boxes (46)  17.54  within sa (47)	+ 36 a water us  Sep  101.4  0 kWh/mor  118.33  0 to (61)  17.75  ame ves	Oct  105.54  Total = Sunth (see Tail 137.9)  Total = Sunth 20.69  sel	Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53  m(45) <sub>112</sub> = 22.58	92 3.47  Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous if (46)m= 25.32  Water storage Storage volum If community if Otherwise if note if Texas if	upancy, I 9, N = 1 9, N = 1 ge hot wa al average filtres per I 109.68  f hot water 147.63  vater heatil 22.14 Floss: ne (litres) neating a o stored	N + 1.76 x ater usage hot water person per Mar 105.54 used - calculated and at point 22.85 including at hot water and no talculated and talcu	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4  132.81  of use (no 19.92  ag any so ank in dw er (this in	es per da 5% if the d rater use, I  May  Vd,m = fa  97.27  onthly = 4.  127.44  o hot water  19.12  olar or W yelling, e	ay Vd,av Iwelling is hot and co Jun ctor from 7 93.13 190 x Vd,r 109.97 r storage), 16.5 /WHRS nter 110	erage = designed to designed t	(25 x N) to achieve  Aug (43)  97.27  77m / 3600  116.93  boxes (46)  17.54  within sa (47)	+ 36 a water us  Sep  101.4  0 kWh/mor  118.33  0 to (61)  17.75  ame ves	Oct  105.54  Total = Sunth (see Tail 137.9)  Total = Sunth 20.69  sel	9)  Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53  m(45) <sub>112</sub> = 22.58	92 3.47  Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46)
Assumed occ if TFA > 13. if TFA £ 13. Annual average Reduce the annual not more that 128 Jan Hot water usage (44)m= 113.82  Energy content of (45)m= 168.79  If instantaneous if instantaneous if community of the water storage of the water storage of the water storage if in water storage if in water storage in the water storage of the water storage of the water storage in water storage in the water storage of the water storage	upancy, I 9, N = 1 9, N = 1 ge hot wa al average be litres per l 109.68 f hot water 147.63 vater heatil 22.14 c loss: ne (litres) neating a o stored c loss: turer's de	N + 1.76 x ater usage hot water person per Mar 105.54 used - calcal 152.34 used - calcal 152.34 and at point 22.85 a including and no talcal hot water eclared lies.	[1 - exp ge in litre usage by s day (all w Apr ach month 101.4  culated mo 132.81  of use (no 19.92  ag any so ank in dw er (this in	es per da 5% if the d rater use, I  May  Vd,m = fa  97.27  onthly = 4.  127.44  o hot water  19.12  olar or W yelling, e	ay Vd,av Iwelling is hot and co Jun ctor from 7 93.13 190 x Vd,r 109.97 r storage), 16.5 /WHRS nter 110	erage = designed to designed t	(25 x N) to achieve  Aug (43)  97.27  77m / 3600  116.93  boxes (46)  17.54  within sa (47)	+ 36 a water us  Sep  101.4  0 kWh/mor  118.33  0 to (61)  17.75  ame ves	Oct  105.54  Total = Sunth (see Tail 137.9)  Total = Sunth 20.69  sel	9)  Nov  109.68  m(44) <sub>112</sub> = ables 1b, 1  150.53  m(45) <sub>112</sub> = 22.58	92 3.47 Dec 113.82 c, 1d) 163.47 24.52	1241.69	(43) (44) (45) (46) (47)

Energy lost from water storage, kWh/year	$(48) \times (49) =$	1.02	(50)
<ul> <li>b) If manufacturer's declared cylinder loss factor is not known</li> <li>Hot water storage loss factor from Table 2 (kWh/litre/day)</li> </ul>	):		1 (54)
If community heating see section 4.3		0	(51)
Volume factor from Table 2a		0	(52)
Temperature factor from Table 2b		0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	0	(54)
Enter (50) or (54) in (55)		1.02	(55)
Water storage loss calculated for each month	$((56)m = (55) \times (41)m$		
(56)m= 31.64 28.58 31.64 30.62 31.64 30.62 31.64	31.64 30.62 31.6	30.62 31.64	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷	(50), else $(57)$ m = $(56)$ m whe	re (H11) is from Append	lix H
(57)m= 31.64 28.58 31.64 30.62 31.64 30.62 31.64	31.64 30.62 31.6	4 30.62 31.64	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month $(59)$ m = $(58) \div$	365 × (41)m		
(modified by factor from Table H5 if there is solar water hea	ting and a cylinder there	mostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26	23.26 22.51 23.2	6 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (4	-1)m		•
(61)m= 0 0 0 0 0 0 0 0	0 0 0	0 0	(61)
Total heat required for water heating calculated for each mon	h (62)m = 0.85 × (45)m	+ (46)m + (57)m +	ı (59)m + (61)m
(62)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8	<del>-                                    </del>	<del>``````</del>	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quar			l
(add additional lines if FGHRS and/or WWHRS applies, see		button to water neating)	
(63)m= 0 0 0 0 0 0 0 0	0 0 0	0 0	(63)
Output from water heater			
	1 171.84 171.47 192.8	31 203.67 218.38	]
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8			2274.54 (64)
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8	Output from water he	ater (annual) <sub>112</sub>	2274.54 (64)
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)	Output from water he m + (61)m] + 0.8 x [(46)	ater (annual) <sub>112</sub> )m + (57)m + (59)m	
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 100.05 88.76 94.58 86.67 86.3 79.07 77.86	Output from water he m + (61)m] + 0.8 x [(46) 82.81 81.85 89.7	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28	(65)
(64)m= $\begin{bmatrix} 223.7 & 197.22 & 207.25 & 185.95 & 182.34 & 163.1 & 156.8 \end{bmatrix}$ Heat gains from water heating, kWh/month 0.25 $\begin{bmatrix} 0.85 \times (45) & (65)m & 100.05 & 88.76 & 94.58 & 86.67 & 86.3 & 79.07 & 77.87 & 100.04 & (57)m$ in calculation of (65)m only if cylinder is in the	Output from water he m + (61)m] + 0.8 x [(46) 82.81 81.85 89.7	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28	(65)
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 100.05 88.76 94.58 86.67 86.3 79.07 77.86	Output from water he m + (61)m] + 0.8 x [(46) 82.81 81.85 89.7	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28	(65)
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 100.05 88.76 94.58 86.67 86.3 79.07 77.8′ include (57)m in calculation of (65)m only if cylinder is in the first term of the	Output from water he m + (61)m] + 0.8 x [(46) 82.81 81.85 89.7 e dwelling or hot water is	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28 s from community h	(65)
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 100.05 88.76 94.58 86.67 86.3 79.07 77.8 include (57)m in calculation of (65)m only if cylinder is in the 5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul	Output from water he m + (61)m] + 0.8 x [(46) 82.81 81.85 89.7 e dwelling or hot water is Aug Sep Oc	ater (annual) <sub>112</sub> om + (57)m + (59)m 8 92.56 98.28 s from community h	] (65) neating
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8  Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45) (65)m= 100.05 88.76 94.58 86.67 86.3 79.07 77.8 include (57)m in calculation of (65)m only if cylinder is in the final gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.88	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> om + (57)m + (59)m 8 92.56 98.28 s from community h	(65)
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8  Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 100.05 88.76 94.58 86.67 86.3 79.07 77.8′ include (57)m in calculation of (65)m only if cylinder is in the standard	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 84 145.84 145.84	[ (65) neating (66)
(64)m= 223.7 197.22 207.25 185.95 182.34 163.1 156.8  Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45) (65)m= 100.05 88.76 94.58 86.67 86.3 79.07 77.8 include (57)m in calculation of (65)m only if cylinder is in the final gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul (66)m= 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.84 145.88	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 84 145.84 145.84	] (65) neating
(64)m=       223.7       197.22       207.25       185.95       182.34       163.1       156.8         Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45) (65)m=         100.05       88.76       94.58       86.67       86.3       79.07       77.8²         include (57)m in calculation of (65)m only if cylinder is in the colspan="6">in the colspan="6">5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan Feb Mar Apr May Jun Jul (66)m=       145.84       145.84       145.84       145.84       145.84       145.84       145.84         Lighting gains (calculated in Appendix L, equation L9 or L9a).         (67)m=       27.57       24.49       19.91       15.08       11.27       9.51       10.28         Appliances gains (calculated in Appendix L, equation L13 or L	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 84 145.84 145.84 7 26.58 28.34	[ (65) neating (66) (67)
(64)m=       223.7       197.22       207.25       185.95       182.34       163.1       156.8         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m=         (65)m=       100.05       88.76       94.58       86.67       86.3       79.07       77.8′ (78.8′ (	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 84 145.84 145.84 7 26.58 28.34	[] (65) neating (66)
(64)m=       223.7       197.22       207.25       185.95       182.34       163.1       156.8         Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45) (65)m=         100.05       88.76       94.58       86.67       86.3       79.07       77.8²         include (57)m in calculation of (65)m only if cylinder is in the colspan="6">in the colspan="6">5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan Feb Mar Apr May Jun Jul (66)m=       145.84       145.84       145.84       145.84       145.84       145.84       145.84         Lighting gains (calculated in Appendix L, equation L9 or L9a).         (67)m=       27.57       24.49       19.91       15.08       11.27       9.51       10.28         Appliances gains (calculated in Appendix L, equation L13 or L	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> )m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 84 145.84 145.84 7 26.58 28.34	[ (65) neating (66) (67)
(64)m=       223.7       197.22       207.25       185.95       182.34       163.1       156.8         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m=         100.05       88.76       94.58       86.67       86.3       79.07       77.8′ (65)m=         include (57)m in calculation of (65)m only if cylinder is in the colspan="6">include (57)m in calculation of (65)m only if cylinder is in the colspan="6">in	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 34 145.84 145.84 7 26.58 28.34 45 275.18 295.61	[ (65) neating (66) (67)
(64)m=       223.7       197.22       207.25       185.95       182.34       163.1       156.8         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m=         (65)m=       100.05       88.76       94.58       86.67       86.3       79.07       77.8′ (45) (65)m         include (57)m in calculation of (65)m only if cylinder is in the color of the cylinder is in	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 34 145.84 145.84 7 26.58 28.34 45 275.18 295.61	[ (65) neating (66) (67) (68)
(64)m=       223.7       197.22       207.25       185.95       182.34       163.1       156.8         Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m=         100.05       88.76       94.58       86.67       86.3       79.07       77.8′ (65)m=         include (57)m in calculation of (65)m only if cylinder is in the colspan="6">include (57)m in calculation of (65)m only if cylinder is in the colspan="6">include (57)m only if cylinder is in the colspan="6">include (57)m only if cylinder is in the colspan="6">include (57)m only if cylinder is in the colspan="6">include (58)m only if cylinder is in the colspan="6">include (57)m only if cylinder is in the colspan="6">include (58)m only if cylinder is in the colspan="6">include (58)m only if cylinder is in the colspan="6">include (57)m only if cylinder is in the colspan="6">include (58)m only if cylinder is in the colspan="6">include (57)m only if cylinder is in the cylinder is in the colspan="6">include (58)m only if cylinder is in the c	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) <sub>112</sub> m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 34 145.84 145.84 7 26.58 28.34 45 275.18 295.61	(65) neating (66) (67) (68)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)]  (65)m= 100.05 88.76 94.58 86.67 86.3 79.07 77.8′ include (57)m in calculation of (65)m only if cylinder is in the standard section of t	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) 112 )m + (57)m + (59)m 8 92.56 98.28 s from community h ct Nov Dec 84 145.84 145.84 7 26.58 28.34 45 275.18 295.61 8 37.58 37.58	(65) neating (66) (67) (68) (69)
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45) (65)m= 100.05   88.76   94.58   86.67   86.3   79.07   77.8 ′ include (57)m in calculation of (65)m only if cylinder is in the standard section of (65)m only if cylinder is in the section of (65)m only if cylinder is in the standard section of (65)m only if cylinder is in the standard section of (65)m only if cylinder is in the standard section of (65)m only if cylinder is in the standard section of (65)m only if cylinder is in the standard section of (65)m only if cylinder is in the standard sec	Output from water he m + (61)m] + 0.8 x [(46) 82.81	ater (annual) 112 )m + (57)m + (59)m 8 92.56 98.28 s from community h 2t Nov Dec 84 145.84 145.84 7 26.58 28.34 45 275.18 295.61 8 37.58 37.58	(65) neating (66) (67) (68) (69)

Water	heating	gains (T	able 5)											
(72)m=	134.48	132.09	127.12	120.37	115.99	10	09.82 104.58	111	1.3 113.69	120.6	7 128.56	132.1	]	(72)
Total	internal	gains =					(66)m + (67)m	1 + (68	3)m + (69)m + (	70)m +	(71)m + (72)	m	•	
(73)m=	541.05	538.79	521.16	492.36	462.44	43	34.09 415.97	422	.56 437.61	466.6	5 500.07	525.79		(73)
6. So	lar gains	s:												
			_	r flux from	Table 6a	and	associated equa	itions	to convert to the	e applic		ion.		
Orient		Access F Fable 6d	actor	Area m²			Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	0.7	72	x	10.63	x	0.63	x	0.7	=	9.36	(74)
North	0.9x	0.77	х	1.	3	x	10.63	x	0.63	x	0.7	=	12.67	(74)
North	0.9x	0.77	X	3.	5	x	10.63	x	0.63	x	0.7	=	11.37	(74)
North	0.9x	0.77	X	3.	5	x	10.63	x	0.63	X	0.7	=	11.37	(74)
North	0.9x	0.77	X	0.7	<b>7</b> 2	x	20.32	x	0.63	X	0.7	=	17.89	(74)
North	0.9x	0.77	X	1.	3	x	20.32	x	0.63	x	0.7	=	24.22	(74)
North	0.9x	0.77	X	3.	5	x	20.32	x	0.63	X	0.7	=	21.74	(74)
North	0.9x	0.77	X	3.	5	x	20.32	X	0.63	X	0.7	=	21.74	(74)
North	0.9x	0.77	X	0.7	72	x	34.53	x	0.63	x	0.7	=	30.39	(74)
North	0.9x	0.77	X	1.	3	x	34.53	x	0.63	X	0.7	=	41.16	(74)
North	0.9x	0.77	X	3.	5	x	34.53	x	0.63	X	0.7	=	36.94	(74)
North	0.9x	0.77	X	3.	5	x	34.53	x	0.63	X	0.7	=	36.94	(74)
North	0.9x	0.77	X	0.7	72	x	55.46	x	0.63	X	0.7	=	48.82	(74)
North	0.9x	0.77	X	1.	3	x	55.46	x	0.63	X	0.7	=	66.11	(74)
North	0.9x	0.77	X	3.	5	x	55.46	x	0.63	X	0.7	=	59.33	(74)
North	0.9x	0.77	X	3.	5	x	55.46	x	0.63	X	0.7	=	59.33	(74)
North	0.9x	0.77	X	0.7	72	x	74.72	x	0.63	X	0.7	=	65.76	(74)
North	0.9x	0.77	X	1.	3	x	74.72	x	0.63	X	0.7	=	89.05	(74)
North	0.9x	0.77	Х	3.	5	X	74.72	X	0.63	X	0.7	=	79.92	(74)
North	0.9x	0.77	X	3.	5	x	74.72	x	0.63	X	0.7	=	79.92	(74)
North	0.9x	0.77	X	0.7	<b>7</b> 2	X	79.99	x	0.63	X	0.7	=	70.4	(74)
North	0.9x	0.77	X	1.	3	x	79.99	X	0.63	X	0.7	=	95.33	(74)
North	0.9x	0.77	X	3.	5	x	79.99	x	0.63	x	0.7	=	85.56	(74)
North	0.9x	0.77	X	3.	5	x	79.99	x	0.63	X	0.7	=	85.56	(74)
North	0.9x	0.77	X	0.7	72	x	74.68	x	0.63	x	0.7	=	65.73	(74)
North	0.9x	0.77	X	1.	3	X	74.68	x	0.63	X	0.7	=	89.01	(74)
North	0.9x	0.77	X	3.	5	x	74.68	x	0.63	X	0.7	=	79.88	(74)
North	0.9x	0.77	х	3.	5	x	74.68	x	0.63	X	0.7	=	79.88	(74)
North	0.9x	0.77	х	0.7	72	x	59.25	x	0.63	X	0.7	=	52.15	(74)
North	0.9x	0.77	X	1.	3	x	59.25	x	0.63	X	0.7	=	70.62	(74)
North	0.9x	0.77	X	3.	5	x	59.25	x	0.63	x	0.7	=	63.37	(74)

59.25

0.63

North

63.37

North	ا میں		1		1		1		l		1		7(74)
	0.9x	0.77	X	0.72	X	41.52	X	0.63	X	0.7	] = 1	36.54	(74)
North	0.9x	0.77	X	1.3	X	41.52	X	0.63	X	0.7	] = 1	49.48	(74)
North	0.9x	0.77	X	3.5	X	41.52	X 1	0.63	X	0.7	] = 1	44.41	(74)
North	0.9x	0.77	X	3.5	X	41.52	X 1	0.63	X	0.7	] =	44.41	(74)
North	0.9x	0.77	X	0.72	X	24.19	X	0.63	X	0.7	] =	21.29	(74)
North	0.9x	0.77	X	1.3	X	24.19	X	0.63	X	0.7	=	28.83	(74)
North	0.9x	0.77	X	3.5	X	24.19	X	0.63	X	0.7	=	25.87	(74)
North	0.9x	0.77	X	3.5	X	24.19	X	0.63	X	0.7	=	25.87	(74)
North	0.9x	0.77	X	0.72	X	13.12	X	0.63	X	0.7	] =	11.55	(74)
North	0.9x	0.77	X	1.3	X	13.12	X	0.63	X	0.7	] =	15.63	(74)
North	0.9x	0.77	X	3.5	X	13.12	X	0.63	X	0.7	=	14.03	(74)
North	0.9x	0.77	X	3.5	X	13.12	X	0.63	X	0.7	=	14.03	(74)
North	0.9x	0.77	X	0.72	X	8.86	X	0.63	X	0.7	=	7.8	(74)
North	0.9x	0.77	X	1.3	X	8.86	X	0.63	X	0.7	=	10.57	(74)
North	0.9x	0.77	X	3.5	X	8.86	X	0.63	X	0.7	=	9.48	(74)
North	0.9x	0.77	X	3.5	X	8.86	X	0.63	X	0.7	=	9.48	(74)
East	0.9x	0.77	X	0.72	X	19.64	X	0.63	X	0.7	=	8.64	(76)
East	0.9x	0.77	X	0.72	X	38.42	X	0.63	X	0.7	=	16.91	(76)
East	0.9x	0.77	X	0.72	X	63.27	X	0.63	X	0.7	=	27.85	(76)
East	0.9x	0.77	X	0.72	X	92.28	X	0.63	X	0.7	=	40.61	(76)
East	0.9x	0.77	X	0.72	x	113.09	X	0.63	X	0.7	=	49.77	(76)
East	0.9x	0.77	X	0.72	x	115.77	x	0.63	x	0.7	=	50.95	(76)
East	0.9x	0.77	X	0.72	x	110.22	X	0.63	x	0.7	=	48.51	(76)
East	0.9x	0.77	X	0.72	x	94.68	X	0.63	x	0.7	=	41.67	(76)
East	0.9x	0.77	X	0.72	x	73.59	x	0.63	x	0.7	=	32.39	(76)
East	0.9x	0.77	x	0.72	x	45.59	x	0.63	x	0.7	=	20.06	(76)
East	0.9x	0.77	X	0.72	x	24.49	X	0.63	x	0.7	=	10.78	(76)
East	0.9x	0.77	X	0.72	x	16.15	X	0.63	x	0.7	=	7.11	(76)
South	0.9x	0.77	X	4.12	x	46.75	x	0.63	x	0.7	=	58.87	(78)
South	0.9x	0.77	X	1.16	x	46.75	x	0.63	x	0.7	=	16.57	(78)
South	0.9x	0.77	X	2.73	x	46.75	X	0.63	x	0.7	=	78.01	(78)
South	0.9x	0.77	X	1.16	x	46.75	X	0.63	x	0.7	=	49.72	(78)
South	0.9x	0.77	X	4.1	x	46.75	x	0.63	x	0.7	=	58.58	(78)
South	0.9x	0.77	x	4.12	x	76.57	x	0.63	x	0.7	=	96.41	(78)
South	0.9x	0.77	x	1.16	x	76.57	x	0.63	x	0.7	=	27.14	(78)
South	0.9x	0.77	X	2.73	x	76.57	x	0.63	x	0.7	j =	127.76	(78)
South	0.9x	0.77	x	1.16	x	76.57	x	0.63	x	0.7	=	81.43	(78)
South	0.9x	0.77	x	4.1	x	76.57	x	0.63	x	0.7	j =	95.94	(78)
South	0.9x	0.77	X	4.12	x	97.53	x	0.63	x	0.7	j =	122.81	(78)
South	0.9x	0.77	X	1.16	x	97.53	x	0.63	x	0.7	] =	34.58	(78)
South	0.9x	0.77	X	2.73	x	97.53	x	0.63	x	0.7	j =	162.75	(78)
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South	0.9x	0.77	X	1.16	X	97.53	X	0.63	X	0.7	=	103.73	(78)
South	0.9x	0.77	X	4.1	X	97.53	X	0.63	X	0.7	=	122.21	(78)
South	0.9x	0.77	X	4.12	X	110.23	X	0.63	X	0.7	=	138.8	(78)
South	0.9x	0.77	X	1.16	X	110.23	X	0.63	X	0.7	=	39.08	(78)
South	0.9x	0.77	X	2.73	X	110.23	X	0.63	X	0.7	=	183.94	(78)
South	0.9x	0.77	X	1.16	x	110.23	x	0.63	X	0.7	=	117.24	(78)
South	0.9x	0.77	X	4.1	X	110.23	X	0.63	X	0.7	=	138.13	(78)
South	0.9x	0.77	X	4.12	X	114.87	X	0.63	X	0.7	=	144.64	(78)
South	0.9x	0.77	X	1.16	X	114.87	X	0.63	X	0.7	=	40.72	(78)
South	0.9x	0.77	X	2.73	x	114.87	X	0.63	X	0.7	=	191.68	(78)
South	0.9x	0.77	X	1.16	x	114.87	X	0.63	X	0.7	=	122.17	(78)
South	0.9x	0.77	X	4.1	x	114.87	X	0.63	X	0.7	=	143.94	(78)
South	0.9x	0.77	X	4.12	x	110.55	x	0.63	x	0.7	=	139.19	(78)
South	0.9x	0.77	X	1.16	x	110.55	x	0.63	x	0.7	=	39.19	(78)
South	0.9x	0.77	X	2.73	x	110.55	X	0.63	x	0.7	=	184.47	(78)
South	0.9x	0.77	X	1.16	x	110.55	X	0.63	x	0.7	=	117.57	(78)
South	0.9x	0.77	X	4.1	x	110.55	X	0.63	x	0.7	=	138.52	(78)
South	0.9x	0.77	X	4.12	x	108.01	X	0.63	x	0.7	=	136	(78)
South	0.9x	0.77	X	1.16	x	108.01	X	0.63	x	0.7	=	38.29	(78)
South	0.9x	0.77	X	2.73	x	108.01	X	0.63	x	0.7	=	180.23	(78)
South	0.9x	0.77	X	1.16	x	108.01	X	0.63	x	0.7	=	114.87	(78)
South	0.9x	0.77	X	4.1	x	108.01	x	0.63	x	0.7	] =	135.34	(78)
South	0.9x	0.77	X	4.12	x	104.89	x	0.63	x	0.7	<b>=</b>	132.08	(78)
South	0.9x	0.77	X	1.16	x	104.89	X	0.63	x	0.7	=	37.19	(78)
South	0.9x	0.77	X	2.73	x	104.89	x	0.63	x	0.7	] =	175.03	(78)
South	0.9x	0.77	X	1.16	x	104.89	x	0.63	x	0.7	] =	111.56	(78)
South	0.9x	0.77	X	4.1	x	104.89	X	0.63	x	0.7	=	131.43	(78)
South	0.9x	0.77	X	4.12	x	101.89	x	0.63	x	0.7	] =	128.29	(78)
South	0.9x	0.77	X	1.16	x	101.89	X	0.63	x	0.7	=	36.12	(78)
South	0.9x	0.77	X	2.73	x	101.89	X	0.63	x	0.7	=	170.01	(78)
South	0.9x	0.77	x	1.16	x	101.89	x	0.63	x	0.7	] =	108.36	(78)
South	0.9x	0.77	X	4.1	x	101.89	x	0.63	x	0.7	] =	127.66	(78)
South	0.9x	0.77	X	4.12	x	82.59	x	0.63	x	0.7	j =	103.99	(78)
South	0.9x	0.77	X	1.16	x	82.59	x	0.63	x	0.7	] =	29.28	(78)
South	0.9x	0.77	X	2.73	x	82.59	x	0.63	x	0.7	] =	137.81	(78)
South	0.9x	0.77	x	1.16	x	82.59	x	0.63	x	0.7	j =	87.83	(78)
South	0.9x	0.77	x	4.1	x	82.59	x	0.63	x	0.7	] =	103.48	(78)
South	0.9x	0.77	x	4.12	x	55.42	x	0.63	x	0.7	j =	69.78	(78)
South	0.9x	0.77	X	1.16	×	55.42	x	0.63	x	0.7	j =	19.65	(78)
South	0.9x	0.77	X	2.73	x	55.42	x	0.63	x	0.7	j =	92.47	(78)
South	0.9x	0.77	X	1.16	x	55.42	x	0.63	x	0.7	j =	58.94	(78)
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South	0.9x	0.77		x	4.1		X	55.	42	x		0.63	X	0.7		= [	69.44	(78)
South	0.9x	0.77		x	4.12	2	x	40	.4	x		0.63	x	0.7		= [	50.87	(78)
South	0.9x	0.77		x	1.16	6	x	40	.4	X		0.63	X	0.7		= [	14.32	(78)
South	0.9x	0.77		x	2.73	3	x	40	.4	X		0.63	X	0.7		<b>=</b> [	67.41	(78)
South	0.9x	0.77		x	1.16	6	x	40	.4	x		0.63	x	0.7		= [	42.96	(78)
South	0.9x	0.77		x	4.1		x	40	.4	X		0.63	x	0.7		= [	50.62	(78)
West	0.9x	0.77		x	0.72	2	x	19.	64	X		0.63	X	0.7		= [	8.64	(80)
West	0.9x	0.77		x	0.72	2	x	38.	42	X		0.63	X	0.7		= [	16.91	(80)
West	0.9x	0.77		x	0.72	2	X	63.	27	X		0.63	X	0.7		= [	27.85	(80)
West	0.9x	0.77		x	0.72	2	x	92.	28	X		0.63	X	0.7		= [	40.61	(80)
West	0.9x	0.77		x	0.72	2	X	113	.09	X		0.63	X	0.7		= [	49.77	(80)
West	0.9x	0.77		x	0.72	2	X	115	.77	X		0.63	X	0.7		= [	50.95	(80)
West	0.9x	0.77		x	0.72	2	x	110	.22	X		0.63	X	0.7		= [	48.51	(80)
West	0.9x	0.77		x	0.72	2	x	94.	68	X		0.63	X	0.7		= [	41.67	(80)
West	0.9x	0.77		x	0.72	2	x	73.	59	X		0.63	X	0.7		= [	32.39	(80)
West	0.9x	0.77		x	0.72	2	x	45.	59	X		0.63	X	0.7		= [	20.06	(80)
West	0.9x	0.77		x	0.72	2	x	24.	49	X		0.63	X	0.7		= [	10.78	(80)
West	0.9x	0.77		x	0.72	2	x	16.	15	x		0.63	x	0.7		= [	7.11	(80)
(83)m=		548.09	747.19	9		1057.3	4 10		016.24	920	.12	810.05	604.38	387.07	277.7	'3		(83)
(83)m= Total g (84)m=	ains — i 864.87	nternal a	nd sol	9 ar (	931.99 (84)m =	1057.3 ( <b>73</b> )m 1519.7	4 10 1 + (8 8 14		watts	920			604.38 1071.0		803.5			(83)
(83)m= Total g (84)m= 7. Me	ains – i 864.87 an inter	nternal a 1086.87 nal temp	nd sol 1268.3 eratur	ar ( s5 -	931.99 (84)m = 1424.35 heating s	1057.3 (73)m 1519.7 seaso	4 10 n + (a 8 14 on)	83)m , v	watts 432.21	1342	2.69 1	1247.66					24	(84)
(83)m=   Total g (84)m=   7. Me Temp	ains – i 864.87 an inter erature	nternal a 1086.87 nal temp during h	nd sol 1268.3 eratur eating	ar ( 5   1	931.99 (84)m = 1424.35 heating :	1057.3 (73)m 1519.7 seaso the liv	4 10 n + (8 8 14 on) ving	83)m , v 191.78 1 area fro	watts 432.21 om Tab	1342	2.69 1	1247.66					21	(84)
(83)m=   Total g (84)m=   7. Me Temp	ains – i 864.87 an inter erature ation fac	nternal a 1086.87  nal temp during h	1268.3 peratur eating ains fo	ar (	931.99 (84)m = 1424.35 heating : eriods in ving area	1057.3 (73)m 1519.7 seaso the liv a, h1,	4 10 8 14 9n) ving	83)m , v 191.78 1 area fro	watts 432.21 om Tab le 9a)	1342 ble 9,	2.69 1	1247.66 (°C)	1071.0	3 887.14	803.5	52	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa	ains – i 864.87 an inter erature	nternal a 1086.87 nal temp during h	nd sol 1268.3 eratur eating	ar (	931.99 (84)m = 1424.35 heating :	1057.3 (73)m 1519.7 seaso the liv	4 10 8 14 9n) ving m (s	83)m , v 191.78 1 area fro	watts 432.21 om Tab	1342 ble 9,	2.69 1 Th1	1247.66		3 887.14		52	21	(84)
(83)m=   Total g (84)m=   7. Me	ains – i 864.87 an inter erature ation fac Jan 1	nternal a 1086.87  nal temp during h etor for ga Feb 0.99	nd sol 1268.3 peratur eating ains fo Mar 0.98	ar (	931.99 (84)m = 1424.35 heating ariods in ving area Apr 0.95	1057.3 (73)m 1519.7 seasc the liv a, h1, May 0.88	4 10 8 14 9n) Ving m (s	83)m , v 191.78 1 area fro ee Tabl Jun 0.73	watts 432.21 om Tab le 9a) Jul 0.57	1342 ble 9,	2.69 1 Th1	(°C) Sep 0.84	1071.0 Oct	3 887.14 Nov	803.5	52	21	(84)
(83)m=   Total g (84)m=   7. Me Temp Utilisa (86)m=	ains – i 864.87 an inter erature ation fac Jan 1	nternal a 1086.87  nal temp during heter for ga	nd sol 1268.3 peratur eating ains fo Mar 0.98	ar ( s5 e (l pe r liv	931.99 (84)m = 1424.35 heating ariods in ving area Apr 0.95	1057.3 (73)m 1519.7 seasc the liv a, h1, May 0.88	4 10 8 14 9n) ving m (s	area from the second se	watts 432.21 om Tab le 9a) Jul 0.57	1342 ble 9,	2.69 1 Th1 ug	(°C) Sep 0.84	1071.0 Oct	3 887.14 Nov 0.99	803.5	52 [ c	21	(84)
(83)m=   Total g (84)m=   7. Me	ains – i 864.87 an inter erature ation fac Jan 1 interna	nternal a 1086.87  nal temp during h etor for ga Feb 0.99  I tempera	eating one of the control of the con	ar (	931.99 (84)m = 1424.35 heating seriods in ving area	1057.3 (73)m 1519.7 seasc the liv a, h1, May 0.88 a T1 ( 20.69	4 100 + ((8 14 14 14 14 14 14 14 14 14 14 14 14 14	area from the second of the se	watts 432.21 om Tab le 9a) Jul 0.57 s 3 to 7 20.98	1342 ole 9, 0.6	2.69 1 Th1 ug fable	1247.66 (°C)  Sep 0.84  9c) 20.82	1071.0 Oct 0.97	3 887.14 Nov 0.99	803.5 De	52 [ c	21	(84)
(83)m= Total g (84)m= Temp Utilisa (86)m= Mean (87)m= Temp	ains – i  864.87  an inter erature ation fac  Jan 1  interna 19.44 erature	nternal a 1086.87  nal temp during h etor for ga Feb 0.99  I tempera 19.66  during h	nd sol 1268.3 perature eating ains fo Mar 0.98 ature i 19.97	e (li pe	931.99 (84)m = 1424.35 heating area Apr 0.95 ving are 20.36 eriods in	1057.3 (73)m 1519.7 seasc the liv a, h1, May 0.88 a T1 ( 20.69	4 10 8 14 n + ((8 14) nn) ving mm (s //	area from the second se	watts 432.21 om Tab le 9a) Jul 0.57 s 3 to 7 20.98	1342 ole 9, 0.6	2.69 1 Th1 ug fable 96 96 7, Th2	1247.66 (°C)  Sep 0.84  9c) 20.82	Oct 0.97	3 887.14 Nov 0.99	803.5 De	52	21	(84)
(83)m=   Total g (84)m=   Temp Utilisa (86)m=   Mean (87)m=   Temp (88)m=	ains – i 864.87 an inter erature ation fac Jan 1 interna 19.44 erature 19.75	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76	nd sol 1268.3 perature eating ains fo Mar 0.98 ature i 19.97 eating	ar (	931.99 (84)m = 1424.35 heating area Apr 0.95 ving area 20.36 eriods in 19.77	1057.3 (73)m 1519.7 seasc the liv a, h1, May 0.88 a T1 ( 20.69 rest c	4 10 1 + (10 1 + (10 10 10 10 10 10 10 10 10 10	area from the second se	watts 432.21  Dom Tab le 9a) Jul 0.57 s 3 to 7 20.98  rom Ta	1342 Al 0.6 7 in T 20.9	2.69 1 Th1 ug fable 96 96 7, Th2	(°C)  Sep 0.84  9c) 20.82  2 (°C)	1071.0 Oct 0.97	3 887.14 Nov 0.99	De 1	52	21	(84)
(83)m=   Total g (84)m=    7. Me Temp Utilisa (86)m=   Mean (87)m=   Temp (88)m=   Utilisa	ains – i 864.87 an inter erature ation fac Jan 1 interna 19.44 erature 19.75	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76	eating 0.98 ature i 19.97 eating 19.76 ains fo	ar (	931.99 (84)m = 1424.35 heating area Apr 0.95 ving are 20.36 eriods in 19.77 est of dw	1057.3 (73)m 1519.7 seaso the liva, h1, May 0.88 ea T1 ( 20.69 rest of	4 10 + (10 m) + (10 m	area from the second of the se	watts 432.21  Dom Tab le 9a)  Jul 0.57  s 3 to 7 20.98  rom Ta 19.78  Table	1342 ble 9, 0.6 7 in T 20.3 ble § 19.	2.69 1 Th1 ug 52 Table 96 9, Th2	(°C)  Sep  0.84  9c) 20.82  2 (°C) 19.78	Oct 0.97 20.37	Nov 0.99 19.82	De 1 19.4	52	21	(84) (85) (86) (87)
(83)m=   Total g (84)m=   7. Me	ains – i  864.87  an interestion factor  Jan  1  interna  19.44  erature  19.75  ation factor  1	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga	eating 0.98 ature i 19.97 eating 0.98 0.98	e (li pe r liv	931.99 (84)m = 1424.35 heating seriods in ving area 20.36 eriods in 19.77 est of dw 0.93	1057.3 (73)m 1519.7 seaso the liva, h1, May 0.88 a T1 ( 20.69 rest o 19.77 velling	4 10 1 + (10 10 10 10 10 10 10 10 10 10 10 10 10 1	area from the second of the se	watts 432.21  Dom Tab le 9a)  Jul 0.57  s 3 to 7 20.98  rom Ta 19.78  Table 0.42	1342 ble 9, 0.6 7 in T 20. ble 9 19. 9a)	2.69 1 Th1 ug G2 Gable 96 978	1247.66 (°C)  Sep 0.84 9c) 20.82 2 (°C) 19.78 0.76	Oct 0.97 20.37 19.77	3 887.14 Nov 0.99	De 1	52	21	(84) (85) (86) (87)
(83)m=   Total g (84)m=   7. Me Temp Utilisa (86)m=   Mean (87)m=   Temp (88)m=   Utilisa (89)m=	ains – i  864.87  an interesture etion factor Jan 1 interna 19.44 erature 19.75 ation factor 1	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga 0.99 I tempera	nd sol 1268.3  perature eating ains fo Mar 0.98  ature i 19.76 ains fo 0.98  ature i	e (lipe or live)	931.99 (84)m = 1424.35 heating area Apr 0.95 ving area 20.36 eriods in 19.77 est of dw 0.93 he rest of	1057.3 (73)m 1519.7 seasc the liv a, h1, May 0.88 a T1 ( 20.69 rest c 19.77 velling 0.82 of dwe	4 10 1 + (i 8 14 20 10 11 11 11 11 11 11 11 11 1	area from the second se	watts 432.21  Dom Tab le 9a) Jul 0.57 s 3 to 7 20.98  rom Ta 19.78 Table 0.42  low ste	1342  Al  0.6  19a)  9a)  0.4	2.69 1 Th1 ug fable 96 97 78 77	1247.66  (°C)  Sep 0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table	Oct 0.97 20.37 19.77 0.95	3 887.14  Nov 0.99  19.82  19.77  0.99	De 1 19.4 19.70	52 [ C 6	21	(84) (85) (86) (87) (88)
(83)m=   Total g (84)m=   7. Me	ains – i  864.87  an interestion factor  Jan  1  interna  19.44  erature  19.75  ation factor  1	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga	eating 0.98 ature i 19.97 eating 0.98 0.98	e (lipe or live)	931.99 (84)m = 1424.35 heating seriods in ving area 20.36 eriods in 19.77 est of dw 0.93	1057.3 (73)m 1519.7 seaso the liva, h1, May 0.88 a T1 ( 20.69 rest o 19.77 velling	4 10 1 + (i 8 14 20 10 11 11 11 11 11 11 11 11 1	area from the second se	watts 432.21  Dom Tab le 9a)  Jul 0.57  s 3 to 7 20.98  rom Ta 19.78  Table 0.42	1342 ble 9, 0.6 7 in T 20. ble 9 19. 9a)	2.69 1 Th1 ug fable 96 97 78 77	1247.66  (°C)  Sep 0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table 19.63	Oct 0.97 20.37 19.77 0.95 90)	Nov 0.99 19.82 19.77 0.99	De 1 19.4 19.70 1 17.68	52 [ C 6		(84) (85) (86) (87) (88) (89)
(83)m=   Total g (84)m=   7. Me	ains – i  864.87  an inter erature ation fac  Jan  1  interna 19.44  erature 19.75  ation fac  1  interna 17.7	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga 0.99 I tempera 18.02	eating 19.76 ains for 19.76 ains for 19.76 ains for 19.76 ains for 19.47	e (liss) e (liss) n lin n lin n tr	931.99   (84)m = 1424.35   heating seriods in ving area 20.36   eriods in 19.77   est of dw 0.93   he rest of 19.03   he rest o	1057.3 (73)m 1519.7 seaso the liva, h1, May 0.88 a T1 ( 20.69 rest of 19.77 velling 0.82 of dwe 19.48	4 10 1 + (10 8 14 10 10 11 11 11 11 11 11 11 11	area from the second se	watts 432.21  Dom Tab le 9a)  Jul 0.57  s 3 to 7 20.98  rom Ta 19.78  Table 0.42  low ste 19.77	1342 ble 9, 0.6 7 in T 20.9 19. 0.4 19.	2.69 1 Th1 ug 52 Table 96 78 To 7	1247.66  (°C)  Sep 0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table 19.63  fL	Oct 0.97 20.37 19.77 0.95 90)	3 887.14  Nov 0.99  19.82  19.77  0.99	De 1 19.4 19.70 1 17.68	52 [ C 6	0.11	(84) (85) (86) (87) (88) (89)
(83)m=   Total g (84)m=   Total g (84)m=   Temp (86)m=   Temp (88)m=   Utilisa (89)m=   Mean (90)m=   Mean (90)m= (90)m=   Mean (90)m= (90)m= (90)m=   Mean (90)m=	ains – i  864.87  an interestion factor  Jan  1  interna  19.44  erature  19.75  ation factor  1  interna  17.7	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga 0.99 I tempera 18.02	eating 19.97 eating 19.97 eating 19.76 ains fo 0.98 ature i 18.47	ar (s5) e (l) pe or liv n liv pe or re	931.99 (84)m = 1424.35 heating area	1057.3 (73)m 1519.7 seasc the liv a, h1, May 0.88 a T1 ( 20.69 rest c 19.77 velling 0.82 of dwe 19.48	4 10 n + (i 8 12 on) ving m (s / follo 2 of dw 1 1 relling	83)m , v 191.78 1 area fro ee Tabl Jun 0.73 ow steps 20.91 velling fr 9.78 m (see 0.63 T2 (foll 9.72	watts  432.21  Dom Tab  le 9a)  Jul  0.57  20.98  rom Ta  19.78  Table  0.42  low ste  19.77	1342  All 0.66  ' in T 20  19a)  0.4  4 (1	2.69 1 Th1 ug fable 96 77 to 7 77	1247.66  (°C)  Sep 0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table 19.63  fL	Oct 0.97 20.37 19.77 0.95 9c) 19.06 A = Liv	Nov 0.99 19.82 19.77 0.99	De 1 19.4 19.70 1 17.63 4) =	52 C C 5 5 5		(84) (85) (86) (87) (88) (89) (90)
(83)m=   Total g (84)m=   7. Me	ains – i  864.87  an inter erature ation fac  Jan  1  interna 19.44  erature 19.75  ation fac  1  interna 17.7	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga 0.99 I tempera 18.02 I tempera 18.02	eating 19.76 ains for 0.98 ature i 19.76 ains for 0.98 ature i 19.76 ains for 0.98 ature i 18.47	e (list) e (list) per liv r liv r liv r re	931.99   (84)m = 1424.35   heating seriods in ving area 20.36   riods in 19.77   est of dw 0.93   he rest of 19.03   the who	1057.3 (73)m 1519.7 seaso the liva, h1, May 0.88 a T1 ( 20.69 rest of 19.77 velling 0.82 of dwe 19.48	4 100	83)m , v 191.78 1  area fro ee Tabl Jun 0.73  w steps 20.91  velling fr 9.78  T2 (foll 9.72  g) = fLA 9.86	watts 432.21  Dom Tab le 9a)  Jul 0.57  s 3 to 7 20.98  rom Ta 19.78  Table 0.42  low ste 19.77  A × T1 19.91	1342 ble 9, 0.6 7 in T 20.3 ble § 19.3 0.4 + (1 19.3	2.69 1 Th1 ug 52 Table 96 77 to 7 77 — fLA	1247.66  (°C)  Sep 0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table 19.63  fL  A) × T2 19.77	Oct 0.97 20.37 19.77 0.95 9c) 19.06 A = Liv	Nov 0.99 19.82 19.77 0.99	De 1 19.4 19.70 1 17.68	52 C C 5 5 5		(84) (85) (86) (87) (88) (89) (90)
(83)m=   Total g (84)m=   Total g (84)m=   Temp (86)m=   Temp (88)m=   Utilisa (89)m=   Mean (90)m=   Mean (92)m=   Apply	ains – i  864.87  an inter erature ation fac  Jan  1 interna  19.44 erature  19.75 ation fac  1 interna  17.7  interna  17.9 adjustr	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga 0.99 I tempera 18.02 I tempera 18.02	eating 19.97 eating 19.97 eating 19.76 ains fo 0.98 ature i 18.47 ature i 18.64 ne me	ar (s) pe or liver	931.99 (84)m = 1424.35 heating area of the whole of the w	1057.3 (73)m 1519.7 seaso the liv a, h1, May 0.88 a T1 ( 20.69 rest of 19.77 velling 0.82 of dwe 19.48 ble dw 19.61 tempe	4 10  1 + (i  8   14  2   10  N + (i  8   14  N   10	83)m , v 191.78 1  area from ee Tabl Jun 0.73  w steps 20.91 velling fr 9.78  m (see 0.63  T2 (foll 9.72  g) = fLA 9.86  ure from	watts  432.21  Dom Tab  le 9a)  Jul  0.57  20.98  rom Ta  19.78  Table  0.42  low ste  19.77  A × T1  19.91  Table	1342  All 0.66  7 in T 20  19a) 0.4  4e, 1  4e, 1	2.69 1 Th1  ug	1247.66  (°C)  Sep 0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table 19.63  fL  A) × T2 19.77  e appropri	Oct 0.97  20.37  19.77  0.95  90)  19.06  A = Liver priate	Nov 0.99 19.82 19.77 0.99 18.27 ring area ÷ (4)	19.4 19.70 1 17.60 4) =	52 C C 5 5 5 5		(84) (85) (86) (87) (88) (89) (90) (91)
(83)m=   Total g (84)m=   7. Me	ains – i  864.87  an inter erature ation fac  Jan  1  interna 19.44 erature 19.75 ation fac  1 interna 17.7  interna 17.9 adjustr 17.9	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga 0.99 I tempera 18.02 I tempera 18.02	eating 19.76 ains for 0.98 ature i 19.76 ains for 0.98 ature i 19.76 ains for 0.98 ature i 18.47	e (list) e (	931.99   (84)m = 1424.35   heating seriods in ving area 20.36   riods in 19.77   est of dw 0.93   he rest of 19.03   the who 19.18   1424.35   the who 19.18   the who	1057.3 (73)m 1519.7 seaso the liva, h1, May 0.88 a T1 ( 20.69 rest of 19.77 velling 0.82 of dwe 19.48	4 10  1 + (i  8   14  2   10  N + (i  8   14  N   10	83)m , v 191.78 1  area from ee Tabl Jun 0.73  w steps 20.91 velling fr 9.78  m (see 0.63  T2 (foll 9.72  g) = fLA 9.86  ure from	watts 432.21  Dom Tab le 9a)  Jul 0.57  s 3 to 7 20.98  rom Ta 19.78  Table 0.42  low ste 19.77  A × T1 19.91	1342 ble 9, 0.6 7 in T 20.3 ble § 19.3 0.4 + (1 19.3	2.69 1 Th1  ug	1247.66  (°C)  Sep 0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table 19.63  fL  A) × T2 19.77	Oct 0.97 20.37 19.77 0.95 9c) 19.06 A = Liv	Nov 0.99 19.82 19.77 0.99	De 1 19.4 19.70 1 17.63 4) =	52 C C 5 5 5 5		(84) (85) (86) (87) (88) (89) (90) (91)
(83)m=   Total g (84)m=   7. Me	ains – i  864.87  an interestion factor  Jan  1 interna  19.44 erature  19.75 ation factor  1 interna  17.7  interna  17.9 adjustr  17.9 acce hear	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga 0.99 I tempera 18.02 I tempera 18.02 I tempera 18.21 ment to tr 18.21 ting requ	eating 19.97 eating 19.97 eating 19.76 ains fo 0.98 ature i 19.87 eating 19.76 ains fo 18.47 ature ( 18.64 ne mea	ar (s) pe or liver pe or reference per reference pe or referen	931.99 (84)m = 1424.35 heating seriods in ving area 20.36 eriods in 19.77 est of dw 0.93 he rest of 19.03 the who 19.18 internal 19.18	1057.3 (73)m 1519.7 seaso the liv a, h1, May 0.88 a T1 ( 20.69 rest of 19.77 velling 0.82 of dwe 19.48 ble dw 19.61 tempe 19.61	4 10 n + (i 8 12 nn) ving m (s follo 2 of dw 1 nn n	83)m , v 191.78 1  area from 191.78 20.91 20.91 20.63	watts  432.21  Dom Tab  le 9a)  Jul  0.57  20.98  rom Ta  19.78  Table  0.42  low ste  19.77  A × T1  19.91  Table  19.91	1342  All 0.6  All 0.6  19.  9a)  0.4  eps 3  19.  + (1  19.  4e,  19.	2.69 1 Th1 ug   62   63   64   65   67   67   77   67   69   69   60   60   60   60   60   60   60   60	(°C)  Sep  0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table 19.63  fL  A) × T2 19.77  e appro	Oct 0.97  20.37  19.77  0.95  9c) 19.06  A = Liv  19.2  priate 19.2	Nov 0.99 19.82 19.77 0.99 18.27 ring area ÷ (4)	19.4 19.7 1 17.6 17.8 17.8	52 C C 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.11	(84) (85) (86) (87) (88) (89) (90)
(83)m=   (7. Me	ains – i  864.87  an interestion factor  Jan  1  interna  19.44  erature  19.75  ation factor  1  interna  17.7  interna  17.9  adjustr  17.9  ace head  to the i	nternal a 1086.87  nal temp during h etor for ga Feb 0.99 I tempera 19.66 during h 19.76 etor for ga 0.99 I tempera 18.02 I tempera 18.02 I tempera 18.21 ment to tr 18.21 ting requ	nd sol  1268.3  perature eating ains for  0.98  ature i 19.97  eating 19.76  ains for 0.98  ature i 18.47  ature ( 18.64  he mes 18.64  uireme	ar (s) pe or liver record in the limit of th	931.99 (84)m = 1424.35 heating seriods in ving area 20.36 ving area 20.36 eriods in 19.77 est of dw 0.93 he rest of 19.03 the who 19.18 internal	1057.3 (73)m 1519.7 seaso the liv a, h1, May 0.88 a T1 ( 20.69 rest of 19.77 velling 0.82 of dwe 19.48 ble dw 19.61 tempe 19.61	4 100n)  ving m (s  (follogial for the following followi	83)m , v 191.78 1  area from 191.78 20.91 20.91 20.63	watts  432.21  Dom Tab  le 9a)  Jul  0.57  20.98  rom Ta  19.78  Table  0.42  low ste  19.77  A × T1  19.91  Table  19.91	1342  Al	2.69 1 Th1 ug   62   63   64   65   67   67   77   67   69   69   60   60   60   60   60   60   60   60	(°C)  Sep  0.84  9c) 20.82  2 (°C) 19.78  0.76  in Table 19.63  fL  A) × T2 19.77  e appro	Oct 0.97  20.37  19.77  0.95  9c) 19.06  A = Liv  19.2  priate 19.2	Nov 0.99 19.82 19.77 0.99 18.27 ring area ÷ (4) 18.45	19.4 19.7 1 17.6 17.8 17.8	52 C C 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.11	(84) (85) (86) (87) (88) (89) (90) (91)

Jul

Sep

Aug

Oct

Nov

Dec

Page 8 of 10

Stroma FSAP 2012 Version

Mar Mar

Utilisa	ation fac	tor for a	ains, hm	ı <del>.</del>										
(94)m=	0.99	0.99	0.97	0.92	0.82	0.63	0.44	0.49	0.76	0.94	0.99	1		(94)
	ıl gains,	hmGm .	W = (94	ـــــــــــــــــــــــــــــــــــــ	4)m			<u>!</u>	<u> </u>	ļ	!	<u>[</u>		
(95)m=	860.26			1311.54		943.21	626.59	656.65	943.9	1009.34	876.82	800.34		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m=	2684.8		2387.25		1536.99		637.03	673.52	1094.8	1670.95	2212.37	2672.22	I	(97)
		<u> </u>				r	r	24 x [(97	<del>``</del>	<del>í                                     </del>	<u> </u>		ı	
(98)m=	1357.46	1041.14	862.8	495.88	219.64	0	0	0	0	492.24	961.6	1392.68		<b>7</b>
								Tota	ıl per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	6823.43	(98)
Space	e heating	g require	ement in	kWh/m²	/year								48.79	(99)
9a. En	ergy req	uiremer	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatin	_										,		,
Fracti	on of sp	ace hea	it from so	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	it from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fracti	on of tot	al heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								93.5	(206)
Efficie	ency of s	econda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ır
Space	e heating	g require	ement (c	alculate	d above)	)		•	•	•	•			
	1357.46	1041.14	862.8	495.88	219.64	0	0	0	0	492.24	961.6	1392.68		
(211)m	ı = {[(98)	m x (20	4)] } x 1	00 ÷ (20	06)									(211)
	1451.83	1113.51	922.78	530.35	234.91	0	0	0	0	526.46	1028.45	1489.5		_
								Tota	ıl (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	7297.79	(211)
•	`	•		y), kWh/	month									
			00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	O Tota	0	0	0 215) <sub>15,1012</sub>	0	_	7(045)
								TOLA	ıı (KVVII/yea	ar) =Surri(2	213) <sub>15,1012</sub>	F	0	(215)
	heating		tor (oolo	ulated al	hovo)									
Output	223.7	197.22	207.25	ulated al 185.95	182.34	163.1	156.81	171.84	171.47	192.81	203.67	218.38		
Efficier	ncy of wa	ater hea	ter						<u> </u>	<u> </u>	l		79.8	(216)
(217)m=	88.82	88.61	88.21	87.31	85.31	79.8	79.8	79.8	79.8	87.21	88.43	88.88		」 (217)
Fuel fo	r water l	neating,	kWh/mo	onth				•						
, ,			) ÷ (217)				<u> </u>		ı	1			ı	
(219)m=	251.87	222.58	234.95	212.98	213.74	204.39	196.5	215.34	214.87	221.09	230.32	245.68		1
	14.4							I ota	al = Sum(2	<u>-</u>	A/II. /		2664.32	(219)
	l totals	الوا باود	ed main	system	1					k'	Wh/year	· 	<b>kWh/year</b> 7297.79	1
•	_			5,500111	•									J 1
	heating												2664.32	J
Electric	city for p	umps, fa	ans and	electric	keep-ho	t								

central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (2	230a)(230g) =	75 (231)
Electricity for lighting			486.9 (232)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	1576.32 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216	575.49 (264)
Space and water heating	(261) + (262) + (263) + (264)	=	2151.82 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	252.7 (268)
Total CO2, kg/year	\$	sum of (265)(271) =	2443.44 (272)

TER =

(273)

25.93

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:36:51

Project Information:

Assessed By: John Simpson (STRO006273) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 72m<sup>2</sup>

Site Reference: Maitland Park Estate

Plot Reference: GT 002

Address: GT 002, Aspen Court, Maitland Park Estate, London, NW3 2EH

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 29.92 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 10.37 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 61.5 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 57.0 kWh/m²

OK

2 Fabric U-values

**Element Highest Average** 0.12 (max. 0.70) External wall 0.12 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK** Floor 0.12 (max. 0.25) 0.12 (max. 0.70) OK Roof 0.10 (max. 0.20) 0.10 (max. 0.35) OK 1.40 (max. 2.00) **Openings** 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 2.00 (design value)

Maximum 10.0 **OK** 

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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 Lauranaum, limbta		
7 Low energy lights	100.004	
Percentage of fixed lights with low-energy fittings	100.0%	01/
Minimum	75.0%	ОК
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: West	3.43m²	
Windows facing: North	6.66m²	
Windows facing: East	3.43m²	
Windows facing: South	7.7m²	
Windows facing: South	2.65m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
Roofs U-value	0.1 W/m²K	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Floors U-value	0.12 W/m²K	
Community heating, heat from electric heat pump	0.12 W/III IX	
Photovoltaic array		

			User D	etails:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 2	012		Stroma Softwa					006273 on: 1.0.4.26	
		Р	roperty .	Address	GT 002	2				
Address :	GT 002, Aspen C	ourt, Maitla	and Park	k Estate,	London	, NW3 2	2EH			
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	,	Volume(m	<u> </u>
Ground floor				72	(1a) x	2	2.9	(2a) =	208.8	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(	1e)+(1r	n)	72	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	208.8	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	<b>+</b> [	0	] = [	0	X ·	40 =	0	(6a)
Number of open flues	0 +	0		0	; ; = ;	0	x :	20 =	0	(6b)
Number of intermittent fa					J		x	10 =		= ``
					Ļ	0			0	(7a)
Number of passive vents	S				L	0	X	10 =	0	(7b)
Number of flueless gas f	fires					0	X	40 =	0	(7c)
								Air ch	anges per h	our
Infiltration due to chimne	ave flues and fans	(6a) (6b) (7	7a) ı ( <b>7</b> b) ı (	7c) –	Г			ı		
Infiltration due to chimne If a pressurisation test has a	•				ontinuo fr	0 (0) to		÷ (5) =	0	(8)
Number of storeys in t		idea, proceed	u 10 (11), (	Juliel Wise C	orianae n	om ( <del>3)</del> to	(10)		0	(9)
Additional infiltration	are arrening (1.15)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or timbe	er frame or	0.35 for	r masonr	y constr	uction	,		0	(11)
	oresent, use the value con				•				<u> </u>	` ′
deducting areas of open										_
If suspended wooden	•	,	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors draught	stripped		0.05 [0.0	(4.4)4	001			0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate	.50	1. 1		(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value			•		•	etre of e	envelope	area	2	(17)
If based on air permeabi						ia haina	and		0.1	(18)
Number of sides shelter	•	nas been don	ie or a deg	gree air pei	пеаышу	is being u	seu		2	(19)
Shelter factor	cu			(20) = 1 -	0.075 x (1	9)] =			0.85	- (20)
Infiltration rate incorpora	iting shelter factor			(21) = (18)	x (20) =				0.08	(21)
Infiltration rate modified	-	ed								<b></b> ` ′
Jan Feb	Mar Apr Ma	_	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	<u>' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' </u>	-	•		•		•	•	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		
	II	ı	I	ı		I	1	1	I	
Wind Factor $(22a)m = (2a)m =$	<u> </u>		•						•	
(00-)   4 07   4 05	100   11   100	0.05	0.05				1			

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adiasica illillia	ation rate	(allowing	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1	]	
Calculate effec		-	ate for t	he appli	cable ca	se		!	!	<u> </u>	!	J	
If mechanica			andia N. (O	2h) (22a	s) Em. /	aguatian (l	NEW atho	muiaa (22h	) (220)			0.5	(23a)
If exhaust air he									) = (23a)			0.5	(23b)
If balanced with		-	-	_					Ola \ (	005) [4	4 (00-)	76.5	(23c)
a) If balance (24a)m= 0.23	o mecnan	0.22	0.21	0.21	o.2	0.2	HR) (248	m = (2.0) $0.2$	2b)m + (. 0.21	230) <b>x</b> [*	0.22	1 ÷ 100] ]	(24a)
b) If balance					<u> </u>		<u> </u>	ļ	ļ		0.22	J	(214)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h	ļ.	!			<u> </u>		<u> </u>					J	( )
,	$1 < 0.5 \times 0$			•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural									!	!	!	•	
	n = 1, then	<u> </u>		o)m othe	·	24d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air			<u> </u>	<u> </u>	<del>í `</del>	<del>ŕ `</del>	<del></del>	<del>`</del>	1			1	()
(25)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	]	(25)
3. Heat losses	s and heat	t loss p	aramete	er:									
ELEMENT	Gross area (n		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²·l		A X k kJ/K
Doors													
Windows Type					3.89	X	1.4	=	5.446				(26)
Windows Type	: 1				3.89	〓 .	1.4 /[1/( 1.4 )+		5.446 4.55				(26) (27)
Windows Type Windows Type						x1		0.04] =					, ,
• •	2				3.43	x1 x1	/[1/( 1.4 )+	0.04] =	4.55				(27)
Windows Type	3				3.43	x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+	· 0.04] = · 0.04] = · 0.04] =	4.55 4.41				(27) (27)
Windows Type Windows Type	2 3 4				3.43 3.33 3.43	x1 x1 x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] =	4.55 4.41 4.55				(27) (27) (27)
Windows Type Windows Type Windows Type	2 3 4				3.43 3.33 3.43 7.7	x1 x1 x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] =	4.55 4.41 4.55 10.21	9		<b>-</b>	(27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	2 3 4		27.7(	5 T	3.43 3.33 3.43 7.7 2.65	x1 x1 x1 x1 x1 x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	4.55 4.41 4.55 10.21 3.51	9 [			(27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Floor	2 3 4 4 5		27.70	6	3.43 3.33 3.43 7.7 2.65	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04]	4.55 4.41 4.55 10.21 3.51 8.63999	9 [			(27) (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Floor Walls	2 2 3 4 4 4 5 5 83.2 9.02			6	3.43 3.33 3.43 7.7 2.65 72 55.44	x1 x1 x1 x1 x1 x1 x1 x1 x1 x x1 x x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	0.04] = 0.04]	4.55 4.41 4.55 10.21 3.51 8.63999 6.65	9 [			(27) (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Floor Walls Roof	2 2 3 4 4 4 5 5 83.2 9.02	m²		6	3.43 3.33 3.43 7.7 2.65 72 55.44 9.02	x1 x1 x1 x1 x1 x1 x x1 x x x x x x x x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	0.04] = 0.04]	4.55 4.41 4.55 10.21 3.51 8.63999 6.65	9 [			(27) (27) (27) (27) (27) (28) (29) (30)
Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and	83.2 9.02 lements, r	/s, use e	0	ndow U-va	3.43 3.33 3.43 7.7 2.65 72 55.44 9.02 164.2 23.9	x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.12	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = = = = = = = = = = = = =	4.55 4.41 4.55 10.21 3.51 8.63999 6.65 0.9		paragraph		(27) (27) (27) (27) (27) (28) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall	83.2 9.02 lements, r	/s, use e des of in	0 ffective wi	ndow U-va	3.43 3.33 3.43 7.7 2.65 72 55.44 9.02 164.2 23.9	x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.12	- 0.04] =   - 0.04] =   =   =   =	4.55 4.41 4.55 10.21 3.51 8.63999 6.65 0.9		paragraph	] [ ] [ ] 3.2	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area	83.2 9.02 lements, r roof window s on both sides, W/K = S	vs, use endes of in	0 ffective wi	ndow U-va	3.43 3.33 3.43 7.7 2.65 72 55.44 9.02 164.2 23.9	x1 x1 x1 x1 x1 x1 x1 x x1 x x x x x x x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	- 0.04] =   - 0.0	4.55 4.41 4.55 10.21 3.51 8.63999 6.65 0.9	as given in			(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los	83.2 9.02 lements, r roof window is on both sides, W/K = S Cm = S(A	vs, use endes of in S (A x x x k )	0 ffective wi ternal wall	ndow U-va	3.43 3.33 3.43 7.7 2.65 72 55.44 9.02 164.2 23.9 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x2 x1 x2 x2 x2 x2 x2 x4 x4 x4 x5 x4 x4 x6	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	- 0.04] =   - 0.0	4.55 4.41 4.55 10.21 3.51 8.63999 6.65 0.9 0 ue)+0.04] a	as given in 2) + (32a).		53.29	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity (	83.2 9.02 lements, r roof window as on both sides, W/K = S Cm = S(A paramete	vs, use endes of in S (A x x k ) er (TMF	ffective winternal walk  U)  P = Cm ÷  tails of the	ndow U-vals and part	3.43 3.33 3.43 7.7 2.65 72 55.44 9.02 164.2 23.9 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x2 x x x x x x x x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.12 0.1 0 of formula 1	- 0.04] =   - 0.0	4.55 4.41 4.55 10.21 3.51 8.63999 6.65 0.9 0 ue)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	53.29	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity of Thermal mass For design assess	83.2 9.02 lements, r roof window is on both sid is, W/K = S Cm = S(A paramete ments where ad of a detail	vs, use eddes of in S (A x x k ) er (TMF e the det	ffective winternal walk  U)  P = Cm -  tails of the plation.	ndow U-ve ls and part - TFA) ir constructi	3.43 3.33 3.43 7.7 2.65 72 55.44 9.02 164.2 23.9 alue calculations  n kJ/m²K	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.12 0.1 0 of formula 1	- 0.04] =   - 0.0	4.55 4.41 4.55 10.21 3.51 8.63999 6.65 0.9 0 ue)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	53.29	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32) (33) (34) (35)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity of Thermal mass For design assess can be used instead	83.2 9.02 lements, r roof window s on both sides, W/K = S Cm = S(A paramete and of a detail es : S (L x	xs, use endes of in S (A x x k )  x k )  er (TMF)  e the detailed calculy) calculy	ffective winternal walk  U)  P = Cm - tails of the plation.  culated to	ndow U-vals and part - TFA) ir constructi	3.43 3.33 3.43 7.7 2.65 72 55.44 9.02 164.2 23.9 alue calculations  n kJ/m²K ion are not	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.12 0.1 0 of formula 1	- 0.04] =   - 0.0	4.55 4.41 4.55 10.21 3.51 8.63999 6.65 0.9 0 ue)+0.04] a	as given in 2) + (32a).: Medium	(32e) =	53.29	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32) (33) (34) (35)

√entila	ation hea	at loss ca	alculated	l monthly	У				(38)m	= 0.33 × (	25)m x (5)	ı		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m=	15.56	15.42	15.27	14.54	14.39	13.66	13.66	13.51	13.95	14.39	14.69	14.98		(38)
Heat tr	ransfer c	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
39)m=	83.42	83.27	83.12	82.39	82.25	81.51	81.51	81.37	81.81	82.25	82.54	82.83		
Heat Id	oss para	meter (H	HLP), W/	m²K			-			Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	82.36	(39
40)m=	1.16	1.16	1.15	1.14	1.14	1.13	1.13	1.13	1.14	1.14	1.15	1.15		
Numbe	er of day	s in moi	nth (Tab	le 1a)			•	•		Average =	Sum(40) <sub>1</sub> .	12 /12=	1.14	(40
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41
Assum if TF if TF Annua	A £ 13.9 I averag	ipancy, l 9, N = 1 9, N = 1 e hot wa	N + 1.76 x ater usaç	[1 - exp	s per da	ay Vd,av	erage =	)2)] + 0.0 (25 x N)	+ 36		.9)	29 3.68	ear:	(42
	the annua e that 125 Jan	-		• •		•	-	to achieve Aug	a water us	Oct	Nov	Dec		
Hot water	er usage ii			<u> </u>					ОСР	001	1404	DCC		
44)m=	97.54	94	90.45	86.9	83.35	79.81	79.81	83.35	86.9	90.45	94	97.54		
_							_				m(44) <sub>112</sub> =		1064.1	(44
±nergy (								OTm / 3600						
45)m=	144.65	126.51	130.55	113.82	109.21	94.24	87.33	100.21	101.41	118.18	129	140.09		<b>—</b> ,
f instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1395.2	(4
46)m=	21.7	18.98	19.58	17.07	16.38	14.14	13.1	15.03	15.21	17.73	19.35	21.01		(40
	storage													
Ū		` ,					ŭ	within sa	ame ves	sel		0		(47
Otherv	munity h vise if no storage	stored			_			(47) ombi boil	ers) ente	er '0' in (	47)			
a) If m	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48
Tempe	erature fa	actor fro	m Table	2b								0		(4
	y lost fro		_	-		:		(48) x (49)	) =		1	10		(50
ot wa	nanufact ater stora munity h	age loss	factor fr	om Tabl							0.	02		(5
	e factor	•		011 4.3							1	.03		(5:
	erature fa			2b								.6		(53
	y lost fro				ear			(47) x (51)	x (52) x (	53) =		.03		` (54
٠.	(50) or (		_						. , , ,	•		.03		(5
LIIIGI														
	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				

If cylinder contains dec	icated solar st	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	)m where (	H11) is fro	om 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 loss	(annual) fr	om Table	<u>.                                    </u>	<u>l</u>	<u> </u>	<u> </u>	!	!	!	0		(58)
Primary circuit loss	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by fac	or from Tab	ole H5 if t	there is	solar wat	er 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)
Combi loss calcula	ted for eacl	n month	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required	for water h	eating c	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 199.93 176	185.83	167.31	164.49	147.73	142.6	155.49	154.9	173.46	182.5	195.37		(62)
Solar DHW input calcu	ated using Ap	pendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	•	
(add additional line	s if FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water	heater											
(64)m= 199.93 170	185.83	167.31	164.49	147.73	142.6	155.49	154.9	173.46	182.5	195.37		_
						Outp	out from w	ater heate	r (annual) <sub>1</sub>	12	2046.04	(64)
Heat gains from w	ater heating	ı, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 92.32 82	01 87.63	80.64	80.53	74.13	73.26	77.54	76.51	83.52	85.69	90.8		(65)
include (57)m in	calculation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal gains	(see Table	5 and 5a	):									
Metabolic gains (T	able 5), Wa	tts										
Jan F	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 114.68 114	.68 114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68		(66)
Lighting gains (cal	culated in A	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 18 15	99 13	9.84	7.36	6.21	6.71	8.73	11.71	14.87	17.36	18.5		(67)
Appliances gains (	calculated i	n Appen	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m= 201.92 204	.01 198.73	187.49	173.3	159.97	151.06	148.96	154.24	165.48	179.67	193.01		(68)
Cooking gains (ca	culated in A	Appendix	L, equa	tion L15	or L15a)	, also se	ee Table	5				
(69)m= 34.47 34	47 34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47	34.47		(69)
Pumps and fans g	ains (Table	5a)										
(70)m= 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evapo	ration (nega	ative valu	es) (Tab	le 5)								
(71)m= -91.75 -9 <sup>-</sup>	.75 -91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75	-91.75		(71)
Water heating gair	s (Table 5)											
(72)m= 124.08 122	2.04 117.78	112	108.24	102.96	98.46	104.22	106.27	112.25	119.01	122.04		(72)
Total internal gai	1S =			(66)	m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72)	)m		
(73)m= 401.41 399	.44 386.92	366.74	346.31	326.54	313.64	319.32	329.63	350.01	373.45	390.96		(73)
6. Solar gains:												
Solar gains are calcu Orientation: Acce	_	ar flux from Area		and assoc		tions to co	onvert to th	ne applicat	ole orienta	tion.		

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

	_		_										_
North	0.9x	0.77	X	3.33	X	10.63	X	0.4	X	0.8	=	15.7	(74)
North	0.9x	0.77	X	3.33	X	20.32	X	0.4	X	0.8	=	30.01	(74)
North	0.9x	0.77	Х	3.33	X	34.53	X	0.4	X	0.8	=	51	(74)
North	0.9x	0.77	X	3.33	X	55.46	X	0.4	X	0.8	=	81.92	(74)
North	0.9x	0.77	X	3.33	X	74.72	X	0.4	X	0.8	=	110.35	(74)
North	0.9x	0.77	X	3.33	X	79.99	X	0.4	x	0.8	=	118.13	(74)
North	0.9x	0.77	X	3.33	X	74.68	X	0.4	x	0.8	=	110.29	(74)
North	0.9x	0.77	X	3.33	X	59.25	X	0.4	X	0.8	=	87.5	(74)
North	0.9x	0.77	X	3.33	X	41.52	X	0.4	X	0.8	=	61.32	(74)
North	0.9x	0.77	X	3.33	X	24.19	X	0.4	X	0.8	=	35.73	(74)
North	0.9x	0.77	X	3.33	X	13.12	X	0.4	X	0.8	=	19.37	(74)
North	0.9x	0.77	X	3.33	X	8.86	X	0.4	X	0.8	=	13.09	(74)
East	0.9x	0.77	X	3.43	x	19.64	x	0.4	X	0.8	=	14.94	(76)
East	0.9x	0.77	X	3.43	X	38.42	x	0.4	X	0.8	=	29.22	(76)
East	0.9x	0.77	X	3.43	X	63.27	X	0.4	X	0.8	=	48.13	(76)
East	0.9x	0.77	X	3.43	x	92.28	x	0.4	x	0.8	=	70.19	(76)
East	0.9x	0.77	X	3.43	X	113.09	X	0.4	X	0.8	=	86.02	(76)
East	0.9x	0.77	X	3.43	X	115.77	X	0.4	X	0.8	=	88.06	(76)
East	0.9x	0.77	X	3.43	X	110.22	X	0.4	X	0.8	=	83.84	(76)
East	0.9x	0.77	X	3.43	X	94.68	X	0.4	X	0.8	=	72.01	(76)
East	0.9x	0.77	X	3.43	X	73.59	X	0.4	X	0.8	=	55.97	(76)
East	0.9x	0.77	X	3.43	X	45.59	x	0.4	x	0.8	=	34.68	(76)
East	0.9x	0.77	X	3.43	X	24.49	X	0.4	X	0.8	=	18.63	(76)
East	0.9x	0.77	X	3.43	X	16.15	X	0.4	X	0.8	=	12.29	(76)
South	0.9x	0.77	X	7.7	X	46.75	x	0.4	x	0.8	=	79.83	(78)
South	0.9x	0.77	X	2.65	X	46.75	X	0.4	x	0.8	=	27.47	(78)
South	0.9x	0.77	X	7.7	X	76.57	x	0.4	x	0.8	=	130.74	(78)
South	0.9x	0.77	x	2.65	x	76.57	x	0.4	x	0.8	=	45	(78)
South	0.9x	0.77	x	7.7	X	97.53	x	0.4	x	0.8	=	166.54	(78)
South	0.9x	0.77	x	2.65	x	97.53	x	0.4	x	0.8	=	57.32	(78)
South	0.9x	0.77	x	7.7	x	110.23	x	0.4	x	0.8	=	188.23	(78)
South	0.9x	0.77	X	2.65	X	110.23	X	0.4	x	0.8	=	64.78	(78)
South	0.9x	0.77	X	7.7	X	114.87	X	0.4	X	0.8	=	196.15	(78)
South	0.9x	0.77	X	2.65	X	114.87	x	0.4	x	0.8	=	67.51	(78)
South	0.9x	0.77	X	7.7	X	110.55	x	0.4	x	0.8	=	188.77	(78)
South	0.9x	0.77	x	2.65	x	110.55	x	0.4	x	0.8	=	64.96	(78)
South	0.9x	0.77	x	7.7	×	108.01	x	0.4	x	0.8	] =	184.44	(78)
South	0.9x	0.77	x	2.65	x	108.01	x	0.4	x	0.8	] =	63.47	(78)
South	0.9x	0.77	x	7.7	x	104.89	x	0.4	x	0.8	] =	179.11	(78)
South	0.9x	0.77	x	2.65	x	104.89	x	0.4	x	0.8	=	61.64	(78)
South	0.9x	0.77	x	7.7	x	101.89	x	0.4	x	0.8	=	173.97	(78)
	_												

	-								,			_					_
South	0.9x	0.77	X	2.6	65	X	1	01.89	X		0.4	X	0.8	=	5	9.87	(78)
South	0.9x	0.77	X	7.	7	X	8	32.59	X		0.4	X	0.8	=	14	1.02	(78)
South	0.9x	0.77	X	2.6	35	X	8	32.59	X		0.4	X	0.8	=	4	3.53	(78)
South	0.9x	0.77	X	7.	7	X	5	55.42	X		0.4	X	0.8	=	9	4.63	(78)
South	0.9x	0.77	X	2.6	35	X	5	55.42	X		0.4	X	0.8		3	2.57	(78)
South	0.9x	0.77	X	7.	7	X		40.4	X		0.4	x	0.8		6	3.98	(78)
South	0.9x	0.77	X	2.6	S5	X		40.4	X		0.4	x	0.8		2	3.74	(78)
West	0.9x	0.77	X	3.4	13	X	1	9.64	X		0.4	x	0.8	=	1	4.94	(80)
West	0.9x	0.77	X	3.4	13	X	3	88.42	X		0.4	x	0.8		2	9.22	(80)
West	0.9x	0.77	X	3.4	13	X	6	3.27	X		0.4	X	0.8		4	3.13	(80)
West	0.9x	0.77	X	3.4	13	X	9	92.28	X		0.4	x	0.8		7	0.19	(80)
West	0.9x	0.77	X	3.4	13	X	1	13.09	X		0.4	x	0.8		8	6.02	(80)
West	0.9x	0.77	X	3.4	13	X	1	15.77	X		0.4	x	0.8		8	3.06	(80)
West	0.9x	0.77	X	3.4	13	X	1	10.22	X		0.4	x	0.8		8	3.84	(80)
West	0.9x	0.77	X	3.4	13	X	9	94.68	X		0.4	x	0.8		7.	2.01	(80)
West	0.9x	0.77	X	3.4	13	X	7	73.59	X		0.4	X	0.8		5	5.97	(80)
West	0.9x	0.77	X	3.4	13	X	4	15.59	X		0.4	x	0.8		3	4.68	(80)
West	0.9x	0.77	X	3.4	13	X	2	24.49	X		0.4	x	0.8		1	3.63	(80)
West	0.9x	0.77	X	3.4	13	X	1	6.15	X		0.4	X	0.8		1:	2.29	(80)
	_								_						'		<del></del>
Solar g	ains in	watts, ca	alculated	for eac	h month	1			(83)m	n = Su	ım(74)m .	(82)m			_		
(83)m=	152.89	264.2	371.12	475.31	546.05	5	47.98	525.87	472	.29	407.12	294.63	3 183.82	130.38	:		(83)
Total g	ains – i	nternal a	ind sola	r (84)m =	= (73)m	+ (8	83)m	, watts					_		_		
(84)m=	554.3	663.64	758.04	842.05	892.36	8	74.53	839.52	79 <sup>2</sup>	1.6	736.74	644.6	557.27	521.35	;		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)											
Temp	erature	during h	eating p	eriods ir	n the liv	ing	area	from Tal	ble 9	, Th1	1 (°C)					21	(85)
Utilisa	tion fac	ctor for g	ains for	living are	ea, h1,n	n (s	ee Ta	ıble 9a)									_
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec			
(86)m=	0.99	0.98	0.96	0.9	0.76		0.58	0.42	0.4	47	0.71	0.93	0.99	1			(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)			-			
(87)m=	19.9	20.1	20.38	20.68	20.89	_	20.98	21	20.		20.94	20.66	20.22	19.86	7		(87)
Temn	erature	during h	eating r	eriods ir	rest of	- dw	elling	from Ta	ahle (	 9 Th	12 (°C)		<b>!</b>				
(88)m=	19.95	19.95	19.96	19.96	19.97	_	9.97	19.97	19.		19.97	19.97	19.96	19.96	7		(88)
				<u> </u>	<u> </u>									<u>!</u>			
(89)m=	0.99	tor for g	0.95	0.87	0.71	_	,m (se 0.49	0.33	9a) 0.3	37	0.62	0.9	0.98	0.99	7		(89)
				<u> </u>	<u> </u>								0.98	0.99			(00)
I		l temper		i e	i	Ť	,	1	r <del>i —</del>		i		1	ī	7		(0.0)
(90)m=	18.51	18.8	19.19	19.62	19.87	1	9.96	19.97	19.	97	19.93	19.6	18.98	18.46			(90)
											f	LA = Li\	ving area ÷ (	4) =		.38	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	ellin	g) = f	LA × T1	+ (1	– fL	A) × T2				_		
(92)m=	19.04	19.29	19.64	20.02	20.25	2	20.34	20.36	20.	36	20.31	20	19.45	18.99			(92)
Annly	adiustr	nent to th	he mear	n interna	l tempe	ratu	re fro	m Table	4e,	whe	re appro	priate					

(00)	1 40 00	1001	00.00	00.05				00.04		10.45	40.00	l	(02)
(93)m= 19.04 8. Space hea	19.29	19.64	20.02	20.25	20.34	20.36	20.36	20.31	20	19.45	18.99		(93)
Set Ti to the				re obtair	ed at ste	ep 11 of	Table 9	b, so tha	t Ti.m=(	76)m an	d re-calc	culate	
the utilisation													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	<del></del>	i	i									l	
(94)m= 0.99	0.98	0.94	0.87	0.72	0.52	0.36	0.4	0.65	0.9	0.98	0.99		(94)
Useful gains	1	· `	r ·	r ·	1,50,00	005.04		101.5	500.50		547.00	1	(OE)
(95)m= 548.56		716.18	730.6	644.85	459.02	305.21	320.1	481.5	580.58	544.88	517.22		(95)
Monthly aver	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat													(==)
	1198.55		916.01	703.55	468.29	306.37	322.06	508.26	773.25	1019.01	1224.67		(97)
Space heatir	ng require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	24 x [(97	ı )m – (95	)m] x (4	1)m			
(98)m= 506.38	370.1	279.83	133.5	43.67	0	0	0	0	143.35	341.37	526.34		
	•	•		•	•	•	Tota	l per year	(kWh/yea	) = Sum(9	8) <sub>15,912</sub> =	2344.55	(98)
Space heatir	ng require	ement in	kWh/m²	<sup>2</sup> /year								32.56	(99)
9b. Energy re	quiremer	nts – Coi	mmunity	heating	scheme								
This part is us	ed for sp	ace hea	iting, spa	ace cool	ing or wa	ater heat				unity sch	neme.		_
Fraction of sp	ace heat	from se	condary/	/supplen	nentary I	neating (	(Table 1	1) '0' if n	one			0	(301)
Fraction of sp	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community s									up to four	other heat	sources; ti	he latter	
includes boilers, Fraction of he		-			rom powe	r stations.	See Appei	ndix C.				1	(303a)
Fraction of tot	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution lo	ss factor	(Table 1	12c) for c	commun	ity heatii	ng syste	m					1.1	(306)
Space heatin	q											kWh/yea	_ r
Annual space	_	requiren	nent									2344.55	7
Space heat from	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	2579	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space heating	g require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heatin	α												<del>_</del>
Annual water	_	equirem	ent									2046.04	
If DHW from o		•											<u> </u>
Water heat fro	om Comr	nunity he	eat pump	)				(64) x (30	03a) x (30	5) x (306) :	=	2250.65	(310a)
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	(310a)(	(310e)] =	48.3	(313)
Cooling Syste	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	g (if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for											·		_
mechanical ve	entilation	- baland	ed, extra	act or po	sitive in	put from	outside					168.76	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		168.76	(331)
Energy for lighting (calculated in Appendix L)				317.91	(332)
Electricity generated by PVs (Appendix M) (negative quantity	y)			-609.72	(333)
Electricity generated by wind turbine (Appendix M) (negative	e quantity)			0	(334)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto		nissions ı CO2/year	
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)	IP) using two fuels repeat (363) to	(366) for the second f	uel	319	(367a)
CO2 associated with heat source 1 [(30	7b)+(310b)] x 100 ÷ (367b) x	0.52	= [	785.76	(367)
Electrical energy for heat distribution	[(313) x	0.52	= [	25.07	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	= [	810.83	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [	0	(374)
CO2 associated with water from immersion heater or instant	taneous heater (312) x	0.52	= [	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		[	810.83	(376)
CO2 associated with electricity for pumps and fans within dv	velling (331)) x	0.52	= [	87.59	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= [	164.99	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	plicable	0.52 x 0.01 :	= [	-316.44	(380)
Total CO2, kg/year sum of (376)(382) =				746.97	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				10.37	(384)

El rating (section 14)

			l loor [	Details:						
<b>A N</b> 1	0:		User L					OTDO	200070	
Assessor Name:	John Simp				a Num				006273	
Software Name:	Stroma FS	AP 2012	_		are Ve			Versic	n: 1.0.4.26	
			Property							
Address :		oen Court, Ma	itland Par	k Estate,	London	i, NW3 2	2EH			
1. Overall dwelling dime	ensions:									
			Are	a(m²)	1	Av. He	eight(m)	_	Volume(m	<u> </u>
Ground floor				72	(1a) x		2.9	(2a) =	208.8	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1d)+(1e)+	(1n)	72	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	208.8	(5)
2. Ventilation rate:										
	main heating	second heatin		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	] = [	0	Х	40 =	0	(6a)
Number of open flues	0	+ 0	<u> </u>	0		0	x	20 =	0	(6b)
Number of intermittent fa	ıns					3	x	10 =	30	(7a)
Number of passive vents	3				Ē	0	x	10 =	0	(7b)
Number of flueless gas f	ires				F	0	x	40 =	0	(7c)
					L					
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = (6a) + (6b)	+(7a)+(7b)+	(7c) =		30		÷ (5) =	0.14	(8)
If a pressurisation test has b			ceed to (17),	otherwise	continue fr	rom (9) to	(16)			_
Number of storeys in t	he dwelling (ns	5)							0	(9)
Additional infiltration							[(9]	)-1]x0.1 =	0	(10)
Structural infiltration: 0					•	ruction			0	(11)
if both types of wall are p deducting areas of openi			g to the grea	ter wall are	ea (after					
If suspended wooden	floor, enter 0.2	(unsealed) o	r 0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dr	aught strippe	d						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)
Air permeability value,	q50, expresse	d in cubic me	tres per h	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	]+(8), otherw	vise (18) =	(16)		•		0.39	(18)
Air permeability value applie	es if a pressurisation	on test has been	done or a de	gree air pe	rmeability	is being u	ısed			` ′
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor		(21) = (18	s) x (20) =				0.33	(21)
Infiltration rate modified t	for monthly win	d speed							_	
Jan Feb	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table	e 7							_	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2\m : 1									
VVIIIU I actor (22a)III = (2	<i>∠j</i> iii <del>7 4</del> 	1.00	. 0.05	T 0.02		T	1	T	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate (al	lowing for sl	helter an	nd wind s	speed) =	(21a) x	(22a)m					
0.43	0.42 0.4		0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39	]	
Calculate effec		•	the appli	cable ca	se	!	!	!	<u> </u>	!	J	
If mechanica			22h) (22	a) [m, /	augtion (I	\ F\\	muiaa (22h	) (220)			0	(23a)
If exhaust air he								) = (23a)			0	(23b)
If balanced with			_					Ola \ (	00h) [4	4 (00-)	0	(23c)
a) If balance	o mechanica	<u> </u>	with he	at recov	ery (MV)	HR) (248	$\frac{a)m = (2)}{0}$	2b)m + ()	$\frac{230) \times [}{0}$	$\frac{1 - (23c)}{0}$	i ÷ 100] ]	(24a)
` ′											J	(244)
b) If balance			T o	near rec	overy (i	0 0	$\int_{0}^{\infty} \int_{0}^{\infty} \int_{0$	0	230)	0	1	(24b)
c) If whole ho					<u> </u>						J	(=)
,	1 < 0.5 × (23		•	•				.5 × (23b	o)			
(24c)m= 0	0 0	<del></del>	0	0	0	0	0	0	0	0	]	(24c)
d) If natural v	/entilation o	whole hous	se positi	ve input	ventilati	on from	loft		l		,	
if (22b)m	n = 1, then (2	(24d)m = (22)	b)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m= 0.59	0.59 0.5	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(24d)
Effective air	<del></del>	<del></del>	<del>í ` ` </del>	<del>í ` ` </del>	<del>``</del>	<del></del>	x (25)	1		1	1	
(25)m= 0.59	0.59 0.5	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
3. Heat losses	s and heat lo	ss paramet	er:									
ELEMENT	Gross area (m²)	Openir n	ngs n²	Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²·		A X k kJ/K
Doors				3.89	x	1.2		4.668	Ì			(26)
Windows Type	1			2.03	x1	/[1/( 1.4 )+	0.04] =	2.69	Ħ			(27)
Windows Type	2			1.97	x1	/[1/( 1.4 )+	0.04] =	2.61				(27)
Windows Type	3			2.03	x1	/[1/( 1.4 )+	0.04] =	2.69				(27)
Windows Type	4			4.55	x1	/[1/( 1.4 )+	0.04] =	6.03	=			(27)
Windows Type	5			1.57	x1	/[1/( 1.4 )+	0.04] =	2.08	=			(27)
Floor				72	X	0.13	i	9.36	<b>=</b>			(28)
Walls	83.2	18.0	1	65.19	) x	0.18	<del>-</del> - i	11.73	<b>=</b>			(29)
Roof	9.02	0		9.02	x	0.13	<del>-</del> - i	1.17	<b>=</b>			(30)
Total area of el	lements, m²	J		164.2	2							(31)
Party wall				23.9	x	0	<b>—</b> = 1	0	п г			(32)
* for windows and ** include the area				alue calcui	ated using		  /[(1/U-valu		as given in	paragrapl	1 3.2	`
Fabric heat los			no arra par	uuono		(26)(30	) + (32) =				45.65	(33)
Heat capacity (	,	•					((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	•	•	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess	ments where th	e details of the	,			recisely the	e indicative	e values of	TMP in Ta	able 1f		` ′
Thermal bridge			using Ap	pendix l	<						10.93	(36)
if details of therma	` '			•								` ′
Total fabric hea	at loss						(33) +	(36) =			56.58	(37)

/entila	tion hea	at loss ca	alculated	monthly	У				(38)m	= 0.33 × (	(25)m x (5)	)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m=	40.72	40.48	40.24	39.12	38.91	37.93	37.93	37.75	38.31	38.91	39.33	39.78		(3
leat tr	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
39)m=	97.3	97.06	96.82	95.7	95.49	94.51	94.51	94.33	94.89	95.49	95.92	96.36		
loot lo	oce para	motor (L	HLP), W/	/m2k/	_	-	-			Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	95.7	(3
10at ic 40)m=	1.35	1.35	1.34	1.33	1.33	1.31	1.31	1.31	1.32	1.33	1.33	1.34		
10)111=	1.00	1.00	1.04	1.00	1.00	1.01	1.01	1.01			Sum(40) <sub>1</sub>	<u> </u>	1.33	(4
Numbe	er of day	s in mor	nth (Tab	le 1a)							- Cum(10)	12712—		`
	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		(4
4. Wa	ater heat	ing ener	rgy requi	irement:								kWh/ye	ar:	
eeum	ned occu	inancy I	NI									20		(4
				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.29		(4
	A £ 13.9					,		, , <u>-</u>	,					
								(25 x N) to achieve		se target o		3.68		(-
		_		r day (all w		_	_	io acriieve	a water us	se largel o	ı			
	Jan	Feb	Mar			Jun	Jul	Δυα	Sep	Oct	Nov	Dec		
ot wate				Apr ach month	Vd,m = fa			Aug (43)	Зер	Oct	INOV	Dec		
l4)m=	97.54	94	90.45	86.9	83.35	79.81	79.81	83.35	86.9	90.45	94	97.54		
4)111=	97.54	94	90.43	00.9	03.33	79.01	79.01	03.33			m(44) <sub>112</sub> =	<u> </u>	1064.1	
nergy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			. ,	_	1004.1	(
15)m=	144.65	126.51	130.55	113.82	109.21	94.24	87.33	100.21	101.41	118.18	129	140.09		
								1	-	Total = Su	m(45) <sub>112</sub> =	=	1395.2	(4
instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					_
16)m=	21.7	18.98	19.58	17.07	16.38	14.14	13.1	15.03	15.21	17.73	19.35	21.01		(-
	storage							***						
·		` ,		•			Ū	within sa	ame ves	sel		150		(-
	•	•		ınk in dw	•			` '	aua) austi	· · (0' in (	(47)			
	storage		not wate	ei (uiis ii	iciuues i	HStaritai	ieous cc	ombi boil	ers) erite	31 U III (	47)			
	•		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(
,			m Table			`	• • • • • • • • • • • • • • • • • • • •					.54		(
				, kWh/ye	ear			(48) x (49)	· =			.75		(
			_	cylinder I		or is not		(12)11(12)			<u> </u>	.73		(
	ater stora	age loss	factor fr	om Tabl	e 2 (kWl	h/litre/da	ıy)					0		(
lot wa	-	_	ee secti	on 4.3										
comr	e factor			O.L							_	0		(
comr		actor fro	ın rable	∠D								0		(
comr olume empe	erature fa							(47) x (51)	x (52) x (	53) =		0		(:
comrollomore commendation comme	/ lost fro	m water	-	, kWh/ye	ear									
comrollome compercipations compercipation compercipation compercipation compercipation comperc	/ lost fro (50) or (	m water [54) in (5	55)	·							0.	.75		(
comrollome compercipations compercipation compercipation compercipation compercipation comperc	/ lost fro (50) or (	m water [54) in (5	55)	e, kWh/ye				((56)m = (	55) × (41)	m 	0.	.75		

	ains dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) - (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 23.3	3 21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circ	uit loss (ar	nual) fro	m Table	3							0		(58)
Primary circ	•	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified	by factor f	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m= 23.2	6 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) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	equired for	water he	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 191.2	25 168.6	177.15	158.91	155.81	139.33	133.92	146.8	146.5	164.77	174.09	186.68		(62)
Solar DHW inp	ut calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 191.2	25 168.6	177.15	158.91	155.81	139.33	133.92	146.8	146.5	164.77	174.09	186.68		
	-						Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	1943.82	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	]	
(65)m= 85.3	7 75.73	80.68	73.92	73.59	67.41	66.31	70.6	69.79	76.57	78.97	83.86		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic ga	ains (Table	e 5). Wat	ts										
Jai													
	I	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 114.6	_	114.68	Apr 114.68	May 114.68	Jun 114.68	Jul 114.68	Aug 114.68	Sep 114.68	Oct 114.68	Nov 114.68	Dec 114.68		(66)
(66)m= 114.6 Lighting gain	88 114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	<b>—</b>	-			(66)
	88 114.68	114.68	114.68	114.68	114.68	114.68	114.68	114.68	<b>—</b>	-			(66) (67)
Lighting gai	114.68 ns (calcula 15.99	114.68 ted in Ap	114.68 opendix 9.84	114.68 L, equati	114.68 ion L9 oi 6.21	114.68 r L9a), a 6.71	114.68 Iso see	114.68 Table 5	14.68	114.68	114.68		
Lighting gair (67)m= 18	114.68 ns (calcula 15.99 gains (calc	114.68 ted in Ap	114.68 opendix 9.84	114.68 L, equati	114.68 ion L9 oi 6.21	114.68 r L9a), a 6.71	114.68 Iso see	114.68 Table 5	14.68	114.68	114.68		
Lighting gair (67)m= 18 Appliances	114.68 ns (calcula 15.99 gains (calcula 22 204.01	114.68 ted in Ap 13 culated in 198.73	114.68 opendix 9.84 Append 187.49	114.68 L, equati 7.36 dix L, eq	114.68 ion L9 or 6.21 uation L 159.97	114.68 r L9a), a 6.71 13 or L1 151.06	114.68 Iso see 8.73 3a), also	114.68 Table 5 11.71 see Tal	114.68 14.87 ble 5 165.48	17.36	114.68		(67)
Lighting gair (67)m= 18 Appliances (68)m= 201.9	114.68 ns (calcula 15.99 gains (calcula 2 204.01 ns (calcula	114.68 ted in Ap 13 culated in 198.73	114.68 opendix 9.84 Append 187.49	114.68 L, equati 7.36 dix L, eq	114.68 ion L9 or 6.21 uation L 159.97	114.68 r L9a), a 6.71 13 or L1 151.06	114.68 Iso see 8.73 3a), also	114.68 Table 5 11.71 see Tal	114.68 14.87 ble 5 165.48	17.36	114.68		(67)
Lighting gain (67)m= 18 Appliances (68)m= 201.9 Cooking gain (69)m= 34.4	114.68 ns (calcula 15.99 gains (calcula 2 204.01 ns (calcula 34.47	ted in Ap 13 culated in 198.73 ated in Ap 34.47	114.68 ppendix 9.84 Append 187.49 ppendix 34.47	114.68 L, equati 7.36 dix L, equati 173.3 L, equat	114.68 ion L9 or 6.21 uation L 159.97 ion L15	114.68 r L9a), a 6.71 13 or L1 151.06 or L15a)	114.68 lso see 8.73 3a), also 148.96	114.68 Table 5 11.71 See Tal 154.24 ee Table	114.68 14.87 ble 5 165.48	114.68 17.36 179.67	114.68 18.5 193.01		(67) (68)
Lighting gain (67)m= 18  Appliances (68)m= 201.6  Cooking gain	114.68 ns (calcula 15.99 gains (calcula 2 204.01 ns (calcula 34.47	ted in Ap 13 culated in 198.73 ated in Ap 34.47	114.68 ppendix 9.84 Append 187.49 ppendix 34.47	114.68 L, equati 7.36 dix L, equati 173.3 L, equat	114.68 ion L9 or 6.21 uation L 159.97 ion L15	114.68 r L9a), a 6.71 13 or L1 151.06 or L15a)	114.68 lso see 8.73 3a), also 148.96	114.68 Table 5 11.71 See Tal 154.24 ee Table	114.68 14.87 ble 5 165.48	114.68 17.36 179.67	114.68 18.5 193.01		(67) (68)
Lighting gain (67)m= 18  Appliances (68)m= 201.9  Cooking gain (69)m= 34.4  Pumps and (70)m= 3	114.68 ns (calcula 15.99 gains (calcula 2 204.01 ns (calcula 3 34.47 fans gains	ted in Ap 13 culated in 198.73 ated in Ap 34.47 (Table 5	114.68 ppendix 9.84 Append 187.49 ppendix 34.47 5a) 3	114.68 L, equati 7.36 dix L, eq 173.3 L, equat 34.47	114.68 ion L9 or 6.21 uation L 159.97 ion L15 34.47	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47	114.68 Iso see 8.73 3a), also 148.96 ), also se 34.47	114.68 Table 5 11.71 see Tal 154.24 ee Table 34.47	114.68 14.87 ble 5 165.48 5 34.47	114.68 17.36 179.67 34.47	114.68 18.5 193.01 34.47		(67) (68) (69)
Lighting gair (67)m= 18  Appliances (68)m= 201.9  Cooking gair (69)m= 34.4  Pumps and	114.68 ns (calcula 15.99 gains (calcula 2 204.01 ns (calcula 3 34.47 fans gains 3 evaporatio	ted in Ap 13 culated in 198.73 ated in Ap 34.47 (Table 5	114.68 ppendix 9.84 Append 187.49 ppendix 34.47 5a) 3	114.68 L, equati 7.36 dix L, eq 173.3 L, equat 34.47	114.68 ion L9 or 6.21 uation L 159.97 ion L15 34.47	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47	114.68 Iso see 8.73 3a), also 148.96 ), also se 34.47	114.68 Table 5 11.71 see Tal 154.24 ee Table 34.47	114.68 14.87 ble 5 165.48 5 34.47	114.68 17.36 179.67 34.47	114.68 18.5 193.01 34.47		(67) (68) (69)
Lighting gain (67)m= 18  Appliances (68)m= 201.5  Cooking gain (69)m= 34.4  Pumps and (70)m= 3  Losses e.g. (71)m= -91.7	114.68 ns (calcular 15.99 gains (calcular 2 204.01 ns (calcular 3 34.47 fans gains 3 evaporation 5 -91.75	ted in Ap 13 culated in 198.73 ated in A 34.47 (Table 5 3 on (negation)	114.68 ppendix 9.84 Append 187.49 ppendix 34.47 5a) 3 tive valu	114.68 L, equati 7.36 dix L, eq 173.3 L, equat 34.47  3 es) (Tab	114.68 ion L9 of 6.21 uation L 159.97 ion L15 34.47 3	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47	114.68 Iso see 8.73 3a), also 148.96 , also se 34.47	114.68 Table 5 11.71 See Tal 154.24 ee Table 34.47	114.68 14.87 ble 5 165.48 5 34.47	114.68 17.36 179.67 34.47	114.68 18.5 193.01 34.47		(67) (68) (69) (70)
Lighting gain (67)m= 18  Appliances (68)m= 201.9  Cooking gain (69)m= 34.4  Pumps and (70)m= 3  Losses e.g.	114.68 ns (calcular 15.99) gains (calcular 15.99) gains (calcular 34.47) fans gains 3 evaporation 15 -91.75 ng gains (7	ted in Ap 13 culated in 198.73 ated in A 34.47 (Table 5 3 on (negation)	114.68 ppendix 9.84 Append 187.49 ppendix 34.47 5a) 3 tive valu	114.68 L, equati 7.36 dix L, eq 173.3 L, equat 34.47  3 es) (Tab	114.68 ion L9 of 6.21 uation L 159.97 ion L15 34.47 3	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47	114.68 Iso see 8.73 3a), also 148.96 , also se 34.47	114.68 Table 5 11.71 See Tal 154.24 ee Table 34.47	114.68 14.87 ble 5 165.48 5 34.47	114.68 17.36 179.67 34.47	114.68 18.5 193.01 34.47		(67) (68) (69) (70)
Lighting gain (67)m= 18  Appliances (68)m= 201.9  Cooking gain (69)m= 34.4  Pumps and (70)m= 3  Losses e.g. (71)m= -91.7  Water heatin (72)m= 114.7	114.68 114.68 15.99 193	114.68  ted in Ap 13 culated in 198.73 ated in Ap 34.47 (Table 5 3 on (negation of the second of the	114.68 ppendix 9.84 Appendix 187.49 ppendix 34.47 5a) 3 tive valu -91.75	114.68 L, equati 7.36 dix L, equati 173.3 L, equati 34.47  3 es) (Tab	114.68 ion L9 or 6.21 uation L 159.97 ion L15 34.47 3 lle 5) -91.75	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47 3	114.68 Iso see 8.73 3a), also 148.96 0, also se 34.47 3	114.68 Table 5 11.71 see Tal 154.24 ee Table 34.47 3	114.68  14.87 ble 5 165.48 5 34.47  3 -91.75	114.68 17.36 179.67 34.47 3 -91.75	114.68 18.5 193.01 34.47 3 -91.75		(67) (68) (69) (70)
Lighting gain (67)m= 18  Appliances (68)m= 201.9  Cooking gain (69)m= 34.4  Pumps and (70)m= 3  Losses e.g. (71)m= -91.7  Water heatin	114.68 ns (calcular 15.99) gains (calcular 15.99) gains (calcular 34.47) fans gains 3 evaporation 15 -91.75 ng gains (175 112.7) nal gains =	114.68  ted in Ap 13 culated in 198.73 ated in Ap 34.47 (Table 5 3 on (negation of the second of the	114.68 ppendix 9.84 Appendix 187.49 ppendix 34.47 5a) 3 tive valu -91.75	114.68 L, equati 7.36 dix L, equati 173.3 L, equati 34.47  3 es) (Tab	114.68 ion L9 or 6.21 uation L 159.97 ion L15 34.47 3 lle 5) -91.75	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47 3	114.68 Iso see 8.73 3a), also 148.96 0, also se 34.47 3	114.68 Table 5 11.71 See Tal 154.24 ee Table 34.47 3 -91.75	114.68  14.87 ble 5 165.48 5 34.47  3 -91.75	114.68 17.36 179.67 34.47 3 -91.75	114.68 18.5 193.01 34.47 3 -91.75		(67) (68) (69) (70)
Lighting gain (67)m= 18  Appliances (68)m= 201.5  Cooking gain (69)m= 34.4  Pumps and (70)m= 3  Losses e.g. (71)m= -91.7  Water heatin (72)m= 114.7  Total intern	114.68  15.99  gains (calcula 15.99  gains (calcula 2 204.01  ns (calcula 3 34.47  fans gains 3  evaporation 5 -91.75  ng gains (7) 112.7  al gains =	114.68  ted in Ap	114.68 ppendix 9.84 Appendix 187.49 ppendix 34.47 5a) 3 tive valu -91.75	114.68 L, equati 7.36 dix L, equati 173.3 L, equati 34.47  3 es) (Tab -91.75	114.68 ion L9 or 6.21 uation L 159.97 ion L15 34.47  3 lle 5) -91.75	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47 3 -91.75	114.68 Iso see 8.73 3a), also 148.96 ), also se 34.47 3 -91.75	114.68 Table 5 11.71 see Tal 154.24 ee Table 34.47  3  -91.75  96.93 + (69)m + (	114.68  14.87  ble 5  165.48  5  34.47  3  -91.75  102.92  (70)m + (7	114.68 17.36 179.67 34.47 3 -91.75 109.68 1)m + (72)	114.68 18.5 193.01 34.47 3 -91.75		(67) (68) (69) (70) (71) (72)
Lighting gain (67)m= 18  Appliances (68)m= 201.9  Cooking gain (69)m= 34.4  Pumps and (70)m= 3  Losses e.g. (71)m= -91.7  Water heatin (72)m= 114.7  Total interm (73)m= 395.6	114.68  15.99  gains (calcula 15.99  gains (calcula 2 204.01  ns (calcula 3 34.47  fans gains 3  evaporation 5 -91.75  ng gains (7  112.7  al gains = 07 393.11  ins:	114.68  ted in Ap	114.68 ppendix 9.84 Appendix 187.49 ppendix 34.47 5a) 3 tive valu -91.75 102.66	114.68 L, equati 7.36 dix L, eq 173.3 L, equati 34.47  3 es) (Tab -91.75  98.91	114.68 ion L9 or 6.21 uation L 159.97 ion L15 34.47  3 lle 5) -91.75  93.62 (66) 320.21	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47  3 -91.75  89.13 m + (67)m 307.31	114.68 Iso see 8.73 3a), also 148.96 ), also se 34.47  3  -91.75  94.89 1+(68)m+ 312.98	114.68 Table 5 11.71 see Tal 154.24 ee Table 34.47  3  -91.75  96.93 + (69)m +	114.68  14.87  ble 5  165.48  5  34.47  3  -91.75  102.92  (70)m + (7  343.68	114.68 17.36 179.67 34.47 3 -91.75 109.68 1)m + (72) 367.11	114.68  18.5  193.01  34.47  3  -91.75  112.71		(67) (68) (69) (70) (71) (72)
Lighting gain (67)m= 18  Appliances (68)m= 201.5  Cooking gain (69)m= 34.4  Pumps and (70)m= 3  Losses e.g. (71)m= -91.7  Water heatin (72)m= 114.7  Total interm (73)m= 395.6  6. Solar gain	114.68  15.99  gains (calcula 15.99  gains (calcula 2 204.01  ns (calcula 3 34.47  fans gains 3  evaporatio 5 -91.75  ng gains (7) 112.7  al gains = 07 393.11  ins: re calculated	114.68  ted in Ap	114.68 ppendix 9.84 Appendix 187.49 ppendix 34.47 5a) 3 tive valu -91.75 102.66	114.68 L, equati 7.36 dix L, eq 173.3 L, equati 34.47  3 es) (Tab -91.75  98.91	114.68 ion L9 of 6.21 uation L 159.97 ion L15 34.47  3 lle 5) -91.75  93.62 (66) 320.21  and associ	114.68 r L9a), a 6.71 13 or L1: 151.06 or L15a) 34.47  3 -91.75  89.13 m + (67)m 307.31	114.68 Iso see 8.73 3a), also 148.96 1, also se 34.47 3 -91.75 94.89 1+ (68)m + 312.98	114.68 Table 5 11.71 see Tal 154.24 ee Table 34.47  3  -91.75  96.93 + (69)m +	114.68  14.87  ble 5  165.48  5  34.47  3  -91.75  102.92  (70)m + (7  343.68	114.68 17.36 179.67 34.47 3 -91.75 109.68 1)m + (72) 367.11	114.68  18.5  193.01  34.47  3  -91.75  112.71	Gains (W)	(67) (68) (69) (70) (71) (72)

	_		,						ı		,		_
North	0.9x	0.77	X	1.97	X	10.63	X	0.63	X	0.7	=	12.8	(74)
North	0.9x	0.77	X	1.97	X	20.32	X	0.63	X	0.7	=	24.47	(74)
North	0.9x	0.77	X	1.97	X	34.53	X	0.63	X	0.7	=	41.58	(74)
North	0.9x	0.77	X	1.97	X	55.46	X	0.63	X	0.7	=	66.79	(74)
North	0.9x	0.77	X	1.97	X	74.72	X	0.63	X	0.7	=	89.97	(74)
North	0.9x	0.77	X	1.97	X	79.99	X	0.63	X	0.7	=	96.31	(74)
North	0.9x	0.77	X	1.97	x	74.68	X	0.63	X	0.7	=	89.92	(74)
North	0.9x	0.77	X	1.97	x	59.25	x	0.63	x	0.7	=	71.34	(74)
North	0.9x	0.77	X	1.97	x	41.52	X	0.63	x	0.7	=	49.99	(74)
North	0.9x	0.77	X	1.97	x	24.19	x	0.63	x	0.7	] =	29.13	(74)
North	0.9x	0.77	x	1.97	x	13.12	X	0.63	x	0.7	=	15.8	(74)
North	0.9x	0.77	X	1.97	x	8.86	X	0.63	x	0.7	=	10.67	(74)
East	0.9x	0.77	X	2.03	x	19.64	X	0.63	x	0.7	=	12.18	(76)
East	0.9x	0.77	x	2.03	x	38.42	X	0.63	x	0.7	=	23.84	(76)
East	0.9x	0.77	X	2.03	x	63.27	X	0.63	x	0.7	=	39.25	(76)
East	0.9x	0.77	X	2.03	x	92.28	X	0.63	x	0.7	=	57.25	(76)
East	0.9x	0.77	x	2.03	x	113.09	X	0.63	x	0.7	=	70.16	(76)
East	0.9x	0.77	x	2.03	x	115.77	X	0.63	x	0.7	=	71.82	(76)
East	0.9x	0.77	X	2.03	x	110.22	X	0.63	x	0.7	=	68.38	(76)
East	0.9x	0.77	X	2.03	x	94.68	X	0.63	X	0.7	=	58.74	(76)
East	0.9x	0.77	x	2.03	x	73.59	X	0.63	x	0.7	=	45.65	(76)
East	0.9x	0.77	X	2.03	x	45.59	x	0.63	x	0.7	] =	28.28	(76)
East	0.9x	0.77	x	2.03	x	24.49	x	0.63	x	0.7	] =	15.19	(76)
East	0.9x	0.77	X	2.03	x	16.15	x	0.63	x	0.7	] =	10.02	(76)
South	0.9x	0.77	x	4.55	x	46.75	x	0.63	x	0.7	=	65.01	(78)
South	0.9x	0.77	x	1.57	x	46.75	x	0.63	x	0.7	] =	22.43	(78)
South	0.9x	0.77	X	4.55	x	76.57	X	0.63	x	0.7	=	106.47	(78)
South	0.9x	0.77	x	1.57	x	76.57	x	0.63	x	0.7	] =	36.74	(78)
South	0.9x	0.77	X	4.55	x	97.53	X	0.63	X	0.7	=	135.62	(78)
South	0.9x	0.77	X	1.57	x	97.53	X	0.63	x	0.7	=	46.8	(78)
South	0.9x	0.77	X	4.55	x	110.23	x	0.63	x	0.7	] =	153.29	(78)
South	0.9x	0.77	x	1.57	x	110.23	x	0.63	x	0.7	] =	52.89	(78)
South	0.9x	0.77	X	4.55	x	114.87	x	0.63	x	0.7	j =	159.73	(78)
South	0.9x	0.77	x	1.57	x	114.87	x	0.63	x	0.7	] =	55.12	(78)
South	0.9x	0.77	X	4.55	x	110.55	x	0.63	x	0.7	] =	153.72	(78)
South	0.9x	0.77	x	1.57	x	110.55	x	0.63	x	0.7	j =	53.04	(78)
South	0.9x	0.77	X	4.55	x	108.01	x	0.63	x	0.7	] =	150.19	(78)
South	0.9x	0.77	X	1.57	x	108.01	x	0.63	x	0.7	j =	51.83	(78)
South	0.9x	0.77	j x	4.55	×	104.89	x	0.63	x	0.7	j =	145.86	(78)
South	0.9x	0.77	x	1.57	x	104.89	x	0.63	x	0.7	j =	50.33	(78)
South	0.9x	0.77	x	4.55	x	101.89	x	0.63	x	0.7	i =	141.68	(78)
	L		_						ı				_

	_								,			_					_
South	0.9x	0.77	X	1.5	57	X	1	01.89	X	0.63	X		0.7		=	48.89	(78)
South	0.9x	0.77	X	4.5	55	X	8	2.59	X	0.63	X		0.7		=	114.84	(78)
South	0.9x	0.77	X	1.5	57	X	8	2.59	X	0.63	Х		0.7		=	39.63	(78)
South	0.9x	0.77	X	4.5	55	X	5	5.42	X	0.63	х		0.7		=	77.06	(78)
South	0.9x	0.77	X	1.5	57	X	5	5.42	x	0.63	X		0.7		=	26.59	(78)
South	0.9x	0.77	X	4.5	55	X	4	40.4	X	0.63	X		0.7		=	56.18	(78)
South	0.9x	0.77	X	1.5	7	X		40.4	X	0.63	х		0.7		=	19.38	(78)
West	0.9x	0.77	Х	2.0	13	X	1	9.64	x	0.63	х		0.7		=	12.18	(80)
West	0.9x	0.77	Х	2.0	13	X	3	8.42	x	0.63	х		0.7		=	23.84	(80)
West	0.9x	0.77	X	2.0	13	X	6	3.27	x	0.63	х		0.7		=	39.25	(80)
West	0.9x	0.77	X	2.0	13	X	9	2.28	x	0.63	x		0.7		=	57.25	(80)
West	0.9x	0.77	X	2.0	13	X	1	13.09	x	0.63	x		0.7		=	70.16	(80)
West	0.9x	0.77	X	2.0	13	x	1	15.77	x	0.63	x		0.7		=	71.82	(80)
West	0.9x	0.77	x	2.0	3	x	1	10.22	x	0.63	x	F	0.7		=	68.38	(80)
West	0.9x	0.77	X	2.0	3	x	9	4.68	x	0.63	x		0.7		=	58.74	(80)
West	0.9x	0.77	x	2.0	3	X	7	3.59	x	0.63	x	F	0.7		=	45.65	(80)
West	0.9x	0.77	x	2.0	3	X	4	5.59	x	0.63	x		0.7		=	28.28	(80)
West	0.9x	0.77	х	2.0	13	X	2	4.49	x	0.63	x	Ī	0.7		=	15.19	(80)
West	0.9x	0.77	X	2.0	13	X	1	6.15	x	0.63	x	F	0.7		=	10.02	(80)
West 0.9x 0.77 x 2.03 x 16.15 x 0.63 x 0.7 = 10.02 (80)																	
Solar g	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																
(83)m=	124.62	215.35	302.51	387.46	445.14	4	46.72	428.7	38	5 331.86	240.	16	149.83	106.	27		(83)
		nternal a	nd solar	(84)m =	(73)m	+ (	83)m	, watts									
(84)m=	519.69	608.46	683.1	747.87	785.12	7	66.93	736	697	.98 655.15	583.	84	516.94	490.	.9		(84)
7. Mea	an inter	nal temp	erature	(heating	seasor	1)											
Tempe	erature	during h	eating p	eriods ir	the livi	ing	area	from Tal	ble 9,	Th1 (°C)						21	(85)
Utilisa	tion fac	tor for g	ains for l	iving are	a, h1,n	า (ร	ee Ta	ble 9a)			_					1	
ļ	Jan	Feb	Mar	Apr	May	┖	Jun	Jul	Aı	ug Sep	00	ct	Nov	De	C		
(86)m=	1	0.99	0.98	0.95	0.86	L	0.71	0.55	0.5	0.82	0.9	6	0.99	1			(86)
Mean	interna	l tempera	ature in	living are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	19.61	19.79	20.07	20.43	20.74	2	20.92	20.98	20.	97 20.85	20.4	15	19.96	19.5	8		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	able 9	), Th2 (°C)	)					•	
(88)m=	19.8	19.8	19.81	19.82	19.82	1	9.83	19.83	19.		19.8	32	19.82	19.8	1		(88)
Utilisa	tion fac	tor for ga	ains for	rest of d	welling	h2	m (se	e Table	9a)								
(89)m=	0.99	0.99	0.97	0.92	0.81	1	0.61	0.41	0.4	6 0.73	0.9	4	0.99	1			(89)
· · L								allaw ata	<u> </u>	<u> </u>		!					
(90)m=	17.97	18.24	18.65	19.16	19.57	Ť	9.78	19.82	19.8	to 7 in Tal	19.2		18.5	17.9	13		(90)
(90)111=	17.91	10.24	10.03	19.10	19.57	<u> </u>	9.70	19.02	19.	19.71			area ÷ (4			0.38	(91)
													, a. sa , (1	-, -		0.38	(31)
г						_		<del> </del>	<del></del>	– fLA) × T2			1		_	ı	(0.5)
(92)m=	18.59	18.83	19.19	19.64	20.01		20.21	20.26	20.:				19.05	18.5	5		(92)
Apply	adjustr	nent to th	ne mean	ınternal	tempe	ratu	ire tro	m Table	e 4e,	where app	ropriat	е					

(00)	40.50	40.02	40.40	40.04	20.04	20.24	20.20	00.00	20.44	40.00	40.05	40.55		(93)
(93)m=	18.59	18.83	19.19	19.64	20.01	20.21	20.26	20.26	20.14	19.68	19.05	18.55		(93)
			uirement				44 -4	Table 0	41	4 T: /	70\	-11-	lata	
			or gains			ed at ste	ер ттог	rable 9	b, so tha	t 11,m=(	rojm an	d re-caid	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm					,						
(94)m=	0.99	0.98	0.97	0.92	0.82	0.65	0.46	0.51	0.76	0.94	0.98	0.99		(94)
Usefu			W = (94)	<del></del>			ı	,			ı			
(95)m=		598.62	659.78	688.53	645.38	494.97	339.84	354.43	497.93	547.34	508.8	487.76		(95)
	nly aver	age exte	rnal tem	perature			•	,						
(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)
							<del>-``</del>	<del>- `                                   </del>	– (96)m					
	1390.28			1027.88	793.17	530.41	345.95	363.76	573.17	866.68	1146.54	1382.99		(97)
Space		· · ·	ı	i		Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	650.85	506.08	423.08	244.33	109.95	0	0	0	0	237.59	459.17	666.05		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	3297.1	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								45.79	(99)
9a En	erav rea	uiremer	nts – Indi	ividual h	eating sy	vstems i	ncluding	micro-C	CHP)					
	e heatir		no ma	Madain	outing of	y otorno r	rioraanig	, moro c	)					
•		•	at from s	econdar	v/supple	mentary	system						0	(201)
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s) (202) = 1 - (201) =														(202)
Fraction of space heat from main system(s) $ (202) = 1 - (201) = $ Fraction of total heating from main system 1 $ (204) = (202) \times [1 - (203)] = $														](204)
			ace heat	-					, -	`			93.5	(206)
	•	-	ry/supple			n eveten	n %						0	(208)
Lillon						-		۸	Can	0-4	Nav	Daa		」` ′
Snac	Jan	Feb	Mar ement (c	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Opac	650.85	506.08	423.08	244.33	109.95	0	0	0	0	237.59	459.17	666.05		
(044)			<u> </u>			Ů			Ŭ	207.00	400.17	000.00		(0.1.1)
(211)m			(4)] } x 1					I 0		05444	404.00	740.05		(211)
	696.09	541.26	452.49	261.32	117.6	0	0	0 Tota	0 II (kWh/yea	254.11	491.09	712.35		7(044)
								1018	ii (KVVII/yea	ar) =Surri(2	2     ) <sub>15,1012</sub>	F	3526.31	(211)
•		•	econdar	• •	month									
			00 ÷ (20		0	0		Ι ο				0		
(215)m=	0	0	0	0	0	0	0	0 Tota	0 II (kWh/yea	0	0	0		7(045)
								1018	ii (KVVII/yea	ar) =Surri(2	213) <sub>15,1012</sub>	F	0	(215)
	heating													
Output	191.25	ater hea 168.6	ter (calc 177.15	ulated al	oove) 155.81	139.33	133.92	146.8	146.5	164.77	174.09	186.68		
Efficio				156.91	155.61	139.33	133.92	140.6	146.5	104.77	174.09	100.00	70.0	(216)
	ncy of w			05.00	00.0	70.0	70.0	T 70.0	70.0	05.70	07.00	07.00	79.8	┙
(217)m=		87.57	87.05	85.96	83.9	79.8	79.8	79.8	79.8	85.79	87.28	87.92		(217)
		•	kWh/mo (217) ÷ (											
	217.76	192.54	203.49	184.87	185.69	174.6	167.82	183.97	183.58	192.07	199.46	212.34		
•			I	I				<u> </u>	l = Sum(2		l .		2298.19	(219)
Annus	al totals										Wh/year		kWh/year	<b>」</b> ` ⁻′
		fuel use	ed, main	system	1					.,	,		3526.31	7
	_												1	_

					_
Water heating fuel used				2298.19	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (23	30a)(230g) =		75	(231)
Electricity for lighting				317.91	(232)
12a. CO2 emissions – Individual heating systems	s 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	=	761.68	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	496.41	(264)
Space and water heating	(261) + (262) + (263) + (264) =	=		1258.09	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	164.99	(268)
Total CO2, kg/year	SL	um of (265)(271) =		1462.01	(272)

TER =

(273)

29.92

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:36:43

Project Information:

Assessed By: John Simpson (STRO006273) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 71.8m<sup>2</sup>

Site Reference: Maitland Park Estate

Plot Reference: GT 004

Address: GT 004, Aspen Court, Maitland Park Estate, London, NW3 2EH

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 32.14 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER)

12.71 kg/m<sup>2</sup>

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 68.9 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 70.3 kWh/m²

Fail

Excess energy =  $1.38 \text{ kg/m}^2 (02.0 \%)$ 

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
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 2.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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%	ОК
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	ok
MVHR efficiency:	90%	
Minimum	70%	ОК
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: West	6.86m²	
Windows facing: North	13.32m²	
Windows facing: East	6.86m²	
Windows facing: North	2.65m²	
Windows facing: East	2.65m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
Roofs U-value	0.1 W/m²K	
External Walls U-value	0.12 W/m <sup>2</sup> K	
Party Walls U-value	0 W/m²K	
Floors U-value	0.12 W/m²K	
Community heating, heat from electric heat pump Photovoltaic array		

			lloor F	Notaile						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20	)12	User D	Strom Softwa					0006273 on: 1.0.4.26	
		Р	roperty	Address	GT 004	ļ				
Address :	GT 004, Aspen Co	ourt, Maitla	and Parl	k Estate,	London	, NW3 2	EH.			
1. Overall dwelling din	nensions:									
Ground floor				<b>a(m²)</b> 71.8	(1a) x		ight(m) 2.9	(2a) =	Volume(m <sup>3</sup> 208.22	(3a)
Total floor area TFA =	(1a)+(1b)+(1c)+(1d)+(1	le)+(1r	٦) [	71.8	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	208.22	(5)
2. Ventilation rate:										
Number of chimneys	heating +	secondai heating	- - - - -	other 0	] = [	total 0		40 =	m³ per hou	(6a)
Number of open flues	0 +	0	+	0	] = [	0	X	20 =	0	(6b)
Number of intermittent	fans					0	X	10 =	0	(7a)
Number of passive ven	ts					0	X	10 =	0	(7b)
Number of flueless gas	fires				Ī	0	X 4	40 =	0	(7c)
					_			A: ak		<del>_</del>
1 600 - 1 - 1 - 1 - 1		(O-) - (Ob.) - (T	<b>7</b> - ) - ( <b>7</b> 1- ) - (	(7.)	_				nanges per ho	_
Infiltration due to chimn	neys, flues and fans = s been carried out or is inten				continuo fr	0		÷ (5) =	0	(8)
Number of storeys in		dea, procee	u 10 (17),	ou iei wise (	onunue m	om ( <del>9)</del> to	(10)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timbe	r frame or	0.35 fo	r masoni	y constr	uction			0	(11)
	present, use the value corre nings); if equal user 0.35	esponding to	o the great	ter wall are	a (after					
If suspended wooder	n floor, enter 0.2 (unse	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	enter 0.05, else enter 0	)							0	(13)
Percentage of windo	ws and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
	e, q50, expressed in cu		•	•	•	etre of e	envelope	area	2	(17)
If based on air permeal	ollity value, then (10) = 1 dies if a pressurisation test h					is heina u	sad		0.1	(18)
Number of sides shelte		ao been aei	10 01 a ao	groo an po	modelinty	io boilig a	ocu		2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpor	ating shelter factor			(21) = (18	x (20) =				0.08	(21)
Infiltration rate modified	for monthly wind spee	ed								<u> </u>
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind	speed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (	 (22)m ∸ 4									
(22a)m = 1.27  1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
` '									j	

Adjusted infiltra	ation rate (allov	ving for sl	nelter an	ıd wind s	speed) =	: (21a) x	(22a)m					
0.11	0.11 0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1	]	
Calculate effec	-	rate for t	he appli	cable ca	se							
If mechanica		aandiy NL (C	12h) (22a	s) Fm; //	aguatian (	NEW atho		·) (22a)			0.5	(23a)
	eat pump using Ap							)) = (23a)			0.5	(23b)
	heat recovery: eff	-	_					Ol- \ /	005) [	4 (00-)	76.5	(23c)
a) if balance (24a)m= 0.23	d mechanical v	0.21	0.21	0.2	0.2	HR) (248	a)m = (2.0)	2b)m + ( 0.21	23b) <b>x</b> [	1 - (23c)	) ÷ 100] ]	(24a)
` '	d mechanical v		<u> </u>			<u> </u>	<u> </u>	ļ		0.22		(244)
(24b)m= 0		0	0	0		0 0	0	0	0	0	1	(24b)
\ ''	ouse extract ve	<u> </u>	<u> </u>								J	(=)
,	$0.5 \times (23b)$ ,		•	•				.5 × (23b	o)			
(24c)m= 0	0 0	O	0	0	0	0	0	O	0	0	]	(24c)
d) If natural	ventilation or w	hole hous	se positiv	ve input	ventilati	on from	loft		!	•	J	
if (22b)m	n = 1, then (24c	l)m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	22b)m² x	0.5]				
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change rate - e	enter (24a	) or (24b	o) or (24	c) or (24	ld) in bo	x (25)					
(25)m= 0.23	0.22 0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(25)
3. Heat losses	s and heat loss	paramet	er:									
ELEMENT	Gross area (m²)	Openin		Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²-		A X k kJ/K
Doors				3.89	x	1.4	=	5.446				(26)
Windows Type	1			3.43	x1	/[1/( 1.4 )+	0.04] =	4.55	=			(27)
Windows Type	2			3.33	x1	/[1/( 1.4 )+	- 0.04] =	4.41	Ħ			(27)
Windows Type	3			3.43	x1	/[1/( 1.4 )+	- 0.04] =	4.55	=			(27)
Windows Type	4			2.65	x1	/[1/( 1.4 )+	- 0.04] =	3.51				(27)
Windows Type	5			2.65		/[1/( 1.4 )+	- 0.04] =	3.51	Ħ			(27)
Floor				71.8	=	0.12		8.616	Ħ r			(28)
Walls	81.72	36.2	3	45.49	=	0.12		5.46	=		7 F	(29)
Roof	18.04	0		18.04	=	0.1		1.8	륵 ;			(30)
Total area of e				171.5	=	0.1		1.0				(31)
Party wall	,			54.23	=	0		0				(32)
* for windows and	roof windows. use	effective wi	ndow U-va						L as aiven in	paragrapl		(02)
** include the area						,		,	<b>J</b>	7		
Fabric heat los	s, $W/K = S(A)$	k U)				(26)(30	) + (32) =				64.2	(33)
Heat capacity (	Cm = S(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parameter (TM	IP = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used instea			construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	es:S(LxY)ca	alculated	using Ap	pendix l	K						18.54	(36)
if details of therma		nown (36) =	= 0.05 x (3	11)			(0.5)	(0.0)				<del></del> 1.
Total fabric hea	at IOSS						(33) +	- (36) =			82.74	(37)

Ventilat	ion hea	nt loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	(25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.52	15.37	15.23	14.5	14.35	13.62	13.62	13.48	13.91	14.35	14.64	14.94		(38)
Heat tra	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (37)	38)m		•	
(39)m=	98.26	98.11	97.96	97.23	97.09	96.36	96.36	96.21	96.65	97.09	97.38	97.67		
				/ 014	•	•		•		_	Sum(39) <sub>1</sub>	12 /12=	97.2	(39)
г		<u>`</u>	HLP), W/	i	4.05		1			= (39)m ÷		4.00	1	
(40)m=	1.37	1.37	1.36	1.35	1.35	1.34	1.34	1.34	1.35	1.35	1.36	1.36	4.05	7(40)
Numbe	r of day	s in moi	nth (Tab	le 1a)						Average =	Sum(40) <sub>1</sub>	12 / 1 Z=	1.35	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
-	•		•	•	•	•		•		•	•	•	•	
4. Wat	ter heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
A course	ad agai	nonov. I	NI.										1	(40
		ipancy, I 9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		29		(42
	A £ 13.9				`	•		, ,1	`					
								(25 x N)				3.56		(43
		_	not water person per			_	_	to achieve	a water us	se target o	T			
Г								- Λα	Con	Oct	Nov	Doo	1	
L Hot wate	Jan r usage ir	Feb	Mar day for ea	Apr ach month	May <i>Vd.m</i> = fa	Jun ctor from	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
г	97.42	93.88	90.34	86.79	83.25	79.71	79.71	83.25	86.79	90.34	93.88	97.42		
(44)m=	97.42	93.00	90.34	66.79	63.23	79.71	79.71	63.25	<u> </u>		m(44) <sub>112</sub> =		1062.77	(44
Energy c	ontent of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600			. ,		1002.77	(
(45)m=	144.47	126.36	130.39	113.68	109.07	94.12	87.22	100.08	101.28	118.03	128.84	139.91		
If in atoms		otor booti	na ot noint	of upo (no	bot water	r otorogol	antar O in	havea (46		Total = Su	m(45) <sub>112</sub> =	=	1393.46	(45)
_	-		· ·	·		· · · ·		boxes (46		47.7	1000	00.00	1	(40
(46)m=   Water s	21.67 storage	18.95	19.56	17.05	16.36	14.12	13.08	15.01	15.19	17.7	19.33	20.99		(46
	U		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47
_		` ,	nd no ta	•			_					0	l	
	-	•			-			mbi boil	ers) ente	er '0' in (	47)			
Water s	storage	loss:											_	
a) If ma	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48
Tempe	rature fa	actor fro	m Table	2b								0		(49
• • •			storage	-				(48) x (49	) =		1	10		(50
,			eclared o	-									1	
		_	factor fr ee section		e 2 (KVV	n/litre/da	ay)				0.	.02		(51
	•	from Tal		011 4.5								.03	]	(52
			m Table	2b							-	.6		(52
•			storage		ear			(47) x (51	) x (52) x (	53) =			]	(54
•		54) in (5	-	, INVIII/ y	Jui			( +1 ) X (U1	, ^ (02) ^ (			.03		(54)
,	,		culated f	for each	month			((56)m = (	55) × (41)	m	<u>'</u>		I	,55
г	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	1	(56
(56)m=	J∠.U1	20.92	32.01	30.96	32.01	30.96	32.01	J 32.01	30.86	32.01	30.96	32.01	I	(30)

If cylinder cont	ains dedicate	ed solar sto	orage, (57)	m = (56)m	x [(50) – (	[H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.0	1 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circ	uit loss (ar	nnual) fro	om Table		•	•	•	•	•		0		(58)
Primary circ	`	,			(59)m = (	(58) ÷ 36	65 × (41)	m				'	
(modified	by factor f	rom Tab	le H5 if t	here is	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.2	6 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) ÷ 30	65 × (41)	)m	_	-				
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat r	equired for	water h	eating ca	alculated	d for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 199.	75 176.28	185.66	167.17	164.35	147.62	142.5	155.36	154.77	173.31	182.34	195.19		(62)
Solar DHW inp	ut calculated	using App	endix G o	r Appendix	κ Η (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter											
(64)m= 199.	75 176.28	185.66	167.17	164.35	147.62	142.5	155.36	154.77	173.31	182.34	195.19		_
							Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2044.3	(64)
Heat gains	from water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	1] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	]	
(65)m= 92.2	6 81.96	87.58	80.59	80.49	74.09	73.22	77.5	76.47	83.47	85.63	90.74		(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	5 and 5a	):									
Metabolic g	ains (Table	e 5), Wat	tts										
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 114.	45 114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45		(66)
Lighting gai	ns (calcula	ited in Ap	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 17.9	6 15.95	12.97	9.82	7.34	6.2	6.7	8.71	11.68	14.84	17.32	18.46		(67)
Appliances	gains (calc	culated in	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		-	•	
(68)m= 201.	46 203.55	198.28	187.07	172.91	159.61	150.72	148.63	153.89	165.11	179.27	192.57		(68)
Cooking ga	ns (calcula	ated in A	ppendix	L, equat	tion L15	or L15a)	, also se	ee Table	5			•	
(69)m= 34.4	5 34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45		(69)
Pumps and	fans gains	(Table 5	<del></del> 5а)	•	•	•		•	•	•		•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporation	on (nega	tive valu	es) (Tab	le 5)	•	•	•		•	•	•	
(71)m= -91.5	66 -91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56		(71)
Water heati	ng gains (	rable 5)		!		!			!	!	•	1	
(72)m= 12 <sup>2</sup>	121.96	117.71	111.93	108.18	102.9	98.42	104.17	106.21	112.19	118.94	121.97		(72)
Total interr	nal gains =	<u> </u>			(66)	)m + (67)m	n + (68)m +	- (69)m + (	(70)m + (7	1)m + (72)	)m	l	
(73)m= 400.	<del></del>	386.3	366.16	345.77	326.04	313.17	318.83	329.12	349.47	372.85	390.33		(73)
6. Solar ga	ins:				1		Į.	ı.					
Solar gains a	re calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicat	ole orienta	tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ix ble 6a		g_ able 6b		FF able 6c		Gains (W)	

N I as set la			1		1		1		ı		1		٦
North	0.9x	0.77	X	3.33	X	10.63	X	0.4	X	0.8	=	31.41	(74)
North	0.9x	0.77	X	2.65	X	10.63	X	0.4	X	0.8	=	6.25	(74)
North	0.9x	0.77	X	3.33	X	20.32	X	0.4	X	0.8	=	60.02	(74)
North	0.9x	0.77	X	2.65	X	20.32	X	0.4	X	0.8	=	11.94	(74)
North	0.9x	0.77	X	3.33	X	34.53	X	0.4	X	0.8	=	102	(74)
North	0.9x	0.77	X	2.65	X	34.53	X	0.4	X	0.8	=	20.29	(74)
North	0.9x	0.77	X	3.33	X	55.46	X	0.4	X	0.8	=	163.83	(74)
North	0.9x	0.77	X	2.65	X	55.46	X	0.4	X	0.8	=	32.59	(74)
North	0.9x	0.77	X	3.33	X	74.72	X	0.4	X	0.8	=	220.7	(74)
North	0.9x	0.77	X	2.65	X	74.72	X	0.4	x	0.8	=	43.91	(74)
North	0.9x	0.77	X	3.33	X	79.99	X	0.4	X	0.8	=	236.26	(74)
North	0.9x	0.77	X	2.65	X	79.99	X	0.4	X	0.8	=	47	(74)
North	0.9x	0.77	X	3.33	x	74.68	x	0.4	x	0.8	=	220.58	(74)
North	0.9x	0.77	X	2.65	X	74.68	x	0.4	x	0.8	=	43.88	(74)
North	0.9x	0.77	X	3.33	x	59.25	x	0.4	X	0.8	=	175	(74)
North	0.9x	0.77	X	2.65	x	59.25	x	0.4	x	0.8	=	34.82	(74)
North	0.9x	0.77	X	3.33	x	41.52	x	0.4	X	0.8	=	122.63	(74)
North	0.9x	0.77	X	2.65	x	41.52	x	0.4	x	0.8	=	24.4	(74)
North	0.9x	0.77	X	3.33	x	24.19	х	0.4	x	0.8	] =	71.45	(74)
North	0.9x	0.77	x	2.65	x	24.19	x	0.4	x	0.8	] =	14.22	(74)
North	0.9x	0.77	X	3.33	x	13.12	x	0.4	x	0.8	=	38.75	(74)
North	0.9x	0.77	x	2.65	x	13.12	x	0.4	x	0.8	=	7.71	(74)
North	0.9x	0.77	x	3.33	x	8.86	x	0.4	x	0.8	=	26.18	(74)
North	0.9x	0.77	X	2.65	x	8.86	x	0.4	x	0.8	] =	5.21	(74)
East	0.9x	0.77	x	3.43	x	19.64	x	0.4	x	0.8	] =	29.88	(76)
East	0.9x	0.77	x	2.65	x	19.64	x	0.4	x	0.8	] =	11.54	(76)
East	0.9x	0.77	X	3.43	x	38.42	x	0.4	x	0.8	j =	58.45	(76)
East	0.9x	0.77	x	2.65	x	38.42	x	0.4	x	0.8	=	22.58	(76)
East	0.9x	0.77	X	3.43	x	63.27	x	0.4	x	0.8	=	96.26	(76)
East	0.9x	0.77	X	2.65	x	63.27	x	0.4	x	0.8	j =	37.18	(76)
East	0.9x	0.77	X	3.43	x	92.28	x	0.4	x	0.8	=	140.38	(76)
East	0.9x	0.77	x	2.65	x	92.28	х	0.4	х	0.8	j =	54.23	(76)
East	0.9x	0.77	X	3.43	x	113.09	x	0.4	x	0.8	j =	172.04	(76)
East	0.9x	0.77	x	2.65	x	113.09	x	0.4	х	0.8	j =	66.46	(76)
East	0.9x	0.77	X	3.43	x	115.77	x	0.4	x	0.8	j =	176.12	(76)
East	0.9x	0.77	×	2.65	x	115.77	x	0.4	x	0.8	=	68.03	(76)
East	0.9x	0.77	X	3.43	×	110.22	x	0.4	х	0.8	=	167.67	(76)
East	0.9x	0.77	x	2.65	×	110.22	x	0.4	x	0.8	=	64.77	(76)
East	0.9x	0.77	X	3.43	X	94.68	X	0.4	X	0.8	=	144.03	(76)
East	0.9x	0.77	X	2.65	X	94.68	X	0.4	X	0.8	=	55.64	(76)
East	0.9x	0.77	X	3.43	X	73.59	X	0.4	X	0.8	   =	111.95	(76)
	L		_						1				_

				East 0.9x 0.77 x 2.65 x 73.59 x 0.4 x 0.8 = 43.25 (76)													
East 0.9x 0.77 x 2.65 x							7	3.59	X	0.	4	x	0.8		=	43.25	(76)
East	0.9x	0.77	х	3.4	13	X	4	15.59	x	0.	4	x	0.8		=	69.35	(76)
East	0.9x	0.77	X	2.6	35	X	4	5.59	X	0.	4	x	0.8		=	26.79	(76)
East	0.9x	0.77	X	3.4	13	X	2	24.49	X	0.	4	x	0.8		=	37.25	(76)
East	0.9x	0.77	x	2.6	35	X	2	24.49	x	0.	4	×	0.8		=	14.39	(76)
East	0.9x	0.77	x	3.4	13	X	1	6.15	x	0.	4	×	0.8		=	24.57	(76)
East	0.9x	0.77	X	2.6	35	X	1	6.15	x	0.	4	x	0.8		=	9.49	(76)
West	0.9x	0.77	x	3.4	13	X	1	9.64	x	0.	4	x	0.8		=	29.88	(80)
West	0.9x	0.77	X	3.4	13	X	3	88.42	X	0.	4	x	0.8		=	58.45	(80)
West	0.9x	0.77	X	3.4	13	X	6	3.27	X	0.	4	x	0.8		=	96.26	(80)
West	0.9x	0.77	x	3.4	13	X	9	2.28	x	0.	4	×	0.8		=	140.38	(80)
West	0.9x	0.77	X	3.4	13	X	1	13.09	x	0.	4	x	0.8		=	172.04	(80)
West	0.9x	0.77	x	3.4	13	X	1	15.77	x	0.	4	x	0.8		=	176.12	(80)
West	0.9x	0.77	x	3.4	13	X	1	10.22	x	0.	4	x	0.8		=	167.67	(80)
West	0.9x	0.77	X	3.4	13	X	9	94.68	x	0.	4	x	0.8		=	144.03	(80)
West	0.9x	0.77	x	3.4	13	X	7	3.59	x	0.	4	x	0.8		=	111.95	(80)
West	0.9x	0.77	X	3.4	13	X	4	15.59	x	0.	4	x	0.8		=	69.35	(80)
West	0.9x	0.77	X	3.4	13	X	2	24.49	x	0.	4	x	0.8		=	37.25	(80)
West 0.9x 0.77 x 3.43 x 16.15 x 0.4 x 0.8 =														24.57	(80)		
vvest 0.9x 0.77 x 3.43 x 16.15 x 0.4 x 0.8 = 24.57 (80)																	
Solar g	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																
(83)m=	108.96	211.44	351.98	531.42	675.16	7	03.54	664.58	553	.51 41	4.18	251.17	7 135.36	90.	03		(83)
Total g	ains – i	nternal a	nd solai	r (84)m =	= (73)m	+ (	83)m	, watts								•	
(84)m=	509.72	610.24	738.29	897.58	1020.93	3 10	029.58	977.75	872	.35 74	43.3	600.63	508.21	480	.36		(84)
7. Me	an inter	nal temp	erature	(heating	seaso	n)											
Temp	erature	during h	eating p	eriods ir	n the liv	/ing	area	from Tal	ole 9	, Th1 (°	'C)					21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,r	n (s	ее Та	ble 9a)						_			_
	Jan	Feb	Mar	Apr	May	<u>'                                    </u>	Jun	Jul	Α	ug S	Sep	Oct	Nov	D	ес		
(86)m=	1	0.99	0.97	0.91	0.76		0.57	0.43	0.4	19 0	.77	0.96	0.99	1			(86)
Mean	interna	l temper	ature in	living are	ea T1 (	follo	w ste	ps 3 to 7	7 in T	able 9	c)						
(87)m=	19.57	19.77	20.12	20.54	20.84	2	20.97	20.99	20.	99 20	0.88	20.45	19.93	19.	54		(87)
Temp	erature	during h	eating p	eriods ir	n rest o	f dw	/ellina	from Ta	able 9	9. Th2 (	(°C)					•	
(88)m=	19.79	19.79	19.79	19.8	19.8	_	19.81	19.81	19.	1	9.8	19.8	19.8	19.	79		(88)
l Itilies	ation fac	tor for g	ains for	rest of d	welling	h2	m (se	a Tahla	(aa)		•			!		l	
(89)m=	0.99	0.99	0.96	0.88	0.7	$\neg$	0.48	0.31	0.3	37 0	.68	0.94	0.99	1			(89)
		<u> </u>		<u> </u>			TO /6	<u> </u>									
(90)m=	17.92	l temper	18.7	19.29	19.66	Ť	12 (10 19.79	19.81	2ps 3		9.72	9C) 19.19	18.44	17.	97		(90)
(30)111=	17.32	10.21	10.7	13.23	19.00		9.13	19.01	T 19	.0   13			ring area ÷ (		<i>01</i>	0.39	(91)
												— LIV	ig aroa 🕶	. •, =		0.39	(a)
		l temper			<del> </del>	_			_		$\overline{}$		1			ı	
(92)m=	18.56	18.81	19.25	19.78	20.12		20.24	20.27	20.		0.17	19.68		18.	51		(92)
vlaaA	adjustr	nent to tl	ne mear	n interna	I tempe	eratu	ıre fro	m Table	4e,	where	appro	priate					

	•				•	•							
(93)m= 18.56	18.81	19.25	19.78	20.12	20.24	20.27	20.26	20.17	19.68	19.02	18.51		(93)
8. Space hea						44 -4	Table O	41	4 T: (	70)	-ll-	ulata	
Set Ti to the i the utilisation			•		ied at ste	ер ттог	rable 9	o, so tha	t 11,m=(	rojin an	d re-caic	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:										
(94)m= 0.99	0.98	0.96	0.88	0.72	0.51	0.36	0.42	0.71	0.93	0.99	0.99		(94)
Useful gains,		, W = (94	4)m x (84	4)m	r	ı	1			ī			
(95)m= 505.84	600.25	706.43	785.9	730.39	528.4	350.74	366.78	526.81	560.54	500.66	477.49		(95)
Monthly avera	<u> </u>	1			r								(00)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate (97)m= 1401.05		an intern			Lm , vv =	=[(39)m 353.18	X [(93)m 371.59	- (96)m 586.45	] 881.3	1160.51	1397.96		(97)
Space heatin	<u> </u>				l .	<u> </u>					1397.90		(07)
(98)m= 666.04	513.94	403.56	195.67	64.7	0	0.02	0	0	238.64	475.1	684.82		
(55)								l per year			<u> </u>	3242.48	(98)
Space heatin	a roquir	omont in	k\\/h/m2	!/voar				,	(**************************************	,(-			(99)
·	• .			•							L	45.16	(99)
9b. Energy red				Ĭ			ting prov	idad by	o oomm	unity ook	omo		
This part is use Fraction of spa										urilly SCI	ienie.	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 เ	up to four	other heat	sources; th	ne latter	
includes boilers, h	eat pump	s, geotheri	mal and wa	aste heat f					•				_
Fraction of hea	at from C	Commun	ity heat <sub>l</sub>	oump							L	1	(303a)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	1	(304a)
Factor for conf	rol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.1	(306)
Space heating	g										-	kWh/yea	r
Annual space	heating	requiren	nent									3242.48	
Space heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	- Ī	3566.73	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	require	ment fro	m secon	dary/su	plemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water beating	_										L		_
Water heating Annual water h		equirem	ent								ſ	2044.3	7
If DHW from c	ommuni	ty schem	ne:								_		_
Water heat fro	m Comr	nunity he	eat pump	)				(64) x (30	)3a) x (30	5) x (306) :	= [	2248.73	(310a)
Electricity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	58.15	(313)
Cooling System	m Energ	y Efficie	ncy Ratio	)								0	(314)
Space cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		Ī	0	(315)
Electricity for p	oumps a	nd fans v	within dv	velling (T	Γable 4f)	:					_		<u> </u>
mechanical ve							outside					168.29	(330a)

warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330l	o) + (330g) =		168.29	(331)
Energy for lighting (calculated in Append	dix L)				317.19	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)				-607.99	(333)
Electricity generated by wind turbine (Ap	ppendix M) (negative q	uantity)			0	(334)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emission facto kg CO2/kWh		nissions g CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)		) ng two fuels repeat (363) to	(366) for the second for	uel	319	(367a)
CO2 associated with heat source 1	[(307b)	)+(310b)] x 100 ÷ (367b) x	0.52	=	946.15	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	30.18	(372)
Total CO2 associated with community s	ystems	(363)(366) + (368)(372	2)	=	976.33	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instantar	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			976.33	(376)
CO2 associated with electricity for pump	os and fans within dwe	lling (331)) x	0.52	=	87.34	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	164.62	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	cable	0.52 × 0.01 =	- <u> </u>	-315.55	(380)
Total CO2, kg/year	sum of (376)(382) =			F	912.75	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.71	(384)

El rating (section 14)

(385)

89.53

			User [	Details:						
Assessor Name:	John Simps	son		Strom	a Num	ber:		STRO	006273	
Software Name:	Stroma FS/	AP 2012		Softwa	are Ve	rsion:		Versio	n: 1.0.4.26	
			Property							
Address :		en Court, Ma	itland Par	k Estate,	London	, NW3 2	2EH			
1. Overall dwelling dim	ensions:		_	4 ->						
Ground floor				a(m²)	l., ,		ight(m)	٦,, ١	Volume(m	<u> </u>
Ground Hoor				71.8	(1a) x	2	2.9	(2a) =	208.22	(3a
Total floor area TFA = (	la)+(1b)+(1c)+(	1d)+(1e)+	(1n)	71.8	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	208.22	(5)
2. Ventilation rate:										
	main heating	second heatin		other		total			m³ per hou	ır
Number of chimneys	0	+   0	<u>a</u> + L	0	] = [	0	X	40 =	0	(6a
Number of open flues	0	] + [ 0	<del></del>	0	]	0	X	20 =	0	<u> </u>     (6b
Number of intermittent fa		ــــــا لـــــــــ					=	10 =		(7a
					Ļ	3			30	╡`
Number of passive vent					L	0	×	10 =	0	(7t
Number of flueless gas	fires					0	X	40 =	0	(70
								A ir ob	anges nor h	011F
		(0.) (01)	(7.)	( <del>-</del> )	_			ı	anges per h	_
Infiltration due to chimne If a pressurisation test has	-				aantinuu fr	30		÷ (5) =	0.14	(8)
Number of storeys in			:eea 10 (17),	otrierwise (	conunue ir	om (9) to (	(10)		0	(9)
Additional infiltration	and amouning (inc	,					[(9)	-1]x0.1 =	0	(10
Structural infiltration: (	0.25 for steel or	timber frame	or 0.35 fo	r masoni	ry constr	uction		1	0	<b>-</b>  `  (11
if both types of wall are p	present, use the val	ue correspondin	g to the grea	ter wall are	a (after			ļ		
deducting areas of open			. 0.4 /2221	ممال مامم	amta# 0			1		<b></b> ,,,
If suspended wooden		,	0.1 (seal	ea), eise	enter u				0	(12
If no draught lobby, er Percentage of window			1						0	(13
Window infiltration	is and doors dra	augiii sirippei	ı	0.25 - [0.2	! x (14) ÷ 1	001 =			0	(14
Infiltration rate				(8) + (10)			+ (15) =		0	(16
Air permeability value	. a50. expresse	d in cubic me	tres per h					area	5	=\(\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
If based on air permeab	•		•	•	•	01.0 0.0	жоюро	, a.oa	0.39	(18
Air permeability value appli	-					is being u	sed		0.00	
Number of sides shelter	ed								2	(19
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20
Infiltration rate incorpora	iting shelter fact	tor		(21) = (18	) x (20) =				0.33	(21
Infiltration rate modified	for monthly win	d speed							ı	
Jan Feb	Mar Apr	May Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Mind Footor (00-) (0	22\m · 4									
Wind Factor (22a)m = (2	(2)III ÷ 4	1.00 0.00	0.05	1	ı	ı	1	1	I	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39	]	
Calculate effec		_	rate for t	he appli	cable ca	se	!	!	!	<u>l</u>	!		
If mechanica			or disciplination	Ol- ) (OO -			\(\f\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		) (00-)			0	(23a)
If exhaust air he									) = (23a)			0	(23b)
If balanced with		-	-	_								0	(23c)
a) If balance					i	<del>,                                    </del>	<del>,                                    </del>	<del>í `</del>	<del>,                                    </del>	<del>-                                    </del>	<del>1 ` '</del>	) ÷ 100] 1	(240)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24a)
b) If balance	o mecha	anicai ve	entilation 0	without	neat red	overy (r	<del>-                                    </del>	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	<del>r ´       `</del>	<u> </u>	Ι ,	1	(24b)
` ′			<u> </u>		<u> </u>		0	<u> </u>	0	0	0	J	(240)
c) If whole he if (22b)m				•	•				5 × (23h	<b>)</b>			
(24c)m = 0	0	0	0	0	0	0	0) = (22.	0	0	0	0	1	(24c)
d) If natural	ventilatio	n or wh	ole hous	e positiv		ventilatio	on from	ļ			<u> </u>	J	
if (22b)m				•	•				0.5]				
(24d)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	]	(24d)
Effective air	change	rate - en	nter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	]	(25)
3. Heat losses	s and he	at loss r	paramete	er:									
ELEMENT	Gros area	s	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²-		A X k kJ/K
Doors	G.1. G.G.	( )							( , .		,		
					3.89	X	1.2	=	4.668				(26)
Windows Type	e 1				1.49	〓 .	1.2 /[1/( 1.4 )+		4.668 1.98				(26) (27)
Windows Type Windows Type					1.49	x1	/[1/( 1.4 )+	0.04] =	1.98				(27)
Windows Type	2				1.49	x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+	0.04] =	1.98				(27) (27)
Windows Type Windows Type	2 3				1.49 1.45 1.49	x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] =	1.98 1.92 1.98				(27) (27) (27)
Windows Type Windows Type Windows Type	2 2 3 4				1.49 1.45 1.49	x1 x1 x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] =	1.98 1.92 1.98 1.52				(27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	2 2 3 4				1.49 1.45 1.49 1.15	x1 x1 x1 x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	1.98 1.92 1.98 1.52 1.52				(27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Floor	2 2 3 4 4 5	2	47.0		1.49 1.45 1.49 1.15 1.15 71.8	x1 x1 x1 x1 x1 x1 x1 x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334				(27) (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Floor Walls	2 2 3 4 4 5 5 81.72	=	17.9	5	1.49 1.45 1.49 1.15 1.15 63.77	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334 11.48				(27) (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Floor Walls Roof	2 2 3 3 4 4 4 5 5 81.72 18.04	4	17.99	5	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334				(27) (27) (27) (27) (27) (28) (29) (30)
Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	2 2 3 3 4 4 4 5 5 81.72 18.04	4		5	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04	x1 x1 x1 x1 x1 x1 x x1 x x1 x x1 x x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35				(27) (27) (27) (27) (27) (28) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall	2 2 3 4 4 5 5 81.72 18.04 llements,	4 , m²	0		1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04 171.5	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =   =	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35				(27) (27) (27) (27) (27) (28) (29) (30)
Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e	8 2 8 3 9 4 8 5 81.72 18.00 1 roof windo	4 , m² ows, use e	0	ndow U-va	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04 171.5 54.23 alue calcul	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   0.04] =   =   =	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35	as given in	paragraph	] [ ] [ ] [	(27) (27) (27) (27) (27) (28) (29) (30) (31)
Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and	8 2 8 3 8 4 8 5 81.72 18.04 18.04 19.04 10.04 10.04 10.04 10.04 10.04 10.04 10.04 10.04 10.04 10.04 10.04 10.04 10.04 10.04 10	4 , m <sup>2</sup> ows, use e sides of in	0  offective winternal wall	ndow U-va	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04 171.5 54.23 alue calcul	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35	as given in	paragraph	1	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area	8 2 8 3 9 4 8 5 81.77 18.00 1 roof windows on both as on both as so, W/K =	yws, use e sides of in	0  offective winternal wall	ndow U-va	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04 171.5 54.23 alue calcul	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35				(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los	8 2 8 3 8 4 8 5 81.72 18.00 18.00 18.00 19.00 windown	yws, use e sides of in S (A x A x k)	0  iffective winternal walk U)	ndow U-va	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.0 171.5 54.23 alue calculatitions	x1 x1 x1 x1 x1 x1 x x1 x x1 x x1 x x1	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35 0 ue)+0.04] a	2) + (32a).		46.4	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity (	8 2 8 3 8 4 8 5 81.77 18.04 18.04 19.	4 m²  ws, use e sides of in a S (A x A x k)  ter (TMF desired the	offective winternal walk U)  P = Cm ÷ tails of the	ndow U-va Is and pan	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04 171.5 54.23 alue calculatitions	x1 x1 x1 x1 x1 x1 x x1 x x x x x x x x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13 0.19 (26)(30	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35 0 ue)+0.04] a	2) + (32a). : Medium	(32e) =	46.4	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity of Thermal mass For design assess	8 2 8 3 8 4 8 5 81.72 18.00 18.	ws, use e sides of in a S (A x A x k ) ter (TMF ere the decailed calcular)	offective winternal wall  U)  P = Cm ÷ tails of the culation.	ndow U-va ls and pan - TFA) ir construct	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04 171.5 54.23 alue calculatitions	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13 0.19 (26)(30	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35 0 ue)+0.04] a	2) + (32a). : Medium	(32e) =	46.4	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)  7 (33) (34) (35)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity of Thermal mass For design assess can be used instead	8 2 8 3 8 4 8 5 81.77 18.04 18.04 18.04 19.	ws, use e sides of in a S (A x A x k) ter (TMF ere the detailed calcular X Y) x X Y x X X Y x X X X X	offective winternal wall U)  P = Cm ÷ tails of the culation. culated to	ndow U-vals and pand - TFA) ir construction	1.49 1.45 1.49 1.15 1.15 71.8 63.77 18.04 171.5 54.23 alue calculatitions  n kJ/m²K ppendix l	x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.13 0.18 0.13 0.19 (26)(30	0.04] = 0.04]	1.98 1.92 1.98 1.52 1.52 9.334 11.48 2.35 0 ue)+0.04] a	2) + (32a). : Medium	(32e) =	46.4	(27) (27) (27) (27) (27) (28) (29) (30) (31) (32)  7 (33) (34) (35)

Ventilati	ion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	(25)m x (5)	ı		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	40.62	40.38	40.14	39.02	38.81	37.84	37.84	37.65	38.21	38.81	39.24	39.68		(38)
Heat tra	nsfer c	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	99.81	99.57	99.33	98.21	98	97.02	97.02	96.84	97.4	98	98.42	98.86		
Heat los	ss para	meter (H	HLP), W/	m²K				•		Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	98.21	(39)
(40)m=	1.39	1.39	1.38	1.37	1.36	1.35	1.35	1.35	1.36	1.36	1.37	1.38		
Number	of day	s in mor	nth (Tab	le 1a)						Average =	Sum(40) <sub>1</sub>	12 /12=	1.37	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wate	er heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
Assume	nd occu	inancy I	NI									00		(42)
if TFA	\ > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		29		(42
Annual a	averag	e hot wa						(25 x N)				3.56		(43
		_	hot water person per			_	-	to achieve	a water us	se target o	f			
постноге с				<u> </u>		i .	·							
Hot water	Jan	Feb	Mar day for ea	Apr ach month	May	Jun	Jul Table 1c v	Aug	Sep	Oct	Nov	Dec		
г				1		1	1	1	00.70	00.04		07.40		
(44)m=	97.42	93.88	90.34	86.79	83.25	79.71	79.71	83.25	86.79	90.34	93.88	97.42	4000 77	(44
Energy co	ontent of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1062.77	(44
(45)m=	144.47	126.36	130.39	113.68	109.07	94.12	87.22	100.08	101.28	118.03	128.84	139.91		_
lf instanta	neous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	= [	1393.46	(45
` '	21.67	18.95	19.56	17.05	16.36	14.12	13.08	15.01	15.19	17.7	19.33	20.99		(46
Water s	_		المسالمينات ما		۸۱ سمار	WILLDO	.4	م ماطانی		امما				
_		` ,		•			_	within sa	ame ves	sei		150		(47)
	se if no	stored	nd no ta		_			mbi boil	ers) ente	er '0' in (	47)			
	•		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48
Tempera	ature fa	actor fro	m Table	2b							0.	54		(49
•			storage		ear			(48) x (49)	) =			75		(50
b) If ma	anufact	urer's de	eclared o	cylinder l	oss fact									
			factor fr		e 2 (kW	h/litre/da	ıy)					0		(51
	-	eating s from Tal	ee secti	on 4.3										(50
			bie ∠a m Table	2h							_	0		(52 (53
•					aar			(A7) v (51)	\ v (52\ v (	53) –				
		m water [54) in (5	storage	, KVV11/ye	zai			(47) x (51)	) X (O∠) X (	J3) =	-	0 75		(54 (55
,	, ,	. , .	culated f	for each	month			((56)m = (	55) × (41)	m	<u> </u>	10		(55)
		21.07				22.50	22.22				22.50	22.22		(56
arrantine i	23.33	∠1.∪/	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(30

If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	 e 3	!	!	!	!	!	!	0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	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 ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 191.07	168.44	176.98	158.77	155.67	139.21	133.81	146.68	146.37	164.63	173.93	186.51		(62)
Solar DHW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	y) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additiona	l lines if	FGHRS	and/or \	<b>NWHRS</b>	applies	, see Ap	pendix (	3)				-	
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter		-	-	-	-	-	-	-	-		
(64)m= 191.07	168.44	176.98	158.77	155.67	139.21	133.81	146.68	146.37	164.63	173.93	186.51		
							Outp	out from w	ater heate	r (annual) <sub>1</sub>	12	1942.08	(64)
Heat gains from	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 85.31	75.68	80.63	73.87	73.54	67.37	66.28	70.55	69.75	76.52	78.91	83.8		(65)
include (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a	):									
Metabolic gain				,									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45	114.45		(66)
Lighting gains	(calcula	ted in Ar	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				ı	
(67)m= 17.96	15.95	12.97	9.82	7.34	6.2	6.7	8.71	11.68	14.84	17.32	18.46		(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5			•	
(68)m= 201.46	203.55	198.28	187.07	172.91	159.61	150.72	148.63	153.89	165.11	179.27	192.57		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a	), also se	ee Table	5			•	
(69)m= 34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45	34.45		(69)
Pumps and far	ns gains	(Table 5	 Ба)	Į.	Į.	Į.	!	!	!		!	ı	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)								
(71)m= -91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56	-91.56		(71)
Water heating		able 5)					•	•	•	•	•	•	
Water neating	gains ( i					_	•			1		•	
(72)m= 114.67	<del>~ `</del>	108.37	102.6	98.85	93.57	89.08	94.83	96.87	102.85	109.6	112.63		(72)
	112.62	108.37	102.6	98.85		<u> </u>		96.87 + (69)m +					(72)
(72)m= 114.67	112.62 gains =	108.37	102.6 359.82	98.85		<u> </u>							(72)
(72)m= 114.67  Total internal	112.62 <b>gains =</b> 392.46	108.37		!	(66)	m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72)	)m		
(72)m= 114.67 <b>Total internal</b> (73)m= 394.42	112.62 <b>gains =</b> 392.46	108.37	359.82	339.44	(66) 319.71	m + (67)m 306.83	n + (68)m - 312.5	+ (69)m + (322.79	(70)m + (7 343.13	1)m + (72) 366.52	)m 384		

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

North			7		1		1		ı		1		7
North	0.9x	0.77	X	1.45	X	10.63	X	0.63	X	0.7	=	18.85	(74)
North	0.9x	0.77	X	1.15	X	10.63	X	0.63	X	0.7	=	3.74	(74)
North	0.9x	0.77	X	1.45	X	20.32	X	0.63	X	0.7	=	36.02	(74)
North	0.9x	0.77	X	1.15	X	20.32	X	0.63	Х	0.7	=	7.14	(74)
North	0.9x	0.77	X	1.45	X	34.53	X	0.63	Х	0.7	=	61.21	(74)
North	0.9x	0.77	X	1.15	X	34.53	X	0.63	X	0.7	=	12.14	(74)
North	0.9x	0.77	X	1.45	X	55.46	X	0.63	х	0.7	=	98.31	(74)
North	0.9x	0.77	X	1.15	X	55.46	X	0.63	X	0.7	=	19.49	(74)
North	0.9x	0.77	X	1.45	X	74.72	X	0.63	X	0.7	=	132.44	(74)
North	0.9x	0.77	X	1.15	X	74.72	X	0.63	X	0.7	=	26.26	(74)
North	0.9x	0.77	X	1.45	X	79.99	X	0.63	X	0.7	=	141.78	(74)
North	0.9x	0.77	X	1.15	X	79.99	X	0.63	х	0.7	=	28.11	(74)
North	0.9x	0.77	X	1.45	X	74.68	X	0.63	X	0.7	=	132.37	(74)
North	0.9x	0.77	X	1.15	X	74.68	X	0.63	X	0.7	=	26.25	(74)
North	0.9x	0.77	X	1.45	X	59.25	X	0.63	X	0.7	=	105.02	(74)
North	0.9x	0.77	X	1.15	X	59.25	X	0.63	X	0.7	=	20.82	(74)
North	0.9x	0.77	X	1.45	X	41.52	X	0.63	X	0.7	=	73.59	(74)
North	0.9x	0.77	X	1.15	X	41.52	x	0.63	X	0.7	=	14.59	(74)
North	0.9x	0.77	X	1.45	X	24.19	X	0.63	X	0.7	=	42.88	(74)
North	0.9x	0.77	X	1.15	X	24.19	x	0.63	X	0.7	=	8.5	(74)
North	0.9x	0.77	X	1.45	X	13.12	X	0.63	X	0.7	=	23.25	(74)
North	0.9x	0.77	X	1.15	X	13.12	x	0.63	x	0.7	=	4.61	(74)
North	0.9x	0.77	X	1.45	X	8.86	x	0.63	X	0.7	=	15.71	(74)
North	0.9x	0.77	x	1.15	X	8.86	X	0.63	X	0.7	=	3.12	(74)
East	0.9x	0.77	X	1.49	X	19.64	X	0.63	X	0.7	=	17.89	(76)
East	0.9x	0.77	X	1.15	X	19.64	X	0.63	X	0.7	=	6.9	(76)
East	0.9x	0.77	x	1.49	X	38.42	X	0.63	X	0.7	=	34.99	(76)
East	0.9x	0.77	X	1.15	X	38.42	X	0.63	X	0.7	=	13.5	(76)
East	0.9x	0.77	X	1.49	X	63.27	X	0.63	X	0.7	=	57.62	(76)
East	0.9x	0.77	X	1.15	X	63.27	x	0.63	X	0.7	=	22.24	(76)
East	0.9x	0.77	X	1.49	X	92.28	x	0.63	X	0.7	=	84.04	(76)
East	0.9x	0.77	X	1.15	X	92.28	X	0.63	X	0.7	=	32.43	(76)
East	0.9x	0.77	X	1.49	X	113.09	x	0.63	X	0.7	=	103	(76)
East	0.9x	0.77	x	1.15	X	113.09	x	0.63	X	0.7	=	39.75	(76)
East	0.9x	0.77	X	1.49	X	115.77	X	0.63	X	0.7	=	105.44	(76)
East	0.9x	0.77	x	1.15	x	115.77	x	0.63	x	0.7	] =	40.69	(76)
East	0.9x	0.77	x	1.49	x	110.22	x	0.63	x	0.7	=	100.38	(76)
East	0.9x	0.77	x	1.15	x	110.22	x	0.63	x	0.7	=	38.74	(76)
East	0.9x	0.77	x	1.49	x	94.68	x	0.63	x	0.7	] =	86.22	(76)
East	0.9x	0.77	x	1.15	x	94.68	x	0.63	x	0.7	] =	33.27	(76)
East	0.9x	0.77	x	1.49	x	73.59	x	0.63	x	0.7	<b>=</b>	67.02	(76)

									1			-			_		_
East -	0.9x	0.77	X	1.1	5	X	7	3.59	X	0.63		Χ	0.7	•	* <u>L</u>	25.86	(76)
East	0.9x	0.77	Х	1.4	19	X	4	5.59	X	0.63		x [	0.7	•	• <u>L</u>	41.52	(76)
East	0.9x	0.77	Х	1.1	5	X	4	5.59	X	0.63		x [	0.7	:	- <u>L</u>	16.02	(76)
East	0.9x	0.77	X	1.4	19	X	2	24.49	Х	0.63		x [	0.7	:	= <u>L</u>	22.3	(76)
East	0.9x	0.77	X	1.1	5	X	2	4.49	X	0.63		x	0.7	=	= [	8.61	(76)
East	0.9x	0.77	X	1.4	19	X	1	6.15	X	0.63		x [	0.7	:	= [	14.71	(76)
East	0.9x	0.77	X	1.1	5	X	1	6.15	X	0.63		<b>x</b> [	0.7	:	= [	5.68	(76)
West	0.9x	0.77	Х	1.4	<b>!</b> 9	X	1	9.64	X	0.63		x	0.7	=	• [	17.89	(80)
West	0.9x	0.77	X	1.4	19	X	3	8.42	X	0.63		x [	0.7		= [	34.99	(80)
West	0.9x	0.77	X	1.4	19	X	6	3.27	x	0.63		x [	0.7		= [	57.62	(80)
West	0.9x	0.77	X	1.4	<b>1</b> 9	X	9	2.28	x	0.63		x [	0.7		• [	84.04	(80)
West	0.9x	0.77	Х	1.4	19	X	1	13.09	x	0.63		x [	0.7		= [	103	(80)
West	0.9x	0.77	х	1.4	19	X	1	15.77	x	0.63		x [	0.7		• [	105.44	(80)
West	0.9x	0.77	х	1.4	19	X	1	10.22	x	0.63		x	0.7	$\overline{}$ .	• Ī	100.38	(80)
West	0.9x	0.77	х	1.4	19	X	9	4.68	x	0.63		x [	0.7	╡:	- ┌	86.22	(80)
West	0.9x	0.77	x	1.4	19	X	7	3.59	x	0.63		x [	0.7	<b>=</b>	- Ē	67.02	(80)
West	0.9x	0.77	x	1.4	19	X	4	5.59	х	0.63		x [	0.7	一 .	• Ē	41.52	(80)
West	0.9x	0.77	х	1.4	19	X	2	4.49	х	0.63		x [	0.7	<b>=</b>	• Ī	22.3	(80)
West	0.9x	0.77	x	1.4	19	X	1	6.15	x	0.63		x [	0.7	一.	- ┌	14.71	(80)
	•						•		•						_		_
Solar	gains in	watts, ca	alculated	for eac	h month	1			(83)m	n = Sum(74)	m(82	)m					
(83)m=	65.26	126.65	210.83	318.32	404.44	4:	21.45	398.11	331	.56 248.0	)8 150	).44	81.07	53.92	2		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (8	83)m	, watts									
(84)m=	459.69	519.11	590.8	678.15	743.87	7.	41.16	704.94	644	.06 570.8	37 493	3.57	447.59	437.9	2		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	1)											
Temp	erature	during h	eating p	eriods ir	the livi	ng	area	from Tal	ole 9	, Th1 (°C)	)				Γ	21	(85)
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,n	า (ร	ee Ta	ble 9a)							_		_
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Se <sub>l</sub>	р С	Oct	Nov	Dec	2		
(86)m=	1	0.99	0.99	0.96	0.89		0.74	0.58	0.6	0.88	0.5	98	0.99	1			(86)
Mean	interna	ıl temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)	-						
(87)m=	19.49	19.64	19.93	20.33	20.68	1	20.91	20.98	20.		8 20	.32	19.84	19.46	;		(87)
Temn	erature	during h	eating r	eriods ir	rest of	dw	elling	from Ta	hle (	<b>.</b> 9, Th2 (°C	:)		_ <b>!</b>		_		
(88)m=	19.77	19.77	19.78	19.79	19.79	1	19.8	19.8	19		<del> </del>	.79	19.79	19.78	3		(88)
	tion for	tor for a	oine for	root of d	walling	<u> </u>	m (00	L Toblo	00/	<u> </u>			_!		_		
(89)m=	1	o.99	0.98	0.95	0.84	1	0.64	0.43	9a) 0.	5 0.8	0	97	0.99	1	$\neg$		(89)
		Į	!					<u> </u>					0.55	•			(00)
		i :	i	1	1	Ť	,	i	r <del>i</del>	to 7 in Ta			1		_		(00)
(90)m=	17.78	18	18.42	19	19.48	1	9.74	19.79	19.	79 19.62		.01	18.3	17.75	`\		(90)
											rLA =	LIV	ing area ÷ (4	+) =	L	0.39	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = f	LA × T1	+ (1	– fLA) × ٦	Γ2						
(92)m=	18.44	18.63	19	19.51	19.95		20.19	20.25	20.			.52	18.9	18.41			(92)
Apply	adjustr	ment to t	he mear	n interna	tempe	ratu	ire fro	m Table	4e,	where ap	propria	ate					

(93)m= 18.	44 18.63	19	19.51	19.95	20.19	20.25	20.24	20.07	19.52	18.9	18.41		(93)
8. Space	neating req	uirement											
	he mean in				ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	tion factor for						Π.	Ι -	T _				
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	factor for g	1	i										(0.4)
(94)m= 0.9		0.98	0.94	0.85	0.67	0.49	0.56	0.82	0.96	0.99	1		(94)
	ns, hmGm	· `	<u> </u>	r –	407.07	0.45.50	L 057.40	100.00	175.07	1 440 00	400.05		(OE)
(95)m= 457		578.3	638.21	629.76	497.67	345.58	357.49	469.63	475.27	443.33	436.05		(95)
	verage exte	T T	·			40.0	104		100	74			(06)
(96)m= 4.3		6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	rate for me		<del></del>			<del>- `                                   </del>	<del>- `                                   </del>	<del>`</del>		1404.07	1405 40		(07)
(97)m= 1411		L	1042.25	808.07	542.42	354.16	372.02	581.43	874.01	1161.27	1405.19		(97)
	ating requir	1	ı	i -		ı		í ·	<del>í - `</del>	·	704.04		
(98)m= 709	573.35	493.69	290.91	132.66	0	0	0	0	296.66	516.92	721.04		٦,,,,
							Tota	l per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	3734.93	(98)
Space hea	ating requir	ement in	kWh/m²	²/year								52.02	(99)
9a. Energy	requireme	nts – Indi	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					_
Space he								, i					
•	f space hea	at from s	econdar	y/supple	mentary	system					[	0	(201)
Fraction o	f space hea	at from m	nain syst	em(s)			(202) = 1	- (201) =			Ì	1	(202)
	· f total heati		-	. ,			(204) = (2	02) × [1 –	(203)1 =			1	(204)
		_	-					- / [	(/1		l I		╡
•	of main spa		• .								ļ	93.5	(206)
Efficiency	of seconda	ry/suppl	ementar	y heating	g system	า, % 		_	_			0	(208)
Ja	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
	ating requir	· `			)								
709	573.35	493.69	290.91	132.66	0	0	0	0	296.66	516.92	721.04		
(211)m = {[	(98)m x (20	)4)] } x 1	00 ÷ (20	06)									(211)
759	.04 613.21	528.01	311.13	141.88	0	0	0	0	317.29	552.85	771.16		
	•	•				•	Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	<u></u>	3994.58	(211)
Space he	ating fuel (s	econdar	y), kWh/	month							L		_
= {[(98)m x													
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
		!					Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<u>.                                    </u>	0	(215)
Water hea	tina										L		J
Output from	•	ter (calc	ulated al	bove)									
191		176.98	158.77	155.67	139.21	133.81	146.68	146.37	164.63	173.93	186.51		
Efficiency of	of water hea	ater	•	•		•	•	•	•	•		79.8	(216)
(217)m= 8	87.83	87.41	86.41	84.39	79.8	79.8	79.8	79.8	86.37	87.54	88.07		(217)
Fuel for wa	ter heating.	. kWh/mo	onth				!	Į.	Į	!	<u> </u>		
(219)m = (	•							_	_				
(219)m= 217	.13 191.79	202.48	183.74	184.46	174.45	167.69	183.81	183.42	190.61	198.68	211.77		_
<del></del>							Tota	I = Sum(2	19a) <sub>112</sub> =	·		2290.03	(219)
Annual tot									k'	Wh/year	· _	kWh/year	_
Space hear	ting fuel use	ed, main	system	1								3994.58	_
											•		_

					_
Water heating fuel used				2290.03	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30	]	(230c)
boiler with a fan-assisted flue			45	]	(230e)
Total electricity for the above, kWh/year	sum of (23	30a)(230g) =		75	(231)
Electricity for lighting				317.19	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	862.83	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	494.65	(264)
Space and water heating	(261) + (262) + (263) + (264)	=		1357.48	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	164.62	(268)
Total CO2, kg/year	SI	um of (265)(271) =		1561.02	(272)

TER =

(273)

32.14

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:35:31

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** 

Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 68.2m<sup>2</sup> Site Reference: Plot Reference: Maitland Park Estate GT 101

GT 101, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 26.25 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 8.44 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.7 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 44.4 kWh/m<sup>2</sup>

OK 2 Fabric U-values

**Element Highest Average** 

External wall 0.12 (max. 0.30) 0.12 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK OK

Floor 0.10 (max. 0.25) 0.10 (max. 0.70)

Roof (no roof)

**Openings** 

1.40 (max. 2.00) 1.40 (max. 3.30)

Thermal bridging calculated from linear thermal transmittances for each junction

2a Thermal bridging

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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

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:	0.53	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: West	6.18m²	
Windows facing: West	6.18m²	
Windows facing: North	2.78m²	
Windows facing: North	4.47m²	
Windows facing: North	2.15m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
40 Voy footures		
10 Key features	2.0 m³/m²h	
Air permeablility External Walls U-value		
	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Floors U-value	0.1 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

Assessor Name:
Address: GT 101, Aspen Court, Maitland Park Estate, London, NW3 2EH  1. Overall dwelling dimensions:  Area(m²)
Area(m²)   Av. Height(m)   Volume(m³)
Area(m²)   Av. Height(m)   Volume(m³)
Ground floor    68.2   (1a) x   2.6   (2a) =   177.32   (3a)
Dwelling volume $ (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 177.32                                   $
2. Ventilation rate:    main heating heating heating heating   heating heating     Number of chimneys   0
Number of chimneys         0         +         0         +         0         =         0         x 40 =         0         (6a)           Number of open flues         0         +         0         +         0         =         0         x 20 =         0         (6b)           Number of intermittent fans         0         x 10 =         0         (7a)           Number of passive vents         0         x 10 =         0         (7b)           Number of flueless gas fires         0         x 40 =         0         (7c)    Air changes per hour  Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)         + (5) =         0         (8)           Number of storeys in the dwelling (ns)         0         (9)         (9)         (9)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (10)         (11)         (10)         (11)         (10)         (11)         (10)         (11)         (10)         (11)         (10)         (11)         (10)         (11)         (10)         (11)
Number of chimneys $0 + 0 + 0 + 0 = 0$ $\times 40 = 0$ (6a)  Number of open flues $0 + 0 + 0 + 0 = 0$ $\times 20 = 0$ (6b)  Number of intermittent fans $0 \times 10 = 0$ (7a)  Number of passive vents $0 \times 10 = 0$ (7b)  Number of flueless gas fires $0 \times 40 = 0$ (7c)  Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $(7a)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $(7a)$ Air changes per hour  Infiltration test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction
Number of open flues $0 + 0 + 0 + 0 = 0$ $\times 20 = 0$ (6b)  Number of intermittent fans $0 \times 10 = 0$ (7a)  Number of passive vents $0 \times 10 = 0$ (7b)  Number of flueless gas fires $0 \times 40 = 0$ (7c)  Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $(5) = 0$ (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration (9) to (10)  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)
Number of intermittent fans $0 \times 10 = 0  (7a)$ Number of passive vents $0 \times 10 = 0  (7b)$ Number of flueless gas fires $0 \times 40 = 0  (7c)$ Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0  \div (5) = 0  (8)$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  [(9)-1]x0.1 = 0 (10)  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction
Number of passive vents  Number of flueless gas fires $ \begin{array}{cccccccccccccccccccccccccccccccccc$
Number of flueless gas fires  Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration $(9) + (1) + ($
Air changes per hour  Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration [(9)-1]x0.1 = 0 (10)  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = 0$ (8)  If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration [(9)-1]x0.1 = 0 (10)  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)  Additional infiltration  [(9)-1]x0.1 = 0 (10)  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  0 (11)
Number of storeys in the dwelling (ns)  Additional infiltration $[(9)-1]\times 0.1 = 0 \qquad (10)$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction $[(9)-1]\times 0.1 = 0 \qquad (11)$
Additional infiltration $ [(9)-1]x0.1 = 0 $ (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction $ 0 $ (11)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  0 (11)
•
deducting areas of openings); if equal user 0.35
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0
If no draught lobby, enter 0.05, else enter 0 0 (13)
Percentage of windows and doors draught stripped 0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0$ (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used
Number of sides sheltered  2 (19)
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.85$ (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.08$ (21)
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor (22a)m = (22)m ÷ 4
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

Adjusted infiltration rate (allowing for shelter ar	nd wind speed) =	- (21a) v (22a)n					
0.11 0.11 0.1 0.09 0.09	0.08 0.08	0.08 0.08	0.09	0.1	0.1		
Calculate effective air change rate for the appl	1	1 0.00	0.00	<b>0.</b>	<b></b>		
If mechanical ventilation:						0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23	a) × Fmv (equation (	N5)), otherwise (23	3b) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing	for in-use factor (from	m Table 4h) =				76.5	(23c)
a) If balanced mechanical ventilation with he	eat recovery (MV	HR) (24a)m = (	22b)m + (2	23b) × [1	1 – (23c)	÷ 100]	
(24a)m= 0.23 0.22 0.22 0.21 0.21	0.2 0.2	0.2 0.2	0.21	0.21	0.22		(24a)
b) If balanced mechanical ventilation without	t heat recovery (	MV) (24b)m = (	22b)m + (2	23b)		•	
(24b)m= 0 0 0 0 0	0 0	0 0	0	0	0		(24b)
c) If whole house extract ventilation or positi if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$	•			)			
(24c)m= 0 0 0 0 0	0 0	0 0	0	0	0		(24c)
d) If natural ventilation or whole house positi if (22b)m = 1, then (24d)m = (22b)m other	•		x 0.5]			•	
(24d)m= 0 0 0 0 0	0 0	0 0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24	b) or (24c) or (24	1d) in box (25)				l	
(25)m= 0.23 0.22 0.22 0.21 0.21	0.2 0.2	0.2 0.2	0.21	0.21	0.22		(25)
3. Heat losses and heat loss parameter: <b>ELEMENT</b> Gross Openings	Net Area	U-value	AXU		k-value	Λ .	X k
area (m²) m²	A ,m²	W/m2K	(W/ł	<)	kJ/m²-l		/K
Windows Type 1		I/[1/( 1.4 )+ 0.04] <sub>=</sub>		_			(27)
Windows Type 2	6.18 x <sup>1</sup>	I/[1/( 1.4 )+ 0.04] <sub>=</sub>	8.19	_			(27)
Windows Type 3	2.78 x1	I/[1/( 1.4 )+ 0.04] <sub>=</sub>	3.69				(27)
Windows Type 4	4.47 x1	1/[1/( 1.4 )+ 0.04] =	5.93				(27)
Windows Type 5	2.15 x <sup>1</sup>	1/[1/( 1.4 )+ 0.04] =	2.85				(27)
Floor	68.2 ×	0.1 =	6.82				(28)
Walls 48.39 21.76	26.63 ×	0.12 =	3.2				(29)
Total area of elements, m <sup>2</sup>	116.59						(31)
Party wall	39.03 ×	0 =	0				(32)
* for windows and roof windows, use effective window U-v	value calculated using	g formula 1/[(1/U-va	alue)+0.04] a	s given in	paragraph	3.2	
** include the areas on both sides of internal walls and par	rtitions	(20) (20) (20)					_
Fabric heat loss, W/K = S (A x U)		(26)(30) + (32) =				38.86	(33)
Heat capacity Cm = S(A x k)			)(30) + (32		(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) i			cative Value:			250	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.	,	recisely the indicati	ve values of	IMP IN TE	able 1f		_
Thermal bridges: S (L x Y) calculated using A	ppendix K					8.16	(36)
if details of thermal bridging are not known (36) = $0.05 x$ (5) Total fabric heat loss	31)	(22)	. (26) –				<b>—</b> (07)
			+ (36) =	0E\m v (E\		47.03	(37)
Ventilation heat loss calculated monthly	lus lui	<del> </del>	$m = 0.33 \times (3)$			]	
(38)m=   Jan   Feb   Mar   Apr   May	Jun Jul 11.6 11.6	Aug Sep	+	Nov 12.47	Dec 12.72		(38)
` '	11.0 11.0		<u> </u>		12.12		(00)
Heat transfer coefficient, W/K	F9 62   F0 00	<del> </del>	m = (37) + (37)		E0 74	]	
(39)m= 60.24 60.12 59.99 59.37 59.25	58.63 58.63	58.5 58.87	59.25 Average =	59.5	59.74	50 24	(30)
Stroma FSAP 2012 Version: 1.0.4.26 (SAP 9.92) - http://w	ww.stroma.com		Average =	Juiii(Ja)1.	12 / 12=	59.3 <b>∮</b> age	<u>∠ or 80</u> 1

Heat loss para	ameter (I	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.88	0.88	0.88	0.87	0.87	0.86	0.86	0.86	0.86	0.87	0.87	0.88		
		!							Average =	Sum(40) <sub>1</sub>	12 /12=	0.87	(40)
Number of day	<u> </u>	<u> </u>	· ·						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occurring TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		2.2		(42)
if TFA £ 13.  Annual average	•	ater usad	na in litra	se nar da	v Vd av	erane –	(25 v N)	± 36		0.0	10		(43)
Reduce the annua									se target o		5.49		(43)
not more that 125	litres per	person pei	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 95.14	91.68	88.22	84.76	81.3	77.84	77.84	81.3	84.76	88.22	91.68	95.14		_
Energy content of	f hat water	unad aal	aulated m	anthly — 1	100 v Vd r	n v nm v [	Tm / 2600			im(44) <sub>112</sub> =		1037.87	(44)
Energy content of										1			
(45)m= 141.09	123.4	127.33	111.01	106.52	91.92	85.18	97.74	98.91	115.27	125.82	136.64	1000.01	(45)
If instantaneous v	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	ım(45) <sub>112</sub> =	=	1360.81	(45)
(46)m= 21.16	18.51	19.1	16.65	15.98	13.79	12.78	14.66	14.84	17.29	18.87	20.5		(46)
Water storage		10.1	10.00	10.00	10.70	12.70	14.00	14.04	17.20	10.07	20.0		(10)
Storage volum	ne (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage		ا ام معمام		ممامات	/1.\^/L	- /-l-> -\							(40)
a) If manufact				or is kno	wn (Kvvr	i/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		•			or is not		(48) x (49)	) =		1	10		(50)
Hot water stor			-							0.	.02		(51)
If community h	•		on 4.3										
Volume factor			0.1							1.	.03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	-	.03		(54)
Enter (50) or	` , ` `	,	طممم سما				//EC\ /	(FF) (44)		1.	.03		(55)
Water storage							. , ,	(55) × (41)	ı				,
(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	11	(56)
If cylinder contain		u solar slo		· · ·					m where (	(H I I ) IS II (		хп	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,		` '	, ,			_			
(modified by			ı —	ı —			<del></del>	<del>-</del>		<del>-                                    </del>			
(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 × (41)m														
(61)m= 0	0	0	0	0	0	0	)	)	0	0	0	0	]	(61)
	equired for	water he	eating ca	alculated	l for ea	ch month	(62)	 m =	0.85 × (	′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 196.3	<del></del>	182.61	164.51	161.8	145.41		153	_	152.4	170.54	179.32	191.91	]	(62)
Solar DHW inp	ut calculated	using App	endix G oı	· Appendix	H (nega	tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	<b>.</b>	
(add addition												•		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter				•	•				•	•	•	
(64)m= 196.3	36 173.32	182.61	164.51	161.8	145.41	140.45	153	.02	152.4	170.54	179.32	191.91	]	
	•							Outp	out from wa	ater heate	er (annual)	112	2011.65	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	n ]	
(65)m= 91.13	3 80.97	86.56	79.71	79.64	73.36	72.54	76.	72	75.68	82.55	84.63	89.65	]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):										
Metabolic ga	ains (Table	e 5), Wat	ts											
Jar	T '	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
(66)m= 110.0	8 110.08	110.08	110.08	110.08	110.08	110.08	110	.08	110.08	110.08	110.08	110.08		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5				-	
(67)m= 17.2	1 15.29	12.43	9.41	7.04	5.94	6.42	8.3	34	11.2	14.22	16.59	17.69		(67)
Appliances (	gains (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a),	also	see Tal	ble 5	•		•	
(68)m= 193.0	06 195.06	190.01	179.27	165.7	152.95	144.43	142	.43	147.48	158.22	171.79	184.54	]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5	•	•	•	
(69)m= 34.0	1 34.01	34.01	34.01	34.01	34.01	34.01	34.	01	34.01	34.01	34.01	34.01	]	(69)
Pumps and	fans gains	(Table 5	5a)								•	•	•	
(70)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(70)
Losses e.g.	evaporation	n (nega	tive valu	es) (Tab	le 5)						•		•	
(71)m= -88.0	7 -88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88	.07	-88.07	-88.07	-88.07	-88.07		(71)
Water heating	ng gains (T	able 5)									•		•	
(72)m= 122.4	19 120.49	116.34	110.7	107.04	101.89	97.5	103	.12	105.11	110.95	117.54	120.5		(72)
Total intern	al gains =				(60	6)m + (67)n	n + (68	3)m +	- (69)m + (	(70)m + (	71)m + (72)	)m	•	
(73)m= 388.7	9 386.87	374.82	355.41	335.8	316.8	304.38	309	.91	319.81	339.42	361.95	378.76		(73)
6. Solar ga	ins:										•			
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica	ble orienta	tion.		
Orientation:			Area			ux		_	g_ 	-	FF		Gains	
	Table 6d		m²			able 6a			able 6b	_ '	able 6c		(W)	_
North 0.9	× 0.77	X	2.7	<b>'</b> 8	x	10.63	X		0.4	x	0.8	=	6.56	(74)
North 0.9		X	4.4	7	X	10.63	X		0.4	x	0.8	=	10.54	(74)
North 0.9	× 0.77	X	2.1	5	X	10.63	X		0.4	x	0.8	=	5.07	(74)
North 0.9	× 0.77	X	2.7	'8	X	20.32	X		0.4	×	0.8	=	12.53	(74)
North 0.9	× 0.77	X	4.4	7	X	20.32	Х		0.4	X	0.8	=	20.14	(74)

	_		_										_
North	0.9x	0.77	X	2.15	X	20.32	X	0.4	X	0.8	=	9.69	(74)
North	0.9x	0.77	X	2.78	X	34.53	X	0.4	X	0.8	=	21.29	(74)
North	0.9x	0.77	X	4.47	x	34.53	X	0.4	X	0.8	=	34.23	(74)
North	0.9x	0.77	X	2.15	X	34.53	X	0.4	X	0.8	=	16.46	(74)
North	0.9x	0.77	X	2.78	x	55.46	X	0.4	X	0.8	=	34.19	(74)
North	0.9x	0.77	X	4.47	x	55.46	X	0.4	x	0.8	=	54.98	(74)
North	0.9x	0.77	X	2.15	X	55.46	X	0.4	x	0.8	=	26.44	(74)
North	0.9x	0.77	X	2.78	x	74.72	x	0.4	X	0.8	=	46.06	(74)
North	0.9x	0.77	X	4.47	x	74.72	X	0.4	x	0.8	=	74.06	(74)
North	0.9x	0.77	X	2.15	X	74.72	X	0.4	X	0.8	=	35.62	(74)
North	0.9x	0.77	X	2.78	x	79.99	x	0.4	X	0.8	=	49.31	(74)
North	0.9x	0.77	X	4.47	x	79.99	X	0.4	X	0.8	=	79.29	(74)
North	0.9x	0.77	X	2.15	x	79.99	x	0.4	X	0.8	=	38.14	(74)
North	0.9x	0.77	X	2.78	x	74.68	X	0.4	X	0.8	=	46.04	(74)
North	0.9x	0.77	X	4.47	x	74.68	X	0.4	X	0.8	=	74.02	(74)
North	0.9x	0.77	X	2.15	x	74.68	x	0.4	X	0.8	=	35.6	(74)
North	0.9x	0.77	X	2.78	x	59.25	x	0.4	X	0.8	=	36.52	(74)
North	0.9x	0.77	X	4.47	X	59.25	X	0.4	x	0.8	=	58.73	(74)
North	0.9x	0.77	X	2.15	x	59.25	X	0.4	X	0.8	=	28.25	(74)
North	0.9x	0.77	X	2.78	x	41.52	X	0.4	X	0.8	=	25.59	(74)
North	0.9x	0.77	X	4.47	X	41.52	X	0.4	x	0.8	=	41.15	(74)
North	0.9x	0.77	X	2.15	x	41.52	X	0.4	X	0.8	=	19.79	(74)
North	0.9x	0.77	X	2.78	x	24.19	X	0.4	X	0.8	=	14.91	(74)
North	0.9x	0.77	X	4.47	x	24.19	x	0.4	X	0.8	=	23.98	(74)
North	0.9x	0.77	X	2.15	x	24.19	X	0.4	X	0.8	=	11.53	(74)
North	0.9x	0.77	X	2.78	x	13.12	X	0.4	X	0.8	=	8.09	(74)
North	0.9x	0.77	X	4.47	x	13.12	x	0.4	X	0.8	=	13	(74)
North	0.9x	0.77	X	2.15	x	13.12	x	0.4	X	0.8	=	6.25	(74)
North	0.9x	0.77	X	2.78	x	8.86	X	0.4	X	0.8	=	5.46	(74)
North	0.9x	0.77	X	4.47	x	8.86	X	0.4	X	0.8	=	8.79	(74)
North	0.9x	0.77	X	2.15	x	8.86	X	0.4	X	0.8	=	4.23	(74)
West	0.9x	0.77	X	6.18	x	19.64	X	0.4	X	0.8	=	26.92	(80)
West	0.9x	0.77	X	6.18	x	19.64	X	0.4	X	0.8	] =	26.92	(80)
West	0.9x	0.77	X	6.18	x	38.42	x	0.4	X	0.8	=	52.65	(80)
West	0.9x	0.77	X	6.18	x	38.42	X	0.4	x	0.8	=	52.65	(80)
West	0.9x	0.77	X	6.18	x	63.27	x	0.4	x	0.8	=	86.71	(80)
West	0.9x	0.77	X	6.18	x	63.27	x	0.4	x	0.8	=	86.71	(80)
West	0.9x	0.77	X	6.18	x	92.28	x	0.4	x	0.8	=	126.47	(80)
West	0.9x	0.77	X	6.18	x	92.28	x	0.4	x	0.8	=	126.47	(80)
West	0.9x	0.77	X	6.18	x	113.09	x	0.4	X	0.8	=	154.99	(80)
West	0.9x	0.77	x	6.18	X	113.09	X	0.4	X	0.8	=	154.99	(80)

West	0.9x	0.77	X	6.1	8	x	1′	15.77	X	(	0.4	x	0.8		=	158.66	(80)
West	0.9x	0.77	x	6.1	8	x [	1′	15.77	x	(	0.4	x	0.8		=	158.66	(80)
West	0.9x	0.77	X	6.1	8	x	1′	10.22	x	(	0.4	x	0.8		=	151.05	(80)
West	0.9x	0.77	X	6.1	8	x	11	10.22	X	(	0.4	x	0.8		=	151.05	(80)
West	0.9x	0.77	X	6.1	8	x	9	4.68	X	(	0.4	x	0.8		=	129.75	(80)
West	0.9x	0.77	X	6.1	8	x [	9	4.68	x	(	0.4	×	0.8		=	129.75	(80)
West	0.9x	0.77	X	6.1	8	x	7	3.59	X	(	0.4	×	0.8		=	100.85	(80)
West	0.9x	0.77	X	6.1	8	x	7	3.59	x	(	0.4	×	0.8		=	100.85	(80)
West	0.9x	0.77	X	6.1	8	x	4	5.59	X	(	0.4	×	0.8		=	62.48	(80)
West	0.9x	0.77	X	6.1	8	x	4	5.59	X	(	0.4	x	0.8		=	62.48	(80)
West	0.9x	0.77	X	6.1	8	x	2	4.49	X	(	0.4	x	0.8		=	33.56	(80)
West	0.9x	0.77	X	6.1	8	x	2	4.49	X	(	0.4	x	0.8		=	33.56	(80)
West	0.9x	0.77	X	6.1	8	x	1	6.15	X	(	0.4	x	0.8		=	22.13	(80)
West	0.9x	0.77	X	6.1	8	x	1	6.15	X	(	0.4	×	0.8		=	22.13	(80)
Solar (	ains in	watts, ca	alculated	for eac	h month	1			(83)m	= Sum	ı(74)m	.(82)m					
(83)m=	76	147.67	245.41	368.55	465.73		34.05	457.77	38	3 2	288.25	175.38	94.47	62.7	75		(83)
Total g	ains – i	nternal a	ınd sola		= (73)m	<del>`</del>										İ	
(84)m=	464.79	534.54	620.22	723.96	801.53	80	0.85	762.15	692.	92 6	608.06	514.8	456.42	441.	.51		(84)
7. Me	an inte	rnal temp	erature	(heating	seasor	n)											
Temp	erature	during h	eating p	eriods ir	n the livi	ng a	area f	from Tab	ole 9,	Th1 (	(°C)					21	(85)
											` '						
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,m	ı (se	е Та	ble 9a)			· ,		_				_
Utilisa	ation fac Jan	ctor for ga	ains for Mar	living are	ea, h1,m May	Ť	ee Ta Jun	ble 9a) Jul	Αι	<u> </u>	Sep	Oct	Nov	De	ес		
Utilisa (86)m=		Ť				į,			At 0.3	ıg	Sep 0.65	Oct 0.93	Nov 0.99	De			(86)
(86)m=	Jan 1	Feb	Mar 0.96	Apr 0.86	May 0.67	0	Jun 9.47	Jul 0.34	0.3	a a	0.65		_	<del></del>			(86)
(86)m=	Jan 1	Feb 0.99	Mar 0.96	Apr 0.86	May 0.67	0 ollov	Jun 9.47	Jul 0.34	0.3	ug 9 able 9	0.65		_	<del></del>			(86)
(86)m= Mean (87)m=	Jan 1 interna 20.21	Feb 0.99 al temper 20.36	Mar 0.96 ature in 20.6	Apr 0.86 living are 20.86	May 0.67 ea T1 (for 20.98	0 ollov	Jun 0.47 w ste 21	Jul 0.34 ps 3 to 7 21	0.3 ' in T 21	able 9	0.65 9 <b>c)</b> 20.98	0.93	0.99	1			
(86)m= Mean (87)m=	Jan 1 interna 20.21	Feb 0.99	Mar 0.96 ature in 20.6	Apr 0.86 living are 20.86	May 0.67 ea T1 (for 20.98	0 ollov dwe	Jun 0.47 w ste 21	Jul 0.34 ps 3 to 7 21	0.3 ' in T 21	able 9	0.65 9 <b>c)</b> 20.98	0.93	0.99	1	18		
(86)m=  Mean (87)m=  Temp (88)m=	Jan 1 interna 20.21 erature 20.18	Feb 0.99 1 temper 20.36 during h	Mar 0.96 ature in 20.6 eating p	Apr 0.86 living are 20.86 eriods ir 20.19	May 0.67 ea T1 (for 20.98 or rest of 20.19	ollow dwe	Jun 0.47 w ste 21 elling	Jul 0.34 ps 3 to 7 21 from Ta 20.2	0.3 7 in T 21 able 9 20.	able 9	0.65 9c) 20.98	20.8	0.99	20.	18		(87)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa	Jan 1 interna 20.21 erature 20.18 ation fac	Feb 0.99 al temper 20.36 during h 20.18 ctor for ga	Mar 0.96 ature in 20.6 eating p 20.18 ains for	Apr 0.86 living are 20.86 periods ir 20.19 rest of decidents	May 0.67 ea T1 (for 20.98 or rest of 20.19 welling,	ollov dwe	Jun 0.47 w ste 21 elling 20.2 m (se	Jul 0.34 ps 3 to 7 21 from Ta 20.2 ee Table	0.3 7 in T 21 able 9 20.	able 9 20, Th2	0.65 9c) 20.98 (°C) 20.2	0.93 20.8 20.19	0.99 20.46 20.19	20.	18		(87)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=	Jan 1 interna 20.21 erature 20.18 ation fac	Feb 0.99 al temper 20.36 during h 20.18 etor for ga 0.99	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95	Apr 0.86 living are 20.86 periods ir 20.19 rest of do 0.83	May 0.67 ea T1 (for 20.98 or rest of 20.19 welling, 0.62	0 ollow dwe 2 h2,r	Jun 0.47 w ste 21 elling 0.2 m (se	Jul 0.34 ps 3 to 7 21 from Ta 20.2 ee Table 0.28	0.3 7 in T 21 able 9 20. 9a) 0.3	able 9 2 2 2 2	0.65   O.65   O.	0.93 20.8 20.19	0.99	20.	18		(87)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean	Jan 1 interna 20.21 erature 20.18 ation fac 0.99 interna	Feb 0.99 al temper 20.36 during h 20.18 ctor for gas 0.99 al temper	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in	Apr 0.86 living are 20.86 eeriods ir 20.19 rest of dr 0.83 the rest	May 0.67 ea T1 (for 20.98 in rest of 20.19 welling, 0.62 of dwell	dwe 2 h2,r 0	Jun  1.47  w ste 21  elling 10.2  m (se 1.41  T2 (fo	Jul 0.34 ps 3 to 7 21 from Ta 20.2 ee Table 0.28 ollow ste	0.3 7 in T 21 able 9 20. 9a) 0.3	able 9  able 9  7, Th2  2  to 7 iii	0.65 9c) 20.98 (°C) 20.2 0.58	0.93 20.8 20.19 0.9 e 9c)	0.99 20.46 20.19 0.99	20.7	118		(87) (88) (89)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=	Jan 1 interna 20.21 erature 20.18 ation fac	Feb 0.99 al temper 20.36 during h 20.18 etor for ga 0.99	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95	Apr 0.86 living are 20.86 periods ir 20.19 rest of do 0.83	May 0.67 ea T1 (for 20.98 or rest of 20.19 welling, 0.62	dwe 2 h2,r 0	Jun 0.47 w ste 21 elling 0.2 m (se	Jul 0.34 ps 3 to 7 21 from Ta 20.2 ee Table 0.28	0.3 7 in T 21 able 9 20. 9a) 0.3	able 9  able 9  7, Th2  2  to 7 iii	0.65	0.93  20.8  20.19  0.9  9c) 19.97	0.99 20.46 20.19 0.99	20.7	118	0.27	(87) (88) (89) (90)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean	Jan 1 interna 20.21 erature 20.18 ation fac 0.99 interna	Feb 0.99 al temper 20.36 during h 20.18 ctor for gas 0.99 al temper	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in	Apr 0.86 living are 20.86 eeriods ir 20.19 rest of dr 0.83 the rest	May 0.67 ea T1 (for 20.98 in rest of 20.19 welling, 0.62 of dwell	dwe 2 h2,r 0	Jun  1.47  w ste 21  elling 10.2  m (se 1.41  T2 (fo	Jul 0.34 ps 3 to 7 21 from Ta 20.2 ee Table 0.28 ollow ste	0.3 7 in T 21 able 9 20. 9a) 0.3	able 9  able 9  7, Th2  2  to 7 iii	0.65	0.93  20.8  20.19  0.9  9c) 19.97	0.99 20.46 20.19 0.99	20.7	118	0.37	(87) (88) (89)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=	Jan 1 interna 20.21 erature 20.18 ation fac 0.99 interna 19.13	Feb 0.99 al temper 20.36 during h 20.18 ctor for ga 0.99 al temper 19.35	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69	Apr 0.86 living are 20.86 eriods ir 20.19 rest of dr 0.83 the rest 20.04	May 0.67 ea T1 (for 20.98 n rest of 20.19 welling, 0.62 of dwell 20.17	dwe 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Jun  0.47  w ste 21  elling 0.2  m (se 0.41  T2 (fo 0.2	Jul 0.34 ps 3 to 7 21 from Ta 20.2 pe Table 0.28 pollow ste 20.2	0.3 7 in T 27 able 9 20. 9a) 0.3 eps 3	able 9 2 3 7 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1	0.65	0.93  20.8  20.19  0.9  0.9  19.97  A = Liv	0.99 20.46 20.19 0.99	20.7	118	0.37	(87) (88) (89) (90) (91)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=	Jan  1 interna 20.21 erature 20.18 ation fac 0.99 interna 19.13 interna 19.53	Feb 0.99 al temper 20.36 during h 20.18 ctor for ga 0.99 al temper 19.35	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69 ature (for 20.03	Apr 0.86 living are 20.86 eeriods ir 20.19 rest of de 0.83 the rest 20.04	May 0.67 ea T1 (for 20.98 or rest of 20.19 welling, 0.62 of dwell 20.17 ole dwell 20.47	dwee 2 h2,r 0 oing 2 20	Jun  0.47  w ste 21  elling 0.2  m (se 0.41  T2 (fo 0.2)  g) = fl 0.49	Jul 0.34  ps 3 to 7 21  from Ta 20.2  ee Table 0.28  ollow ste 20.2  LA × T1 20.5	0.3 7 in T 21 able 9 20. 9a) 0.3 eps 3 20. + (1 - 20.	able 9 20, Th2 2 1 to 7 ii 2	0.65   0.65   0.65   0.65   0.9c   0.98   0.58   0.58   0.58   0.58   0.19   0.58   0.19   0.58   0.20.19	0.93  20.8  20.19  0.9  9c)  19.97  A = Liv	0.99 20.46 20.19 0.99	20.7	119	0.37	(87) (88) (89) (90)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply	Jan 1 interna 20.21 erature 20.18 ation fac 0.99 interna 19.13 interna 19.53 adjustr	Feb 0.99 al temper 20.36 during h 20.18 ctor for ga 0.99 al temper 19.35 al temper 19.72 ment to th	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69 ature (for 20.03 ne mear	Apr 0.86 living are 20.86 eriods ir 20.19 rest of dr 0.83 the rest 20.04 or the wh 20.34 n internal	May 0.67 ea T1 (for 20.98 n rest of 20.19 welling, 0.62 of dwell 20.17 ole dwell 20.47 temper	dwe 2 2 h2,r 0 ing 2 2 catur	Jun 0.47  w ste 21 elling 0.2 m (se 0.41  T2 (fc 0.2) g) = fl 0.49 re fro	Jul 0.34 ps 3 to 7 21 from Ta 20.2 pe Table 0.28 pollow ste 20.2  LA × T1 20.5 m Table	0.3 7 in T 21 able 9 20. 9a) 0.3 eps 3 20. + (1 - 20. 4e, 1	able 9 able 9 7, Th2 2 to 7 in 2 fLA) 5 2 where	0.65  9c) 20.98  (°C) 20.2  0.58  n Table 20.19  ft  1 × T2 20.48  e appro	0.93  20.8  20.19  0.9  0.9  19.97  A = Liv	0.99  20.46  20.19  0.99  19.49 ing area ÷ (4	1 20.° 20.° 1 19.0 4) =	118	0.37	(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=	Jan  1 interna 20.21 erature 20.18 ation fac 0.99 interna 19.13 interna 19.53 adjustr 19.53	Feb 0.99 al temper 20.36 during h 20.18 ctor for ga 0.99 al temper 19.35 al temper 19.72 ment to th 19.72	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69 ature (for 20.03 ne mean 20.03	Apr 0.86 living are 20.86 periods ir 20.19 rest of dr 0.83 the rest 20.04 or the wh 20.34 n internal 20.34	May 0.67 ea T1 (for 20.98 or rest of 20.19 welling, 0.62 of dwell 20.17 ole dwell 20.47	dwe 2 2 h2,r 0 ing 2 2 catur	Jun  0.47  w ste 21  elling 0.2  m (se 0.41  T2 (fo 0.2)  g) = fl 0.49	Jul 0.34  ps 3 to 7 21  from Ta 20.2  ee Table 0.28  ollow ste 20.2  LA × T1 20.5	0.3 7 in T 21 able 9 20. 9a) 0.3 eps 3 20. + (1 - 20.	able 9 able 9 7, Th2 2 to 7 in 2 fLA) 5 2 where	0.65   0.65   0.65   0.65   0.9c   0.98   0.58   0.58   0.58   0.58   0.19   0.58   0.19   0.58   0.20.19	0.93  20.8  20.19  0.9  9c)  19.97  A = Liv	0.99  20.46  20.19  0.99  19.49 ing area ÷ (4	20. <sup>-</sup> 20. <sup>-</sup> 1 19.0 4) =	118	0.37	(87) (88) (89) (90) (91)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp	Jan 1 interna 20.21 erature 20.18 ation fac 0.99 interna 19.13 interna 19.53 adjustr 19.53 ace hea	Feb 0.99 al temper 20.36 during h 20.18 ctor for ga 0.99 al temper 19.35 al temper 19.72 ment to th 19.72 ating requ	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69 ature (for 20.03 he mean 20.03	Apr 0.86 living are 20.86 eriods ir 20.19 rest of dr 0.83 the rest 20.04 or the wh 20.34 n internal 20.34	May 0.67 ea T1 (for 20.98 n rest of 20.19 welling, 0.62 of dwell 20.17 ole dwe 20.47 temper 20.47	dwe 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Jun 0.47  w ste 21 elling 0.2 m (se 0.41  T2 (fc 0.2) g) = fl 0.49 re fro 0.49	Jul 0.34 ps 3 to 7 21 from Ta 20.2 pe Table 0.28 pollow ste 20.2  LA × T1 20.5 m Table 20.5	0.3 7 in T 21 able 9 20. 9a) 0.3 20. + (1 - 20. 4e, 1	able 9 able 9 20, Th2 2 to 7 ii 2 2 fLA) 5 2 where 5 2	0.65  9c) 20.98  (°C) 20.2  0.58  n Table 20.19  ft  1 × T2 20.48  e appro	0.93  20.8  20.19  0.9  9c) 19.97  A = Liv  20.28  priate 20.28	0.99  20.46  20.19  0.99  19.49 ing area ÷ (4	1 20.4 20.4 1 19.4 19.4	118		(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T	Jan  1 interna 20.21 erature 20.18 ation fac 0.99 interna 19.13 interna 19.53 adjustr 19.53 ace head i to the	Feb  0.99  al temper 20.36  during h 20.18  ctor for ga 0.99  al temper 19.35  al temper 19.72 ment to th 19.72 ating requesting req	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69 ature (for 20.03 he mean 20.03 uirement ernal tel	Apr 0.86 living are 20.86 eriods ir 20.19 rest of de 0.83 the rest 20.04 or the wh 20.34 in internal 20.34 mperature	May 0.67 ea T1 (for 20.98 no rest of 20.19 welling, 0.62 of dwell 20.17 ole dwell 20.47 temper 20.47	dwe 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Jun 0.47  w ste 21 elling 0.2 m (se 0.41  T2 (fc 0.2) g) = fl 0.49 re fro 0.49	Jul 0.34 ps 3 to 7 21 from Ta 20.2 pe Table 0.28 pollow ste 20.2  LA × T1 20.5 m Table 20.5	0.3 7 in T 21 able 9 20. 9a) 0.3 20. + (1 - 20. 4e, 1	able 9 able 9 20, Th2 2 to 7 ii 2 2 fLA) 5 2 where 5 2	0.65  9c) 20.98  (°C) 20.2  0.58  n Table 20.19  ft  1 × T2 20.48  e appro	0.93  20.8  20.19  0.9  9c) 19.97  A = Liv  20.28  priate 20.28	0.99  20.46  20.19  0.99  19.49 ing area ÷ (4	1 20.4 20.4 1 19.4 19.4	118		(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T	Jan 1 interna 20.21 erature 20.18 ation fac 0.99 interna 19.13 interna 19.53 adjustr 19.53 ace hea it to the illisation	Feb 0.99 1 temper 20.36 20.18	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69 ature (for 20.03 he mean 20.03 uirement ernal telepr gains	Apr 0.86 living are 20.86 eriods ir 20.19 rest of dr 0.83 the rest 20.04 or the wh 20.34 or internal 20.34 mperaturusing Ta	May 0.67 ea T1 (for 20.98 n rest of 20.19 welling, 0.62 of dwell 20.17 ole dwe 20.47 temper 20.47	dwed 2/2 h2,r 0 ing 2/2 coned	Jun 0.47  w ste 21 elling 0.2 m (se 0.41  T2 (fc 0.2) co.49 re fro 0.49 at ste	Jul 0.34 ps 3 to 7 21 from Ta 20.2 ee Table 0.28 collow ste 20.2  LA × T1 20.5 m Table 20.5 ep 11 of	0.3 7 in T 21 able 9 20. 9a) 0.3 2ps 3 20. + (1 20. 4e, 1	able 9 2 2 7 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7	0.65  9c) 20.98  (°C) 20.2  0.58  n Table 20.19  ft  0 × T2 20.48  e appro 20.48  so that	0.93  20.8  20.19  0.9  e 9c)  19.97  A = Liv  20.28  priate 20.28	0.99  20.46  20.19  0.99  19.49  ing area ÷ (4  19.85  19.85	19.0 20.1 19.0 4) =	118 119 119 119 119 119		(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T the utilisa	Jan 1 interna 20.21 erature 20.18 ation face 0.99 interna 19.13 interna 19.53 adjustr 19.53 ace head i to the cillisation Jan	Feb  0.99  al temper 20.36  during h 20.18  ctor for ga 0.99  al temper 19.35  al temper 19.72 ment to th 19.72 ating requesting req	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69 ature (for 20.03 ne mean 20.03 direment ernal teleor gains Mar	Apr 0.86 living are 20.86 eriods ir 20.19 rest of dr 0.83 the rest 20.04 or the wh 20.34 n internal 20.34 mperaturusing Ta Apr	May 0.67 ea T1 (for 20.98 no rest of 20.19 welling, 0.62 of dwell 20.17 ole dwell 20.47 temper 20.47	dwed 2/2 h2,r 0 ing 2/2 coned	Jun 0.47  w ste 21 elling 0.2 m (se 0.41  T2 (fc 0.2) g) = fl 0.49 re fro 0.49	Jul 0.34 ps 3 to 7 21 from Ta 20.2 pe Table 0.28 pollow ste 20.2  LA × T1 20.5 m Table 20.5	0.3 7 in T 21 able 9 20. 9a) 0.3 20. + (1 - 20. 4e, 1	able 9 2 2 7 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7	0.65  9c) 20.98  (°C) 20.2  0.58  n Table 20.19  ft  1 × T2 20.48  e appro	0.93  20.8  20.19  0.9  9c) 19.97  A = Liv  20.28  priate 20.28	0.99  20.46  20.19  0.99  19.49 ing area ÷ (4	19.0 20.1 19.0 4) =	118		(87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T the utilisa	Jan 1 interna 20.21 erature 20.18 ation face 0.99 interna 19.13 interna 19.53 adjustr 19.53 ace head i to the cillisation Jan	Feb  0.99  al temper 20.36  during h 20.18  ctor for ga 0.99  al temper 19.35  al temper 19.72  ment to th 19.72  mean int factor for Feb	Mar 0.96 ature in 20.6 eating p 20.18 ains for 0.95 ature in 19.69 ature (for 20.03 ne mean 20.03 direment ernal teleor gains Mar	Apr 0.86 living are 20.86 eriods ir 20.19 rest of dr 0.83 the rest 20.04 or the wh 20.34 n internal 20.34 mperaturusing Ta Apr	May 0.67 ea T1 (for 20.98 n rest of 20.19 welling, 0.62 of dwell 20.17 ole dwe 20.47 temper 20.47	dwed 2/2 h2,r 0 0 ing 2/2 20 20 20 20 20 20 20 20 20 20 20 20 20	Jun 0.47  w ste 21 elling 0.2 m (se 0.41  T2 (fc 0.2) co.49 re fro 0.49 at ste	Jul 0.34 ps 3 to 7 21 from Ta 20.2 ee Table 0.28 collow ste 20.2  LA × T1 20.5 m Table 20.5 ep 11 of	0.3 7 in T 21 able 9 20. 9a) 0.3 2ps 3 20. + (1 20. 4e, 1	able 9 able 9 7 7 7 7 7 7 7 8 8 8 9 8 9 1 1 2 1 2 1 2 1 2 1 2 1 2 2 4 4 7 8 8 8 8 9 9 9 9 9 1 1 1 1 1 1 1 1 1 1 1	0.65  9c) 20.98  (°C) 20.2  0.58  n Table 20.19  ft  0 × T2 20.48  e appro 20.48  so that	0.93  20.8  20.19  0.9  e 9c)  19.97  A = Liv  20.28  priate 20.28	0.99  20.46  20.19  0.99  19.49  ing area ÷ (4  19.85  19.85	19.0 20.1 19.0 4) =	118 119 119 119 119 119 119 119		(87) (88) (89) (90) (91) (92)

Useful gains, hmGm , W = (94)m x (84)m													
(95)m= 461.47 525.56 588.61 604.11 507.22 344.62 228.31 239.46 368.76 466.1 448.84 439.13		(95)											
Monthly average external temperature from Table 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 loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]	•												
(97)m= 917.54 891.22 811.7 679.41 519.48 345.54 228.38 239.64 375.67 573.35 758.37 913.77		(97)											
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	1												
(98)m= 339.31 245.72 165.97 54.21 9.12 0 0 0 79.8 222.86 353.13  Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	4470.40	(98)											
Space heating requirement in kWh/m²/year  Total per year (kWh/year) = Sum(98) <sub>15,912</sub> = 1470.13 (21.56)													
9b. Energy requirements – Community heating scheme													
9b. Energy requirements – Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme.													
This part is used for space heating, space cooling or water heating provided by a community scheme.  Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  0 (301)													
Fraction of space heat from community system 1 – (301) =													
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; to includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	he latter												
Fraction of heat from Community heat pump	1	(303a)											
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)											
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)											
Distribution loss factor (Table 12c) for community heating system	1.1	(306)											
Space heating													
Annual space heating requirement													
Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) =		(307a)											
	1470.13												
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	1470.13 1617.14	(307a)											
Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (304a) x (305) x (306) =  (98) x (301) x 100 ÷ (308) =	1470.13 1617.14	(307a) (308											
Space heat from Community heat pump (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	1470.13 1617.14	(307a) (308											
Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (304a) x (305) x (306) =  Water heating	1470.13 1617.14 0	(307a) (308											
Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:	1470.13 1617.14 0 0 2011.65	(307a) (308 (309)											
Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) =	1470.13  1617.14  0  0  2011.65	(307a) (308 (309) (310a)											
Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) =  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =	1470.13  1617.14  0  0  2011.65  2212.81  38.3	(307a) (308 (309) (310a) (313)											
Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) =  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =  Electricity for pumps and fans within dwelling (Table 4f):	1470.13  1617.14  0  0  2011.65  2212.81  38.3  0  0	(307a) (308 (309) (310a) (313) (314) (315)											
Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) =  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	1470.13  1617.14  0  0  2011.65  2212.81  38.3  0  0  143.32	(307a) (308 (309) (310a) (313) (314) (315) (330a)											
Space heat from Community heat pump  (98) × (304a) × (305) × (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) × (301) × 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) =  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] =  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans	1470.13  1617.14  0  0  2011.65  2212.81  38.3  0  0  143.32  0	(307a) (308 (309) (310a) (313) (314) (315) (330a) (330b)											
Space heat from Community heat pump  (98) × (304a) × (305) × (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) × (301) × 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) =  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] =  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating	1470.13  1617.14  0  0  2011.65  2212.81  38.3  0  0  143.32  0  0	(307a) (308 (309) (310a) (313) (314) (315) (330a) (330b) (330g)											
Space heat from Community heat pump  (98) x (304a) x (305) x (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) =  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating  Total electricity for the above, kWh/year = (330a) + (330b) + (330g) =	1470.13  1617.14  0  0  2011.65  2212.81  38.3  0  0  143.32  0  143.32	(307a) (308 (309) (310a) (313) (314) (315) (330a) (330b) (330g) (331)											
Space heat from Community heat pump  (98) × (304a) × (305) × (306) =  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) × (301) × 100 ÷ (308) =  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community heat pump  (64) × (303a) × (305) × (306) =  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] =  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =  Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside  warm air heating system fans  pump for solar water heating	1470.13  1617.14  0  0  2011.65  2212.81  38.3  0  0  143.32  0  0	(307a) (308 (309) (310a) (313) (314) (315) (330a) (330b) (330g)											

(334)Electricity generated by wind turbine (Appendix M) (negative quantity) 12b. CO2 Emissions – Community heating scheme Energy **Emission factor Emissions** kWh/year kg CO2/kWh kg CO2/year CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel Efficiency of heat source 1 (%) 319 (367a) CO2 associated with heat source 1  $[(307b)+(310b)] \times 100 \div (367b) \times$ 623.12 (367)0.52 Electrical energy for heat distribution (372)[(313) x]0.52 19.88 Total CO2 associated with community systems (363)...(366) + (368)...(372)(373)643 CO2 associated with space heating (secondary) (309) x(374)0 0 CO2 associated with water from immersion heater or instantaneous heater (312) x (375)0.52 Total CO2 associated with space and water heating (373) + (374) + (375) =643 (376)CO2 associated with electricity for pumps and fans within dwelling (331)) x (378)0.52 74.38 CO2 associated with electricity for lighting (332))) x (379)0.52 157.75 Energy saving/generation technologies (333) to (334) as applicable Item 1 x = 0.01 =(380) 0.52 -299.86 sum of (376)...(382) =Total CO2, kg/year (383)575.27  $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)8.44

El rating (section 14)

(385)

93.19

		User	Details:						
Assessor Name:	006273								
Software Name:	John Simpson Stroma FSAP 2012	)	Stroma Softwai					n: 1.0.4.26	
Software Name.	Stroma i SAI 2012		Address: 0				V 61310	11. 1.0.4.20	
Address :	GT 101, Aspen Cour	·				FH			
Overall dwelling dime	<u> </u>	t, maitiana i a	K Estato, E	Joriaori,	, 14000 21				
<u> </u>	Volume(m <sup>3</sup>	3)							
Ground floor			ea(m²) 68.2	la) x	Av. Hei	.6	(2a) =	177.32	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	68.2	<b>1</b> )			J [		
Dwelling volume			(	(3a)+(3b)	)+(3c)+(3d)	)+(3e)+	(3n) =	177.32	(5)
2. Ventilation rate:									
		condary	other		total			m³ per hou	ır
Number of chimneys	heating he	eating +	0	= [	0	x -	40 =	0	(6a)
Number of open flues	0 +	0 +	0	- F	0	x :	20 =	0	(6b)
Number of intermittent fa	ans			Ē	2	x	10 =	20	(7a)
Number of passive vents	3			Ē	0	x	10 =	0	(7b)
Number of flueless gas f	ires			Ė	0	x -	40 =	0	(7c)
				<u> </u>			L		_
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a	)+(6b)+(7a)+(7b)+	·(7c) =		20		÷ (5) =	0.11	(8)
If a pressurisation test has b	peen carried out or is intended	d, proceed to (17),	otherwise co	ntinue fro	om (9) to (	16)			
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber fr		•		uction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresp nas): if equal user 0.35	onding to the grea	iter wall area	(atter					
- · · · · · · · · · · · · · · · · · · ·	floor, enter 0.2 (unseale	ed) or 0.1 (sea	ed), else e	nter 0			[	0	(12)
If no draught lobby, en	iter 0.05, else enter 0						İ	0	(13)
Percentage of window	s and doors draught str	ipped					İ	0	(14)
Window infiltration			0.25 - [0.2 x	(14) ÷ 1	00] =		Ì	0	(15)
Infiltration rate			(8) + (10) +	(11) + (1	2) + (13) +	· (15) =	Ì	0	(16)
Air permeability value,	q50, expressed in cubi	c metres per h	our per sq	uare me	etre of e	nvelope	area	5	(17)
If based on air permeabi	lity value, then $(18) = [(17)]$	() ÷ 20]+(8), other	vise (18) = (10	6)			Ì	0.36	(18)
Air permeability value applie	es if a pressurisation test has	been done or a de	egree air pern	neability i	is being us	ed	-		
Number of sides sheltered	ed		(00) 4 50	075 (4	<b>6</b> ).			2	(19)
Shelter factor			(20) = 1 - [0		9)] =			0.85	(20)
Infiltration rate incorpora	-		(21) = (18)	((20) =				0.31	(21)
Infiltration rate modified		los los	1 4	0	0.4	NI			
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		- 1	1 1	. 1			<u> </u>		
(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								
	<del>'</del>		т т						

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltration rate (allowing for shelter a	nd wind speed) -	- (21a) v (	(22a)m					
0.39 0.39 0.38 0.34 0.33	0.29 0.29	0.29	0.31	0.33	0.35	0.36		
Calculate effective air change rate for the app		1	****					
If mechanical ventilation:							0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23	Ba) × Fmv (equation	(N5)), other	wise (23b)	) = (23a)			0	(23b)
If balanced with heat recovery: efficiency in % allowing	for in-use factor (fro	m Table 4h)	=				0	(23c)
a) If balanced mechanical ventilation with he	eat recovery (MV	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 balanced mechanical ventilation withou	t heat recovery (	MV) (24b	)m = (22	2b)m + (2	23b)		•	
(24b)m= 0 0 0 0 0	0 0	0	0	0	0	0		(24b)
c) If whole house extract ventilation or positi if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$	•			5 × (23b	o)			
(24c)m= 0 0 0 0 0	0 0	7 0	0	0	0	0		(24c)
d) If natural ventilation or whole house posit	ive input ventilat	ion from l	oft		<u> </u>	ļ.		
if (22b)m = 1, then (24d)m = (22b)m oth	•			0.5]				
(24d)m= 0.58 0.57 0.57 0.56 0.55	0.54 0.54	0.54	0.55	0.55	0.56	0.57		(24d)
Effective air change rate - enter (24a) or (24	lb) or (24c) or (2	4d) in box	(25)				_	
(25)m= 0.58 0.57 0.57 0.56 0.55	0.54 0.54	0.54	0.55	0.55	0.56	0.57		(25)
3. Heat losses and heat loss parameter:								
ELEMENT Gross Openings	Net Area	U-valu	ıe	AXU		k-value	e A	Χk
area (m²) m²	A ,m²	W/m2	_	(W/I	K)	kJ/m²-l	< κ.	J/K
Windows Type 1	4.84 X	1/[1/( 1.4 )+	0.04] =	6.42	_			(27)
Windows Type 2	4.84 X	1/[1/( 1.4 )+	0.04] =	6.42				(27)
Windows Type 3	2.18 x	1/[1/( 1.4 )+	0.04] =	2.89				(27)
Windows Type 4	3.5 ×	1/[1/( 1.4 )+	0.04] =	4.64				(27)
Windows Type 5	1.68 ×	1/[1/( 1.4 )+	0.04] =	2.23				(27)
Floor	68.2 x	0.13	= [	8.86599	9			(28)
Walls 48.39 17.04	31.35 ×	0.18		5.64				(29)
Total area of elements, m <sup>2</sup>	116.59							(31)
Party wall	39.03 ×	0		0				(32)
* for windows and roof windows, use effective window U-	value calculated usin	g formula 1/	 /[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
** include the areas on both sides of internal walls and pa	rtitions							
Fabric heat loss, $W/K = S (A \times U)$		(26)(30)	+ (32) =				37.1	(33)
Heat capacity Cm = S(A x k)			((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA)				tive Value			250	(35)
For design assessments where the details of the construction can be used instead of a detailed calculation.	ction are not known p	recisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridges : S (L x Y) calculated using A	ppendix K						5.44	(36)
if details of thermal bridging are not known (36) = $0.05 x$ (	(31)		(00)	(00)				<b>—</b> ,
Total fabric heat loss			(33) +		(-)		42.54	(37)
Ventilation heat loss calculated monthly	l luca l 1.1	1 1			25)m x (5)			
(38)m= 33.78 33.61 33.43 32.62 32.47	Jun Jul 31.77 31.77	Aug 31.64	Sep 32.04	Oct 32.47	Nov 32.78	33.1		(38)
` '	31.77	31.04	!		<u> </u>	33.1		(00)
Heat transfer coefficient, W/K	7404 7404	7440		= (37) + (37)		75.04	Ī	
(39)m= 76.32 76.15 75.98 75.17 75.02	74.31 74.31	74.18	74.58	75.02	75.32	75.64	75 47	(30)
Stroma FSAP 2012 Version: 1.0.4.26 (SAP 9.92) - http://v	vww.stroma.com		,	-verage =	Sum(39) <sub>1</sub>	12 / 1∠=	75.1≱ <sub>age</sub>	: 2 of 8")

Heat loss	s parar	neter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
_	1.12	1.12	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11		
<u> </u>	· ·						ı			Average =	Sum(40) <sub>1</sub> .	12 /12=	1.1	(40)
Number	of days	s in mor	nth (Tab	le 1a)							1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wate	r heati	ng ener	rgy requi	rement:								kWh/ye	ear:	
Assumed				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		2		(42)
if TFA					`	,	•	, , <del>-</del>	,					
Annual a										an target o		5.49		(43)
not more th		-		•		-	-	o acriieve	a water us	se largel o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water u					,			_	Оер		1407	Dec		
(44)m= 9	95.14	91.68	88.22	84.76	81.3	77.84	77.84	81.3	84.76	88.22	91.68	95.14		
(44)111=	00.14	31.00	00.22	04.70	01.0	77.04	17.04	01.0	<u> </u>	<u> </u>	m(44) <sub>112</sub> =	L	1037.87	(44)
Energy con	ntent of I	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600			` '		1007.07	(/
(45)m= 1-	41.09	123.4	127.33	111.01	106.52	91.92	85.18	97.74	98.91	115.27	125.82	136.64		
		-					<u> </u>				m(45) <sub>112</sub> =	L	1360.81	(45)
If instantan	eous wa	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			( - /2			
(46)m= 2	21.16	18.51	19.1	16.65	15.98	13.79	12.78	14.66	14.84	17.29	18.87	20.5		(46)
Water sto	orage	oss:						ļ	!	ļ				
Storage v	volume	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If commu	ınity he	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwis			hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water sto	-				!	/1.\^/!	. /-							(15)
a) If mar					or is kno	wn (Kvvr	i/day):					39		(48)
Tempera											0.	.54		(49)
Energy Id			•			or io not		(48) x (49)	) =		0.	75		(50)
<ul><li>b) If mar</li><li>Hot wate</li></ul>				-								0		(51)
If commu		-			<b>-</b> (	., 0, 0.0	-97					<u> </u>		(0.)
Volume f		•										0		(52)
Tempera	ture fa	ctor fro	m Table	2b								0		(53)
Energy Id	ost fror	n water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50	0) or (	54) in (5	55)								0.	75		(55)
Water sto	orage I	oss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 2	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 c		dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	<u>I</u> H11)] ÷ (5		<u>I</u> 7)m = (56)	m where (		m Append	ix H	
(57)m= 2	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 o	circuit	loss (an	nual) fro	m Table	3							0		(58)
Primary of		,	,			59)m = (	(58) ÷ 36	65 × (41)	m					* *
-					•		ter heati	, ,		r thermo	stat)			
(59)m= 2	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)

0	1	1- 1-(-1			(04)	(00)	205 (44	<b>V</b>							
ı		1		1	ì	<del>`</del>	365 × (41	<u> </u>		0	Γ ,	Ι ,	Ι ,	1	(61)
(61)m=	0	0	0	0	0	0	0	(22)		0	0	0	0	(50)	(01)
1				<del></del>				<del>`</del>	_		<del>ì '</del>	<del>ì ´</del>	<del>`</del>	(59)m + (61)m 1	(62)
(62)m=	187.68	165.48	173.93		153.11	137.01	131.77	144.		144	161.86	170.91	183.23	J	(62)
							tive quantit				r contribut	ion to wate	er heating)		
(63)m=	0	0	0	0			s, see Ap	pena 0		0	0	0	0	1	(63)
					1 -					0				J	(00)
(64)m=	187.68	ater hea	173.93	156.1	153.11	137.01	131.77	144.	33	144	161.86	170.91	183.23	1	
(01)	101.00	100.10	170.00	100.1	1 100.11	107.01	1	<u> </u>				r (annual) <sub>1</sub>	l	1909.43	(64)
Heat o	aine fro	m water	heating	ı k\//h/m	onth 0.2	5 ′ [O 8	5 × (45)m								J` ′
(65)m=	84.19	74.7	79.61	72.98	72.69	66.64	65.6	69.7		68.96	75.6	77.91	82.71	]	(65)
					ļ		is in the					<u> </u>		] posting	()
	` ′					yılı lu <del>c</del> ı	is in the	uweiii	ing	OI HOLW	alei is ii	OIII COIII	indinty i	leating	
		ains (see			1).										
IVIETADO	Jan	ns (Table Feb	Mar	Apr	May	Jun	Jul	Αι	ıa	Sep	Oct	Nov	Dec	]	
(66)m=	110.08	110.08	110.08	<del>+</del>	110.08	110.08	+	110.	Ť	110.08	110.08	110.08	110.08		(66)
Liahtin	a aains	(calculat	ted in A	.ppendix	L. eguat	ion L9 (	or L9a), a	ılso se	ee <sup>-</sup>	Table 5	1	<u> </u>		ı	
(67)m=	17.21	15.29	12.43	9.41	7.04	5.94	6.42	8.3	_	11.2	14.22	16.59	17.69	]	(67)
Appliar	nces ga	ins (calc	ulated i	n Appen	dix L, ea	uation l	_13 or L1	3a), a	also	see Ta	ble 5	!	!	J	
(68)m=	193.06	<del>`</del>	190.01	179.27	165.7	152.95		142.	_	147.48	158.22	171.79	184.54	]	(68)
Cookin	g gains	(calcula	ted in A	Appendix	L, equa	tion L1	or L15a	), also	ىــــ o se	e Table	5	!	!	J	
(69)m=	34.01	34.01	34.01	34.01	34.01	34.01	34.01	34.0	_	34.01	34.01	34.01	34.01	]	(69)
Pumps	and fa	ns gains	(Table	5a)	•		•	<u> </u>				•		J	
(70)m=	3	3	3	3	3	3	3	3		3	3	3	3	]	(70)
Losses	e.g. e	vaporatio	n (nega	ative valu	ues) (Tab	le 5)	-1								
(71)m=	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.07	-88.	07	-88.07	-88.07	-88.07	-88.07	]	(71)
Water l	heating	gains (T	able 5)		•		•	•			!		!	•	
(72)m=	113.15	111.16	107.01	101.37	97.71	92.55	88.17	93.7	78	95.78	101.62	108.21	111.17	]	(72)
Total i	nterna	gains =		•	•	(6)	6)m + (67)n	n + (68	)m +	- (69)m +	(70)m + (7	'1)m + (72)	)m	•	
(73)m=	382.45	380.53	368.48	349.07	329.47	310.46	298.04	303.	.58	313.48	333.08	355.62	372.42	]	(73)
6. Sol	ar gain	s:		•			•				,	•	•		
Solar g	ains are	calculated	using sol	ar flux fron	n Table 6a	and asso	ciated equa	ations t	о со	nvert to th	ne applicat	ole orienta	tion.		
Orienta		Access F	actor	Area	a		ux		_	g_ - 1.1 01	_	FF		Gains	
		Table 6d		m²			able 6a		- 1	able 6b	_ '	able 6c		(W)	_
North	0.9x	0.77	,	2.	18	x	10.63	X		0.63	x	0.7	=	7.08	(74)
North	0.9x	0.77	,	3	.5	х	10.63	X		0.63	x	0.7	=	11.37	(74)
North	0.9x	0.77	)	1.	68	x	10.63	X		0.63	х	0.7	=	5.46	(74)
North	0.9x	0.77	)	2.	18	x	20.32	X		0.63	x	0.7	=	13.54	(74)
North	0.9x	0.77	,	3	.5	х	20.32	] x		0.63	х	0.7	=	21.74	(74)

North		_		_										_
North	North	0.9x	0.77	X	1.68	X	20.32	X	0.63	X	0.7	=	10.43	(74)
North	North	0.9x	0.77	X	2.18	X	34.53	X	0.63	X	0.7	=	23.01	(74)
North	North	0.9x	0.77	X	3.5	x	34.53	X	0.63	X	0.7	=	36.94	(74)
North	North	0.9x	0.77	X	1.68	x	34.53	X	0.63	x	0.7	=	17.73	(74)
North	North	0.9x	0.77	X	2.18	X	55.46	x	0.63	X	0.7	=	36.95	(74)
North	North	0.9x	0.77	X	3.5	X	55.46	x	0.63	X	0.7	=	59.33	(74)
North	North	0.9x	0.77	X	1.68	x	55.46	X	0.63	x	0.7	=	28.48	(74)
North	North	0.9x	0.77	X	2.18	X	74.72	X	0.63	X	0.7	=	49.78	(74)
North	North	0.9x	0.77	X	3.5	x	74.72	x	0.63	x	0.7	=	79.92	(74)
North	North	0.9x	0.77	X	1.68	x	74.72	X	0.63	x	0.7	=	38.36	(74)
North	North	0.9x	0.77	X	2.18	x	79.99	x	0.63	X	0.7	=	53.29	(74)
North	North	0.9x	0.77	X	3.5	X	79.99	x	0.63	X	0.7	=	85.56	(74)
North	North	0.9x	0.77	X	1.68	X	79.99	x	0.63	X	0.7	=	41.07	(74)
North	North	0.9x	0.77	X	2.18	X	74.68	X	0.63	X	0.7	=	49.75	(74)
North	North	0.9x	0.77	X	3.5	X	74.68	X	0.63	x	0.7	=	79.88	(74)
North	North	0.9x	0.77	X	1.68	x	74.68	x	0.63	x	0.7	=	38.34	(74)
North	North	0.9x	0.77	X	2.18	X	59.25	x	0.63	X	0.7	=	39.47	(74)
North	North	0.9x	0.77	X	3.5	X	59.25	x	0.63	X	0.7	=	63.37	(74)
North	North	0.9x	0.77	X	1.68	x	59.25	x	0.63	x	0.7	=	30.42	(74)
North	North	0.9x	0.77	X	2.18	X	41.52	x	0.63	X	0.7	=	27.66	(74)
North	North	0.9x	0.77	X	3.5	X	41.52	x	0.63	X	0.7	=	44.41	(74)
North	North	0.9x	0.77	X	1.68	x	41.52	x	0.63	x	0.7	=	21.32	(74)
North	North	0.9x	0.77	X	2.18	X	24.19	X	0.63	X	0.7	=	16.12	(74)
North	North	0.9x	0.77	X	3.5	X	24.19	x	0.63	X	0.7	=	25.87	(74)
North	North	0.9x	0.77	X	1.68	X	24.19	X	0.63	X	0.7	=	12.42	(74)
North	North	0.9x	0.77	X	2.18	X	13.12	X	0.63	X	0.7	=	8.74	(74)
North	North	0.9x	0.77	X	3.5	X	13.12	x	0.63	X	0.7	=	14.03	(74)
North	North	0.9x	0.77	X	1.68	X	13.12	x	0.63	X	0.7	=	6.73	(74)
North 0.9x 0.77 x 1.68 x 8.86 x 0.63 x 0.7 = 4.55 (74)  West 0.9x 0.77 x 4.84 x 19.64 x 0.63 x 0.7 = 29.05 (80)  West 0.9x 0.77 x 4.84 x 19.64 x 0.63 x 0.7 = 29.05 (80)  West 0.9x 0.77 x 4.84 x 38.42 x 0.63 x 0.7 = 56.83 (80)  West 0.9x 0.77 x 4.84 x 38.42 x 0.63 x 0.7 = 56.83 (80)  West 0.9x 0.77 x 4.84 x 38.42 x 0.63 x 0.7 = 56.83 (80)  West 0.9x 0.77 x 4.84 x 63.27 x 0.63 x 0.7 = 93.59 (80)  West 0.9x 0.77 x 4.84 x 63.27 x 0.63 x 0.7 = 93.59 (80)  West 0.9x 0.77 x 4.84 x 63.27 x 0.63 x 0.7 = 93.59 (80)  West 0.9x 0.77 x 4.84 x 92.28 x 0.63 x 0.7 = 136.5 (80)  West 0.9x 0.77 x 4.84 x 92.28 x 0.63 x 0.7 = 136.5 (80)  West 0.9x 0.77 x 4.84 x 92.28 x 0.63 x 0.7 = 136.5 (80)  West 0.9x 0.77 x 4.84 x 92.28 x 0.63 x 0.7 = 136.5 (80)  West 0.9x 0.77 x 4.84 x 92.28 x 0.63 x 0.7 = 136.5 (80)	North	0.9x	0.77	X	2.18	X	8.86	X	0.63	X	0.7	=	5.91	(74)
West         0.9x         0.77         x         4.84         x         19.64         x         0.63         x         0.7         =         29.05         (80)           West         0.9x         0.77         x         4.84         x         19.64         x         0.63         x         0.7         =         29.05         (80)           West         0.9x         0.77         x         4.84         x         38.42         x         0.63         x         0.7         =         56.83         (80)           West         0.9x         0.77         x         4.84         x         38.42         x         0.63         x         0.7         =         56.83         (80)           West         0.9x         0.77         x         4.84         x         63.27         x         0.63         x         0.7         =         93.59         (80)           West         0.9x         0.77         x         4.84         x         92.28         x         0.63         x         0.7         =         136.5         (80)           West         0.9x         0.77         x         4.84         x         92.28	North	0.9x	0.77	X	3.5	X	8.86	x	0.63	X	0.7	=	9.48	(74)
West         0.9x         0.77         x         4.84         x         19.64         x         0.63         x         0.7         =         29.05         (80)           West         0.9x         0.77         x         4.84         x         38.42         x         0.63         x         0.7         =         56.83         (80)           West         0.9x         0.77         x         4.84         x         63.27         x         0.63         x         0.7         =         56.83         (80)           West         0.9x         0.77         x         4.84         x         63.27         x         0.63         x         0.7         =         93.59         (80)           West         0.9x         0.77         x         4.84         x         92.28         x         0.63         x         0.7         =         93.59         (80)           West         0.9x         0.77         x         4.84         x         92.28         x         0.63         x         0.7         =         136.5         (80)           West         0.9x         0.77         x         4.84         x         92.28	North	0.9x	0.77	X	1.68	X	8.86	x	0.63	X	0.7	=	4.55	(74)
West         0.9x         0.77         x         4.84         x         38.42         x         0.63         x         0.7         =         56.83         (80)           West         0.9x         0.77         x         4.84         x         63.27         x         0.63         x         0.7         =         56.83         (80)           West         0.9x         0.77         x         4.84         x         63.27         x         0.63         x         0.7         =         93.59         (80)           West         0.9x         0.77         x         4.84         x         92.28         x         0.63         x         0.7         =         93.59         (80)           West         0.9x         0.77         x         4.84         x         92.28         x         0.63         x         0.7         =         136.5         (80)           West         0.9x         0.77         x         4.84         x         113.09         x         0.63         x         0.7         =         136.5         (80)           West         0.9x         0.77         x         4.84         x         113.09	West	0.9x	0.77	X	4.84	X	19.64	X	0.63	X	0.7	=	29.05	(80)
West       0.9x       0.77       x       4.84       x       38.42       x       0.63       x       0.7       =       56.83       (80)         West       0.9x       0.77       x       4.84       x       63.27       x       0.63       x       0.7       =       93.59       (80)         West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       113.09       x       0.63       x       0.7       =       167.28       (80)	West	0.9x	0.77	X	4.84	X	19.64	x	0.63	X	0.7	=	29.05	(80)
West       0.9x       0.77       x       4.84       x       63.27       x       0.63       x       0.7       =       93.59       (80)         West       0.9x       0.77       x       4.84       x       63.27       x       0.63       x       0.7       =       93.59       (80)         West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       113.09       x       0.63       x       0.7       =       167.28       (80)	West	0.9x	0.77	X	4.84	X	38.42	x	0.63	X	0.7	=	56.83	(80)
West       0.9x       0.77       x       4.84       x       63.27       x       0.63       x       0.7       =       93.59       (80)         West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       113.09       x       0.63       x       0.7       =       167.28       (80)	West	0.9x	0.77	X	4.84	X	38.42	X	0.63	X	0.7	=	56.83	(80)
West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       113.09       x       0.63       x       0.7       =       167.28       (80)	West	0.9x	0.77	x	4.84	x	63.27	x	0.63	x	0.7	=	93.59	(80)
West       0.9x       0.77       x       4.84       x       92.28       x       0.63       x       0.7       =       136.5       (80)         West       0.9x       0.77       x       4.84       x       113.09       x       0.63       x       0.7       =       167.28       (80)	West	0.9x	0.77	X	4.84	x	63.27	x	0.63	x	0.7	=	93.59	(80)
West 0.9x 0.77 x 4.84 x 113.09 x 0.63 x 0.7 = 167.28 (80)	West	0.9x	0.77	x	4.84	x	92.28	x	0.63	x	0.7	=	136.5	(80)
	West	0.9x	0.77	X	4.84	x	92.28	x	0.63	x	0.7	=	136.5	(80)
West 0.9x 0.77 x 4.84 x 113.09 x 0.63 x 0.7 = 167.28 (80)	West	0.9x	0.77	X	4.84	x	113.09	x	0.63	x	0.7	=	167.28	(80)
	West	0.9x	0.77	X	4.84	х	113.09	x	0.63	x	0.7	=	167.28	(80)

West	0.9x	0.77	х	4.8	34	x	11:	5.77	x	0.63		x	0.7		=	171.24	(80)
West	0.9x	0.77	Х	4.8	34	x	11:	5.77	X	0.63		x	0.7		=	171.24	(80)
West	0.9x	0.77	х	4.8	34	x	110	0.22	x	0.63		x	0.7		=	163.03	(80)
West	0.9x	0.77	Х	4.8	34	x	11	0.22	X	0.63		x	0.7		=	163.03	(80)
West	0.9x	0.77	Х	4.8	34	x	94	4.68	x	0.63		x	0.7		=	140.04	(80)
West	0.9x	0.77	х	4.8	34	x	94	4.68	x	0.63		x	0.7		=	140.04	(80)
West	0.9x	0.77	Х	4.8	34	x	73	3.59	x	0.63		x	0.7		=	108.85	(80)
West	0.9x	0.77	х	4.8	34	x	73	3.59	x	0.63		x	0.7		=	108.85	(80)
West	0.9x	0.77	Х	4.8	34	x	45	5.59	X	0.63		x	0.7		=	67.43	(80)
West	0.9x	0.77	X	4.8	34	x	45	5.59	X	0.63		x	0.7		=	67.43	(80)
West	0.9x	0.77	Х	4.8	34	x	24	1.49	X	0.63		x	0.7		=	36.22	(80)
West	0.9x	0.77	X	4.8	34	x	24	1.49	X	0.63		x	0.7		=	36.22	(80)
West	0.9x	0.77	х	4.8	34	x	16	6.15	x	0.63		x	0.7		=	23.89	(80)
West	0.9x	0.77	Х	4.8	34	x	16	6.15	X	0.63		x	0.7		=	23.89	(80)
Solar	ains in	watts, ca	alculated	for eac	h month	<u> </u>			(83)m	= Sum(74)	m(8	32)m				ı	
(83)m=	82.02	159.37	264.85	397.75	502.62			494.03	413.	35 311.0	)9   18	89.28	101.95	67.7	2		(83)
_		nternal a	1	· ,	<del>`</del>	·	<del></del>						_			ı	(0.1)
(84)m=	464.47	539.9	633.33	746.82	832.09	832	2.86	792.08	716.	92 624.5	56   52	22.36	457.57	440.1	14		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	n)											
Temp	erature	during h	eating p	eriods ir	n the livi	ng a	rea fr	rom Tab	ole 9.	Th1 (°C)	1					21	(85)
						-			,	( 0)							``′
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,m	ı (se			,								`
Utilisa	ation fac	tor for g	ains for Mar	living are	ea, h1,m May	TÌ.			Αι	<u> </u>		Oct	Nov	De	:C		_]` ′
Utilisa (86)m=		Ť		T .	I	J	e Tab	ole 9a)	I .	ıg Se	р	Oct 0.96	Nov 0.99	De 1	c		(86)
(86)m=	Jan 1	Feb	Mar 0.97	Apr 0.91	May 0.76	0.	e Tab lun 56	Jul 0.41	Au 0.4	ıg Se	р		+		c		
(86)m=	Jan 1	Feb 0.99	Mar 0.97	Apr 0.91	May 0.76	J 0.s	e Tab lun 56	Jul 0.41	Au 0.4	ug Se 7 0.75 able 9c)	p (		+				
(86)m= Mean (87)m=	Jan 1 interna 19.88	Feb 0.99 1 temper 20.04	Mar 0.97 ature in 20.33	Apr 0.91 living are 20.68	May 0.76 ea T1 (for 20.91	0.9 ollow 20	e Tak lun 56 v step	ole 9a)  Jul  0.41  os 3 to 7	0.4 ' in T	ug Se 7 0.75 able 9c)	p   (	0.96	0.99	1			(86)
(86)m= Mean (87)m=	Jan 1 interna 19.88	Feb 0.99 1 temper 20.04	Mar 0.97 ature in 20.33	Apr 0.91 living are 20.68	May 0.76 ea T1 (for 20.91	J 0.: ollow 20 dwe	e Tak lun 56 v step	ole 9a)  Jul  0.41  os 3 to 7	0.4 ' in T	ug Se 7 0.75 able 9c) 99 20.9	p   (3 2 2 2 ))	0.96	0.99	1	5		(86)
(86)m=  Mean (87)m=  Temp (88)m=	Jan 1 interna 19.88 perature 19.99	Feb 0.99 Il temper 20.04 during h	Mar 0.97 ature in 20.33 eating p	Apr 0.91 living are 20.68 periods ir 20	May 0.76 ea T1 (for 20.91 n rest of 20	ollow 20 dwe 20	e Tablun 56 v step	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01	0.4 7 in T 20.9 able 9	ug Se 7 0.75 able 9c) 99 20.9	p   (3 2 2 2 ))	20.61	0.99	19.8	5		(86)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa	Jan 1 interna 19.88 perature 19.99	Feb 0.99 Il temper 20.04 during h	Mar 0.97 ature in 20.33 eating p	Apr 0.91 living are 20.68 periods ir 20	May 0.76 ea T1 (for 20.91 n rest of 20	ollow 20 dwe 20 h2,n	e Tablun 56 v step	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01	0.4 7 in T 20.9 able 9	Ig Se 7 0.75 able 9c) 99 20.9 1, Th2 (°C	p	20.61	0.99	19.8	5		(86)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=	Jan 1 interna 19.88 perature 19.99 ation fac	Feb 0.99 ltemper 20.04 during h 19.99 etor for ga 0.99	Mar 0.97 ature in 20.33 neating p 19.99 ains for 0.97	Apr 0.91 living are 20.68 periods ir 20 rest of d 0.88	May 0.76 ea T1 (for 20.91 rest of 20 welling, 0.7	J 0.00llow 20 dwe 20 h2,n	e Tablun   56   v step   0.98   elling to 0.01   m (see 48   1	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3	Ig Se 7 0.75 able 9c) 99 20.9 1, Th2 (°C) 11 20.0	p   33   22   22   23   24   24   25   25   25   25   25   25	20.94	0.99 20.18	19.8	5		(86) (87) (88)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean	Jan 1 19.88 perature 19.99 ation fac	Feb 0.99 Il temper 20.04 during h 19.99 ctor for gas 0.99 Il temper	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in	Apr 0.91 living are 20.68 periods ir 20 rest of di 0.88 the rest	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell	J Ollow 20 dwe 20 h2,n 0.	e Tablun 56 v step 0.98 elling for 1001 m (see 48 T2 (fo	Jul 0.41  os 3 to 7 21  from Ta 20.01  e Table 0.32  ollow ste	Au 0.47 in T 20.9 able 9 20.0 9a) 0.3	ug Se 7 0.75 able 9c) 99 20.99 1, Th2 (°C) 11 20.0 7 0.67 to 7 in Ta	p   (3   2   2   2   2   2   2   2   2   2	20.94 20.94	0.99 20.18 20 0.99	19.8	9		(86) (87) (88) (89)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=	Jan 1 interna 19.88 perature 19.99 ation fac	Feb 0.99 ltemper 20.04 during h 19.99 etor for ga 0.99	Mar 0.97 ature in 20.33 neating p 19.99 ains for 0.97	Apr 0.91 living are 20.68 periods ir 20 rest of d 0.88	May 0.76 ea T1 (for 20.91 rest of 20 welling, 0.7	J Ollow 20 dwe 20 h2,n 0.	e Tablun   56   v step   0.98   elling to 0.01   m (see 48   1	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3	ug Se 7 0.75 able 9c) 99 20.99 1, Th2 (°C) 11 20.0 7 0.67 to 7 in Ta	p	20.94 20.94 9.56	0.99 20.18 20 0.99	19.8	9		(86) (87) (88) (89)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=	Jan 1 19.88 perature 19.99 ation fac 1 interna 18.49	Feb 0.99 Il temper 20.04 during h 19.99 ctor for ga 0.99 Il temper 18.74	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15	Apr 0.91 living are 20.68 periods in 20 rest of de 0.88 the rest 19.64	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell 19.92	J   0    20   dwe   20   h2,n   0    0    2   2   2   2	v step 0.98 elling to 1.01 m (see 48 T2 (fo	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0	ug Se 7 0.75 able 9c) 99 20.9 9, Th2 (°C) 1 20.0 7 0.67 to 7 in Ta	p   33   22   22   22   22   23   24   24	20.94 20.94 9.56	0.99 20.18 20 0.99	19.8	9	0.37	(86) (87) (88) (89)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=	Jan 1 19.88 perature 19.99 ation face 1 interna 18.49	Feb 0.99 Il temper 20.04 during h 19.99 ctor for ga 0.99 Il temper 18.74	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15	Apr 0.91 living are 20.68 periods ir 20 rest of d 0.88 the rest 19.64	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell 19.92	J 0.: ollow 20 dwe 20 h2,n 0.: ing 1	e Tablun   56   v step   1.98   elling   1.01   m (see   48   T2 (fo	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 -	ug Se 7 0.75 able 9c) 99 20.99 7, Th2 (°C) 7 0.67 to 7 in Ta 19.99 - fLA) ×	p   (3   2   2   2   2   2   2   2   2   2	20 20.61 20 3.94 9c) 9.56 = Livi	0.99  20.18  20  0.99  18.94  ng area ÷ (4	19.89 19.99 1 18.44 4) =	5 9		(86) (87) (88) (89) (90) (91)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=	Jan  1 interna 19.88 perature 19.99 ation fac 1 interna 18.49 interna	Feb 0.99 Il temper 20.04 during h 19.99 etor for ga 0.99 Il temper 18.74 Il temper 19.22	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15 ature (for	Apr 0.91 living are 20.68 periods ir 20 rest of dr 0.88 the rest 19.64  or the wh 20.02	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell 19.92 cole dwell 20.28	J   0    0    20     4   20     1   1   2     2   1   2     2   2   2     3   4   1     4   7   7     5   7     6   7     7   7     7   7     7   7     8   7     9   7     10   7	e Tablun   56   v step   0.98     0.01   m (see   48   T2 (fo   20   ) = fL   0.36	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01  A × T1  20.37	9a) 0.3 20.0 4 (1 - 20.3	ag Se 7 0.75  able 9c) 99 20.9  7, Th2 (°C) 1 20.0  7 0.67  to 7 in Ta 1 19.9  - fLA) ×  - fLA) ×  - 20.3	p   3   2   2   2   1   1   1   1   1   1   1	20 20 20 20 9.56 = Livi	0.99 20.18 20 0.99	19.8	5 9		(86) (87) (88) (89)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply	Jan 1 1 19.88 perature 19.99 ation fac 1 interna 18.49 interna 19 r adjustr	Feb 0.99 Il temper 20.04 during h 19.99 ctor for ga 0.99 Il temper 18.74 Il temper 19.22 ment to th	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15 ature (for	Apr 0.91 living are 20.68 periods ir 20 rest of d 0.88 the rest 19.64 or the wh 20.02 n internal	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell 19.92 cole dwe 20.28 I temper	dwe 20 h2,n 0 ing 1 2 cature	e Tablun   56   v step   1.98   1.01	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01  A × T1  20.37  m Table	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3 4e, 1	able 9c) 99   20.9: 9, Th2 (°C) 1   20.0  7   0.67  to 7 in Ta 19.9:	p   3   2   2   5   6   1   fLA   T2   2   1   propr	20 20.61 20 20 20 20 9.56 = Livi	0.99  20.18  20  0.99  18.94  ng area ÷ (4	19.89 19.99 1 18.44 1) =	5 9 6		(86) (87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=	Jan  1  interna  19.88  perature  19.99  ation fact  1 interna  18.49  interna  19  adjustr  19	Feb 0.99 Il temper 20.04 during h 19.99 ctor for ga 0.99 Il temper 18.74 Il temper 19.22 ment to tl 19.22	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15 ature (for 19.58 ne mean 19.58	Apr 0.91 living are 20.68 periods ir 20 rest of d 0.88 the rest 19.64 or the wh 20.02 n interna 20.02	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell 19.92 cole dwell 20.28	dwe 20 h2,n 0 ing 1 2 cature	e Tablun   56   v step   0.98     0.01   m (see   48   T2 (fo   20   ) = fL   0.36	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01  A × T1  20.37	9a) 0.3 20.0 4 (1 - 20.3	able 9c) 99   20.9: 9, Th2 (°C) 1   20.0  7   0.67  to 7 in Ta 19.9:	p   3   2   2   5   6   1   fLA   T2   2   1   propr	20 20 20 20 9.56 = Livi	0.99  20.18  20  0.99  18.94  ng area ÷ (4	19.89 19.99 1 18.44 4) =	5 9 6		(86) (87) (88) (89) (90) (91)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp	Jan 1 1 19.88 perature 19.99 ation face 1 18.49 radjustr 19 ace hea	Feb 0.99 Il temper 20.04 during h 19.99 eter for ga 0.99 Il temper 18.74 Il temper 19.22 ment to th 19.22 sting requ	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15 ature (for 19.58 he mean 19.58 uiremen	Apr 0.91 living are 20.68 periods ir 20 rest of d 0.88 the rest 19.64 or the wh 20.02 n internal 20.02	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell 19.92 cole dwe 20.28 I temper 20.28	dwe 20 h2,n 0.ing 1 20 ellling 20 cature 20	e Tablun   56   v step   1.98   1.01   m (see   48   1.02   1.36   e from   1.36   e from   1.36   m (see   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01  A × T1  20.37  m Table  20.37	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3 4e, v 20.3	ag Se 7 0.75 able 9c) 99 20.9 9, Th2 (°C) 1 20.0 7 0.67 to 7 in Ta 19.9 - fLA) x - fLA) x - gr 20.3 where ap	p   (3   2   2   2   1   1   1   1   1   1   1	20 20 3.94 9.56 = Livi	0.99  20.18  20  0.99  18.94  19.4	19.89 19.99 1 18.44 1) =	5 9 6	0.37	(86) (87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T	Jan  1 interna 19.88 perature 19.99 ation fac 1 interna 18.49 radjustr 19 ace head i to the	Feb  0.99  I temper 20.04  during h 19.99  ctor for gr 0.99  I temper 18.74  I temper 19.22  ment to th 19.22  ating required	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15 ature (for 19.58 he mean 19.58 uiremen ernal te	Apr O.91 living are 20.68 periods ir 20 rest of dr O.88 the rest 19.64 or the wh 20.02 minternal 20.02	May 0.76 ea T1 (for 20.91 no rest of 20 welling, 0.7 of dwell 19.92 cole dwe 20.28 I temper 20.28 re obtain	dwe 20 h2,n 0.ing 1 20 ellling 20 cature 20	e Tablun   56   v step   1.98   1.01   m (see   48   1.02   1.36   e from   1.36   e from   1.36   m (see   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01  A × T1  20.37  m Table  20.37	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3 4e, v 20.3	ag Se 7 0.75 able 9c) 99 20.9 9, Th2 (°C) 1 20.0 7 0.67 to 7 in Ta 19.9 - fLA) x - fLA) x - gr 20.3 where ap	p   (3   2   2   2   1   1   1   1   1   1   1	20 20 3.94 9.56 = Livi	0.99  20.18  20  0.99  18.94  ng area ÷ (4	19.89 19.99 1 18.44 1) =	5 9 6	0.37	(86) (87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T	Jan  1 interna 19.88 perature 19.99 ation fac 1 interna 18.49 radjustr 19 ace head i to the	Feb 0.99 Il temper 20.04 during h 19.99 eter for ga 0.99 Il temper 18.74 Il temper 19.22 ment to th 19.22 sting requ	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15 ature (for 19.58 he mean 19.58 uiremen ernal te	Apr O.91 living are 20.68 periods ir 20 rest of dr O.88 the rest 19.64 or the wh 20.02 minternal 20.02	May 0.76 ea T1 (for 20.91 no rest of 20 welling, 0.7 of dwell 19.92 cole dwe 20.28 I temper 20.28 re obtain	dwe 20 h2,n 0 ing 1 2 corature 20 med a	e Tablun   56   v step   1.98   1.01   m (see   48   1.02   1.36   e from   1.36   e from   1.36   m (see   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36   1.36   1.36   1.36   m (see   1.36	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01  A × T1  20.37  m Table  20.37	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.3 4e, v 20.3	alg Se 7 0.75 able 9c) 99 20.9 9, Th2 (°C) 10 1 20.0 7 0.67 to 7 in Ta 19.9 10 1 19.9 10 20.3 10 20.3 10 20.3 10 20.3 10 20.3	p	20 20 3.94 9.56 = Livi	0.99  20.18  20  0.99  18.94  19.4	19.89 19.99 1 18.44 1) =	5 9 6	0.37	(86) (87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T the ut	Jan 1 1 19.88 perature 19.99 ation face 1 1 18.49 perature 19 adjustr 19 ace head i to the cilisation Jan	Feb  0.99  I temper  20.04  during h  19.99  ctor for ga  0.99  I temper  18.74  I temper  19.22  ment to th  19.22  ating requires reacting requires factor for ga  to factor for ga  19.22  to factor for ga  19.22  to factor for ga  19.22  to factor for ga  19.22  to factor for ga  19.22  to factor for ga  19.22	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15 ature (for 19.58 he mean 19.58 uiremen ernal te or gains Mar	Apr 0.91 living are 20.68 periods ir 20 rest of d 0.88 the rest 19.64 or the wh 20.02 n interna 20.02 mperaturusing Tal Apr	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell 19.92 cole dwe 20.28 I temper 20.28 re obtain able 9a	dwe 20 h2,n 0 ing 1 2 corature 20 med a	e Tablun   56   v step   0.98   elling   10.01     10.01	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01  A × T1  20.37  m Table  20.37	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.5 4e, ) 20.5	ag Se 7 0.75  able 9c) 99 20.9  7 0.67  to 7 in Ta 19.9  - fLA) ×  - 7 20.3  where ap 37 20.3	p	20 20 30.94 20 30.94 30.94 30.95 30.95 30.95 30.95 30.95 30.95 30.95 30.95 30.95 30.95	0.99  20.18  20  0.99  18.94  19.4  19.4  (76)m and	19.89 19.99 1 18.44 18.9 18.9	5 9 6	0.37	(86) (87) (88) (89) (90) (91) (92)
(86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=  Mean (92)m=  Apply (93)m=  8. Sp Set T the ut	Jan 1 1 19.88 perature 19.99 ation face 1 1 18.49 perature 19 adjustr 19 ace head i to the cilisation Jan	Feb  0.99  I temper 20.04  during h 19.99  ctor for ga 0.99  I temper 18.74  I temper 19.22  ment to th 19.22  ting required factor for for ga in factor for ga	Mar 0.97 ature in 20.33 eating p 19.99 ains for 0.97 ature in 19.15 ature (for 19.58 he mean 19.58 uiremen ernal te or gains Mar	Apr 0.91 living are 20.68 periods ir 20 rest of d 0.88 the rest 19.64 or the wh 20.02 n interna 20.02 mperaturusing Tal Apr	May 0.76 ea T1 (for 20.91 n rest of 20 welling, 0.7 of dwell 19.92 cole dwe 20.28 I temper 20.28 re obtain able 9a	dwe 20 h2,n 0 ing 1 2 20 rature 20 med a	e Tablun   56   v step   0.98   elling   10.01     10.01	ole 9a)  Jul  0.41  os 3 to 7  21  from Ta  20.01  e Table  0.32  ollow ste  20.01  A × T1  20.37  m Table  20.37	Au 0.4 7 in T 20.9 able 9 20.0 9a) 0.3 eps 3 20.0 + (1 - 20.5 4e, ) 20.5	Ig Se 7 0.75  able 9c) 99 20.93  7 0.67  to 7 in Ta 19.90  — fLA) x  — fLA) x  — re ap 37 20.33  where ap 37 20.33	p	20 20 30.94 30.94 99.56 = Livii 99.95 iate 99.95	0.99  20.18  20  0.99  18.94  19.4  19.4  (76)m and	19.89 19.99 1 18.44 18.9 18.9	5 9 6	0.37	(86) (87) (88) (89) (90) (91) (92)

Useful gains, hmG	<u>`</u>	<u> </u>	r –	1	1	1	ı		ı			4
(95)m= 461.53 532.		658.79	595.67	421.78	279.56	293.01	433.93	488.1	451.54	437.98		(95)
Monthly average e	1	<del>i                                     </del>	r	1					ι	1		(00)
(96)m= 4.3 4.9		8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for I	-	1	i	1	· · · · · ·				0000	44474		(07)
(97)m= 1122.19 1090		836.1	643.69	428.21	280.34	294.64	463.72	701.14	926.2	1117.1		(97)
Space heating req (98)m= 491.53 374.	i	or each n	35.73	1	T			)m] X (4 <sup>-1</sup>	1)m 341.76	505.27		
(98)m= 491.53 374.	200.20	127.07	35.73	0	0	0	0			<u> </u>	2024.00	7(00)
						Tota	ıl per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	2321.63	(98)
Space heating req	uirement ir	n kWh/m²	<sup>2</sup> /year								34.04	(99)
9a. Energy requirer	nents – Inc	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heating:			, ,							Г		<b>7</b> ,,,,
Fraction of space				ementary	system		(004)				0	(201)
Fraction of space	neat from r	nain syst	em(s)			(202) = 1	, ,			ļ	1	(202)
Fraction of total he	ating from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main	space hea	ting syste	em 1								93.5	(206)
Efficiency of secor	dary/supp	lementar	y heatin	g systen	า, %						0	(208)
Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating req	uirement (d	calculate	d above	)								
491.53 374.	286.26	127.67	35.73	0	0	0	0	158.5	341.76	505.27		
$(211)m = \{[(98)m x$	[204)] } x	100 ÷ (20	06)									(211)
525.71 400.	306.16	136.54	38.21	0	0	0	0	169.51	365.51	540.39		
	-		-		-	Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	2483.03	(211)
Space heating fue	(seconda	ry), kWh/	month							-		
$= \{[(98)m \times (201)]\}$	x 100 ÷ (20	08)										
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		_
						Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)
Water heating												
Output from water h		T		127.04	131.77	144.22	144	161.06	170.01	102.22		
187.68 165.		156.1	153.11	137.01	131.77	144.33	144	161.86	170.91	183.23		7(040)
Efficiency of water I		1 04 00	04.00	70.0	70.0	70.0	70.0	04.70	00.00	07.00	79.8	(216)
(217)m= 87.27 86.9		84.28	81.63	79.8	79.8	79.8	79.8	84.76	86.63	87.38		(217)
Fuel for water heati (219)m = (64)m x	-											
(219)m= $215.07$ 190.		185.21	187.58	171.69	165.13	180.87	180.45	190.97	197.3	209.69		
						Tota	I = Sum(2	19a) <sub>112</sub> =			2276.24	(219)
Annual totals								k\	Wh/year		kWh/yea	<u>,</u>
Space heating fuel	used, mair	system	1						•		2483.03	
Water heating fuel	sed									j	2276.24	Ī
Electricity for pump	s, fans and	l electric	keep-ho	t						L		_
central heating pu			•							30		(230c)
٠.												

boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a	a)(230g) =	75 (231)
Electricity for lighting			303.96 (232)
12a. CO2 emissions – Individual heating system	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	536.33 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	491.67 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1028 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	38.93 (267)
Electricity for lighting	(232) x	0.519	157.75 (268)
Total CO2, kg/year	sum	n of (265)(271) =	1224.68 (272)

TER =

(273)

26.25

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:35:41

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 51.3m<sup>2</sup> Site Reference: Plot Reference: Maitland Park Estate GT 102

GT 102, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 25.98 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 7.48 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.1 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 33.8 kWh/m<sup>2</sup>

OK 2 Fabric U-values

**Element Highest Average** 

External wall 0.12 (max. 0.30) 0.12 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK OK

Floor 0.10 (max. 0.25) 0.10 (max. 0.70)

Roof (no roof)

**Openings** 

1.40 (max. 2.00) 1.40 (max. 3.30) 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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

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:	0.5	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: West	1.5m <sup>2</sup>	
Windows facing: West	9.25m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Floors U-value	0.1 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

			lloor D	) otoilo						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20		User D	Strom Softwa	are Vei	rsion:			0006273 on: 1.0.4.26	
Address :	GT 102, Aspen Co		i i	Address			PEH			
1. Overall dwelling dime	· ·	art, maith	and r an	t Lotato,	London	, 11110 2				
Ground floor				<b>a(m²)</b> 51.3	(1a) x		<b>ight(m)</b> 2.6	(2a) =	<b>Volume(m³</b> 133.38	<b>)</b> (3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	51.3	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	133.38	(5)
2. Ventilation rate:										
Number of chimneys  Number of open flues		secondar heating 0	ry	0 0	] = [ ] = [	0 0		40 = 20 =	m³ per hou  0	(6a)
Number of intermittent fa	ans				 	0	x	10 =	0	 (7a)
Number of passive vents					F	0	x	10 =	0	(7b)
Number of flueless gas f					F	0	x	40 =	0	(7c)
rtamber of nacious gas i									0	
								Air ch	nanges per ho	ur
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	7a)+(7b)+(	7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has I		led, procee	d to (17),	otherwise (	ontinue fr	om (9) to	(16)			_
Number of storeys in t Additional infiltration	the dwelling (ns)						[(0)	41.04	0	(9)
Structural infiltration: (	) 25 for steel or timber	frame or	· 0 35 fo	r macanı	v constr	uction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p	oresent, use the value corre ings); if equal user 0.35	sponding to	the great	er wall are	a (after	uction			0	
If suspended wooden	,	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er		له م ددنده							0	(13)
Percentage of window Window infiltration	s and doors draught s	unppea		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15)
Air permeability value,	, q50, expressed in cu	bic metre	es per ho	our per s	guare m	etre of e	envelope	area	2	(17)
If based on air permeabi	•		•	•	•		•		0.1	(18)
Air permeability value applie	es if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			<b>_</b>
Number of sides sheltered	ed			(00)		10)1			3	(19)
Shelter factor				(20) = 1 -		[9)] =			0.78	(20)
Infiltration rate incorpora	-			(21) = (18	(20) =				0.08	(21)
Infiltration rate modified	<del></del>	1		Ι	0	0.1			1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	- I			0.7	4	4.0	4.5	4 7	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor (22a)m = (2	22)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.1	0.1	0.09	0.09	0.08	0.07	0.07	0.07	0.08	0.08	0.09	0.09	]	
Calculate effect		•	rate for t	he appli	cable ca	se	•		•	•	•	-	
If mechanica			andiv N. /O	2h) _ (22c	) Em. (a	auation (	VEVV otho	auioo (22h	) - (220)			0.5	(23a
									) = (23a)			0.5	(23b
If balanced with		-	-	_					21. )	001.) [	4 (00)	76.5	(23c)
a) If balance		ı —			1	<del>- ` `                                 </del>	<del>-                                    </del>	<del>``</del>	<del> </del>	<del>-                                    </del>	<del>``</del>	) ÷ 100] 1	(24a
(24a)m= 0.22	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.2	0.2	0.2	0.21	J	(24a
b) If balance		i			1		<del>- ^ ` ` </del>	<u> </u>	<del>r Ó - Ò -</del>		Ι ,	1	(24b
(24b)m= 0	0	0	0	0		0	0	0	0	0	0	J	(240
c) If whole h	ouse ex n < 0.5 ×			•	•				5 v (23h	,)			
(24c)m = 0	0.5 x	0	0	0	0	0	0	0	0	0	0	1	(240
d) If natural						<u> </u>						J	(= .0
,	n = 1, the			•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24d
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			•	•	
(25)m= 0.22	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.2	0.2	0.2	0.21	1	(25)
0 11			1									_	
3. Heat losse		_			NIat Am		المناا		A V 11		la condicio	_	A V I.
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
Windows Type	e 1	` ,			1.5	x1.	/[1/( 1.4 )+	0.04] =	1.99	, T			(27)
Windows Type	2				9.25	x1	/[1/( 1.4 )+	0.04] =	12.26	╡			(27)
Floor					51.3	x	0.1		5.13	=			(28)
Walls	23.9	12	10.7		13.17	=	0.12	<u> </u>	1.58	<b>ଟ</b> ¦		$\exists \vdash$	(29)
Total area of e			10.7		75.22	=	0.12		1.00				(31)
Party wall	nomonto	,				_				— г		$\neg$	`
* for windows and	l roof wind	owe uso c	offoctivo wi	ndow I I ve	49.92		0 tormula 1	/[(1/    volu	0		naragrani		(32)
** include the area		· ·				ateu using	j iorriula i	/[( 1/ <b>U-</b> valu	1 <del>0</del> )+0.04] a	is giveri iii	paragrapi	1 3.2	
Fabric heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				20.96	(33)
Heat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess	sments wh	ere the de	tails of the	construct	ion are no	t known pr	recisely the	indicative	values of	TMP in Ta	able 1f		
can be used inste													
Thermal bridge	•	,			•	<						4.13	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	11)			(22)	(26) -				
Total fabric he		مامان مام	را طاعم مصل						(36) =	OF\ (F)		25.1	(37)
Ventilation hea		i			1	11	<b>1 1 1 1 1 1 1 1 1 1</b>			25)m x (5)	i	1	
Jan 0.53	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(20)
(38)m= 9.52	9.44	9.35	8.92	8.84	8.41	8.41	8.33	8.58	8.84	9.01	9.18	J	(38)
Heat transfer of		nt, W/K						(39)m	= (37) + (3	38)m		7	
(39)m= 34.62	34.53	34.45	34.02	33.94	33.51	33.51	33.42	33.68	33.94	34.11	34.28		<del></del> 1
								,	Average =	Sum(39) <sub>1</sub>	12 /12=	34	(39)

Heat loss para	ımeter (l	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.67	0.67	0.67	0.66	0.66	0.65	0.65	0.65	0.66	0.66	0.66	0.67		
		!				!			Average =	Sum(40) <sub>1</sub>	12 /12=	0.66	(40)
Number of day		<del>- ` -</del>	<u> </u>						<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occurring TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		73		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $c$	lwelling is	designed i	,		se target c		i.25		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								- 1					
(44)m= 82.77	79.76	76.75	73.74	70.73	67.72	67.72	70.73	73.74	76.75	79.76	82.77		
	<u> </u>	!		<u> </u>	<u> </u>	!	<u> </u>		Total = Su	ım(44) <sub>112</sub> =	<u>-</u>	903	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x E	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m= 122.75	107.36	110.79	96.59	92.68	79.97	74.11	85.04	86.05	100.29	109.47	118.88		
15 % 1 1			-6 (		( )		h (40		Total = Su	ım(45) <sub>112</sub> =	=	1183.97	(45)
If instantaneous w	/ater neati ı		,	not water	r storage), r		DOXES (46)	,					
(46)m= 18.41 Water storage	16.1	16.62	14.49	13.9	12	11.12	12.76	12.91	15.04	16.42	17.83		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` '					•		ao 100	00.		<u> </u>		(47)
Otherwise if no	_			-			, ,	ers) ente	er '0' in (	(47)			
Water storage	loss:		`					,		,			
<ul><li>a) If manufact</li></ul>	urer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
b) If manufact			-										(=4)
Hot water stor	-			ie Z (KVV	n/litre/da	ay)				0.	.02		(51)
Volume factor	_		JII 4.5							1	.03		(52)
Temperature f			2b							-	.6		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or		_	,							-	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains												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)
	<u>l</u>			<u>l</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	0		(58)
Primary circuit Primary circuit	`	,			59)m – 1	(58) <u>-</u> 36	\$5 <b>y</b> (41)	ım			U		(30)
(modified by				,	•		, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
. ,					L								

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$																	
(61)m=	0	0	0	<u> </u>	0	0	T	0	0	0		0	0	Το	0	1	(61)
	t requ	ired for	water	L heat	ting ca	lculated	l fo	r eac	L h month	(62)	—— m =	0 85 x (	L ′45)m ⊣	 - (46)m +	(57)m +	ו - (59)m + (61)m	
	78.03	157.29	166.06	_	50.08	147.95	_	33.47	129.38	140	_	139.55	155.56	<del>``</del>	174.16	]	(62)
Solar DHW	input ca	ـــــــــــــــــــــــــــــــــــــ	using A	pend	dix G or	Appendix	ι κΗ (	(negati	ve quantity	/) (ent	er '0'	if no sola	r contribu	 ution to wate	r heating)	) T	
(add addi								-							•		
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0	]	(63)
Output fro	om wa	ater heat	er		•										•	•	
(64)m= 17	78.03	157.29	166.06	3 1	50.08	147.95	1:	33.47	129.38	140	.32	139.55	155.56	162.97	174.16	]	
		,			•						Outp	out from wa	ater heat	er (annual)	112	1834.81	(64)
Heat gain	ns fron	n water	heatin	g, k\	Wh/mc	onth 0.2	5 ′	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	((46)n	n + (57)m	+ (59)m	ı ]	
(65)m= 8	5.04	75.64	81.06	7	74.91	75.04	6	9.39	68.86	72.	.5	71.41	77.57	79.19	83.75	]	(65)
include	(57)n	n in calc	ulation	of (	(65)m	only if c	ylir	nder i	s in the o	dwell	ing	or hot w	ater is	from com	munity h	- neating	
5. Intern	nal ga	ins (see	Table	5 a	nd 5a)	)]											
Metabolic	gains	s (Table	5), W	atts													
	Jan	Feb	Mai		Apr	May		Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec	]	
(66)m= 8	6.42	86.42	86.42	8	86.42	86.42	8	6.42	86.42	86.	42	86.42	86.42	86.42	86.42	]	(66)
Lighting g	gains (	(calculat	ed in	Арре	endix l	_, equat	ion	L9 o	r L9a), a	lso s	ee 7	Table 5				-	
(67)m= 13	3.43	11.93	9.7		7.34	5.49	4	4.63	5.01	6.5	51	8.74	11.09	12.95	13.8	]	(67)
Appliance	es gaiı	ns (calcı	ulated	in A	ppend	lix L, eq	uat	ion L	13 or L1	3a), a	also	see Tal	ble 5		-	-	
(68)m= 15	50.61	152.17	148.23	3 1	39.85	129.27	1	19.32	112.67	111	.11	115.05	123.43	134.02	143.96	]	(68)
Cooking (	gains	(calcula	ted in	App	endix	L, equa	tior	ո L15	or L15a)	, als	o se	e Table	5		-	_	
(69)m= 3	1.64	31.64	31.64	3	31.64	31.64	3	1.64	31.64	31.	64	31.64	31.64	31.64	31.64	]	(69)
Pumps ar	nd fan	s gains	(Table	5a)	)												
(70)m=	0	0	0		0	0		0	0	0		0	0	0	0	]	(70)
Losses e.	.g. eva	aporatio	n (neg	ative	e value	es) (Tab	ole	5)								_	
(71)m= -6	69.14	-69.14	-69.14	- (	69.14	-69.14	-6	59.14	-69.14	-69.	.14	-69.14	-69.14	-69.14	-69.14	]	(71)
Water hea	ating	gains (T	able 5	)												_	
(72)m= 1	14.3	112.56	108.9	5 1	04.04	100.86	9	6.37	92.56	97.	44	99.18	104.26	109.99	112.57	]	(72)
Total inte	ernal	gains =						(66)	m + (67)m	+ (68	8)m +	- (69)m + (	(70)m + (	(71)m + (72)	)m	_	
(73)m= 32	27.26	325.58	315.8	3	300.16	284.54	2	69.25	259.16	263	.99	271.89	287.71	305.88	319.26	]	(73)
6. Solar	Ĭ																
ŭ			Ū	lar flu		Table 6a	and			tions	to co		e applica	able orienta	tion.		
Orientatio		ccess Fable 6d	actor		Area m²			Flu Tal	x ble 6a		Т	g_ able 6b		FF Table 6c		Gains (W)	
West	_			_												. ,	٦,,,,
	0.9x	0.77	=	× L	1.5		X		9.64	X		0.4	_  ×	0.8	=	6.53	(80)
	0.9x	0.77	=	X L	9.2		X		9.64	X		0.4	_  ×	0.8	=	40.29	](80)
	0.9x	0.77	=	x L	1.5		X		38.42	X		0.4	_  ×	0.8	=	12.78	](80)
	0.9x	0.77		× L	9.2	==	X		88.42	X		0.4	_  ×	0.8	_ =	78.81	[(80)]
West	0.9x	0.77		X	1.5	5	X	6	3.27	X		0.4	X	0.8	=	21.05	(80)

	_						_								_
	0.9x	0.77	X	9.2	25	X	6	3.27	X	0.4	X	0.8	=	129.79	(80)
West (	0.9x	0.77	X	1.5	5	X	9	2.28	X	0.4	X	0.8	=	30.7	(80)
West (	0.9x	0.77	X	9.2	:5	X	9	2.28	X	0.4	X	0.8	=	189.29	(80)
West (	0.9x	0.77	X	1.5	5	X	1	13.09	X	0.4	X	0.8	=	37.62	(80)
West (	0.9x	0.77	X	9.2	25	X	1	13.09	X	0.4	X	0.8	=	231.98	(80)
West (	0.9x	0.77	X	1.5	5	X	1	15.77	X	0.4	X	0.8	=	38.51	(80)
West (	0.9x	0.77	X	9.2	25	X	1	15.77	X	0.4	X	0.8	=	237.48	(80)
West (	0.9x	0.77	X	1.5	5	X	1	10.22	x	0.4	X	0.8	=	36.66	(80)
West (	0.9x	0.77	X	9.2	25	X	1	10.22	X	0.4	X	0.8	=	226.09	(80)
West (	0.9x	0.77	X	1.5	5	X	9	4.68	x	0.4	X	0.8	=	31.49	(80)
West (	0.9x	0.77	X	9.2	.5	X	9	4.68	X	0.4	X	0.8	=	194.21	(80)
West (	0.9x	0.77	X	1.5	5	X	7	3.59	X	0.4	X	0.8	=	24.48	(80)
West (	0.9x	0.77	X	9.2	25	X	7	3.59	X	0.4	X	0.8	=	150.95	(80)
West (	0.9x	0.77	X	1.5	5	X	4	5.59	X	0.4	x	0.8	=	15.16	(80)
West (	0.9x	0.77	X	9.2	25	X	4	5.59	X	0.4	x	0.8	=	93.52	(80)
West (	0.9x	0.77	X	1.5	5	X	2	4.49	x	0.4	X	0.8	=	8.15	(80)
West (	0.9x	0.77	X	9.2	25	X	2	4.49	x	0.4	X	0.8	=	50.23	(80)
West (	0.9x	0.77	x	1.5	5	X	1	6.15	X	0.4	x	0.8	=	5.37	(80)
West (	0.9x	0.77	x	9.2	25	X	1	6.15	x	0.4	x	0.8	_ =	33.13	(80)
Solar gain $(83)m = 46$ Total gain: $(84)m = 376$	6.82 s – ir	91.59 Iternal an	150.84	219.99	269.6	+ (	75.99 83)m 45.24	262.75	(83)m 225	!	108.6	8 58.38	38.5	]	(83)
											1	-			
7. Mean				`				Tab	-1- 0	Th4 (00)					7(05)
•		_	•			_			ые 9,	Th1 (°C)				21	(85)
Utilisatio	. 1	Feb	Mar			Ť			Ι	ug Sep	1 00	Nov	Dec	1	
	Jan .99	0.97	0.92	Apr 0.76	May 0.57	+	Jun 0.39	Jul 0.28	0.3		0.83	+	0.99	-	(86)
` '											0.00	0.07	1 0.00	_	()
Mean into		tempera 20.7	r			Ollo	w ste	i	1	<del></del>	20.95	5 20.76	20.56	7	(87)
	0.58		20.85	20.97	21			21	2	<u> </u>	20.93	20.76	20.56		(07)
· —			<del>~~</del>			_			1	9, Th2 (°C)		<u> </u>	1	7	(0.0)
(88)m= 20	0.36	20.36	20.37	20.37	20.37	2	20.38	20.38	20.	38 20.38	20.37	20.37	20.37		(88)
Utilisation	n fac	or for ga	ins for r	est of d	welling,	h2	,m (se	e Table	9a)					_	
(89)m = 0.	.99	0.96	0.9	0.73	0.53		0.36	0.24	0.2	7 0.47	0.8	0.96	0.99		(89)
Mean_int	ernal	tempera	ture in t	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7 in Tal	ole 9c)			_	
(90)m= 19	9.81	19.98	20.19	20.34	20.37	2	20.38	20.38	20.3	38 20.38	20.33	3 20.07	19.78		(90)
											fLA = Li	ving area ÷ (	4) =	0.5	(91)
NA : t	امدما	tempera	ture (fo	r the wh	ole dwe	ellin	g) = fl	_A × T1	+ (1	– fLA) × T2	2				
iviean inte	emai	tompora	tuic (io												
	0.2	20.34	20.52	20.65	20.68	_	20.69	20.69	20.0		20.64	20.41	20.17		(92)

(93)m= 20.2	20.34	20.52	20.65	20.68	20.69	20.69	20.69	20.69	20.64	20.41	20.17		(93)
8. Space hea													
Set Ti to the the utilisation			•		ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	<u> </u>	l	<u> </u>	Iviay	<u> </u>	<u> </u>	_ / tug	Сор		1101			
(94)m= 0.98	0.96	0.9	0.74	0.55	0.37	0.26	0.29	0.5	0.81	0.96	0.99		(94)
Useful gains,	hmGm	, W = (9	4)m x (84	4)m					ı	ı			
(95)m= 368.12	402.34	421.04	387.37	303.68	204	137.03	143.39	221.45	321.5	349.78	353.4		(95)
Monthly aver	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	î .	i			ì	<del>-``</del>	· · ·	– (96)m	<del></del>				
(97)m= 550.26	533.05	483.03	399.89	304.84	204.05	137.03	143.39	221.85	340.65	453.98	547.25		(97)
Space heatin	<del>i i</del>	1		1		I			<del></del>	r -			
(98)m= 135.51	87.84	46.12	9.01	0.86	0	0	0	0	14.25	75.02	144.22		<b></b> ()
							Tota	l per year	(kWh/yea	') = Sum(9	8) <sub>15,912</sub> =	512.84	(98)
Space heating	ig require	ement in	kWh/m²	<sup>2</sup> /year								10	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme	<b>;</b>							
This part is us										unity sch	neme.		_
Fraction of spa	ace heat	from se	condary,	/suppler	nentary l	heating	(Table 1	1) '0' if n	one		l	0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community s	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and เ	up to four	other heat	sources; th	he latter	
includes boilers, l		-			rom powe	r stations.	See Appei	ndix C.			i		7(2025)
Fraction of he												<u> </u>	(303a)
Fraction of tot	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	1	(304a)
Factor for con	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution los	ss factor	(Table 1	2c) for c	commun	ity heati	ng syste	m					1.1	(306)
Space heatin	g											kWh/yea	r
Annual space	heating	requiren	nent									512.84	
Space heat fro	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	564.12	(307a)
Efficiency of s	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	~										'		
Annual water		equirem	ent								[	1834.81	$\neg$
If DHW from o	_	•									ı		
Water heat fro				)				(64) x (30	03a) x (30	5) x (306) :	=	2018.3	(310a)
							0.01	× [(307a).	(307e) +	· (310a)(	(310e)] =	25.82	(313)
Electricity use	d for hea	at distribi	ution				0.01						
Electricity use Cooling Syste				0			0.01					0	(314)
•	m Energ	y Efficie	ncy Ratio		n, if not e	enter 0)	0.01	= (107) ÷	· (314) =			0	(314)
Cooling Syste	m Energ	y Efficie is a fixe	ncy Ration	g systen		,	0.01	= (107) ÷	· (314) =				<b>=</b>   ` ` `
Cooling Syste Space cooling	m Energ (if there oumps a	y Efficie is a fixe	ncy Rational Report of the cooling within dv	g systen velling ( <sup>-</sup>	Γable 4f)	:		= (107) ÷	· (314) =		 		<b>=</b>   ` ` `

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b	o) + (330g) =	101.7	(331)
Energy for lighting (calculated in Append	dix L)			237.12	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-434.4	(333)
Electricity generated by wind turbine (Ap	ppendix M) (negative q	uantity)		0	(334)
12b. CO2 Emissions – Community heat	ing scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)		) ng two fuels repeat (363) to	(366) for the second fue	319	(367a)
CO2 associated with heat source 1	[(307b)	+(310b)] x 100 ÷ (367b) x	0.52	420.15	(367)
Electrical energy for heat distribution		[(313) x	0.52	13.4	(372)
Total CO2 associated with community s	ystems	(363)(366) + (368)(372	2)	433.55	(373)
CO2 associated with space heating (see	condary)	(309) x	0	0	(374)
CO2 associated with water from immers	ion heater or instantar	neous heater (312) x	0.52	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =		433.55	(376)
CO2 associated with electricity for pump	s and fans within dwe	lling (331)) x	0.52	52.78	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	123.07	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	cable	0.52 x 0.01 =	-225.45	(380)
Total CO2, kg/year	sum of (376)(382) =			383.95	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			7.48	(384)

El rating (section 14)

(385)

94.66

			lloor D	) otaila:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20	)12	User D	Strom Softwa					0006273 on: 1.0.4.26	
			i i	Address						
Address :	GT 102, Aspen Co	ourt, Maitla	and Parl	k Estate,	London	, NW3 2	2EH			
Overall dwelling din	nensions:		Δ	a ( na 2)		Av. IIa	: au la 4 / vaa \		Valuma/m³	n.
Ground floor				<b>a(m²)</b> 51.3	(1a) x		2.6	(2a) =	Volume(m <sup>3</sup>	(3a)
Total floor area TFA =	(1a)+(1b)+(1c)+(1d)+(1	le)+(1r	n) [	51.3	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	133.38	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	′y □ +	other 0	7 = [	total	x	40 =	m³ per hou	(6a)
Number of open flues			┧╻┝		」  L 1 = 「			20 =		= ' '
•		0	」	0	] <sup>-</sup> [	0			0	(6b)
Number of intermittent	fans					2	X	10 =	20	(7a)
Number of passive ven	ts					0	X	10 =	0	(7b)
Number of flueless gas	fires				Γ	0	X	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimn	neys, flues and fans =	(6a)+(6b)+(7	<sup>7</sup> a)+(7b)+(	(7c) =	Г	20		÷ (5) =	0.15	(8)
If a pressurisation test has	s been carried out or is inten	ded, procee	d to (17),	otherwise (	ontinue fr	om (9) to		, ,		``
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
if both types of wall are	0.25 for steel or timbe present, use the value correnings); if equal user 0.35				•	ruction			0	(11)
•	n floor, enter 0.2 (unse	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	enter 0.05, else enter 0	)							0	(13)
Percentage of windo	ws and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
	e, q50, expressed in cu		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeal	•					. , .	,		0.4	(18)
Number of sides shelte	lies if a pressurisation test h	as been dor	ne or a de	gree air pe	теарину	is being u	sea		3	(19)
Shelter factor	icu			(20) = 1 -	[0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorpor	ating shelter factor			(21) = (18	) x (20) =				0.31	(21)
Infiltration rate modified	d for monthly wind spec	ed								
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind	speed from Table 7	•			-		1		4	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
Wind Factor (22a)m = (	(22)m ÷ 4			•		•	•			
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
			<b>.</b>		L	L			J	

Adjusted infilt	ration rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.4	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36	]	
<i>Calcul<del>ate effe</del></i> If mechanic		•	rate for t	he appli	cable ca	se						0	(2:
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(23
If balanced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(23
a) If balance	ed mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)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	ed mech	anical ve	entilation	without	heat rec	covery (N	ЛV) (24b	)m = (22	2b)m + (	23b)		_	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
c) If whole I if (22b)	nouse ex m < 0.5 <b>x</b>				•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural	ventilation = 1, the			•	•				0.5]			•	
24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(24
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(2
3. Heat losse	es and he Gros		oaramete Openin		Net Ar	ea	U-valı	ue	A X U		k-value	9	ΑΧk
	area	(m²)	m	l <sup>2</sup>	A ,r		W/m2		(W/	K)	kJ/m²•	K	kJ/K
Vindows Typ					1.5	=	/[1/( 1.4 )+	L	1.99	_			(2)
Vindows Typ 	e 2				9.25	x1,	/[1/( 1.4 )+	0.04] = [	12.26	亅 ,			(2)
loor					51.3	X	0.13	=	6.669	_		닠 닏	(2)
Valls	23.9		10.7	5	13.17	<b>x</b>	0.18	= [	2.37				(2
otal area of	elements	, m²			75.22	2							(3
Party wall					49.92		0	= [	0				(3:
for windows and * include the are						ated using	ı formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapi	1 3.2	
abric heat lo	ss, W/K :	= S (A x	U)	·			(26)(30)	) + (32) =				23.2	9 (3
leat capacity	Cm = S	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
hermal mass	s parame	ter (TMF	c = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design asses				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
an be used inste hermal bridg				ıcina Δr	nandiy k	<i>(</i>						0.74	(3
details of therm	•	,			•	`						2.71	(3)
otal fabric he			()	(-	,			(33) +	(36) =			26	(3
entilation he	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
38)m= 25.44	25.31	25.18	24.57	24.45	23.92	23.92	23.82	24.12	24.45	24.68	24.93	]	(3
leat transfer	coefficie	nt, W/K						(39)m	= (37) + (	38)m			
	1	1				40.00	10.00	50.40			T	1	
39)m= 51.45	51.31	51.18	50.57	50.45	49.92	49.92	49.82	50.12	50.45	50.69	50.93		

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1	1	1	0.99	0.98	0.97	0.97	0.97	0.98	0.98	0.99	0.99		
Number of day	rs in mo	nth (Tah	le 1a)	•	•	•	•		Average =	Sum(40) <sub>1</sub> .	12 /12=	0.99	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ar:	
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 ( <sup>-</sup>	TFA -13.		73		(42)
Annual averag Reduce the annua not more that 125	ıl average	hot water	usage by	5% if the $c$	lwelling is	designed t			se target o		.25		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 82.77	79.76	76.75	73.74	70.73	67.72	67.72	70.73	73.74	76.75	79.76	82.77		
Energy content of	hot water	used - cal	culated me	onthly = $4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	903	(44)
(45)m= 122.75	107.36	110.79	96.59	92.68	79.97	74.11	85.04	86.05	100.29	109.47	118.88		
If its at a set a			-f (n.	. la atata			havea (40		Total = Su	m(45) <sub>112</sub> =	- [	1183.97	(45)
f instantaneous w									15.04	10.40	47.00		(46)
Water storage	16.1 loss:	16.62	14.49	13.9	12	11.12	12.76	12.91	15.04	16.42	17.83		(40)
Storage volum	e (litres)	) includin	g any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
f community h	•			•			` '		(0):				
Otherwise if no Nater storage		not wate	er (triis ir	iciudes i	nstantar	ieous co	ווטט וטוזוס	ers) ente	er o in (	47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)	) =		0.	75		(50)
<ul><li>b) If manufacted</li><li>Hot water stora</li></ul>			-								0		(51)
f community h	_		on 4.3										
Volume factor i Femperature fa			2h							<b>—</b>	0		(52)
Energy lost fro				aar			(47) x (51)	) x (52) x (	53) -		0		(53) (54)
Enter (50) or (		_	, IXVVII/ y	Jai			(11) x (01)	) X (02) X (	00) =		0 75		(55)
Vater storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	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)
cylinder contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit					•	. ,	, ,		r the	otot\			
(modified by 59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	ng and a	22.51	23.26	22.51	23.26		(59
23.20	∠1.01	23.20	22.01	23.20	22.01	23.20	23.20	22.01	23.20	22.01	20.20		(55)

Combiless	a a la ulata d	for oach	month (	(64)m	(60) · 2	GE (44	١,,,						
Combi loss (61)m= 0		o each	0	0	0 + 3	05 × (41	0	0	0	0	0		(61)
				<u> </u>		<u> </u>	<u> </u>				<u> </u>	(59)m + (61)m	(- /
(62)m= 169.	<del></del>	157.38	141.68	139.27	125.06	120.7	131.63		146.88	154.56	165.47		(62)
Solar DHW in				<u> </u>		I	l		1	Ition to wate	L er heating)	l	, ,
(add additio											3,		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	n water hea	ter										•	
(64)m= 169.	35 149.45	157.38	141.68	139.27	125.06	120.7	131.63	131.15	146.88	154.56	165.47		_
	•						Ou	tput from w	ater heate	r (annual)	112	1732.59	(64)
Heat gains	from water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 78.0	09 69.37	74.11	68.19	68.09	62.66	61.92	65.55	64.69	70.62	72.47	76.8		(65)
include (	57)m in cal	culation of	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. Interna	l gains (see	e Table 5	and 5a	):									
Metabolic g	ains (Table	e 5), Wat	ts										
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 86.4	12 86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42	86.42		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 13.4	17 11.96	9.73	7.36	5.5	4.65	5.02	6.53	8.76	11.12	12.98	13.84		(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5		•	•	
(68)m= 150.	61 152.17	148.23	139.85	129.27	119.32	112.67	111.11	115.05	123.43	134.02	143.96		(68)
Cooking ga	ins (calcula	ted in A	pendix	L, equat	ion L15	or L15a	), also	see Table	5		•	•	
(69)m= 31.6	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64	31.64		(69)
Pumps and	fans gains	(Table 5	āa)					•				•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)	-			-	-	-		
(71)m= -69.	14 -69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14	-69.14		(71)
Water heat	ing gains (T	able 5)		-		-			-	-	-		
(72)m= 104.	96 103.22	99.61	94.71	91.52	87.03	83.22	88.11	89.84	94.92	100.66	103.23		(72)
Total inter	nal gains =	:			(66	)m + (67)m	n + (68)m	ı + (69)m +	(70)m + (7	'1)m + (72)	)m		
(73)m= 320.	96 319.28	309.5	293.85	278.22	262.93	252.84	257.67	265.58	281.4	299.58	312.96		(73)
6. Solar ga	ains:												
Solar gains a	re calculated	using sola	r flux from	Table 6a			tions to	convert to the	ne applical		tion.		
Orientation	: Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains	
						DIE Ga	, –	Table ob	_ '	able oc		(W)	,
	9x 0.77	X	1.5	5	X	19.64	X	0.63	X	0.7	=	9	(80)
West 0.9		Х	9.2	25	X ·	19.64	x	0.63	X	0.7	=	55.52	(80)
West 0.9		Х	1.5	5	x (	38.42	x	0.63	x	0.7	=	17.61	(80)
West 0.9		X	9.2	25	x;	38.42	x	0.63	x	0.7	=	108.61	(80)
West 0.9	9x 0.77	X	1.	5	x (	3.27	X	0.63	X	0.7	=	29.01	(80)

	-								,		_				_
West	0.9x	0.77	X	9.2	25	X	6	3.27	X	0.63	X	0.7	=	178.87	(80)
West	0.9x	0.77	X	1.	5	X	9	2.28	Х	0.63	X	0.7	=	42.3	(80)
West	0.9x	0.77	X	9.2	25	X		2.28	X	0.63	X	0.7	=	260.87	(80)
West	0.9x	0.77	X	1.	5	X	1	13.09	X	0.63	X	0.7	=	51.84	(80)
West	0.9x	0.77	X	9.2	25	X	1	13.09	X	0.63	X	0.7	=	319.7	(80)
West	0.9x	0.77	X	1.	5	X	1	15.77	X	0.63	X	0.7	=	53.07	(80)
West	0.9x	0.77	X	9.2	25	X	1	15.77	X	0.63	X	0.7	=	327.27	(80)
West	0.9x	0.77	х	1.	5	x	1	10.22	x	0.63	x	0.7	=	50.53	(80)
West	0.9x	0.77	X	9.2	25	X	1	10.22	x	0.63	x	0.7	=	311.58	(80)
West	0.9x	0.77	X	1.	5	X	9	94.68	X	0.63	х	0.7	=	43.4	(80)
West	0.9x	0.77	X	9.2	25	x	9	94.68	x	0.63	x	0.7		267.64	(80)
West	0.9x	0.77	X	1.	5	x	7	'3.59	x	0.63	x	0.7		33.73	(80)
West	0.9x	0.77	x	9.2	25	x	7	'3.59	x	0.63	x	0.7		208.03	(80)
West	0.9x	0.77	x	1.	5	x	4	5.59	x	0.63	x	0.7	_ =	20.9	(80)
West	0.9x	0.77	x	9.2	25	X	4	15.59	x	0.63	x	0.7	_ =	128.88	(80)
West	0.9x	0.77	x	1.	5	X	2	24.49	x	0.63	x	0.7	<del>=</del>	11.23	(80)
West	0.9x	0.77	x	9.2	25	X	2	24.49	x	0.63	x	0.7	<u> </u>	69.23	(80)
West	0.9x	0.77	x	1.	5	X	1	6.15	x	0.63	x	0.7	<u> </u>	7.4	(80)
West	0.9x	0.77	x	9.2	25	x	1	6.15	x	0.63	x	0.7		45.66	(80)
	_														
Solar g	ains in	watts, ca	lculated	for eac	h month	1		_	(83)m	n = Sum(74)m	(82)n	1	_	_	
(83)m=	64.52	126.22	207.87	303.17	371.55	3	80.35	362.1	311	.04 241.77	149.7	78 80.46	53.06		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (	83)m	, watts						_	
(84)m=	385.49	445.51	517.37	597.02	649.77	6	43.27	614.95	568	.71 507.34	431.′	8 380.04	366.02		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	า)									
Temp	erature	during h	eating p	eriods ir	n the liv	ing	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for ga	ains for	living are	ea, h1,n	า (ธ	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May	┖	Jun	Jul	Α	ug Sep	Oc	t Nov	Dec		
(86)m=	0.99	0.99	0.96	0.86	0.69		0.49	0.36	0.4	4 0.66	0.92	0.99	1		(86)
Mean	interna	l tempera	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	20.1	20.27	20.53	20.82	20.96	2	20.99	21	2	1 20.98	20.7	6 20.38	20.07		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dw	elling	from Ta	able 9	9, Th2 (°C)					
(88)m=	20.08	20.08	20.09	20.1	20.1	2	20.11	20.11	20.	11 20.1	20.1	20.09	20.09	7	(88)
Utilisa	tion fac	tor for ga	ains for	rest of d	welling.	h2	m (se	ee Table	9a)	•	•	•	•	_	
(89)m=	0.99	0.98	0.94	0.83	0.63	_	0.43	0.28	0.3	32 0.58	0.89	0.98	0.99	7	(89)
Moon	intorno	l tompor	aturo in	the rest	of dwol	lina	T2 (f	ollow etc	nc 2	to 7 in Tak		- !	<u> </u>	_	
(90)m=	18.9	19.14	19.51	19.9	20.06	Ť	12 (II 20.1	20.11	20.	to 7 in Tab	19.8	4 19.3	18.86	٦	(90)
(50).11-		.0.13	. 5.51	L .0.0		1		L				iving area ÷ (	ļ	0.5	(91)
							,			<b>4.</b> - > -		5 a a - 1 (	,	0.5	(``')
ı						_		i e	<del></del>	– fLA) × T2		0 1 10 5 1	1,0:5	٦	(00)
(92)m=	19.5	19.7	20.02	20.35	20.51	1	20.55	20.55	20.		20.2		19.46	_	(92)
Apply	adjustr	nent to th	ie mear	ıınterna	tempe	ratu	ire tro	ın rable	40,	where app	ropriate	÷			

(02)	40.5	40.7	20.00	20.25	20.54	20.55	20.55	00.55	20.52	20.20	10.04	40.40		(93)
(93)m=	19.5	19.7	20.02	20.35	20.51	20.55	20.55	20.55	20.53	20.29	19.84	19.46		(93)
			uirement				44 £	Table O	41	4 T: /	70)	-11-	late	
			or gains	•		ed at ste	ер ттог	rable 9	o, so tha	t 11,m=(	rojm an	d re-caid	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	:			,		, ,					
(94)m=	0.99	0.98	0.94	0.84	0.66	0.46	0.32	0.36	0.62	0.9	0.98	0.99		(94)
Usefu			W = (94)	4)m x (84			ı	,			,	1	ı	
(95)m=	381.77	436.09	487.77	499.97	426.86	294.94	196.98	206.37	313.06	387.6	372.13	363.29		(95)
		age exte	rnal tem	perature			1	,			,		1	
(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							<del>-``</del>	<del>- `                                   </del>	– (96)m		,			
(97)m=	781.87	759.58	692.06	579.14	444.27	296.81	197.17	206.76	322.17	489.12	645.62	777.35		(97)
Space		· · ·		r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	<u> </u>	·		1	
(98)m=	297.67	217.38	151.99	57.01	12.95	0	0	0	0	75.53	196.92	308.06		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	1317.51	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								25.68	(99)
9a En	erav rea	wiremer	nts — Indi	vidual h	eating sy	vstems i	ncludina	micro-C	:HP)					
	e heatir		no ma	vidadi ii	oainig oʻ	y otorno r	rioraanig	, moro c	,					
•		•	at from s	econdar	v/supple	mentary	system						0	(201)
			at from m			,	-	(202) = 1	- (201) =				1	] (202)
			ng from	-	. ,			(204) = (2	02) × [1 – (	(203)] =			1	(204)
			ace heat	-									93.5	(206)
	•	-	ry/supple			a svstem	າ. %						0	] (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ´ ar
Space			ement (c	•			<u> </u>	l /tag	ССР	001	1407	_ D00	KVVII, y Cc	41
	297.67		151.99	57.01	12.95	0	0	0	0	75.53	196.92	308.06		
(211)m	 	)m x (20	 (4)] } x 1	00 ÷ (20	16)			<u> </u>	<u> </u>			<u> </u>	l	(211)
(211)11	318.37	232.5	162.56	60.97	13.85	0	0	0	0	80.78	210.6	329.48		(211)
									l (kWh/yea		1 211), <sub>540, 46</sub>		1409.1	(211)
Space	o bootin	a fuel (e	econdar	v) k)//b/	month					, ,	715,1012		1400.1	](= )
•		•	00 ÷ (20	• , .	monun									
(215)m=		0	0 . (20	0	0	0	0	0	0	0	0	0		
(=:-)									l (kWh/yea		_		0	(215)
Motor	hootine									, ,	715,1012			](=10)
	heating		ter (calc	ulated al	hove)									
Output	169.35	149.45	157.38	141.68	139.27	125.06	120.7	131.63	131.15	146.88	154.56	165.47		
Efficier	ncy of w	ater hea	ıter				<u> </u>	<u> </u>			<u> </u>	<u>I</u>	79.8	(216)
(217)m=	86.3	85.81	84.72	82.6	80.61	79.8	79.8	79.8	79.8	83.14	85.46	86.45		」`´´´ (217)
. ,			kWh/mo									<u> </u>		•
		•	) ÷ (217)											
, ,	196.22	174.15	185.76	171.52	172.77	156.72	151.26	164.95	164.34	176.67	180.86	191.41		
								Tota	I = Sum(21	19a) <sub>112</sub> =			2086.65	(219)
Annua	al totals									k'	Wh/year	•	kWh/year	_
Space	heating	fuel use	ed, main	system	1								1409.1	
												ļ		_

Water heating fuel used				2086.65	٦
Electricity for pumps, fans and electric keep-hot					_
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230	a)(230g) =		75	(231)
Electricity for lighting				237.81	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	<b>Energy</b> kWh/year	Emission fact kg CO2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x	0.216	=	304.37	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	450.72	(264)
Space and water heating	(261) + (262) + (263) + (264) =			755.08	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	123.42	(268)
Total CO2, kg/year	sur	m of (265)(271) =		917.43	(272)

TER =

(273)

25.98

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:35:57

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 74.8m<sup>2</sup> Site Reference: Plot Reference: Maitland Park Estate GT 103

GT 103, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 24.38 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 7.37 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 44.7 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 39.9 kWh/m<sup>2</sup>

OK 2 Fabric U-values

**Element Highest Average** 

External wall 0.12 (max. 0.30) 0.12 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK OK

Floor 0.10 (max. 0.25) 0.10 (max. 0.70)

Roof (no roof) **Openings** 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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:	0.53	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: East	4.01m²	
Windows facing: South	3.95m²	
Windows facing: South	2.24m²	
Windows facing: South	2.24m²	
Windows facing: South	4.01m²	
Windows facing: West	4.01m²	
Windows facing: West	1.5m <sup>2</sup>	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Floors U-value	0.1 W/m²K	
Community heating, heat from electric heat pump Photovoltaic array		

			User D	Notoile:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20			Strom Softwa	are Vei	rsion:			0006273 on: 1.0.4.26	
Address :	GT 103, Aspen Co			Address k Estate			PFH			
1. Overall dwelling dim	· ·	ort, marti	and r an	r Ediaio,	London	, 11110 2				
				a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	<u> </u>
Ground floor				74.8	(1a) x		2.6	(2a) =	194.48	(3a)
Total floor area TFA = (	(1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	74.8	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	194.48	(5)
2. Ventilation rate:				-41		4-4-1				
Number of chimneys	heating	secondar heating	ry □ + □	other	] = [	total	x,	40 =	m³ per hou	(6a)
•		0	╛╘	0	<u> </u>	0			0	╡``
Number of open flues	0 +	0	+	0	] = [	0		20 =	0	(6b)
Number of intermittent	fans					0	X	10 =	0	(7a)
Number of passive ven	ts					0	X	10 =	0	(7b)
Number of flueless gas	fires					0	X ·	40 =	0	(7c)
								A ir ob	anges per he	
Inditantian due to abinom	and force	(60)	7a) ı (7b) ı (	(70) -	_				nanges per ho	_
Infiltration due to chimn	s been carried out or is inten				continue fr	0 om (9) to		÷ (5) =	0	(8)
Number of storeys in		aoa, procee	u 10 (11),	ouror moo (	oriando m	0111 (0) 10	(10)		0	(9)
Additional infiltration	3 ( )						[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timbe	r frame or	0.35 fo	r masoni	y constr	uction			0	(11)
	present, use the value corre	esponding to	the great	ter wall are	a (after					<del></del>
• ,	nings); if equal user 0.35 n floor, enter 0.2 (unsea	aled) or 0	1 (seale	ed) else	enter 0				0	(12)
•	enter 0.05, else enter 0	,	. 1 (00010	<i>3</i> 4), 0.00	oritor o				0	(13)
• •	ws and doors draught								0	(14)
Window infiltration	· ·			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value	e, q50, expressed in cu	ıbic metre	s per ho	our per s	quare m	etre of e	envelope	area	2	(17)
If based on air permeal	oility value, then (18) = [	(17) ÷ 20]+(	8), otherw	rise (18) = (	16)				0.1	(18)
	lies if a pressurisation test h	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			<b>-</b> 1
Number of sides shelte Shelter factor	red			(20) = 1 -	0.075 x (1	9) <u> </u>  =			1	(19) (20)
Infiltration rate incorpor	ating shelter factor			(21) = (18		-/1			0.92	(21)
Infiltration rate modified	-	ed							0.09	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	1 . 1	1	1	1 -3		<u> </u>	1	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	]	
· · · L	I				<u> </u>	I		<u> </u>	ı	
Wind Factor $(22a)m = ($	<u> </u>	1		1					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	]	

,	ation rate (allo	owing for s	helter an	nd wind s	peed) =	(21a) x	(22a)m					
0.12	0.12 0.11	I -	0.1	0.09	0.09	0.09	0.09	0.1	0.1	0.11	]	
Calculate effect	-	ge rate for	the appli	icable ca	se	•	•	•				
If mechanical		nnondiy N (	)2h) _ (22	a) v Emy (a	auation (	VEVV otho	nuina (22h	·) - (220)			0.5	(23
If exhaust air he								) = (23a)			0.5	(23)
If balanced with	-	-	_								76.5	(230
a) If balanced	-		1		<u> </u>	<del>- ^ ` </del>	<del>í `</del>	<del>r `</del>		<del>- `                                   </del>	i ÷ 100] 1	(0.4)
(24a)m= 0.24	0.23 0.23		0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	]	(248
b) If balanced			1	1	<u> </u>	<del>, ` `                                   </del>	<del>í `</del>	<del>r `</del>		1	1	(0.4)
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24)
c) If whole ho if (22b)m	ouse extract \ 1 < 0.5 × (23b)			•				.5 × (23b	)		_	
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(240
d) If natural v if (22b)m	ventilation or ventilation or ventilation (24)			•				0.5]				
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(240
Effective air of	change rate -	enter (24a	a) or (24l	b) or (24	c) or (24	d) in bo	x (25)			•	•	
(25)m= 0.24	0.23 0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	]	(25)
3. Heat losses	and heat los	e paramet	or:								•	
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val		A X U (W/ł	<b>〈</b> )	k-value kJ/m²-l		A X k kJ/K
Windows Type	1			4.01	x1	/[1/( 1.4 )+	0.04] =	5.32				(27)
Windows Type	2			3.95	x1.	/[1/( 1.4 )+	0.04] =	5.24				(27)
Windows Type	3			2.24	x1,	/[1/( 1.4 )+	0.04] =	2.97				(27)
Windows Type	4			2.24		/[1/( 1.4 )+	· 0.04] =	2.97				(27)
Windows Type	5			4.01	<sub>x1</sub>	/[1/( 1.4 )+	· 0.041 =	5.32	=			(27)
Windows Type				4.01		- ` / /[1/( 1.4 )+		5.32	=			(27)
Windows Type					_	/[1/( 1.4 )+						(27)
Floor	,			1.5	=		;	1.99	륵 ,			`
Walls				74.8	×	0.1	=	7.48	닠 ¦		<b>-</b>	(28)
	61.39	21.9	6	39.43	*	0.12	=	4.73				(29)
Total area of el	ements, m²			136.1	9							(31)
Party wall				52.57		0	=	0				(32)
* for windows and i ** include the areas					ated using	g formula 1	1/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	1 3.2	
Fabric heat loss	s, W/K = S (A	x U)				(26)(30)	) + (32) =				41.32	(33)
Heat capacity C	Cm = S(A x k	)					((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass <sub>l</sub>	parameter (T	MP = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
			oonotruot	tion are no	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
For design assessr can be used instea			CONSTRUCT			-						
· ·	nd of a detailed c	alculation.			<	·					10.08	(36)
can be used instea	nd of a detailed c es : S (L x Y) o I bridging are no	alculation. calculated	using Ap	opendix ł	<	•		(36) =			10.08	(36)

Ventila	tion hea	nt loss ca	alculated	l monthly	У				(38)m	= 0.33 × (	(25)m x (5)	ı		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.11	14.96	14.81	14.07	13.92	13.18	13.18	13.03	13.48	13.92	14.22	14.52		(38)
Heat tr	ansfer c	oefficier	nt, W/K	•	•		•	•	(39)m	= (37) + (37)	38)m	•		
(39)m=	66.51	66.36	66.21	65.47	65.32	64.58	64.58	64.43	64.88	65.32	65.62	65.92		
Heat lo	ss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub> - (4)	12 /12=	65.43	(39)
(40)m=	0.89	0.89	0.89	0.88	0.87	0.86	0.86	0.86	0.87	0.87	0.88	0.88		
Numbe	er of day	s in moi	nth (Tab	le 1a)				•	,	Average =	Sum(40) <sub>1</sub> .	12 /12=	0.87	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing enei	rgy requi	irement:								kWh/ye	ear:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	ΓFA -13.		36		(42
Reduce	the annua	ıl average	ater usag hot water person per	usage by	5% if the $a$	lwelling is	designed t			se target o		).17		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)	-	-	-	-		
(44)m=	99.19	95.58	91.98	88.37	84.76	81.16	81.16	84.76	88.37	91.98	95.58	99.19		
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1082.09	(44
(45)m=	147.1	128.65	132.76	115.74	111.06	95.83	88.8	101.9	103.12	120.18	131.18	142.46		
lf instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	•	1418.79	(45
(46)m=	22.06	19.3	19.91	17.36	16.66	14.38	13.32	15.29	15.47	18.03	19.68	21.37		(46
	storage													
If comr Otherw	nunity h	eating a	includin and no ta hot wate	ınk in dw	velling, e	nter 110	litres in	(47)				0		(47
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48
Tempe	rature fa	actor fro	m Table	2b								0		(49
			storage	-		or is not		(48) x (49)	) =		1	10		(50
ot wa	iter stora	age loss	factor fr	om Tabl							0.	02		(51
	-	from Ta									1.	.03		(52
Tempe	rature fa	actor fro	m Table	2b							0	.6		(53
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54
	. ,	54) in (5	•								1.	.03		(55
Water :	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
-														

•	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 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	loss (an	nual) fro	m Table	 3				•	•		0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	55 × (41)	m				•	
(modified by	factor fi	rom Tabl	le H5 if t	here is s	olar wat	er 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)
Combi loss ca	culated	for each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 202.38	178.58	188.04	169.24	166.33	149.33	144.08	157.18	156.61	175.45	184.68	197.73		(62)
Solar DHW input of	calculated	using App	endix G oı	Appendix	H (negativ	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	l lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from wa	ater hea	ter											
(64)m= 202.38	178.58	188.04	169.24	166.33	149.33	144.08	157.18	156.61	175.45	184.68	197.73		_
							Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2069.63	(64)
Heat gains from	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	]	
(65)m= 93.13	82.72	88.36	81.28	81.15	74.66	73.75	78.1	77.08	84.18	86.41	91.59		(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylinder is	s in the	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal ga	ains (see	Table 5	and 5a	):									
Metabolic gain	s (Table	5). Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 117.84	117.84	117.84	117.84	117.01				l Ocb	1 000	1 1101	l Dec		
<del></del>		1 1		117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84		(66)
Lighting gains	(calcula	ted in Ap					117.84	117.84		-			(66)
(67)m= 18.56	(calcula <sup>-</sup> 16.49	ted in Ap					117.84	117.84		-			(66) (67)
	16.49	13.41	pendix 10.15	_, equati 7.59	on L9 oi 6.41	L9a), a	117.84 Iso see	117.84 Table 5	117.84	117.84	117.84		, ,
(67)m= 18.56	16.49	13.41	pendix 10.15	_, equati 7.59	on L9 oi 6.41	L9a), a	117.84 Iso see	117.84 Table 5	117.84	117.84	117.84		, ,
(67)m= 18.56 Appliances ga	16.49 ins (calc 210.39	13.41 ulated in 204.95	10.15 Appendix	L, equati 7.59 dix L, equ 178.72	6.41 uation L	6.92 13 or L1	117.84 Iso see 9 3a), also	117.84 Table 5 12.08 see Ta	117.84 15.33 ble 5 170.66	117.84	117.84		(67)
(67)m= 18.56 Appliances ga (68)m= 208.23	16.49 ins (calc 210.39	13.41 ulated in 204.95	10.15 Appendix	L, equati 7.59 dix L, equ 178.72	6.41 uation L	6.92 13 or L1	117.84 Iso see 9 3a), also	117.84 Table 5 12.08 see Ta	117.84 15.33 ble 5 170.66	117.84	117.84		(67)
(67)m= 18.56 Appliances gai (68)m= 208.23 Cooking gains	16.49 Ins (calc 210.39 (calcula 34.78	13.41 ulated in 204.95 ted in Ap 34.78	10.15 Appendix 193.36 Opendix 34.78	L, equati 7.59 dix L, equ 178.72 L, equat	on L9 or 6.41 uation L 164.97 ion L15	r L9a), a 6.92 13 or L1 155.78 or L15a)	117.84 lso see 9 3a), also 153.62	117.84  Table 5	117.84 15.33 ble 5 170.66	117.84 17.9 185.29	117.84 19.08		(67) (68)
(67)m= 18.56 Appliances ga (68)m= 208.23 Cooking gains (69)m= 34.78	16.49 Ins (calc 210.39 (calcula 34.78	13.41 ulated in 204.95 ted in Ap 34.78	10.15 Appendix 193.36 Opendix 34.78	L, equati 7.59 dix L, equ 178.72 L, equat	on L9 or 6.41 uation L 164.97 ion L15	r L9a), a 6.92 13 or L1 155.78 or L15a)	117.84 lso see 9 3a), also 153.62	117.84  Table 5	117.84 15.33 ble 5 170.66	117.84 17.9 185.29	117.84 19.08		(67) (68)
(67)m= 18.56 Appliances gai (68)m= 208.23 Cooking gains (69)m= 34.78 Pumps and far	16.49 ins (calc 210.39 (calcula 34.78 ns gains 0	13.41 ulated in 204.95 tted in Ap 34.78 (Table 5	10.15 Appendix 193.36 Appendix 34.78 5a) 0	L, equati 7.59 dix L, equ 178.72 L, equat 34.78	6.41 uation L 164.97 ion L15 34.78	r L9a), a 6.92 13 or L1 155.78 or L15a) 34.78	117.84 lso see 9 3a), also 153.62 , also se 34.78	117.84 Table 5 12.08 see Ta 159.07 ee Table 34.78	117.84 15.33 ble 5 170.66 5 34.78	117.84 17.9 185.29 34.78	117.84 19.08 199.04 34.78		(67) (68) (69)
(67)m= 18.56  Appliances gains (68)m= 208.23  Cooking gains (69)m= 34.78  Pumps and far (70)m= 0	16.49 ins (calc 210.39 (calcula 34.78 ns gains 0	13.41 ulated in 204.95 tted in Ap 34.78 (Table 5	10.15 Appendix 193.36 Appendix 34.78 5a) 0	L, equati 7.59 dix L, equ 178.72 L, equat 34.78	6.41 uation L 164.97 ion L15 34.78	r L9a), a 6.92 13 or L1 155.78 or L15a) 34.78	117.84 lso see 9 3a), also 153.62 , also se 34.78	117.84 Table 5 12.08 see Ta 159.07 ee Table 34.78	117.84 15.33 ble 5 170.66 5 34.78	117.84 17.9 185.29 34.78	117.84 19.08 199.04 34.78		(67) (68) (69)
(67)m= 18.56 Appliances gai (68)m= 208.23 Cooking gains (69)m= 34.78 Pumps and far (70)m= 0 Losses e.g. ev	16.49 ins (calc 210.39 (calcula 34.78 ns gains 0 aporatio -94.27	13.41 ulated in 204.95 tted in Ap 34.78 (Table 5 0 on (negat -94.27	10.15 Appendix 193.36 Opendix 34.78 Sa) 0 tive valu	L, equati 7.59 dix L, equati 178.72 L, equati 34.78	6.41 uation L' 164.97 ion L15 34.78	r L9a), a 6.92 13 or L1 155.78 or L15a) 34.78	117.84 lso see 9 3a), also 153.62 , also se 34.78	117.84 Table 5 12.08 See Ta 159.07 ee Table 34.78	117.84 15.33 ble 5 170.66 5 34.78	117.84 17.9 185.29 34.78	117.84 19.08 199.04 34.78		(67) (68) (69) (70)
(67)m= 18.56  Appliances ga (68)m= 208.23  Cooking gains (69)m= 34.78  Pumps and far (70)m= 0  Losses e.g. ev (71)m= -94.27	16.49 ins (calc 210.39 (calcula 34.78 ns gains 0 aporatio -94.27	13.41 ulated in 204.95 tted in Ap 34.78 (Table 5 0 on (negat -94.27	10.15 Appendix 193.36 Opendix 34.78 Sa) 0 tive valu	L, equati 7.59 dix L, equati 178.72 L, equati 34.78	6.41 uation L' 164.97 ion L15 34.78	r L9a), a 6.92 13 or L1 155.78 or L15a) 34.78	117.84 lso see 9 3a), also 153.62 , also se 34.78	117.84 Table 5 12.08 See Ta 159.07 ee Table 34.78	117.84 15.33 ble 5 170.66 5 34.78	117.84 17.9 185.29 34.78	117.84 19.08 199.04 34.78		(67) (68) (69) (70)
(67)m= 18.56  Appliances gains (68)m= 208.23  Cooking gains (69)m= 34.78  Pumps and far (70)m= 0  Losses e.g. ev (71)m= -94.27  Water heating	16.49 ins (calc 210.39 (calcula 34.78 ns gains 0 aporatio -94.27 gains (T	13.41 ulated in 204.95 tted in Ap 34.78 (Table 5 0 on (negat -94.27 Table 5) 118.77	10.15 Appendix 193.36 Appendix 34.78 5a) 0 cive valu -94.27	L, equati 7.59 dix L, equati 178.72 L, equat 34.78  0 es) (Tab	on L9 or 6.41  uation L  164.97  ion L15  34.78  0  le 5)  -94.27	r L9a), a 6.92 13 or L1 155.78 or L15a) 34.78  0  -94.27	117.84 Iso see 9 3a), also 153.62 , also se 34.78 0	117.84 Table 5 12.08 See Ta 159.07 The Table 34.78  0  -94.27	117.84  15.33 ble 5  170.66  5  34.78  0  -94.27	117.84 17.9 185.29 34.78 0 -94.27	117.84 19.08 199.04 34.78 0 -94.27		(67) (68) (69) (70) (71)
(67)m= 18.56  Appliances gai (68)m= 208.23  Cooking gains (69)m= 34.78  Pumps and far (70)m= 0  Losses e.g. ev (71)m= -94.27  Water heating (72)m= 125.18	16.49 ins (calcolor) 210.39 (calcula 34.78 ns gains 0 aporatio -94.27 gains (T 123.09 gains =	13.41 ulated in 204.95 tted in Ap 34.78 (Table 5 0 on (negat -94.27 Table 5) 118.77	10.15 Appendix 193.36 Appendix 34.78 5a) 0 cive valu -94.27	L, equati 7.59 dix L, equati 178.72 L, equat 34.78  0 es) (Tab	on L9 or 6.41  uation L  164.97  ion L15  34.78  0  le 5)  -94.27	r L9a), a 6.92 13 or L1 155.78 or L15a) 34.78  0  -94.27	117.84 Iso see 9 3a), also 153.62 , also se 34.78 0	117.84  Table 5 12.08 See Ta 159.07 See Table 34.78  0  -94.27	117.84  15.33 ble 5  170.66  5  34.78  0  -94.27	117.84 17.9 185.29 34.78 0 -94.27	117.84 19.08 199.04 34.78 0 -94.27		(67) (68) (69) (70) (71)
(67)m= 18.56 Appliances ga (68)m= 208.23 Cooking gains (69)m= 34.78 Pumps and far (70)m= 0 Losses e.g. ev (71)m= -94.27 Water heating (72)m= 125.18 Total internal	16.49 ins (calc 210.39 (calcula 34.78 ns gains 0 aporatio -94.27 gains (T 123.09 gains =	13.41 ulated in 204.95 tted in Ap 34.78 (Table 5 0 on (negat -94.27 Table 5) 118.77	10.15 Appendix 193.36 Appendix 34.78 Sa) 0 cive valu -94.27	L, equati 7.59 dix L, equati 178.72 L, equati 34.78  0 es) (Tab -94.27	on L9 or 6.41  uation L  164.97  ion L15  34.78  0  le 5)  -94.27  103.69  (66)	r L9a), a 6.92 13 or L1 155.78 or L15a) 34.78  0  -94.27  99.12 m + (67)m	117.84 lso see 9 3a), also 153.62 ), also se 34.78 0	117.84 Table 5 12.08 see Ta 159.07 ee Table 34.78  0  -94.27  107.06 + (69)m + (	117.84  15.33  ble 5  170.66  5  34.78  0  -94.27  113.15  (70)m + (7	117.84 17.9 185.29 34.78 0 -94.27 120.02 1)m + (72)	117.84  19.08  199.04  34.78  0  -94.27		(67) (68) (69) (70) (71) (72)
(67)m= 18.56  Appliances gai (68)m= 208.23  Cooking gains (69)m= 34.78  Pumps and far (70)m= 0  Losses e.g. ev (71)m= -94.27  Water heating (72)m= 125.18  Total internal (73)m= 410.32	16.49 ins (calcolor) 210.39 (calcula 34.78 ns gains 0 aporatio -94.27 gains (T 123.09 gains = 408.33	13.41 ulated in 204.95 tted in Ap 34.78 (Table 5 0 on (negat -94.27 Table 5) 118.77	10.15 Appendix 193.36 Appendix 34.78 Sa) 0 Eive valu -94.27 112.89	L, equati 7.59 dix L, equati 178.72 L, equati 34.78  0 es) (Tab -94.27  109.07	on L9 or 6.41  uation L  164.97  ion L15  34.78  0  le 5)  -94.27  103.69  (66)  333.42	or L9a), a 6.92 13 or L1 155.78 or L15a) 34.78  0  -94.27  99.12 m + (67)m 320.18	117.84 lso see 9 3a), also 153.62 1, also se 34.78 0 -94.27 104.98 1+(68)m+ 325.95	117.84 Table 5 12.08 see Ta 159.07 ee Table 34.78  0  -94.27  107.06 + (69)m +	117.84  15.33 ble 5  170.66  5  34.78  0  -94.27  113.15  (70)m + (7  357.49	117.84 17.9 185.29 34.78 0 -94.27 120.02 1)m + (72) 381.56	117.84  19.08  199.04  34.78  0  -94.27  123.1		(67) (68) (69) (70) (71) (72)

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

_	_		_						ı		,		_
East	0.9x	0.77	X	4.01	X	19.64	X	0.4	X	0.8	=	17.47	(76)
East	0.9x	0.77	X	4.01	X	38.42	X	0.4	X	0.8	=	34.17	(76)
East	0.9x	0.77	X	4.01	X	63.27	X	0.4	X	0.8	=	56.27	(76)
East	0.9x	0.77	X	4.01	X	92.28	X	0.4	X	0.8	=	82.06	(76)
East	0.9x	0.77	X	4.01	x	113.09	X	0.4	X	0.8	=	100.57	(76)
East	0.9x	0.77	X	4.01	X	115.77	X	0.4	X	0.8	=	102.95	(76)
East	0.9x	0.77	X	4.01	x	110.22	X	0.4	X	0.8	=	98.01	(76)
East	0.9x	0.77	X	4.01	x	94.68	x	0.4	x	0.8	=	84.19	(76)
East	0.9x	0.77	X	4.01	X	73.59	X	0.4	x	0.8	=	65.44	(76)
East	0.9x	0.77	X	4.01	x	45.59	x	0.4	x	0.8	] =	40.54	(76)
East	0.9x	0.77	X	4.01	x	24.49	x	0.4	x	0.8	=	21.78	(76)
East	0.9x	0.77	X	4.01	x	16.15	X	0.4	x	0.8	=	14.36	(76)
South	0.9x	0.77	X	3.95	x	46.75	X	0.4	x	0.8	=	40.95	(78)
South	0.9x	0.77	X	2.24	x	46.75	X	0.4	x	0.8	=	23.22	(78)
South	0.9x	0.77	X	2.24	x	46.75	X	0.4	x	0.8	=	23.22	(78)
South	0.9x	0.77	X	4.01	x	46.75	X	0.4	x	0.8	=	41.57	(78)
South	0.9x	0.77	X	3.95	x	76.57	x	0.4	x	0.8	=	67.07	(78)
South	0.9x	0.77	X	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	X	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	X	4.01	X	76.57	x	0.4	x	0.8	=	68.09	(78)
South	0.9x	0.77	X	3.95	X	97.53	X	0.4	X	0.8	=	85.43	(78)
South	0.9x	0.77	X	2.24	x	97.53	x	0.4	x	0.8	=	48.45	(78)
South	0.9x	0.77	X	2.24	x	97.53	x	0.4	x	0.8	=	48.45	(78)
South	0.9x	0.77	X	4.01	x	97.53	x	0.4	x	0.8	=	86.73	(78)
South	0.9x	0.77	X	3.95	x	110.23	x	0.4	x	0.8	=	96.56	(78)
South	0.9x	0.77	X	2.24	x	110.23	x	0.4	x	0.8	=	54.76	(78)
South	0.9x	0.77	X	2.24	x	110.23	X	0.4	X	0.8	=	54.76	(78)
South	0.9x	0.77	X	4.01	x	110.23	x	0.4	x	0.8	=	98.03	(78)
South	0.9x	0.77	X	3.95	X	114.87	X	0.4	x	0.8	=	100.62	(78)
South	0.9x	0.77	X	2.24	x	114.87	X	0.4	X	0.8	=	57.06	(78)
South	0.9x	0.77	X	2.24	x	114.87	x	0.4	x	0.8	=	57.06	(78)
South	0.9x	0.77	X	4.01	X	114.87	X	0.4	x	0.8	=	102.15	(78)
South	0.9x	0.77	X	3.95	x	110.55	x	0.4	x	0.8	=	96.83	(78)
South	0.9x	0.77	X	2.24	x	110.55	X	0.4	x	0.8	=	54.91	(78)
South	0.9x	0.77	X	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(78)
South	0.9x	0.77	x	4.01	x	110.55	x	0.4	x	0.8	=	98.31	(78)
South	0.9x	0.77	x	3.95	x	108.01	x	0.4	x	0.8	=	94.61	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.4	x	0.8	=	53.65	(78)
South	0.9x	0.77	X	2.24	x	108.01	x	0.4	x	0.8	=	53.65	(78)
South	0.9x	0.77	x	4.01	x	108.01	x	0.4	x	0.8	=	96.05	(78)
South	0.9x	0.77	X	3.95	x	104.89	x	0.4	x	0.8	=	91.88	(78)

	_												_
South	0.9x	0.77	X	2.24	X	104.89	X	0.4	X	0.8	=	52.11	(78)
South	0.9x	0.77	X	2.24	X	104.89	X	0.4	X	0.8	=	52.11	(78)
South	0.9x	0.77	X	4.01	X	104.89	X	0.4	x	0.8	=	93.28	(78)
South	0.9x	0.77	X	3.95	X	101.89	X	0.4	X	0.8	=	89.25	(78)
South	0.9x	0.77	X	2.24	X	101.89	X	0.4	X	0.8	=	50.61	(78)
South	0.9x	0.77	X	2.24	X	101.89	X	0.4	X	0.8	=	50.61	(78)
South	0.9x	0.77	X	4.01	x	101.89	x	0.4	X	0.8	=	90.6	(78)
South	0.9x	0.77	X	3.95	x	82.59	x	0.4	x	0.8	=	72.34	(78)
South	0.9x	0.77	X	2.24	X	82.59	X	0.4	X	0.8	=	41.02	(78)
South	0.9x	0.77	X	2.24	x	82.59	X	0.4	X	0.8	=	41.02	(78)
South	0.9x	0.77	X	4.01	X	82.59	X	0.4	X	0.8	=	73.44	(78)
South	0.9x	0.77	X	3.95	X	55.42	X	0.4	X	0.8	=	48.54	(78)
South	0.9x	0.77	X	2.24	x	55.42	x	0.4	X	0.8	=	27.53	(78)
South	0.9x	0.77	X	2.24	x	55.42	X	0.4	X	0.8	=	27.53	(78)
South	0.9x	0.77	X	4.01	x	55.42	X	0.4	X	0.8	=	49.28	(78)
South	0.9x	0.77	X	3.95	x	40.4	x	0.4	X	0.8	=	35.39	(78)
South	0.9x	0.77	X	2.24	x	40.4	X	0.4	X	0.8	=	20.07	(78)
South	0.9x	0.77	X	2.24	x	40.4	X	0.4	X	0.8	=	20.07	(78)
South	0.9x	0.77	X	4.01	X	40.4	X	0.4	X	0.8	=	35.92	(78)
West	0.9x	0.77	X	4.01	X	19.64	X	0.4	X	0.8	=	17.47	(80)
West	0.9x	0.77	X	1.5	x	19.64	X	0.4	X	0.8	=	6.53	(80)
West	0.9x	0.77	X	4.01	x	38.42	x	0.4	x	0.8	=	34.17	(80)
West	0.9x	0.77	X	1.5	x	38.42	X	0.4	x	0.8	=	12.78	(80)
West	0.9x	0.77	X	4.01	x	63.27	X	0.4	X	0.8	=	56.27	(80)
West	0.9x	0.77	X	1.5	x	63.27	x	0.4	X	0.8	=	21.05	(80)
West	0.9x	0.77	X	4.01	x	92.28	X	0.4	X	0.8	=	82.06	(80)
West	0.9x	0.77	X	1.5	x	92.28	x	0.4	X	0.8	=	30.7	(80)
West	0.9x	0.77	X	4.01	X	113.09	X	0.4	X	0.8	=	100.57	(80)
West	0.9x	0.77	X	1.5	x	113.09	X	0.4	X	0.8	=	37.62	(80)
West	0.9x	0.77	X	4.01	x	115.77	x	0.4	X	0.8	=	102.95	(80)
West	0.9x	0.77	X	1.5	x	115.77	x	0.4	X	0.8	=	38.51	(80)
West	0.9x	0.77	X	4.01	x	110.22	X	0.4	X	0.8	=	98.01	(80)
West	0.9x	0.77	X	1.5	x	110.22	X	0.4	X	0.8	=	36.66	(80)
West	0.9x	0.77	X	4.01	x	94.68	x	0.4	x	0.8	=	84.19	(80)
West	0.9x	0.77	X	1.5	x	94.68	x	0.4	x	0.8	=	31.49	(80)
West	0.9x	0.77	x	4.01	x	73.59	x	0.4	x	0.8	=	65.44	(80)
West	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(80)
West	0.9x	0.77	x	4.01	x	45.59	x	0.4	x	0.8	=	40.54	(80)
West	0.9x	0.77	x	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(80)
West	0.9x	0.77	x	4.01	x	24.49	x	0.4	x	0.8	=	21.78	(80)
West	0.9x	0.77	X	1.5	x	24.49	x	0.4	x	0.8	=	8.15	(80)
	_												_

West	0.9x	0.77	x	4.0	)1	x	1	6.15	x [		0.4	×		0.8		=	14.36	(80)
West	0.9x	0.77	x	1.	5	X	1	6.15	x		0.4	Ī×	Ē	0.8		=	5.37	(80)
	_		_										_					
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																		
(83)m=		292.34	402.65	498.92	555.65	$\overline{}$	49.38	530.66	489.	.25	436.43	324	.07	204.58	145.	54		(83)
Total g	jains – i	nternal a	and solar	(84)m =	= (73)m	+ (	83)m	, watts	•								J	
(84)m=	580.76	700.67	798.12	873.67	909.38	8	382.8	850.84	815	.2	772.98	681	.57	586.14	545.	12		(84)
7. Me	an inter	nal temp	perature	(heating	season	)												
Temp	erature	during h	neating p	eriods ir	n the livi	ng	area	from Tab	ole 9,	Th	1 (°C)						21	(85)
-		_	ains for l			_					` ,							_
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	Jg	Sep	0	ct	Nov	D	эс		
(86)m=	0.99	0.97	0.93	0.82	0.65	H	0.47	0.33	0.3	<del>-  </del>	0.57	0.8		0.98	0.9			(86)
, ,		l		ļ	T. "	<u></u>		<u> </u>	<u> </u>						<u> </u>		l	
			ature in		· ·	OIIC		i		-		00	00	00.55	00.6	\	I	(07)
(87)m=	20.29	20.49	20.71	20.9	20.98		21	21	21		20.99	20.	88	20.55	20.2	25		(87)
Temp	erature	during h	neating p	eriods ir	rest of	dw	elling/	from Ta	able 9	), Th	n2 (°C)							
(88)m=	20.18	20.18	20.18	20.19	20.19		20.2	20.2	20.	2	20.2	20.	19	20.19	20.	18		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2	,m (se	ee Table	9a)									
(89)m=	0.99	0.97	0.91	0.78	0.6	$\overline{}$	0.41	0.27	0.3	3	0.51	0.8	32	0.97	0.9	9		(89)
Moon	intorno	l tompor	oturo in	the rest	of dwall	ina	T2 /f	ollow etc	<u> </u>	<u>+0.7</u>	in Tabl	0.00	\		<u> </u>		1	
(90)m=	19.25	19.53	ature in	20.08	20.17	Ť	20.2	20.2	20.	-	20.19	20.		19.62	19.	10	1	(90)
(90)111=	19.25	19.55	19.03	20.00	20.17		20.2	20.2	20.					g area ÷ (4		19	0.00	<b>_</b> ``
											•	LA - 1	LIVIII	g area + (-	+) -		0.36	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = f	LA × T1	+ (1 -	– fL	A) × T2							
(92)m=	19.62	19.87	20.15	20.37	20.46	2	20.48	20.49	20.4	49	20.48	20.	36	19.96	19.	57		(92)
Apply	adjustn	nent to t	he mean	interna	temper	atu	ıre fro	m Table	4e, \	whe	re appro	opria	te					
(93)m=	19.62	19.87	20.15	20.37	20.46	2	20.48	20.49	20.4	49	20.48	20.	36	19.96	19.	57		(93)
8. Sp	ace hea	ting requ	uirement															
			ternal ter			nec	l at st	ep 11 of	Table	e 9b	, so tha	t Ti,r	n=(	76)m an	d re-	calc	ulate	
the ut			or gains			_						_					I	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	Jg	Sep	0	ct	Nov	D	ес		
		<u>_</u>	ains, hm			_				_						_	I	(0.4)
(94)m=	0.99	0.96	0.91	0.79	0.62		0.43	0.29	0.3	2	0.53	0.8	3	0.97	0.9	9		(94)
			, W = (94		<del></del>	Τ.								l			I	(05)
(95)m=	573.01	675.08	725.55	690.11	560.39	_	78.99	250.87	263.	.18	410.05	567	.35	566.57	539.	85		(95)
			rnal tem		r	_		100		. 1		40					I	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.		14.1	10.	.6	7.1	4.2	<u>'</u>		(96)
			an intern	<u>.</u>		_		<del>-``</del>	<del></del>	<del> </del>	<u> </u>		<u> </u>	0.46.57	450		l	(07)
(97)m=	1019.1	993.65	903.64	751.1	572.25	_	380	250.94	263.		413.75	637		843.65	1013	3.3		(97)
•		ř	ement fo		i	vvr		T	T -	Ì		ŕ		r			I	
(98)m=	331.89	214.08	132.5	43.91	8.82	L	0	0	0		0	52.		199.5	352.			7,
										Total	per year	(kWh/	yeaı	r) = Sum(9	8)15,9	12 =	1335	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year												17.85	(99)
																		_

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

	,		_
Fraction of space heat from secondary/supplementary heating (Ta	ble 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)
The community scheme may obtain heat from several sources. The procedure allo includes boilers, heat pumps, geothermal and waste heat from power stations. See		ne latter	
Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for communit	y heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		kWh/year	_
Annual space heating requirement		1335	╛
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1468.5	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			_
Annual water heating requirement		2069.63	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2276.59	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	37.45	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from our	tside	157.19	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	157.19	(331)
Energy for lighting (calculated in Appendix L)		327.85	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-633.9	(333)
Electricity generated by wind turbine (Appendix M) (negative quan	tity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two	vo fuels repeat (363) to (366) for the second fuel	319	(367a)
CO2 associated with heat source 1 [(307b)+(31	0b)] x 100 ÷ (367b) x	609.31	(367)
Electrical energy for heat distribution [(31	(3) x 0.52 =	19.44	(372)
Total CO2 associated with community systems (36	3)(366) + (368)(372) =	628.75	(373)
CO2 associated with space heating (secondary) (30	9) x 0 =	0	(374)
CO2 associated with water from immersion heater or instantaneou	s heater (312) x 0.52 =	0	(375)
			_

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 628.75 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 81.58 CO2 associated with electricity for lighting (332))) x (379) 0.52 170.15 Energy saving/generation technologies (333) to (334) as applicable x = 0.01 =Item 1 (380)0.52 -328.99 sum of (376)...(382) =Total CO2, kg/year 551.49 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)7.37 El rating (section 14) (385)93.83

			User D	Notoile:									
Assessor Name: Software Name:	Assessor Name: John Simpson Stroma Number: STRC												
Address :	GT 103, Aspen Co						PFH						
Overall dwelling dim		art, maiti	and r di	t Lotato,	London	, 11110 2							
				a(m²)			ight(m)	1	Volume(m <sup>3</sup>	<u>^</u>			
Ground floor				74.8	(1a) x		2.6	(2a) =	194.48	(3a)			
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	۱) 📗	74.8	(4)								
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	194.48	(5)			
2. Ventilation rate:				11									
Number of chimneys	heating	secondar heating	'y □ + □	other	7 <sub>=</sub> [	total	x,	40 =	m³ per hou	(6a)			
•		0	╛╘	0	╛╘	0		20 =	0	= ' '			
Number of open flues	0 +	0	+	0	] = [	0			0	(6b)			
Number of intermittent fa	ans					3	X '	10 =	30	(7a)			
Number of passive vent	S					0	Χ.	10 =	0	(7b)			
Number of flueless gas	fires					0	X 4	40 =	0	(7c)			
								Air oh	anges per he				
Indiltunction along to plaining	ava fluor and force (	60\1/6b\1/7	70) ı (7b) ı (	( <b>7</b> 0) –	_				nanges per ho	_			
Infiltration due to chimne	been carried out or is intend				continue fr	30		÷ (5) =	0.15	(8)			
Number of storeys in		леа, ргосее	u 10 (17), 1	ourer wise (	onunae m	om ( <del>3)</del> to	(10)		0	(9)			
Additional infiltration	3 ( -)						[(9)	-1]x0.1 =	0	(10)			
Structural infiltration:	0.25 for steel or timber	frame or	0.35 fo	r masoni	y constr	uction			0	(11)			
	present, use the value corre	sponding to	the great	ter wall are	a (after								
deducting areas of open	nings); if equal user 0.35 floor, enter 0.2 (unsea	aled) or 0	1 (coal	معام (امد	antar N					(12)			
·	nter 0.05, else enter 0	aled) Of O	. i (Scale	ou), eise	enter o				0	(12)			
• •	vs and doors draughts	stripped							0	(14)			
Window infiltration	.o aa accie alaagiii s			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)			
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)			
Air permeability value	, q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)			
If based on air permeab	ility value, then (18) = [(	17) ÷ 20]+(	8), otherw	ise (18) = (	16)				0.4	(18)			
	ies if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			_			
Number of sides shelter	ed			(20) = 1 -	în 075 v (1	Q\1 <b>-</b>			1	(19)			
Shelter factor	ating shalter factor			$(20) = 1^{-2}$ (21) = (18)		3)] =			0.92	(20)			
Infiltration rate incorpora Infiltration rate modified	_	d		(21) = (10	/ X (20) =				0.37	(21)			
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1				
		Juli	Jui	Aug	Seb	l Oct	INOV	Dec					
Monthly average wind s (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1				
(-2)	7.7   7.0	1 5.5	L 5.5	L 3.7		I 7.5	I 7.5	I 7.1	J				
Wind Factor (22a)m = (2	22)m ÷ 4												
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18					

Adjusted infiltr	ation rate	(allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	0.37	0.4	0.42	0.44	]	
Calculate effec		_	rate for t	he appli	cable ca	se						,	
If mechanica			andiv NL (O	ah) (aa	.\ <b></b>	auatian (I	NEN otho	muiaa (22h	\ (220\			0	(23a)
If exhaust air h									) = (23a)			0	(23b)
If balanced with				_					0h) //	00h) [4	4 (OO =)	0	(23c)
a) If balance (24a)m= 0	ed mecha	nicai ve	ntilation	with ne	at recove		TR) (248	$\frac{1}{1} m = (22)$	2b)m + (2 0   1	23b) × [* 0	0	1 ÷ 100] ]	(24a)
` '											0	J	(244)
b) If balance (24b)m= 0		0	0	without 0	neat rec	overy (N	0	0	0	0	0	1	(24b)
c) If whole h									U I			J	(2.0)
,	iouse exii n < 0.5 ×			•	•				5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural	ventilatio	n or wh	ole hous	e positiv	re input	ventilatio	on from I	oft	<u> </u>		<u>!</u>	J	
if (22b)n	n = 1, the	n (24d)	m = (221)	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air	change r	rate - en	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. Heat losse	s and hea	at loss p	paramete	er:									
ELEMENT	Gross area (	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/h	<b>(</b> )	k-value kJ/m²-		A X k kJ/K
Windows Type	<b>•</b> 1				3.41	x1.	/[1/( 1.4 )+	0.04] =	4.52				(27)
Windows Type	⊋2				3.36		/[1/( 1.4 )+	0.04] =	4.45	Ħ			(27)
Windows Type	∍ 3				1.91		/[1/( 1.4 )+	0.04] =	2.53	Ħ			(27)
Windows Type	e 4				1.91	x <sub>1</sub> ,	/[1/( 1.4 )+	0.04] =	2.53	=			(27)
Windows Type	∍ 5				3.41	x <sub>1</sub> ,	/[1/( 1.4 )+	0.04] =	4.52	=			(27)
Windows Type	∍ 6				3.41	= x1,	/[1/( 1.4 )+	0.04] =	4.52	Ħ			(27)
Windows Type					1.28	=  <sub>x1</sub> ,	/[1/( 1.4 )+	0.04] =	1.7	Ħ			(27)
Floor					74.8	×	0.13		9.724	<b>=</b>			(28)
Walls	61.39	9	18.69	9	42.7	x	0.18	<u> </u>	7.69	<b>-</b>		7 F	(29)
Total area of e					136.1	=	00						(31)
	,				100.1	<b>兰</b>							(32)
Party wall					52 57	·   x	0		Ω				(0-)
Party wall  * for windows and	' roof windo	ws, use e	ffective wi	ndow U-va	52.57		0 formula 1	=   /[(1/U-valu	0 (e)+0.04] a	 s given in	paragrapl		
* for windows and ** include the area					alue calcul					L s given in	paragraph	1 3.2	
* for windows and	as on both s	sides of in	ternal wal		alue calcul	ated using		 /[(1/U-valu		L s given in	paragraph	3.2 42.19	(33)
* for windows and ** include the area	as on both s ss, W/K =	sides of in	ternal wal		alue calcul	ated using	formula 1	/[(1/U-valu ) + (32) =					(33)
* for windows and ** include the area Fabric heat los	as on both s ss, W/K = Cm = S(A	sides of in S (A x A x k )	ternal wal	ls and par	alue calcul titions	ated using	formula 1	/[(1/U-valu ) + (32) = ((28)	ie)+0.04] a	?) + (32a).		42.19	==
* for windows and ** include the area Fabric heat los Heat capacity	as on both s ss, W/K = Cm = S(A s paramete sments whe	sides of in S (A x A x k ) er (TMF ere the de	ternal wall U) P = Cm ÷	ls and pan	alue calcul titions	ated using	g formula 1	/[(1/U-valu ) + (32) = ((28) Indica	.(30) + (32 tive Value:	2) + (32a). Medium	(32e) =	42.19	(34)
* for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	as on both s ss, W/K = Cm = S(A paramete sments whe had of a deta	sides of in S (A x A x k ) er (TMF ere the des ailed calcu	ternal wall U) P = Cm ÷ tails of the	s and pan	alue calcul titions n kJ/m²K ion are not	ated using	g formula 1	/[(1/U-valu ) + (32) = ((28) Indica	.(30) + (32 tive Value:	2) + (32a). Medium	(32e) =	42.19	(34)
* for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste	as on both s ss, W/K = Cm = S(A s paramete sments whe had of a deta es: S(L) al bridging a	sides of in  S (A x  A x k)  Ler (TMF  Lere the declarited calculum  x Y) calculum  x Y) calculum  x Y) calculum  x X (A x x x x x x x x x x x x x x x x x x	ternal wall U) $P = Cm + \frac{1}{2}$ tails of the ulation. culated t	F TFA) ir construct	alue calcul hitions n kJ/m²K ion are not opendix l	ated using	g formula 1	/[(1/U-valu ) + (32) = ((28) Indica	.(30) + (32 tive Value:	2) + (32a). Medium	(32e) =	42.19 0 250	(34) (35) (36)

Ventila	ition hea	t loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	39.38	39.1	38.82	37.52	37.27	36.14	36.14	35.93	36.58	37.27	37.77	38.28		(38)
Heat tr	ansfer c	oefficier	nt, W/K	-		-	-	-	(39)m	= (37) + (3	38)m			
(39)m=	88.14	87.86	87.58	86.28	86.03	84.9	84.9	84.69	85.33	86.03	86.53	87.04		
Heat lo	oss para	meter (H	HLP), W/	/m²K				-		Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	86.28	(39)
(40)m=	1.18	1.17	1.17	1.15	1.15	1.13	1.13	1.13	1.14	1.15	1.16	1.16		
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.15	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing enei	gy requi	irement:								kWh/ye	ear:	
if TF	ned occu A > 13.9 A £ 13.9	), N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		36		(42)
Reduce	the annua	l average	hot water	usage by	5% if the a		designed t	(25 x N) to achieve		se target o		.17		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ir	iltres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	99.19	95.58	91.98	88.37	84.76	81.16	81.16	84.76	88.37	91.98	95.58	99.19		_
Energy o	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	m x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1082.09	(44)
(45)m=	147.1	128.65	132.76	115.74	111.06	95.83	88.8	101.9	103.12	120.18	131.18	142.46		_
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1418.79	(45)
(46)m=	22.06	19.3	19.91	17.36	16.66	14.38	13.32	15.29	15.47	18.03	19.68	21.37		(46)
	storage		inaludin	na opv o	olor or M	MAILIDE	otorogo	within sa	ma vaa	ool				(47)
If commodule of the com	munity h vise if no storage	eating a stored loss:	nd no ta hot wate	ink in dw er (this in	velling, e ncludes i	nter 110 nstantar	litres in neous co					150		(47)
,					or is kno	wn (kWh	n/day):				1.	39		(48)
•			m Table								0.	54		(49)
			storage eclared o	-		or is not		(48) x (49)	) =		0.	75		(50)
Hot wa	ater stora	age loss		om Tabl		h/litre/da						0		(51)
	e factor	_										0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
_	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51) x (52) x (53) = 0				0		(54)
Energy	, 1001 110							0.75						
٠.	(50) or (		55)								0.	75		(55)
Enter	(50) or (	54) in (5	55) culated f	for each	month			((56)m = (	55) × (41)	m	0.	75		(55)

If cylinder con	ains dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 23.3	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 circ	cuit loss (ar	nnual) fro	m Table	 e 3	•	•	•	•			0		(58)
Primary circ	`	,			59)m = (	(58) ÷ 36	65 × (41)	m				•	
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.2	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) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat r	equired for	water he	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 193.	69 170.74	179.35	160.83	157.65	140.93	135.4	148.5	148.21	166.77	176.28	189.05		(62)
Solar DHW inp	out calculated	using App	endix G oı	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additio	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 193.	69 170.74	179.35	160.83	157.65	140.93	135.4	148.5	148.21	166.77	176.28	189.05		
	-	-					Outp	out from wa	ater heate	r (annual)₁	12	1967.41	(64)
Heat gains	from water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	]	
(65)m= 86. <sup>2</sup>	9 76.45	81.42	74.56	74.2	67.94	66.8	71.16	70.36	77.24	79.69	84.64		(65)
include (5	57)m in cal	culation (	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Interna	gains (see	e Table 5	and 5a	):									
Metabolic g	ains (Table	e 5). Wat	ts										
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 117.	84 117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84	117.84		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 18.5	16.49	13.41	10.15	7.59	6.41	6.92	9	12.08	15.33	17.9	19.08		(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5			•	
(68)m= 208.	23 210.39	204.95	193.36	178.72	164.97	155.78	153.62	159.07	170.66	185.29	199.04		(68)
Cooking ga	ins (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)	), also se	ee Table	5			•	
(69)m= 34.7	78 34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78	34.78		(69)
Pumps and	fans gains	(Table 5	 5a)									•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporation	n (nega	tive valu	es) (Tab	le 5)							•	
(71)m= -94.	27 -94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27	-94.27		(71)
Water heati	ng gains (	rable 5)	•	•	•	•	•	•	•	•	•	•	
(72)m= 115.	84 113.76	109.43	103.55	99.73	94.36	89.79	95.64	97.72	103.81	110.68	113.77		(72)
Total interi	nal gains =	:		•	(66)	m + (67)m	n + (68)m -	+ (69)m + (	(70)m + (7	1)m + (72)	m	•	
(73)m= 403.	99 401.99	389.14	368.41	347.4	327.09	313.85	319.62	330.22	351.16	375.22	393.24		(73)
6. Solar ga	ains:			•		•	•						
Solar gains a	re calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	e applicat	le orientat	ion.		
Orientation	Access f		Area m²		Flu Tal	x ble 6a	т	g_ able 6b	т.	FF able 6c		Gains (W)	
	i abie 00		111=		iai	oic ua	'	abie UD	1.	adi <del>c</del> UC		( * * )	

East	0.9x	0.77	1 ,	2.44	l v	40.04	l .	0.00	l <b>v</b>	0.7	1 _	20.47	(76)
East		0.77	] X ]	3.41	X	19.64	l x	0.63	X	0.7	] = ]	20.47	╡` ′
East	0.9x 0.9x	0.77	] X ]	3.41	X 	38.42	X I	0.63	X	0.7	] = ]	40.04	(76)
East	0.9x	0.77	] X ] v	3.41	l X	63.27	l x	0.63	X	0.7	] = 1 _	65.94	(76)
East	<u> </u>	0.77	] X ]	3.41	X 	92.28	l x	0.63	X	0.7	] = ]	96.17	(76)
East	0.9x	0.77	] X ]	3.41	X 	113.09	X 1	0.63	X	0.7	] = ]	117.86	(76)
East	0.9x	0.77	X	3.41	X 	115.77	X 1	0.63	X	0.7	] = 1	120.65	(76)
East	0.9x	0.77	X	3.41	X	110.22	X	0.63	X	0.7	] = 1	114.86	(76)
East	0.9x	0.77	X	3.41	X	94.68	X	0.63	X	0.7	] = 1	98.67	(76)
	0.9x	0.77	) X	3.41	X	73.59	X	0.63	X	0.7	] = 1	76.69	(76)
East	0.9x	0.77	J X 1	3.41	X I	45.59	X I	0.63	X	0.7	] = 1	47.51	(76)
East	0.9x	0.77	X	3.41	X	24.49	X	0.63	X	0.7	] = 1	25.52	(76)
East	0.9x	0.77	X	3.41	X I	16.15	X I	0.63	X	0.7	] = 1	16.83	(76)
South	0.9x	0.77	X	3.36	X	46.75	X	0.63	X	0.7	] = 1	48.01	(78)
South	0.9x	0.77	X	1.91	X	46.75	X	0.63	X	0.7	] = 1	27.29	(78)
South	0.9x	0.77	X	1.91	X	46.75	X	0.63	X	0.7	] = 1	27.29	(78)
South	0.9x	0.77	X	3.41	X	46.75	X	0.63	X	0.7	] =	48.72	(78)
South	0.9x	0.77	X	3.36	X	76.57	X	0.63	X	0.7	] =	78.62	(78)
South	0.9x	0.77	X	1.91	X	76.57	X	0.63	X	0.7	=	44.69	<u> </u> (78)
South	0.9x	0.77	X	1.91	Х	76.57	X	0.63	X	0.7	=	44.69	(78)
South	0.9x	0.77	X	3.41	X	76.57	X	0.63	X	0.7	] =	79.79	(78)
South	0.9x	0.77	X	3.36	Х	97.53	X	0.63	X	0.7	] =	100.15	(78)
South	0.9x	0.77	X	1.91	х	97.53	X	0.63	X	0.7	=	56.93	(78)
South	0.9x	0.77	X	1.91	X	97.53	X	0.63	X	0.7	=	56.93	(78)
South	0.9x	0.77	X	3.41	X	97.53	X	0.63	X	0.7	=	101.64	(78)
South	0.9x	0.77	X	3.36	x	110.23	X	0.63	X	0.7	=	113.2	(78)
South	0.9x	0.77	X	1.91	X	110.23	X	0.63	X	0.7	=	64.35	(78)
South	0.9x	0.77	X	1.91	x	110.23	X	0.63	X	0.7	=	64.35	(78)
South	0.9x	0.77	X	3.41	X	110.23	X	0.63	X	0.7	=	114.88	(78)
South	0.9x	0.77	X	3.36	X	114.87	X	0.63	X	0.7	=	117.96	(78)
South	0.9x	0.77	X	1.91	X	114.87	X	0.63	X	0.7	=	67.05	(78)
South	0.9x	0.77	X	1.91	X	114.87	X	0.63	X	0.7	=	67.05	(78)
South	0.9x	0.77	X	3.41	X	114.87	X	0.63	X	0.7	=	119.71	(78)
South	0.9x	0.77	X	3.36	X	110.55	X	0.63	X	0.7	=	113.52	(78)
South	0.9x	0.77	X	1.91	x	110.55	X	0.63	X	0.7	=	64.53	(78)
South	0.9x	0.77	X	1.91	X	110.55	X	0.63	X	0.7	=	64.53	(78)
South	0.9x	0.77	X	3.41	x	110.55	X	0.63	x	0.7	=	115.21	(78)
South	0.9x	0.77	X	3.36	x	108.01	X	0.63	x	0.7	=	110.91	(78)
South	0.9x	0.77	x	1.91	x	108.01	X	0.63	x	0.7	] =	63.05	(78)
South	0.9x	0.77	X	1.91	x	108.01	x	0.63	x	0.7	] =	63.05	(78)
South	0.9x	0.77	x	3.41	x	108.01	X	0.63	x	0.7	] =	112.56	(78)
South	0.9x	0.77	×	3.36	×	104.89	×	0.63	X	0.7	=	107.71	(78)

South 0.58		_		_		_						_		_
South	South	0.9x	0.77	X	1.91	X	104.89	X	0.63	X	0.7	=	61.23	(78)
South	South	0.9x	0.77	X	1.91	x	104.89	X	0.63	X	0.7	=	61.23	(78)
South         0.98         0.77         x         1.91         x         101.89         x         0.63         x         0.77         general section of the control of t	South	0.9x	0.77	X	3.41	X	104.89	x	0.63	X	0.7	=	109.31	(78)
South         0.98         0.77         x         1.91         x         10188         x         0.63         x         0.77         g 59.47         (78)           South         0.98         0.77         x         3.341         x         10189         x         0.63         x         0.77         a         106.18         (78)           South         0.98         0.77         x         1.91         x         82.59         x         0.63         x         0.77         a         48.21         (78)           South         0.98         0.77         x         1.91         x         82.59         x         0.63         x         0.7         a         48.21         (78)           South         0.98         0.77         x         1.91         x         65.42         x         0.63         x         0.7         a         48.21         (78)           South         0.92         0.77         x         1.91         x         55.42         x         0.63         x         0.7         a         32.35         (78)           South         0.92         0.77         x         1.91         x         55.42         x	South	0.9x	0.77	X	3.36	x	101.89	X	0.63	X	0.7	=	104.62	(78)
South	South	0.9x	0.77	X	1.91	x	101.89	X	0.63	X	0.7	=	59.47	(78)
South         0.9x         0.77         x         3.36         x         82.59         x         0.63         x         0.77         =         84.8         1/8           South         0.9x         0.77         x         1.91         x         82.59         x         0.63         x         0.77         =         48.21         (78)           South         0.9x         0.77         x         1.91         x         82.59         x         0.63         x         0.77         =         48.21         (78)           South         0.9x         0.77         x         3.341         x         82.59         x         0.63         x         0.77         =         48.21         (78)           South         0.9x         0.77         x         1.91         x         55.42         x         0.63         x         0.77         =         32.35         (78)           South         0.9x         0.77         x         3.341         x         55.42         x         0.63         x         0.77         =         57.75         (78)           South         0.9x         0.77         x         3.341         x         40.4<	South	0.9x	0.77	X	1.91	X	101.89	X	0.63	X	0.7	=	59.47	(78)
South 0.5x 0.77 x 1.91 x 82.59 x 0.63 x 0.7 = 442.1 (78) South 0.9x 0.77 x 3.41 x 82.59 x 0.63 x 0.7 = 86.07 (78) South 0.9x 0.77 x 3.41 x 82.59 x 0.63 x 0.7 = 86.07 (78) South 0.9x 0.77 x 3.3.6 x 55.42 x 0.63 x 0.7 = 56.91 (78) South 0.9x 0.77 x 1.91 x 55.42 x 0.63 x 0.7 = 56.91 (78) South 0.9x 0.77 x 1.91 x 55.42 x 0.63 x 0.7 = 32.35 (78) South 0.9x 0.77 x 1.91 x 55.42 x 0.63 x 0.7 = 32.35 (78) South 0.9x 0.77 x 3.3.6 x 40.4 x 0.63 x 0.7 = 441.48 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 441.48 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 223.58 (78) South 0.9x 0.77 x 1.91 x 3.41 x 19.64 x 0.63 x 0.7 = 224.7 (80) West 0.9x 0.77 x 1.28 x 19.64 x 0.63 x 0.7 = 224.7 (80) West 0.9x 0.77 x 1.28 x 19.84 x 0.63 x 0.7 = 244.1 (80) West 0.9x 0.77 x 1.28 x 0.341 x 0.63 x 0.7 = 244.1 (80) West 0.9x 0.77 x 1.28 x 0.32 x 0.63 x 0.7 = 244.2 (80) West 0.9x 0.77 x 1.28 x 0.341 x 0.63 x 0.7 = 244.2 (80) West 0.9x 0.77 x 1.28 x 0.341 x 0.32 x 0.63 x 0.7 = 244.2 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 442.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.	South	0.9x	0.77	X	3.41	x	101.89	X	0.63	x	0.7	=	106.18	(78)
South         0.98         0.77         x         1.91         x         82.59         x         0.63         x         0.7         =         48.21         (78)           South         0.98         0.77         x         3.41         x         82.59         x         0.63         x         0.7         =         56.91         (78)           South         0.98         0.77         x         1.91         x         55.42         x         0.63         x         0.7         =         56.91         (78)           South         0.98         0.77         x         1.91         x         55.42         x         0.63         x         0.7         =         52.35         (78)           South         0.98         0.77         x         3.341         x         55.42         x         0.63         x         0.7         =         41.48         (78)           South         0.98         0.77         x         1.91         x         40.4         x         0.63         x         0.7         =         41.48         (78)           South         0.98         0.77         x         1.91         x         40.4	South	0.9x	0.77	X	3.36	x	82.59	x	0.63	x	0.7	=	84.8	(78)
South         0.5k         0.77         x         3.41         x         82.59         x         0.63         x         0.7         =         86.07         (78)           South         0.9k         0.77         x         3.36         x         55.42         x         0.63         x         0.7         =         56.91         (78)           South         0.9k         0.77         x         1.91         x         55.42         x         0.63         x         0.7         =         32.35         (78)           South         0.9k         0.77         x         1.91         x         55.42         x         0.63         x         0.7         =         32.35         (78)           South         0.9k         0.77         x         3.36         x         40.4         x         0.63         x         0.7         =         41.48         78           South         0.9k         0.77         x         1.91         x         40.4         x         0.63         x         0.7         =         23.58         78           South         0.9k         0.77         x         3.41         x         40.4	South	0.9x	0.77	X	1.91	x	82.59	X	0.63	x	0.7	=	48.21	(78)
South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 32.35 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 32.35 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 41.48 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 41.48 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 42.1 (78)  West 0.9x 0.77 x 1.28 x 1.964 x 0.63 x 0.7 = 42.1 (78)  West 0.9x 0.77 x 1.28 x 1.964 x 0.63 x 0.7 = 40.04 (80)  West 0.9x 0.77 x 1.28 x 3.41 x 63.27 x 0.63 x 0.7 = 40.04 (80)  West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 65.94 (80)  West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 65.94 (80)  West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 65.94 (80)  West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 65.94 (80)  West 0.9x 0.77 x 1.28 x 1.28 x 0.63 x 0.7 = 65.94 (80)  West 0.9x 0.77 x 1.28 x 1.28 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 1.13.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 1.28 x 113.09 x 0	South	0.9x	0.77	X	1.91	x	82.59	X	0.63	x	0.7	=	48.21	(78)
South 0.9x 0.77 x 1.91 x 55.42 x 0.63 x 0.7 = 32.35 (78)  South 0.9x 0.77 x 1.91 x 55.42 x 0.63 x 0.7 = 32.35 (78)  South 0.9x 0.77 x 3.41 x 55.42 x 0.63 x 0.7 = 32.35 (78)  South 0.9x 0.77 x 3.36 x 40.4 x 0.63 x 0.7 = 41.48 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 3.41 x 40.4 x 0.63 x 0.7 = 23.58 (78)  South 0.9x 0.77 x 3.41 x 40.4 x 0.63 x 0.7 = 23.58 (78)  West 0.9x 0.77 x 3.41 x 40.4 x 0.63 x 0.7 = 20.47 (80)  West 0.9x 0.77 x 3.41 x 19.64 x 0.63 x 0.7 = 442.1 (78)  West 0.9x 0.77 x 3.41 x 38.42 x 0.63 x 0.7 = 40.04 (80)  West 0.9x 0.77 x 3.41 x 38.42 x 0.63 x 0.7 = 40.04 (80)  West 0.9x 0.77 x 3.41 x 63.27 x 0.63 x 0.7 = 40.04 (80)  West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 46.594 (80)  West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 46.594 (80)  West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 46.594 (80)  West 0.9x 0.77 x 1.28 x 1.28 x 0.63 x 0.7 = 46.594 (80)  West 0.9x 0.77 x 1.28 x 1.28 x 0.63 x 0.7 = 46.594 (80)  West 0.9x 0.77 x 1.28 x 1.28 x 0.63 x 0.7 = 46.594 (80)  West 0.9x 0.77 x 3.41 x 113.09 x 0.63 x 0.7 = 46.594 (80)  West 0.9x 0.77 x 3.41 x 113.09 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 3.41 x 115.77 x 0.63 x 0.7 = 44.24 (80)  West 0.9x 0.77 x 3.41 x 115.77 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 115.77 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 115.77 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 110.22 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 110.22 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 110.22 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 110.22 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 110.22 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 110.22 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 1.28 x 110.22 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 110.22 x 0.63 x 0.7 = 45.29 (80)  West 0.9x 0.77 x 3.41 x 4.45.90 x 0.63 x 0.7 = 447.51 (80)  West 0.9x 0.77 x 3.41 x 4.45	South	0.9x	0.77	X	3.41	x	82.59	X	0.63	x	0.7	=	86.07	(78)
South 0.9x 0.77 x 1.91 x 55.42 x 0.63 x 0.7 = 32.55 (78) South 0.9x 0.77 x 1.91 x 55.42 x 0.63 x 0.7 = 57.75 (78) South 0.9x 0.77 x 3.41 x 55.42 x 0.63 x 0.7 = 441.48 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 441.48 (78) South 0.9x 0.77 x 1.91 x 1.91 x 40.4 x 0.63 x 0.7 = 442.1 (78) West 0.9x 0.77 x 1.28 x 1.964 x 0.63 x 0.7 = 20.47 (80) West 0.9x 0.77 x 1.28 x 1.964 x 0.63 x 0.7 = 440.04 (80) West 0.9x 0.77 x 1.28 x 1.28 x 1.28 x 0.63 x 0.7 = 15.03 (80) West 0.9x 0.77 x 1.28 x 1.28 x 1.28 x 0.63 x 0.7 = 440.04 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 440.04 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 465.94 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 465.94 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 465.94 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 465.94 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 440.4 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 441.48 (80) West 0.9x 0.77 x 1.28 x	South	0.9x	0.77	X	3.36	X	55.42	X	0.63	x	0.7	=	56.91	(78)
South 0.9x 0.77 x 3.41 x 55.42 x 0.63 x 0.7 = 57.75 (78) South 0.9x 0.77 x 3.3.6 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 1.9	South	0.9x	0.77	X	1.91	x	55.42	x	0.63	x	0.7	=	32.35	(78)
South 0.9x 0.77 x 3.36 x 40.4 x 0.63 x 0.7 = 41.48 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 1.91 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 3.41 x 40.4 x 0.63 x 0.7 = 23.58 (78) South 0.9x 0.77 x 3.41 x 40.4 x 0.63 x 0.7 = 42.1 (78) West 0.9x 0.77 x 3.41 x 19.64 x 0.63 x 0.7 = 42.1 (78) West 0.9x 0.77 x 3.41 x 38.42 x 0.63 x 0.7 = 40.04 (80) West 0.9x 0.77 x 1.28 x 38.42 x 0.63 x 0.7 = 40.04 (80) West 0.9x 0.77 x 1.28 x 38.42 x 0.63 x 0.7 = 15.03 (80) West 0.9x 0.77 x 1.28 x 38.42 x 0.63 x 0.7 = 65.94 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 65.94 (80) West 0.9x 0.77 x 1.28 x 92.28 x 0.63 x 0.7 = 24.75 (80) West 0.9x 0.77 x 1.28 x 92.28 x 0.63 x 0.7 = 36.1 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 36.1 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 117.86 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 43.12 (80)	South	0.9x	0.77	X	1.91	X	55.42	x	0.63	x	0.7	=	32.35	(78)
South 0.9x 0.77	South	0.9x	0.77	X	3.41	x	55.42	X	0.63	x	0.7	=	57.75	(78)
South 0.9x 0.77	South	0.9x	0.77	X	3.36	x	40.4	x	0.63	x	0.7	=	41.48	(78)
South 0.9x 0.77 x 3.41 x 40.4 x 0.63 x 0.7 = 42.1 (78) West 0.9x 0.77 x 3.41 x 19.64 x 0.63 x 0.7 = 20.47 (80) West 0.9x 0.77 x 1.28 x 19.64 x 0.63 x 0.7 = 40.04 (80) West 0.9x 0.77 x 1.28 x 36.42 x 0.63 x 0.7 = 40.04 (80) West 0.9x 0.77 x 1.28 x 36.42 x 0.63 x 0.7 = 15.03 (80) West 0.9x 0.77 x 3.41 x 63.27 x 0.63 x 0.7 = 65.94 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 24.75 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 96.17 (80) West 0.9x 0.77 x 1.28 x 63.27 x 0.63 x 0.7 = 96.17 (80) West 0.9x 0.77 x 1.28 x 92.28 x 0.63 x 0.7 = 96.17 (80) West 0.9x 0.77 x 1.28 x 92.28 x 0.63 x 0.7 = 117.86 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 117.86 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 117.86 (80) West 0.9x 0.77 x 1.28 x 113.09 x 0.63 x 0.7 = 144.24 (80) West 0.9x 0.77 x 1.28 x 115.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 116.77 x 0.63 x 0.7 = 44.24 (80) West 0.9x 0.77 x 1.28 x 110.22 x 0.63 x 0.7 = 45.29 (80) West 0.9x 0.77 x 1.28 x 110.22 x 0.63 x 0.7 = 98.67 (80) West 0.9x 0.77 x 1.28 x 110.22 x 0.63 x 0.7 = 45.29 (80) West 0.9x 0.77 x 1.28 x 110.22 x 0.63 x 0.7 = 98.67 (80) West 0.9x 0.77 x 1.28 x 110.22 x 0.63 x 0.7 = 98.67 (80) West 0.9x 0.77 x 1.28 x 110.22 x 0.63 x 0.7 = 98.67 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 98.67 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 110.22 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80) West 0.9x 0.77 x 1.28 x 94.68 x 0.63 x 0.7 = 28.79 (80)	South	0.9x	0.77	X	1.91	X	40.4	x	0.63	x	0.7	=	23.58	(78)
West         0.9x         0.77         x         3.41         x         19.64         x         0.63         x         0.7         =         20.47         (80)           West         0.9x         0.77         x         1.28         x         19.64         x         0.63         x         0.7         =         7.68         (80)           West         0.9x         0.77         x         3.41         x         38.42         x         0.63         x         0.7         =         40.04         (80)           West         0.9x         0.77         x         1.28         x         38.42         x         0.63         x         0.7         =         15.03         (80)           West         0.9x         0.77         x         3.41         x         63.27         x         0.63         x         0.7         =         65.94         (80)           West         0.9x         0.77         x         3.41         x         92.28         x         0.63         x         0.7         =         96.17         (80)           West         0.9x         0.77         x         3.41         x         113.09	South	0.9x	0.77	X	1.91	x	40.4	x	0.63	x	0.7	=	23.58	(78)
West         0.9x         0.77         x         1.28         x         19.64         x         0.63         x         0.7         =         7.68         (80)           West         0.9x         0.77         x         3.41         x         38.42         x         0.63         x         0.7         =         40.04         (80)           West         0.9x         0.77         x         1.28         x         38.42         x         0.63         x         0.7         =         40.04         (80)           West         0.9x         0.77         x         3.41         x         63.27         x         0.63         x         0.7         =         65.94         (80)           West         0.9x         0.77         x         1.28         x         63.27         x         0.63         x         0.7         =         65.94         (80)           West         0.9x         0.77         x         1.28         x         63.27         x         0.63         x         0.7         =         65.94         (80)           West         0.9x         0.77         x         1.28         x         113.09	South	0.9x	0.77	X	3.41	x	40.4	x	0.63	x	0.7	=	42.1	(78)
West         0.9x         0.77         x         3.41         x         38.42         x         0.63         x         0.7         =         40.04         (80)           West         0.9x         0.77         x         1.28         x         38.42         x         0.63         x         0.7         =         40.04         (80)           West         0.9x         0.77         x         3.41         x         63.27         x         0.63         x         0.7         =         65.94         (80)           West         0.9x         0.77         x         1.28         x         63.27         x         0.63         x         0.7         =         65.94         (80)           West         0.9x         0.77         x         3.41         x         92.28         x         0.63         x         0.7         =         96.17         (80)           West         0.9x         0.77         x         3.41         x         113.09         x         0.63         x         0.7         =         96.17         (80)           West         0.9x         0.77         x         3.41         x         113.09	West	0.9x	0.77	X	3.41	x	19.64	X	0.63	x	0.7	=	20.47	(80)
West 0.9x 0.77	West	0.9x	0.77	X	1.28	X	19.64	X	0.63	x	0.7	=	7.68	(80)
West 0.9x 0.77	West	0.9x	0.77	X	3.41	x	38.42	x	0.63	x	0.7	=	40.04	(80)
West         0.9x         0.77         x         1.28         x         63.27         x         0.63         x         0.7         =         24.75         (80)           West         0.9x         0.77         x         3.41         x         92.28         x         0.63         x         0.7         =         96.17         (80)           West         0.9x         0.77         x         1.28         x         92.28         x         0.63         x         0.7         =         96.17         (80)           West         0.9x         0.77         x         1.28         x         92.28         x         0.63         x         0.7         =         36.1         (80)           West         0.9x         0.77         x         1.28         x         113.09         x         0.63         x         0.7         =         117.86         (80)           West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         120.65         (80)           West         0.9x         0.77         x         1.28         x         110.22	West	0.9x	0.77	X	1.28	X	38.42	x	0.63	x	0.7	=	15.03	(80)
West         0.9x         0.77         x         3.41         x         92.28         x         0.63         x         0.7         =         96.17         (80)           West         0.9x         0.77         x         1.28         x         92.28         x         0.63         x         0.7         =         36.1         (80)           West         0.9x         0.77         x         3.41         x         113.09         x         0.63         x         0.7         =         117.86         (80)           West         0.9x         0.77         x         1.28         x         113.09         x         0.63         x         0.7         =         117.86         (80)           West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         120.65         (80)           West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         120.65         (80)           West         0.9x         0.77         x         1.28         x         110.22	West	0.9x	0.77	X	3.41	x	63.27	x	0.63	x	0.7	=	65.94	(80)
West         0.9x         0.77         x         1.28         x         92.28         x         0.63         x         0.7         =         36.1         (80)           West         0.9x         0.77         x         3.41         x         113.09         x         0.63         x         0.7         =         117.86         (80)           West         0.9x         0.77         x         1.28         x         113.09         x         0.63         x         0.7         =         117.86         (80)           West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         12.65         (80)           West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         12.65         (80)           West         0.9x         0.77         x         1.28         x         110.22         x         0.63         x         0.7         =         114.86         (80)           West         0.9x         0.77         x         1.28         x         110.22	West	0.9x	0.77	X	1.28	x	63.27	x	0.63	x	0.7	=	24.75	(80)
West         0.9x         0.77         x         3.41         x         113.09         x         0.63         x         0.7         =         117.86         (80)           West         0.9x         0.77         x         1.28         x         113.09         x         0.63         x         0.7         =         44.24         (80)           West         0.9x         0.77         x         3.41         x         115.77         x         0.63         x         0.7         =         44.24         (80)           West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         45.29         (80)           West         0.9x         0.77         x         3.41         x         110.22         x         0.63         x         0.7         =         45.29         (80)           West         0.9x         0.77         x         1.28         x         110.22         x         0.63         x         0.7         =         43.12         (80)           West         0.9x         0.77         x         1.28         x         94.68	West	0.9x	0.77	X	3.41	X	92.28	X	0.63	X	0.7	=	96.17	(80)
West         0.9x         0.77         x         1.28         x         113.09         x         0.63         x         0.7         =         44.24         (80)           West         0.9x         0.77         x         3.41         x         115.77         x         0.63         x         0.7         =         120.65         (80)           West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         45.29         (80)           West         0.9x         0.77         x         3.41         x         110.22         x         0.63         x         0.7         =         45.29         (80)           West         0.9x         0.77         x         3.41         x         110.22         x         0.63         x         0.7         =         43.12         (80)           West         0.9x         0.77         x         3.41         x         94.68         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         3.41         x         73.59	West	0.9x	0.77	X	1.28	x	92.28	X	0.63	x	0.7	=	36.1	(80)
West         0.9x         0.77         x         3.41         x         115.77         x         0.63         x         0.7         =         120.65         (80)           West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         45.29         (80)           West         0.9x         0.77         x         1.28         x         110.22         x         0.63         x         0.7         =         45.29         (80)           West         0.9x         0.77         x         1.28         x         110.22         x         0.63         x         0.7         =         43.12         (80)           West         0.9x         0.77         x         3.41         x         94.68         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         3.41         x         73.59         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         3.41         x         45.59	West	0.9x	0.77	X	3.41	x	113.09	x	0.63	x	0.7	=	117.86	(80)
West         0.9x         0.77         x         1.28         x         115.77         x         0.63         x         0.7         =         45.29         (80)           West         0.9x         0.77         x         3.41         x         110.22         x         0.63         x         0.7         =         114.86         (80)           West         0.9x         0.77         x         1.28         x         110.22         x         0.63         x         0.7         =         114.86         (80)           West         0.9x         0.77         x         3.41         x         94.68         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         1.28         x         94.68         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         1.28         x         94.68         x         0.63         x         0.7         =         76.69         (80)           West         0.9x         0.77         x         1.28         x         73.59	West	0.9x	0.77	X	1.28	x	113.09	X	0.63	x	0.7	=	44.24	(80)
West         0.9x         0.77         x         3.41         x         110.22         x         0.63         x         0.7         =         114.86         (80)           West         0.9x         0.77         x         1.28         x         110.22         x         0.63         x         0.7         =         43.12         (80)           West         0.9x         0.77         x         3.41         x         94.68         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         1.28         x         94.68         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         1.28         x         94.68         x         0.63         x         0.7         =         37.04         (80)           West         0.9x         0.77         x         1.28         x         73.59         x         0.63         x         0.7         =         28.79         (80)           West         0.9x         0.77         x         1.28         x         45.59	West	0.9x	0.77	X	3.41	x	115.77	X	0.63	x	0.7	=	120.65	(80)
West         0.9x         0.77         x         1.28         x         110.22         x         0.63         x         0.7         =         43.12         (80)           West         0.9x         0.77         x         3.41         x         94.68         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         1.28         x         94.68         x         0.63         x         0.7         =         98.67         (80)           West         0.9x         0.77         x         3.41         x         73.59         x         0.63         x         0.7         =         76.69         (80)           West         0.9x         0.77         x         1.28         x         73.59         x         0.63         x         0.7         =         28.79         (80)           West         0.9x         0.77         x         3.41         x         45.59         x         0.63         x         0.7         =         47.51         (80)           West         0.9x         0.77         x         3.41         x         24.59	West	0.9x	0.77	X	1.28	x	115.77	X	0.63	x	0.7	=	45.29	(80)
West       0.9x       0.77       x       3.41       x       94.68       x       0.63       x       0.7       =       98.67       (80)         West       0.9x       0.77       x       1.28       x       94.68       x       0.63       x       0.7       =       37.04       (80)         West       0.9x       0.77       x       1.28       x       73.59       x       0.63       x       0.7       =       76.69       (80)         West       0.9x       0.77       x       1.28       x       73.59       x       0.63       x       0.7       =       28.79       (80)         West       0.9x       0.77       x       3.41       x       45.59       x       0.63       x       0.7       =       47.51       (80)         West       0.9x       0.77       x       1.28       x       45.59       x       0.63       x       0.7       =       17.83       (80)         West       0.9x       0.77       x       3.41       x       24.49       x       0.63       x       0.7       =       25.52       (80)	West	0.9x	0.77	X	3.41	x	110.22	X	0.63	x	0.7	=	114.86	(80)
West       0.9x       0.77       x       1.28       x       94.68       x       0.63       x       0.7       =       37.04       (80)         West       0.9x       0.77       x       3.41       x       73.59       x       0.63       x       0.7       =       76.69       (80)         West       0.9x       0.77       x       1.28       x       73.59       x       0.63       x       0.7       =       28.79       (80)         West       0.9x       0.77       x       3.41       x       45.59       x       0.63       x       0.7       =       47.51       (80)         West       0.9x       0.77       x       1.28       x       45.59       x       0.63       x       0.7       =       17.83       (80)         West       0.9x       0.77       x       3.41       x       24.49       x       0.63       x       0.7       =       25.52       (80)	West	0.9x	0.77	X	1.28	x	110.22	X	0.63	x	0.7	=	43.12	(80)
West       0.9x       0.77       x       3.41       x       73.59       x       0.63       x       0.7       =       76.69       (80)         West       0.9x       0.77       x       1.28       x       73.59       x       0.63       x       0.7       =       28.79       (80)         West       0.9x       0.77       x       1.28       x       45.59       x       0.63       x       0.7       =       47.51       (80)         West       0.9x       0.77       x       1.28       x       45.59       x       0.63       x       0.7       =       17.83       (80)         West       0.9x       0.77       x       3.41       x       24.49       x       0.63       x       0.7       =       25.52       (80)	West	0.9x	0.77	X	3.41	X	94.68	X	0.63	X	0.7	=	98.67	(80)
West       0.9x       0.77       x       1.28       x       73.59       x       0.63       x       0.7       =       28.79       (80)         West       0.9x       0.77       x       3.41       x       45.59       x       0.63       x       0.7       =       47.51       (80)         West       0.9x       0.77       x       1.28       x       45.59       x       0.63       x       0.7       =       17.83       (80)         West       0.9x       0.77       x       3.41       x       24.49       x       0.63       x       0.7       =       25.52       (80)	West	0.9x	0.77	X	1.28	X	94.68	X	0.63	x	0.7	=	37.04	(80)
West       0.9x       0.77       x       3.41       x       45.59       x       0.63       x       0.7       =       47.51       (80)         West       0.9x       0.77       x       1.28       x       45.59       x       0.63       x       0.7       =       17.83       (80)         West       0.9x       0.77       x       3.41       x       24.49       x       0.63       x       0.7       =       25.52       (80)	West	0.9x	0.77	X	3.41	x	73.59	x	0.63	x	0.7	=	76.69	(80)
West       0.9x       0.77       x       1.28       x       45.59       x       0.63       x       0.7       =       17.83       (80)         West       0.9x       0.77       x       3.41       x       24.49       x       0.63       x       0.7       =       25.52       (80)	West	0.9x	0.77	X	1.28	x	73.59	x	0.63	x	0.7	=	28.79	(80)
West 0.9x 0.77 x 3.41 x 24.49 x 0.63 x 0.7 = 25.52 (80)	West	0.9x	0.77	X	3.41	x	45.59	x	0.63	x	0.7	] =	47.51	(80)
0 2	West	0.9x	0.77	X	1.28	x	45.59	x	0.63	x	0.7	=	17.83	(80)
West 0.9x 0.77 x 1.28 x 24.49 x 0.63 x 0.7 = 9.58 (80)	West	0.9x	0.77	X	3.41	x	24.49	x	0.63	x	0.7	=	25.52	(80)
	West	0.9x	0.77	X	1.28	x	24.49	x	0.63	x	0.7	=	9.58	(80)

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West	0.9x	0.77	X	3.4	11	X	1	6.15	X		0.63	X	0.7	=	16.83	(80)
West	0.9x	0.77	X	1.2	28	X	1	6.15	x		0.63	X	0.7	=	6.32	(80)
Solar	gains in	watts, ca	alculated	for eac	h month	1			(83)m	= St	um(74)m .	(82)m				
(83)m=	199.93	342.92	472.29	585.2	651.73	6	44.37	622.42	573.	85	511.91	380.14	239.98	170.73		(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m	+ (	83)m	, watts							_	
(84)m=	603.92	744.91	861.43	953.61	999.13	9	71.45	936.26	893.	47	842.13	731.29	615.2	563.97		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	1)										
Temp	erature	during h	eating p	eriods ir	n the livi	ng	area	from Tab	ole 9,	Th	1 (°C)				21	(85)
-		ctor for g				_					` ,					_
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Αι	ıa T	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.95	0.87	0.73	+	0.55	0.4	0.4	Ť	0.66	0.91	0.98	0.99		(86)
		<u> </u>		,				0					1		l	
		l temper	1		· `	1		i –		$\neg$			T	T	1	(07)
(87)m=	19.91	20.14	20.43	20.73	20.91	2	20.98	21	21		20.96	20.71	20.25	19.87	j	(87)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling/	from Ta	ble 9	), Th	n2 (°C)				_	
(88)m=	19.94	19.94	19.94	19.96	19.96	1	9.97	19.97	19.9	97	19.97	19.96	19.95	19.95		(88)
Utilisa	ation fac	tor for g	ains for i	est of d	welling	h2	m (se	e Table	9a)				-	-		
(89)m=	0.99	0.97	0.93	0.83	0.67	_	0.46	0.31	0.3	4	0.58	0.87	0.98	0.99		(89)
		<u> </u>			<u> </u>	<u> </u>	<b>T</b> 2 //		<u> </u>	!			ı		ı	
		l temper			ı	Ť	•	i	<del>i                                     </del>	$\neg$			1		1	(00)
(90)m=	18.51	18.85	19.26	19.67	19.88	1	9.96	19.97	19.9	97	19.94	19.65	19.01	18.46		(90)
											T	LA = LIVI	ng area ÷ (4	4) =	0.36	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = f	LA × T1	+ (1 -	– fL	A) × T2					
(92)m=	19.01	19.31	19.68	20.05	20.25	2	20.33	20.34	20.3	34	20.3	20.03	19.46	18.97		(92)
Apply	adjustr	nent to the	he mean	interna	l temper	atu	ıre fro	m Table	4e, v	whe	re appro	priate				
(93)m=	19.01	19.31	19.68	20.05	20.25	2	20.33	20.34	20.3	34	20.3	20.03	19.46	18.97		(93)
8. Sp	ace hea	iting requ	uirement													
Set T	i to the	mean int	ernal ter			ned	l at st	ep 11 of	Table	e 9b	, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the ut	tilisation	factor fo	or gains	using Ta	able 9a	_							,	,	1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
		tor for g	<del></del>			_									1	
(94)m=	0.99	0.97	0.93	0.84	0.69	'	0.49	0.34	0.3	7	0.6	0.87	0.97	0.99		(94)
Usefu	<u> </u>	hmGm ,		, ·	<del> </del>	_								T	1	
(95)m=	596.37	721.63	799.26	798.39	686.16		479	316.57	332.	24	509.47	639.25	598.13	558.69	j	(95)
	<del></del>	age exte				$\overline{}$							_	1	1	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	4	14.1	10.6	7.1	4.2	j	(96)
		e for mea				Lm	1 , W =	=[(39)m :	x [(93	3)m-	- (96)m	]	,	,	1	
(97)m=	1296.71	1266.29	1154.22	961.73	735.64	4	86.34	317.43	333.	63	529.48	811.29	1069.24	1285.33		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	24 x [(	(97)	m – (95	)m] x (4	11)m		,	
(98)m=	521.05	366.02	264.09	117.6	36.81		0	0	0		0	127.99	339.2	540.62		
									٦	Total	per year	(kWh/yea	ar) = Sum(9	8) <sub>15,912</sub> =	2313.38	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year										30.93	(99)
·		quiremer				vet	eme i	ncluding	micr	n-C	HD)					
	e heatii		no – IIIUI	vidual II	caling s	ysı	CITIS I	neraaing	тпы	<del>0-</del> 0	rn-)					
-		n <b>g:</b> bace hea	nt from se	econdar	v/sunnle	me	entarv	system							0	(201)
			0.11 0	Josephal	,, 542210		a. y	5,000111							<u> </u>	

									_
Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating s	system	1, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)  521.05   366.02   264.09   117.6   36.81		0	0	0	127.99	220.2	E40.60	1	
	0	0	0	0	127.99	339.2	540.62		(244)
$ (211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ 557.27  391.46  282.45  125.78  39.37 $	0	0	0	0	136.89	362.78	578.2	]	(211)
				I (kWh/yea		211),5,1012		2474.21	(211)
Space heating fuel (secondary), kWh/month									
$= \{[(98)m \times (201)] \} \times 100 \div (208)$								,	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		٦
			Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>		0	(215)
Water heating Output from water heater (calculated above)									
· ·	140.93	135.4	148.5	148.21	166.77	176.28	189.05	]	
Efficiency of water heater								79.8	(216)
(217)m= 87.33 86.8 85.84 83.99 81.63	79.8	79.8	79.8	79.8	84.12	86.53	87.46		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)III = (04)III X 100 ÷ (217)III									
(219)m= 221.8 196.71 208.93 191.48 193.14	176.6	169.67	186.09	185.73	198.26	203.71	216.15	]	
(219)m= 221.8 196.71 208.93 191.48 193.14	176.6	169.67		185.73 I = Sum(2		203.71	216.15	2348.27	(219)
Annual totals	176.6	169.67			19a) <sub>112</sub> =	203.71 Wh/year		kWh/yeai	
Annual totals Space heating fuel used, main system 1	176.6	169.67			19a) <sub>112</sub> =				
Annual totals	176.6	169.67			19a) <sub>112</sub> =			kWh/yeai	
Annual totals Space heating fuel used, main system 1	176.6	169.67			19a) <sub>112</sub> =			kWh/yeai 2474.21	
Annual totals Space heating fuel used, main system 1 Water heating fuel used	176.6	169.67			19a) <sub>112</sub> =			kWh/yeai 2474.21	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	176.6	169.67			19a) <sub>112</sub> =			kWh/yeai 2474.21	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:	176.6	169.67	Tota	I = Sum(2 <sup>-</sup>	19a) <sub>112</sub> =	Wh/year	30	kWh/yeai 2474.21	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue	176.6	169.67	Tota	I = Sum(2 <sup>-</sup>	19a) <sub>112</sub> = <b>k</b> \	Wh/year	30	kWh/yeai 2474.21 2348.27	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Tota	I = Sum(2 <sup>-</sup> of (230a).	19a) <sub>112</sub> = <b>k</b> \	Wh/year	30	kWh/yeai 2474.21 2348.27	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	uding mi	Tota	I = Sum(2 <sup>-1</sup> of (230a).	19a) <sub>112</sub> = <b>k\</b> (230g) =	Wh/year	30 45	kWh/yeai 2474.21 2348.27 75 327.85	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu		Tota	I = Sum(2 <sup>-1</sup> of (230a).	19a) <sub>112</sub> = <b>k\</b> (230g) =	Wh/year	30 45	kWh/yeai 2474.21 2348.27	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu Enc kW	ıding mi	Tota	I = Sum(2 <sup>-1</sup> of (230a).	19a) <sub>112</sub> = kk\footnote{k\footn	Wh/year	30 45	kWh/year 2474.21 2348.27 75 327.85	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	ns inclu Enc kW (211	uding mid ergy /h/year	Tota	I = Sum(2 <sup>-1</sup> of (230a).	(230g) =  Emiss kg CO2	ion fact	30 45 <b>tor</b>	kWh/year 2474.21 2348.27 75 327.85 Emissions kg CO2/year 534.43	(230c) (230e) (231) (232) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	ens inclu Enc kW (211 (215	ergy /h/year	Tota	I = Sum(2 <sup>-1</sup> of (230a).	19a) <sub>112</sub> = kk\footnote{k\footn	ion fact 2/kWh	30 45 <b>tor</b>	kWh/year 2474.21 2348.27 75 327.85 Emissions kg CO2/ye 534.43	(230c) (230e) (231) (232) (261) (263)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Enc kW (211 (215 (219	ergy /h/year ) × 5) ×	sum	I = Sum(2 <sup>-1</sup> )	(230g) =  Emiss kg CO2	ion fact 2/kWh	30 45 <b>tor</b> =	kWh/year 2474.21 2348.27 75 327.85 Emissions kg CO2/ye 534.43 0	(230c) (230e) (231) (232) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating Space and water heating	ence inclusion i	ergy /h/year ) x 5) x 0) x	Tota	I = Sum(2 <sup>-1</sup> )	19a) <sub>112</sub> = kN	ion fact 2/kWh	30 45 <b>tor</b> = =	kWh/year 2474.21 2348.27 75 327.85 Emissions kg CO2/ye 534.43 0 507.23 1041.66	(230c) (230e) (231) (232)  (261) (263) (264) (265)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Enc kW (211 (215 (219 (261 (231	ergy /h/year ) × 5) ×	sum	I = Sum(2 <sup>-1</sup> )	19a) <sub>112</sub> = kk\footnote{k\footn	ion fact 2/kWh	30 45 <b>tor</b> =	kWh/year 2474.21 2348.27 75 327.85 Emissions kg CO2/ye 534.43 0	(230c) (230e) (231) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1250.73 (272)

 $TER = 24.38 \tag{273}$ 

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:36:08

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** 

Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 72.1m<sup>2</sup> Site Reference: Plot Reference: Maitland Park Estate GT 105

GT 105, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

24.5 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 6.49 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.9 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 35.1 kWh/m<sup>2</sup>

OK

2 Fabric U-values

**Element Highest Average** External wall 0.12 (max. 0.30) 0.12 (max. 0.70) OK Party wall 0.00 (max. 0.20) OK Floor 0.10 (max. 0.25) OK 0.10 (max. 0.70) Roof (no roof)

**Openings** 1.40 (max. 2.00) 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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

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:	0.53	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South	2.24m²	
Windows facing: North	1.5m²	
Windows facing: North	6.73m²	
Windows facing: North	2.24m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m <sup>2</sup> K	
Party Walls U-value	0 W/m²K	
Floors U-value	0.1 W/m <sup>2</sup> K	
Community heating, heat from electric heat pump		
Photovoltaic array		
-		

			User D	etails:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 2	2012		Stroma Softwa					0006273 on: 1.0.4.26	
		Р	roperty	Address	GT 105	5				
Address :	GT 105, Aspen (	Court, Maitla	and Park	k Estate,	London	, NW3 2	2EH			
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	,	Volume(m	<u> </u>
Ground floor				72.1	(1a) x	2	2.6	(2a) =	187.46	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+	·(1e)+(1r	n) =	72.1	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	187.46	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +		<b>]</b> + [	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0 +	0	╡╻┝	0	] <sub>=</sub> [	0	X	20 =	0	(6b)
Number of intermittent fa					J		=	10 =		= ``
					Ĺ	0			0	(7a)
Number of passive vents	5					0	X	10 =	0	(7b)
Number of flueless gas f	ires					0	X	40 =	0	(7c)
								A : l.		
		(0.) (0.) (-	- > / > /	_ 、	_				nanges per h	
Infiltration due to chimne	•					0		÷ (5) =	0	(8)
If a pressurisation test has a Number of storeys in t		enaea, procee	d to (17), (	otnerwise d	ontinue tr	om (9) to	(16)			( <sub>(0)</sub>
Additional infiltration	ine aweiling (ns)						[(0)]	-1]x0.1 =	0	(9) (10)
Structural infiltration: (	) 25 for steel or timb	er frame or	0 35 for	r masonr	v constr	uction	[(0)	1]X0.1 =	0	= (10)  (11)
if both types of wall are p					•	dollori			0	(''')
deducting areas of open		, ,	ŭ		,					
If suspended wooden	floor, enter 0.2 (uns	sealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors draugh	t stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,			0	(16)
Air permeability value			•		•	etre of e	envelope	area	2	(17)
If based on air permeabi									0.1	(18)
Air permeability value appli	•	t has been dor	ne or a deg	gree air pe	rmeability	is being u	sed			<b>–</b>
Number of sides shelter Shelter factor	ea			(20) = 1 -	n 075 x (1	19)1 –			2	(19)
Infiltration rate incorpora	ting chalter factor			(21) = (18)					0.85	(20)
•	-	ood		(21) = (10)	/ X (20) =				0.08	(21)
Infiltration rate modified  Jan Feb	<del></del>		Jul	Λιια	Sep	Oct	Nov	Dec	]	
	' '	ay Jun	Jui	Aug	Sep	I OCI	INOV	Dec		
Monthly average wind sp	1		2.0	0.7	4	1 4 0	1 45	4.7	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22)m ÷ 4									
(320)	122 11 10	0 05	0.05	0.00	4	1.00	1 440	1 40	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.11	ation rate	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1		
Calculate effe	ctive air	change i											
If mechanic	al ventila	tion:										0.5	(23
If exhaust air h	eat pump u	ısing Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced wit	n heat reco	very: effici	ency in %	allowing for	or in-use fa	actor (from	Table 4h	) =				76.5	(23
a) If balance	1 1					<u> </u>	HR) (24a	<del>```</del>	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(24
b) If balance						, ,	, <u>`</u>	í `	<del>`</del>	<del></del>		i	
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				•	•				0.51			•	
$\frac{11(220)1}{24d)m=0}$	n = 1, the	en (24a) 0	m = (220)	o)m otne	o o	4a)m = 0	0.5 + [(2	20)m² x	0.5]	0	0		(24
									0		U		(2
Effective air	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(2:
0.20	1 4.22	U.ZZ	0.21	0.21	0.2	0.2	U.E	U.E	V.2 1	0.21	0.22		
3. Heat losse		•											
LEMENT	Gros area		Openin m		Net Are A ,n		U-valı W/m2		A X U (W/I	≺)	k-value kJ/m²-ł		X k J/K
Vindows Type	e 1				2.24	x1/	/[1/( 1.4 )+	0.04] =	2.97				(2
Vindows Type	∍ 2				1.5	x1/	/[1/( 1.4 )+	0.04] =	1.99				(2
Vindows Type	∍ 3				6.73	x1/	/[1/( 1.4 )+	0.04] =	8.92				(2
Vindows Type	e 4				2.24	x1/	/[1/( 1.4 )+	0.04] =	2.97				(2
loor					72.1	x	0.1	= [	7.21				(2
Valls	33.8	3	12.7		21.09	x	0.12	_ =	2.53	$\overline{}$		$\neg   $	(2
otal area of	elements	, m²			105.9								 (3
arty wall					54.21	x	0	=	0				(3
	l roof windo	ows, use e	ffective wi	ndow U-va	alue calcula	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	3.2	
for windows and	as on both	sides of in	ternal wall	s and part	titions						i		_
* include the are							(00) (00)	(00)				26.59	(3
include the are abric heat lo	ss, W/K =	,	U)				(26)(30)	` '					
* include the are Fabric heat lost Heat capacity	ss, W/K = Cm = S(	Axk)	ŕ	<b>TF A</b> ) :	1.1/ 01/		(26)(30)	((28)	.(30) + (32	, , ,	(32e) =	0	=
* include the are Fabric heat loo Heat capacity Thermal mass	ss, W/K = Cm = S( s parame	Axk) ter (TMF	? = Cm ÷	,			, , , ,	((28) Indica	tive Value	: Medium		0 250	=
* include the are Fabric heat loo Heat capacity Thermal mass For design asses	ss, W/K = Cm = S( s parame sments who	A x k) ter (TMF ere the de	P = Cm ÷	,			, , , ,	((28) Indica	tive Value	: Medium		-	(3
* include the are Fabric heat lost Heat capacity Thermal mass For design asses an be used inste	ss, W/K = Cm = S( s parame sments who ead of a det	A x k ) ter (TMF ere the de tailed calcu	P = Cm ÷ tails of the ulation.	constructi	ion are not	known pr	, , , ,	((28) Indica	tive Value	: Medium		-	=
* include the are Fabric heat loo Heat capacity Thermal mass For design asses an be used inste Thermal bridg	ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L	A x k ) ter (TMF ere the det tailed calcu x Y) calc	P = Cm ÷ tails of the ulation. culated t	constructi	ion are not pendix k	known pr	, , , ,	((28) Indica	tive Value	: Medium		250	(3
* include the are fabric heat lossed leat capacity Thermal massed for design assessan be used inste Thermal bridged details of thermal Total fabric he	ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L al bridging seat loss	A x k ) ter (TMF ere the detailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to	constructi	ion are not pendix k	known pr	, , , ,	((28) Indica e indicative	tive Value values of (36) =	: Medium TMP in Ta	able 1f	250	(3
for windows and include the are fabric heat lost leat capacity hermal mass for design assess an be used instead fabric hermal bridg details of thermal fabric hermal fabri	ss, W/K = Cm = S( s parame sments who ead of a det es : S (L al bridging eat loss at loss ca	A x k ) ter (TMF ere the det tailed calcu x Y) calc are not kn	P = Cm ÷ tails of the ulation. culated to own (36) =	constructi	on are not pendix k	known pr	ecisely the	((28) Indica e indicative (33) + (38)m	tive Value e values of (36) = = 0.33 × (	: Medium <i>TMP in T</i>	able 1f	250	(3
* include the are Fabric heat loss leat capacity Thermal mass for design asses an be used inste Thermal bridg I details of therm Total fabric he Ventilation he	cs, W/K = Cm = S( c) cs parame csments who cad of a det es : S (L cal bridging cat loss cat loss ca	A x k ) ter (TMF ere the detailed calcul x Y) calcul are not known	P = Cm ÷ tails of the ulation. culated to own (36) = monthly	constructiusing Ap	pendix k	known pr	ecisely the	((28) Indica e indicative (33) + (38)m Sep	(36) = = 0.33 × (	: Medium TMP in To	able 1f	250	(3
* include the are fabric heat lossed leat capacity Thermal massed for design assessan be used inste Thermal bridg details of therm Total fabric head	ss, W/K = Cm = S( s parame sments who ead of a det es : S (L al bridging eat loss at loss ca	A x k ) ter (TMF ere the det tailed calcu x Y) calc are not kn	P = Cm ÷ tails of the ulation. culated to own (36) =	constructi	on are not pendix k	known pr	ecisely the	((28) Indica e indicative (33) + (38)m	tive Value e values of (36) = = 0.33 × (	: Medium <i>TMP in T</i>	able 1f	250	(3
include the are fabric heat losses the capacity for design assess an be used instantial bridg details of thermal fotal fabric herentilation here	ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L al bridging eat loss at loss ca Feb 13.84	A x k ) ter (TMF ere the detailed calcul x Y) calculated Mar 13.71	P = Cm ÷ tails of the ulation. culated to own (36) = monthly	constructiusing Ap	pendix k	known pr	ecisely the	((28) Indica e indicative (33) + (38)m Sep 12.53	(36) = = 0.33 × (	25)m x (5) Nov	able 1f	250	(3

Heat loss para	ameter (I	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.64	0.64	0.64	0.63	0.62	0.62	0.62	0.61	0.62	0.62	0.63	0.63		
									Average =	Sum(40) <sub>1</sub>	12 /12=	0.63	(40)
Number of day	<u> </u>	<del>1 ` `                                   </del>	le 1a)					1	1	1	<del> </del>		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occurring TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		.3		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target c		3.73		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								Годр	1 001	1 1404			
(44)m= 97.6	94.05	90.5	86.96	83.41	79.86	79.86	83.41	86.96	90.5	94.05	97.6		
(1.7	1								<u> </u>	ım(44) <sub>112</sub> =	L	1064.76	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x D	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 144.74	126.59	130.63	113.89	109.28	94.3	87.38	100.27	101.47	118.25	129.08	140.18		
	•	•				•			Total = Su	ım(45) <sub>112</sub> =	=	1396.07	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)					
(46)m= 21.71	18.99	19.59	17.08	16.39	14.14	13.11	15.04	15.22	17.74	19.36	21.03		(46)
Water storage Storage volum		\ includir	va anv c	olar or M	///IDC	ctorogo	within co	ama vac	col				(47)
If community h	,					_		airie ves	361		0		(47)
Otherwise if no	-			-			, ,	ers) ente	er '0' in <i>(</i>	(47)			
Water storage			(1)					-, -		,			
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
b) If manufact			-										
Hot water stor If community h	-			e 2 (KVV	n/litre/da	ay)				0.	02		(51)
Volume factor	•		011 4.3							1	03		(52)
Temperature f			2b							-	.6		(53)
Energy lost fro				ear			(47) x (51)	) x (52) x (	53) =		.03		(54)
Enter (50) or		_	,				, , , ,	, , , ,	,	-	.03		(55)
Water storage	loss cal	culated	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												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)
	<u> </u>	ļ.						1	1	<u> </u>	<u> </u>		, ,
Primary circuit	`	,			50\ <del>~</del>	(EQ) + 20	SE > (44)	ım			0		(58)
Primary circuit (modified by				,		` '	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
20.20					01						20.20		()

Combi loss calculated for each month (61)m = (60) $\div$ 365 × (41)m														
(61)m= 0	0	0	0	0	0	0	) 	)	0	0	0	0	1	(61)
	uired for	water he	eating ca	Lalculated	L I for ea	_L ch month	(62)	m =	0.85 x (	 ′45)m +	(46)m +	(57)m +	ו · (59)m + (61)m	
(62)m= 200.02	<del>-</del>	185.91	167.38	164.56	147.79		155		154.96	173.53	182.58	195.45	]	(62)
Solar DHW inpu	t calculated	using App	endix G o	r Appendix	H (nega	 itive quantit	y) (ent	ter '0'	if no sola	r contribu	tion to wate	r heating)	<b>.</b>	
(add addition												-		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter				•	•				•	•	•	
(64)m= 200.02	2 176.52	185.91	167.38	164.56	147.79	142.66	155	.55	154.96	173.53	182.58	195.45	1	
	•				•	•		Outp	out from wa	ater heat	er (annual)	l12	2046.91	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	n + (6	31)m	n] + 0.8 x	((46)m	ı + (57)m	+ (59)m	١]	
(65)m= 92.35	82.03	87.66	80.66	80.56	74.15	73.28	77.	56	76.53	83.54	85.72	90.83	]	(65)
include (57	')m in calc	culation of	of (65)m	only if c	ylinder	is in the	dwell	ling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):										
Metabolic ga	ins (Table	5), Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec	]	
(66)m= 114.8	114.8	114.8	114.8	114.8	114.8	114.8	114	1.8	114.8	114.8	114.8	114.8	1	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5				-	
(67)m= 18.14	16.11	13.1	9.92	7.41	6.26	6.76	8.7	79	11.8	14.98	17.48	18.64	]	(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a),	also	see Tal	ble 5	•		•	
(68)m= 202.15	5 204.25	198.96	187.71	173.5	160.15	151.23	149	.13	154.42	165.67	179.88	193.23	]	(68)
Cooking gain	ıs (calcula	ted in Ap	pendix	L, equat	ion L1	5 or L15a	), als	o se	ee Table	5	•	•	•	
(69)m= 34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.	48	34.48	34.48	34.48	34.48	]	(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. 6	evaporatio	n (negat	ive valu	es) (Tab	le 5)	-			=		-	-	-	
(71)m= -91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91	.84	-91.84	-91.84	-91.84	-91.84	]	(71)
Water heatin	g gains (T	able 5)				-							•	
(72)m= 124.12	2 122.07	117.82	112.03	108.28	102.99	98.49	104	.25	106.3	112.29	119.05	122.08	]	(72)
Total interna	al gains =				(6	6)m + (67)n	n + (68	3)m +	+ (69)m + (	(70)m + (	71)m + (72)	)m	•	
(73)m= 401.85	399.87	387.32	367.1	346.63	326.83	313.92	319	.61	329.95	350.38	373.85	391.39	]	(73)
6. Solar gair	ns:													
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica		tion.		
Orientation:			Area			lux		_	g_ Table 6b	-	FF		Gains	
	Table 6d		m²			able 6a	-		able 6b	_ '	Table 6c		(W)	,
North 0.9x		X	1.	5	x	10.63	X		0.4	x	0.8	=	3.54	(74)
North 0.9x		X	6.7	73	x	10.63	X		0.4	x [	0.8	=	15.87	(74)
North 0.9x	0.77	X	2.2	24	x	10.63	X		0.4	x [	0.8	=	5.28	(74)
North 0.9x		X	1.	5	x	20.32	X	<u> </u>	0.4	x [	0.8	=	6.76	(74)
North 0.9x	0.77	X	6.7	73	X	20.32	X		0.4	X	0.8	=	30.33	(74)

	_		_										_
North	0.9x	0.77	X	2.24	X	20.32	X	0.4	X	0.8	=	10.09	(74)
North	0.9x	0.77	X	1.5	X	34.53	х	0.4	X	0.8	=	11.49	(74)
North	0.9x	0.77	X	6.73	X	34.53	х	0.4	X	0.8	=	51.53	(74)
North	0.9x	0.77	X	2.24	X	34.53	х	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	1.5	x	55.46	x	0.4	X	0.8	=	18.45	(74)
North	0.9x	0.77	X	6.73	x	55.46	X	0.4	X	0.8	=	82.78	(74)
North	0.9x	0.77	X	2.24	x	55.46	x	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	1.5	X	74.72	X	0.4	X	0.8	=	24.85	(74)
North	0.9x	0.77	X	6.73	X	74.72	X	0.4	X	0.8	=	111.51	(74)
North	0.9x	0.77	X	2.24	x	74.72	x	0.4	X	0.8	=	37.11	(74)
North	0.9x	0.77	X	1.5	X	79.99	X	0.4	X	0.8	=	26.61	(74)
North	0.9x	0.77	X	6.73	X	79.99	X	0.4	X	0.8	=	119.37	(74)
North	0.9x	0.77	X	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	x	1.5	x	74.68	x	0.4	x	0.8	=	24.84	(74)
North	0.9x	0.77	X	6.73	x	74.68	x	0.4	X	0.8	=	111.45	(74)
North	0.9x	0.77	X	2.24	x	74.68	x	0.4	X	0.8	=	37.1	(74)
North	0.9x	0.77	X	1.5	x	59.25	x	0.4	X	0.8	=	19.71	(74)
North	0.9x	0.77	X	6.73	x	59.25	X	0.4	X	0.8	=	88.42	(74)
North	0.9x	0.77	X	2.24	x	59.25	X	0.4	X	0.8	=	29.43	(74)
North	0.9x	0.77	X	1.5	X	41.52	X	0.4	X	0.8	=	13.81	(74)
North	0.9x	0.77	X	6.73	x	41.52	x	0.4	X	0.8	=	61.96	(74)
North	0.9x	0.77	X	2.24	x	41.52	x	0.4	X	0.8	=	20.62	(74)
North	0.9x	0.77	X	1.5	X	24.19	X	0.4	X	0.8	=	8.05	(74)
North	0.9x	0.77	X	6.73	x	24.19	x	0.4	X	0.8	=	36.1	(74)
North	0.9x	0.77	X	2.24	X	24.19	X	0.4	X	0.8	=	12.02	(74)
North	0.9x	0.77	X	1.5	X	13.12	X	0.4	X	0.8	=	4.36	(74)
North	0.9x	0.77	X	6.73	x	13.12	X	0.4	X	0.8	=	19.58	(74)
North	0.9x	0.77	X	2.24	x	13.12	x	0.4	X	0.8	=	6.52	(74)
North	0.9x	0.77	X	1.5	x	8.86	X	0.4	X	0.8	=	2.95	(74)
North	0.9x	0.77	X	6.73	x	8.86	x	0.4	X	0.8	=	13.23	(74)
North	0.9x	0.77	X	2.24	x	8.86	x	0.4	X	0.8	=	4.4	(74)
South	0.9x	0.77	X	2.24	x	46.75	X	0.4	X	0.8	=	23.22	(78)
South	0.9x	0.77	X	2.24	x	76.57	x	0.4	X	0.8	=	38.03	(78)
South	0.9x	0.77	X	2.24	x	97.53	x	0.4	X	0.8	=	48.45	(78)
South	0.9x	0.77	X	2.24	x	110.23	X	0.4	X	0.8	=	54.76	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.4	x	0.8	=	57.06	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.4	x	0.8	=	53.65	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.4	x	0.8	=	52.11	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.4	x	0.8	=	50.61	(78)
South	0.9x	0.77	X	2.24	x	82.59	x	0.4	x	0.8	=	41.02	(78)

South	0.9x	0.77	x	2.2	24	X	5	55.42	x		0.4	×	Г	0.8		=	27.53	(78)
South	0.9x	0.77	x	2.2	24	X		40.4	x		0.4	₹ x	F	0.8		=	20.07	(78)
	<u></u>												_			ı		
Solar ga	ins in v	watts, ca	alculated	for eacl	h month	ı			(83)m	= St	um(74)m .	(82)ı	m					
<del>-</del>	47.91	85.22	128.62	183.54	230.54	$\overline{}$	40.63	227.04	189.	67	147.01	97.	19	57.98	40.6	5	ı	(83)
Total gai	ins – ir	nternal a	nd solar	(84)m =	= (73)m	+ (	83)m	, watts	!									
(84)m= 4	449.76	485.08	515.94	550.63	577.17	5	67.46	540.96	509.	28	476.96	447.	57	431.84	432.0	04	ı	(84)
7. Mear	n interr	nal temp	erature	(heating	seasor	1)												
Tempe	rature	during h	eating p	eriods ir	n the livi	ng	area t	from Tab	ole 9,	Th	1 (°C)						21	(85)
Utilisati	ion fact	tor for g	ains for I	iving are	ea, h1,m	า (ร	ee Ta	ble 9a)								ı		
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Αι	.g	Sep	0	ct	Nov	De	ЭС	ı	
(86)m=	0.99	0.99	0.97	0.89	0.71	T	0.5	0.36	0.4	Ť	0.64	0.9	1	0.99	1		ı	(86)
Maga:		40,000,00		li da a au	. T4 /5	ـــــــــــــــــــــــــــــــــــــ	646	no 2 to 7		ا مام	. 0 = \							
	20.54	20.63	ature in	20.92	· ·	T	21	i	21 21		i	20.9	14	20.74	20.5		ı	(87)
(87)m=	20.54	20.03	20.76	20.92	20.99	L	<u> </u>	21			21	20.8	11	20.71	20.5	12		(01)
Tempe	rature	during h	eating p	eriods ir	rest of	dw	/elling	from Ta	ble 9	), Th	12 (°C)						ı	
(88)m=	20.4	20.4	20.4	20.41	20.41	2	20.42	20.42	20.4	12	20.41	20.4	11	20.4	20.4	4	ı	(88)
Utilisati	ion fact	tor for g	ains for i	est of d	welling,	h2	,m (se	e Table	9a)									
	0.99	0.99	0.96	0.87	0.67	_	0.45	0.31	0.3	5	0.59	0.8	9	0.98	1		ı	(89)
L Moon in	ntornal	tompor	ature in	the rest	of dwall	ina	T2 /f	ollow etc	no 2	+o 7	in Tobl	0.00						
	19.78	19.91	20.1	20.32	20.4	Ť	20.42	20.42	20.4		20.41	20.3	_	20.03	19.7	<b>'</b> 5	ı	(90)
(50)111=	13.70	10.01	20.1	20.02	20.4	L_	20.42	20.42	20	' <u>'</u>				g area ÷ (4		_	0.37	(91)
												_,	•	g aroa . (	., –		0.37	(31)
_		temper	ature (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1 -	– fL	<del></del>						ı	
(92)m=	20.06	20.17	20.35	20.54	20.62	2	20.63	20.63	20.6	63	20.63	20.5	54	20.28	20.0	14	ı	(92)
Apply a	adjustm	ent to the	he mean	interna	temper	atu	ire fro	m Table	4e, \	whe	re appro	pria	te				ı	
(93)m=	20.06	20.17	20.35	20.54	20.62		20.63	20.63	20.6	53	20.63	20.5	54	20.28	20.0	4		(93)
8. Spac	ce heat	ting requ	uirement															
			ernal ter			nec	l at ste	ep 11 of	Table	e 9b	, so tha	t Ti,n	∩=( <sup>7</sup>	76)m an	d re-c	calc	ulate	
the utilis			or gains			_						_			_		ı	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	0	ct	Nov	De	C		
			ains, hm			_					1		_			_	ı	(0.4)
` '	0.99	0.98	0.96	0.87	0.69		0.47	0.33	0.3	1	0.61	0.8	9	0.98	0.99	9		(94)
			, W = (94	<u> </u>	·	Ι.		l	·								ı	(05)
` ′	446.41	477.75	495.54	479.84	395.37		67.28	178.81	187.	16	289.45	399.	88	423.47	429.	59		(95)
			rnal tem			$\overline{}$							_				ı	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.		14.1	10.	6	7.1	4.2			(96)
			an intern			_			<del></del>	<del>_</del>	<u> </u>						ı	
	725.81	701.46	634.18	525.41	401.31	_	67.51	178.82	187.		291.19	447.		596.68	721.	11		(97)
		•	ement fo		1	Wh		I		Ì	<u> </u>		<u> </u>	<u> </u>		ı	ı	
(98)m= 2	207.87	150.33	103.15	32.81	4.42		0	0	0		0	35.2		124.71	216.8	_		_
									•	Total	per year	(kWh/	year	) = Sum(9	8)15,91	2 =	875.4	(98)
Space I	heating	g require	ement in	kWh/m²	<sup>2</sup> /year												12.14	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table	11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)
The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See App	•		`
Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community he	eating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating Annual space heating requirement		kWh/year 875.4	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	962.94	(307a)
Efficiency of secondary/supplementary heating system in % (from Tab	le 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		2046.91	_ ]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2251.6	(310a)
Electricity used for heat distribution 0.0	01 × [(307a)(307e) + (310a)(310e)] =	32.15	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	е	151.51	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	151.51	(331)
Energy for lighting (calculated in Appendix L)		320.27	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-610.58	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)
12b. CO2 Emissions – Community heating scheme			
	nergy Emission factor Vh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fue	els repeat (363) to (366) for the second fue	319	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] >	( 100 ÷ (367b) x 0.52 =	522.99	(367)
Electrical energy for heat distribution [(313) x	0.52	16.68	(372)
	0.52 = 366) + (368)(372) = =	10.00	(372) (373)
	0.02	539.68	_

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 539.68 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 78.64 CO2 associated with electricity for lighting (332))) x (379) 0.52 166.22 Energy saving/generation technologies (333) to (334) as applicable x = 0.01 =Item 1 (380)0.52 -316.89 sum of (376)...(382) =Total CO2, kg/year 467.64 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)6.49 El rating (section 14) (385)94.65

			User D	otaile:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20	012		Stroma Softwa					0006273 on: 1.0.4.26	
			i í	Address						
Address :	GT 105, Aspen Co	ourt, Maitla	and Park	c Estate,	London	, NW3 2	EH			
1. Overall dwelling dim	ensions:		_							
Ground floor			_	<b>a(m²)</b> 72.1	(1a) x		<b>ight(m)</b> 2.6	(2a) =	<b>Volume(m³</b> 187.46	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(	1e)+(1n	1) 7	72.1	(4)					
Dwelling volume				•	(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	187.46	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	у ] + [	other 0	] = [	total 0	X 4	40 =	m³ per hou	(6a)
Number of open flues	0 +	0	- - - -	0	j = F	0	x	20 =	0	(6b)
Number of intermittent for	ans				J	3	x -	10 =	30	(7a)
Number of passive vent	S				F	0	x	10 =	0	(7b)
Number of flueless gas	fires				<u> </u>	0	X 4	40 =	0	(7c)
3										( -7
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	a)+(7b)+(	7c) =	Г	30		÷ (5) =	0.16	(8)
If a pressurisation test has		nded, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to (	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (  if both types of wall are p	J.25 for steel or timbe present, use the value corr				•	uction			0	(11)
deducting areas of open	• / .									_
If suspended wooden	,	,	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors draught	stripped		0.05 [0.0	v (4.4) · .4	001			0	(14)
Window infiltration				0.25 - [0.2 (8) + (10)			⊥ (15) <b>–</b>		0	(15)
Infiltration rate  Air permeability value	aEO expressed in a	ubic motro		, , , ,	. , , ,	, , ,	` '	aroa	0	= (16)
If based on air permeab	• • •		•	•	•	elle oi e	ilivelope	aica	0.41	(17)
Air permeability value appli	•					is being u	sed		0.41	(10)
Number of sides shelter				,	,	J			2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18)	x (20) =				0.35	(21)
Infiltration rate modified	for monthly wind spe	ed							_	
Jan Feb	Mar Apr Mag	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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										
(22a)m = 1.27	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	7	
(===)	1.00	1 0.00	J.00		•		L <u>-</u>		J	

0.44	0.44	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41	]	
Calculate effe		-	rate for t	he appli	cable ca	se	<u> </u>		<u> </u>	!	!		
If mechanica			or disciplination	OL) (00-		()	.IE\\ - (b		\ (00 -)			0	(2:
If exhaust air h		0		, ,	,	. `	,, .	•	) = (23a)			0	(2:
If balanced with		-	-	_					SI.) (	001) [	4 (00 )	0	(23
a) If balance	ı —	1				ery (MVI	<del>- ` ` - </del>	<u> </u>	<del>- ` `</del>	23b) × [	<del>` ` ´</del>	i ÷ 100] I	(24
24a)m= 0	0	0	0	0	0		0	0	0		0	J	(2.
b) If balance	o mecha	anicai ve	niliation 0	without	neat rec	overy (i	0	0 = (22)	$\frac{20}{0}$	230)	0	1	(24
	<u> </u>				ا							J	(2
c) If whole h				•	o); otherv				5 x (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
d) If natural	ventilation	on or wh	ole hous	e positiv	ve input v	/entilatio	on from I	oft		<u> </u>	<u> </u>	J	
					erwise (2				0.5]				
24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(2
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24d	c) or (24	d) in box	(25)					
25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(2
3. Heat losse	s and he	eat loss r	paramete	er.									
LEMENT	Gros	·	Openin		Net Are	ea	U-valı	ıe	AXU		k-value	9	AXk
	area		m	_	A ,n		W/m2		(W/I		kJ/m²-l		kJ/K
√indows Type	: 1				2.24	x1.	/[1/( 1.4 )+	0.04] =	2.97				(2
Vindows Type	2				1.5	x1.	/[1/( 1.4 )+	0.04] =	1.99				(2
Vindows Type	3				6.73	x1.	/[1/( 1.4 )+	0.04] =	8.92				(2
Vindows Type	<del>:</del> 4				2.24	x1.	/[1/( 1.4 )+	0.04] =	2.97	$\overline{}$			(2
loor					72.1	x	0.13	=	9.37299	9			(28
Valls	33.8	8	12.7	1	21.09	x	0.18	=	3.8			$\exists$	(29
otal area of e	lements	, m²			105.9								(3:
Party wall					54.21	x	0	=	0	$\neg$ [			(32
for windows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcula	ated using	formula 1	 /[(1/U-valu	ie)+0.04] a	as given in	paragraph	n 3.2	
* include the area				ls and par	titions								
abric heat los		•	U)				(26)(30)	+ (32) =				30.02	(3:
leat capacity		` ,						** *	.(30) + (32	, , ,	(32e) =	0	(34
hermal mass	•	•		,					tive Value			250	(3
For design assess an be used inste				construct	ion are not	known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal bridge				usina Ar	pendix k	(						3.82	(3
details of therma	•	,		• .	•							0.02	(
otal fabric he			, ,	·	,			(33) +	(36) =			33.84	(3
entilation hea	at loss ca	alculated	monthly	<u>/</u>				(38)m	= 0.33 × (	(25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 37.04	36.8	36.57	35.48	35.27	34.32	34.32	34.15	34.69	35.27	35.69	36.12		(3
leat transfer of	oefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
leat transfer (39)m= 70.88	70.64	nt, W/K 70.41	69.32	69.11	68.16	68.16	67.99	(39)m 68.53	69.11	38)m 69.53	69.96	]	

eat lo	ss para	meter (F	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
0)m=	0.98	0.98	0.98	0.96	0.96	0.95	0.95	0.94	0.95	0.96	0.96	0.97		_
umbe	r of dov	o in moi	oth (Toh	lo 1o\					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.96	(4
umbe	Jan	Feb	nth (Tab Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m=	31	28	31	30	31	30	31	31	30 30	31	30	31		(4
.,														`
1 Wa	ter heat	ing ener	gy requi	irement:								kWh/ye	ar.	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x (¯	TFA -13		.3		(4
nnual	averag	e hot wa						(25 x N)				.73		(4
		_		usage by : day (all w		_	-	to achieve	a water us	se target d	)Ť			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate					,		Table 1c x	•						
4)m=	97.6	94.05	90.5	86.96	83.41	79.86	79.86	83.41	86.96	90.5	94.05	97.6		
							_				m(44) <sub>112</sub> =	L	1064.76	(4
nergy (					•				<del> </del>	·	ables 1b, 1			
5)m=	144.74	126.59	130.63	113.89	109.28	94.3	87.38	100.27	101.47	118.25	129.08	140.18		<b>—</b> ,
instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) <sub>112</sub> =	= [	1396.07	(4
6)m=	21.71	18.99	19.59	17.08	16.39	14.14	13.11	15.04	15.22	17.74	19.36	21.03		(4
*	storage									<u> </u>				
torag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
	-	_			_		litres in	' '		(01)				
	rise if no storage		not wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	(47)			
	-		eclared I	oss facto	or is kno	wn (kWh	n/day):				1.	39		(4
•			m Table			`	,					54		(4
-				, kWh/ye	ear			(48) x (49)	) =			75		(5
•				cylinder l										
		•		om Tabl	e 2 (kWl	h/litre/da	ıy)					0		(5
	-	ealing s from Tal	ee secti ble 2a	011 4.3								0		(5
			m Table	2b								0		(5
nergy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(5
٠.		54) in (5	•	,							-	75		(!
ater	storage	loss cal	culated t	for each	month			((56)m = (	55) × (41)	m				
6)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		(!
cylinde	r contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	ix H	
7)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		(5
rimar	v circuit	loss (an	nual) fro	m Table	. 3					•		0		(5
		•	,			59)m = (	(58) ÷ 36	65 × (41)	m					•
	•				•		. ,	ng and a		r thermo	stat)			
9)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		(!

Combi loss	calculated	for oach	month (	(61)m –	(60) · 3	65 v (11	)m						
(61)m= 0	0 0	0	0	0	0 - 3	05 x (41	0	0	0	0	0	1	(61)
	equired for	water h	eating ca	<u> </u>	L I for eac	h month	<u>.                                    </u>	$= 0.85 \times$	 (45)m +	(46)m +	ļ	ı (59)m + (61)m	
(62)m= 191.3	<del></del>	177.23	158.98	155.87	139.39	133.98	146.8		164.85	174.17	186.77	]	(62)
Solar DHW inp	ut calculated	using App	endix G o	r Appendix	H (negat	ive quantity	y) (ente	r '0' if no sola	ır contribut	tion to wate	er heating)	ı	
(add addition	nal lines if	FGHRS	and/or \	NWHRS	applies	s, see Ap	pendi	x G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 191.3	168.68	177.23	158.98	155.87	139.39	133.98	146.8	7 146.56	164.85	174.17	186.77		_
							C	utput from w	ater heate	er (annual)	112	1944.69	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61	)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 85.4	75.76	80.71	73.94	73.61	67.43	66.33	70.62	2 69.81	76.6	78.99	83.88		(65)
include (5	7)m in cald	culation (	of (65)m	only if c	ylinder	s in the	dwellir	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):									
Metabolic ga	ains (Table	5), Wat	ts									_	
Jar	n Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 114.8	8 114.8	114.8	114.8	114.8	114.8	114.8	114.8	3 114.8	114.8	114.8	114.8		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				_	
(67)m= 18.4°	7 16.4	13.34	10.1	7.55	6.37	6.89	8.95	12.02	15.26	17.81	18.98		(67)
Appliances (	gains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	lso see Ta	ble 5				
(68)m= 202.1	5 204.25	198.96	187.71	173.5	160.15	151.23	149.1	3 154.42	165.67	179.88	193.23		(68)
Cooking gai	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5				
(69)m= 34.48	8 34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48	34.48		(69)
Pumps and	fans gains	(Table 5	āa)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -91.8	4 -91.84	-91.84	-91.84	-91.84	-91.84	-91.84	-91.8	4 -91.84	-91.84	-91.84	-91.84		(71)
Water heatir	ng gains (T	able 5)										_	
(72)m= 114.7	79 112.74	108.48	102.7	98.94	93.65	89.15	94.9	1 96.96	102.95	109.71	112.75		(72)
Total intern	al gains =				(66	)m + (67)m	n + (68)	m + (69)m +	(70)m + (7	71)m + (72)	)m	_	
(73)m= 395.8	393.83	381.22	360.94	340.43	320.61	307.71	313.4	4 323.84	344.32	367.84	385.4		(73)
6. Solar ga													
Solar gains ar		_					ations to		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
N. a							, ,						1
North 0.9	-	X	1.	5	X	10.63	]	0.63	x	0.7	=	4.87	(74)
North 0.9		X	6.7			10.63	] x [	0.63	x	0.7	=	21.87	[(74)
North 0.9		X	2.2		-	10.63	]	0.63	x	0.7	=	7.28	<u> </u> (74)
North 0.9		X	1.		=	20.32	] x [	0.63	x	0.7	=	9.32	(74)
North 0.9	× 0.77	X	6.7	73	X	20.32	X	0.63	х	0.7	=	41.8	(74)

	_		_								,		_
North	0.9x	0.77	X	2.24	X	20.32	X	0.63	X	0.7	=	13.91	(74)
North	0.9x	0.77	X	1.5	X	34.53	X	0.63	X	0.7	=	15.83	(74)
North	0.9x	0.77	Х	6.73	X	34.53	X	0.63	X	0.7	=	71.02	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.63	X	0.7	=	23.64	(74)
North	0.9x	0.77	X	1.5	X	55.46	X	0.63	X	0.7	=	25.43	(74)
North	0.9x	0.77	X	6.73	X	55.46	X	0.63	X	0.7	=	114.08	(74)
North	0.9x	0.77	X	2.24	x	55.46	X	0.63	X	0.7	=	37.97	(74)
North	0.9x	0.77	X	1.5	x	74.72	x	0.63	x	0.7	=	34.25	(74)
North	0.9x	0.77	X	6.73	x	74.72	X	0.63	x	0.7	=	153.67	(74)
North	0.9x	0.77	X	2.24	x	74.72	x	0.63	x	0.7	=	51.15	(74)
North	0.9x	0.77	x	1.5	x	79.99	X	0.63	x	0.7	=	36.67	(74)
North	0.9x	0.77	x	6.73	x	79.99	X	0.63	x	0.7	=	164.51	(74)
North	0.9x	0.77	x	2.24	x	79.99	X	0.63	x	0.7	=	54.76	(74)
North	0.9x	0.77	x	1.5	x	74.68	X	0.63	x	0.7	=	34.23	(74)
North	0.9x	0.77	x	6.73	x	74.68	X	0.63	x	0.7	=	153.59	(74)
North	0.9x	0.77	x	2.24	x	74.68	X	0.63	x	0.7	=	51.12	(74)
North	0.9x	0.77	x	1.5	x	59.25	X	0.63	x	0.7	=	27.16	(74)
North	0.9x	0.77	x	6.73	x	59.25	X	0.63	X	0.7	=	121.86	(74)
North	0.9x	0.77	x	2.24	x	59.25	X	0.63	x	0.7	=	40.56	(74)
North	0.9x	0.77	x	1.5	x	41.52	X	0.63	x	0.7	=	19.03	(74)
North	0.9x	0.77	x	6.73	x	41.52	X	0.63	x	0.7	=	85.39	(74)
North	0.9x	0.77	х	2.24	x	41.52	x	0.63	x	0.7	] =	28.42	(74)
North	0.9x	0.77	х	1.5	x	24.19	X	0.63	x	0.7	=	11.09	(74)
North	0.9x	0.77	x	6.73	x	24.19	X	0.63	x	0.7	=	49.75	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.63	x	0.7	=	16.56	(74)
North	0.9x	0.77	x	1.5	x	13.12	X	0.63	X	0.7	=	6.01	(74)
North	0.9x	0.77	x	6.73	x	13.12	x	0.63	x	0.7	=	26.98	(74)
North	0.9x	0.77	x	2.24	x	13.12	X	0.63	x	0.7	=	8.98	(74)
North	0.9x	0.77	x	1.5	x	8.86	X	0.63	x	0.7	=	4.06	(74)
North	0.9x	0.77	x	6.73	x	8.86	x	0.63	x	0.7	=	18.23	(74)
North	0.9x	0.77	x	2.24	x	8.86	X	0.63	x	0.7	=	6.07	(74)
South	0.9x	0.77	x	2.24	x	46.75	X	0.63	x	0.7	=	32.01	(78)
South	0.9x	0.77	x	2.24	x	76.57	X	0.63	x	0.7	=	52.42	(78)
South	0.9x	0.77	х	2.24	x	97.53	x	0.63	x	0.7	] =	66.77	(78)
South	0.9x	0.77	х	2.24	x	110.23	x	0.63	x	0.7	] =	75.46	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.63	x	0.7	] =	78.64	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.63	x	0.7	j =	75.68	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.63	x	0.7	j =	73.94	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.63	x	0.7	] =	71.81	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.63	x	0.7	] =	69.75	(78)
South	0.9x	0.77	x	2.24	x	82.59	x	0.63	x	0.7	j =	56.54	(78)
	_		-		-		- '				-		

	_					_						_				_
South	0.9x	0.77	X	2.2	24	X	55	5.42	X	0.63	,	Ĺ	0.7	=	37.94	(78)
South	0.9x	0.77	X	2.2	24	X	4	0.4	X	0.63	>	(	0.7	=	27.66	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m =	Sum(74)r	n(82)	m			1	
(83)m=	66.03	117.44	177.26	252.94	317.71		1.61	312.89	261.3	8 202.5	9 133	.94	79.91	56.02		(83)
Total g	jains – ii	nternal a	and solar	(84)m =	= (73)m	+ (83	3)m ,	watts							•	
(84)m=	461.88	511.27	558.48	613.88	658.14	652	2.23	620.6	574.8	2 526.4	3 478	.26	447.75	441.42		(84)
7. Me	an inter	nal temp	erature	(heating	season	)										
Temp	erature	during h	neating p	eriods ir	n the livi	ng a	rea f	rom Tab	ole 9, <sup>-</sup>	Γh1 (°C)					21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	ı (se	e Tal	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ò.	lun	Jul	Au	Sep	J 0	ct	Nov	Dec		
(86)m=	1	0.99	0.99	0.95	0.84	0.	.65	0.48	0.54	0.8	0.9	97	0.99	1		(86)
	• .				T4 //	<u></u>		0			<b>!</b>				J	
		· ·	ature in		· `	1	<del>i</del>			<del></del>					1	(07)
(87)m=	20.03	20.15	20.37	20.66	20.88	20	.98	21	20.99	20.93	20.	65	20.3	20.01		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwe	elling	from Ta	ble 9,	Th2 (°C	)				_	
(88)m=	20.1	20.1	20.1	20.12	20.12	20	.13	20.13	20.13	20.12	20.	12	20.11	20.11		(88)
Utilisa	ation fac	tor for a	ains for r	est of d	wellina.	h2.n	n (se	e Table	9a)		-					
(89)m=	1	0.99	0.98	0.93	0.8	_	.57	0.39	0.44	0.73	0.9	95	0.99	1	1	(89)
	· ,					<u> </u>									l	
			ature in t		i	Ť	<u> </u>		i –	1	1	_			1	(00)
(90)m=	18.8	18.99	19.29	19.71	20	20	).12	20.13	20.13	20.07			19.2	18.78		(90)
											fLA =	Livin	g area ÷ (4	4) =	0.37	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling	) = fL	A × T1	+ (1 –	fLA) × T	2					
(92)m=	19.25	19.42	19.69	20.06	20.33	20	.44	20.45	20.45	20.39	20.	06	19.61	19.23		(92)
Apply	adjustn	nent to tl	he mean	interna	l temper	atur	e fror	m Table	4e, w	here app	oropria	te			I	
(93)m=	19.25	19.42	19.69	20.06	20.33	20	.44	20.45	20.45	20.39	20.	06	19.61	19.23		(93)
8. Sp	ace hea	ting requ	uirement													
Set T	i to the r	mean int	ernal ter	nperatu	re obtair	ned a	at ste	p 11 of	Table	9b, so th	nat Ti,r	n=(7	76)m an	d re-cald	culate	
			or gains u													
	Jan	Feb	Mar	Apr	May	J	lun	Jul	Au	g Sep	) 0	ct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:												
(94)m=	1	0.99	0.98	0.93	0.81	0.	.6	0.42	0.48	0.76	0.9	95	0.99	1		(94)
Usefu	ıl gains,	hmGm .	, W = (94	1)m x (8	4)m											
(95)m=	459.6	506.46	546.07	572.24	532	389	9.06	261.39	273.3	7 398.7	2 454	.76	443.08	439.71		(95)
Month	hly aver	age exte	rnal tem	perature	from T	able	8								-	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	4.6	16.6	16.4	14.1	10	.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm ,	, W =	:[(39)m	x [(93)	m– (96)ı	m ]				_	
(97)m=	1059.87	1025.49	928.75	773.59	596.29	397	7.74	262.33	275.2	3 431.0	7 654	.03	869.56	1051.81		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/r	montl	h = 0.02	24 x [(9	97)m – (9	95)m] x	<b>(</b> 41	l)m		•	
(98)m=	446.6	348.79	284.71	144.97	47.83	(	0	0	0	0	148	.26	307.06	455.41		
					•	•			Т	otal per ye	ar (kWh	/year	) = Sum(9	8) <sub>15,912</sub> =	2183.63	(98)
Snace	e heatin	a require	ement in	k\/\/h/m²	2/vear										30.29	(99)
·		• '								0112					30.28	(55)
		•	nts – Indi	vidual h	eating s	yste	ms ir	ncluding	micro	-CHP)						
-	e heatir	_	t from -		/o ! -	. <b></b>	ato == :	ov roto in-								7(004)
rracti	ion of sp	ace nea	at from se	econdar	y/suppie	mer	ıtary	system							0	(201)

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)  446.6   348.79   284.71   144.97   47.83	0	0	0	0	148.26	307.06	455.41	]	
		0	0	U	140.20	307.00	433.41		(211)
$ (211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ 477.65  373.04  304.51  155.05  51.15 $	0	0	0	0	158.57	328.41	487.07	]	(211)
	!		Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u> </u>	2335.44	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0 ar) =Sum(2	0	0		7(045)
Water heating			Tota	i (KVVII/yea	ar) =Surri(2	213) <sub>15,1012</sub>	F	0	(215)
Output from water heater (calculated above)									
,	39.39	133.98	146.87	146.56	164.85	174.17	186.77		_
Efficiency of water heater					•	•	•	79.8	(216)
` '	79.8	79.8	79.8	79.8	84.53	86.31	87.1		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	74.68	167.89	184.04	183.66	195.01	201.8	214.42		
			Tota	I = Sum(2	19a) <sub>112</sub> =			2319.77	(219)
								2010.77	``
Annual totals Space heating fuel used, main system 1					k!	Wh/year	•	kWh/yea	
Space heating fuel used, main system 1					k¹	Wh/year		kWh/yeai 2335.44	
Space heating fuel used, main system 1 Water heating fuel used					k¹	Wh/year		kWh/yea	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot					k¹	Wh/year		kWh/yeai 2335.44	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:					k\	Wh/year	30	kWh/yeai 2335.44	(230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot					k\	Wh/year		kWh/yeai 2335.44	
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =		30	kWh/yeai 2335.44	(230c)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue			sum	of (230a).			30	kWh/year 2335.44 2319.77	(230c) (230e)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year	s inclu	iding mic					30	kWh/year 2335.44 2319.77	(230c) (230e) (231)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting					(230g) =		30 45	kWh/year 2335.44 2319.77 75 326.18	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	End	iding mid e <b>rgy</b> h/year			(230g) =	ion fac	30 45	kWh/year 2335.44 2319.77	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	End	<b>ergy</b> h/year			(230g) =	ion fac 2/kWh	30 45	kWh/year 2335.44 2319.77 75 326.18	(230c) (230e) (231) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	<b>En</b> ekW	ergy h/year			(230g) = <b>Emiss</b> kg CO	ion fac 2/kWh	30 45 <b>tor</b>	kWh/year 2335.44 2319.77 75 326.18 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Space heating fuel used, main system 1  Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	Enc kW	ergy h/year ) ×			(230g) =  Emiss kg CO:	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b>	kWh/year 2335.44 2319.77 75 326.18 Emissions kg CO2/ye 504.45	(230c) (230e) (231) (232) (232)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	End kW (211 (215 (219	ergy h/year ) x ) x			(230g) =  Emiss kg CO:  0.2	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> =	kWh/year 2335.44 2319.77 75 326.18 Emissions kg CO2/ye 504.45 0	(230c) (230e) (231) (232) (232) (261) (263) (264)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	End kW (211 (215 (219	ergy h/year ) x ) x ) x ) + (262) -	cro-CHP		(230g) =  Emiss kg CO:  0.2  0.5	<b>ion fac</b> 2/kWh 16	30 45 <b>tor</b> =	kWh/year 2335.44 2319.77 75 326.18 Emissions kg CO2/ye 504.45 0 501.07	(230c) (230e) (231) (232) (232) (261) (263) (264) (265)
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	End kW (211 (215 (219 (261 (231	ergy h/year ) x ) x ) x ) + (262) -	cro-CHP		(230g) =  Emiss kg CO:  0.2	ion fac 2/kWh 16 19	30 45 <b>tor</b> = =	kWh/year 2335.44 2319.77 75 326.18 Emissions kg CO2/ye 504.45 0	(230c) (230e) (231) (232) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1213.74 (272)

TER = 24.5 (273)

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:36:17

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** 

Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 73.5m<sup>2</sup> Site Reference: Plot Reference: Maitland Park Estate GT 106

GT 106, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

22.25 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 6.08 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.7 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 32.4 kWh/m<sup>2</sup>

OK

2 Fabric U-values

**Element Average Highest** 0.12 (max. 0.70) External wall 0.12 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK** Floor (no floor)

Roof (no roof)

**Openings** 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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**

<sup>7</sup> Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
B Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	ок
MVHR efficiency:	90%	
Minimum	70%	ОК
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
ased on:		
Overshading:	Average or unknown	
Windows facing: South	4.47m²	
Windows facing: North	2.24m²	
Windows facing: North	9.25m²	
Windows facing: South	2.24m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m <sup>3</sup> /m <sup>2</sup> h	
External Walls U-value	0.12 W/m <sup>2</sup> K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		

Photovoltaic array

			User D	etails:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 2	2012		Stroma Softwa					006273 on: 1.0.4.26	
		Р	roperty .	Address	GT 106	5				
Address :	GT 106, Aspen 0	Court, Maitla	and Park	k Estate,	London	, NW3 2	2EH			
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	,	Volume(m	<u> </u>
Ground floor				73.5	(1a) x	2	2.6	(2a) =	191.1	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+	(1e)+(1r	n) 📑	73.5	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	191.1	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per ho	ır
Number of chimneys	0 +		+ [	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0 +	0		0	] = [	0	X	20 =	0	(6b)
Number of intermittent fa					J			10 =		= ' '
					Ļ	0			0	(7a)
Number of passive vents	5				L	0	X	10 =	0	(7b)
Number of flueless gas t	fires					0	X	40 =	0	(7c)
								Air ch	anges per h	our
LeChes Consultation of the self-term	()	(C-) · (Ch) · (7	7-)./ <b>7</b>  -)./	<b>7</b> -\	_				ianges per n	
Infiltration due to chimne If a pressurisation test has	•				ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in t		эпаеа, ргосее	u 10 (17), (	ourier wise c	onunue n	OIII (9) 10	(10)		0	(9)
Additional infiltration	ine aweiling (no)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or timb	er frame or	0.35 for	r masonr	v constr	uction	1(-)	.,	0	(11)
if both types of wall are p					•					`
deducting areas of open										_
If suspended wooden	•	•	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors draugh	t stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,			0	(16)
Air permeability value	•		•		•	etre of e	envelope	area	2	(17)
If based on air permeab	•								0.1	(18)
Air permeability value appli Number of sides shelter	•	t nas been dor	ie or a deg	gree air pei	meability	is being u	ised			
Shelter factor	eu			(20) = 1 -	0.075 x (1	19)] =			0.85	(19)
Infiltration rate incorpora	iting shelter factor			(21) = (18)		, <u>-</u>			0.08	(21)
Infiltration rate modified	-	eed		, , (19)	\ -/				U.U8	(~1)
Jan Feb	<del> </del>	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s		~,   Ouii	1 001	, .ug	СОР	1 000	1 1101	1 200	I	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
,, <u></u>		1 0.0	L 0.0	L	· ·	I	1	I	I	
Wind Factor (22a)m = (2	22)m ÷ 4									
(225) - 4.27 4.25	100 11 10	0 005	0.05	0.00	4	4.00	1 40	1.40	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.11	0.11	e (allowi	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1	1	
Calculate effe	1	I -					0.00	0.00	0.03	0.1	0.1	_	
If mechanic	al ventila	ıtion:										0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				76.5	(23
a) If balance			ntilation	with he		ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	) ÷ 100]	
24a)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(24
b) If balance	ed mech	anical ve	ntilation	without	heat rec	overy (N	MV) (24b	m = (22)	2b)m + (2	23b)		7	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•								
<u> </u>	1	∢ (23b), t		<u> </u>	ŕ	· ·	ŕ	<del></del>	· ` ·	<del></del>	1 -	7	(0
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural		on or wh en (24d)							0.51				
24d)m= 0	0	0	0	0	0	0	0.5 1 [(2	0	0.01	0	0	1	(24
Effective air												_	•
25)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	1	(25
0.20	1 5		0.2.	0.21	I	V.=	1 3.2	1	1 0.2	J 0.2 ·	] 0	J	
3. Heat losse	es and he	eat loss p	paramete	er:									
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²•		A X k kJ/K
Vindows Typ		(111 )	111		4.47		+( 1.4 )/[1/		5.93		NO/III -	IX.	(27
Vindows Typ						=	/[1/( 1.4 )+	l l		=			(27
Vindows Typ					2.24	=		l l	2.97	=			,
• •					9.25	_	/[1/( 1.4 )+	l.	12.26	=			(27
Vindows Typ					2.24	=	/[1/( 1.4 )+	0.04] = [	2.97	ᆗ ,			(27
Valls	46.2		18.2		28.08	X	0.12	=	3.37	[			(29
otal area of	elements	, m²			46.28								(3
Party wall					42.85		0	=	0				(32
for windows and * include the are						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	h 3.2	
abric heat lo				s and pan	uuons		(26)(30)	) + (32) =				27.5	(33
leat capacity		•	<b>O</b> )				, , , ,		(30) + (32	2) + (32a).	(32e) =	0	(34
hermal mass	,	` ,	P = Cm -	- TFA) ir	n k.l/m²K				tive Value	, , ,	(020)	250	(35
or design asses	•	`		,			recisely the				able 1f	230	(00
an be used inste													
hermal bridg	es : S (L	x Y) cal	culated ı	using Ap	pendix ł	<						6.97	(36
details of therm		are not kn	own (36) =	= 0.05 x (3	11)								
otal fabric he	eat loss							(33) +	(36) =			34.47	(3
	at loss ca	alculated	monthly						= 0.33 × (		1	7	
entilation he	1	1 ,				Jul	I Aug	Sep	Oct	Nov	Dec	1	
entilation he	Feb	Mar	Apr	May	Jun		Aug	<del></del>			+	1	
entilation he	1	Mar 13.98	Apr 13.31	May 13.17	12.5	12.5	12.37	12.77	13.17	13.44	13.71	j	(3
entilation he	Feb 14.11	13.98					<del>†                                    </del>	12.77		13.44	+	<u></u>	(38

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.66	0.66	0.66	0.65	0.65	0.64	0.64	0.64	0.64	0.65	0.65	0.66		
	•	!							Average =	Sum(40) <sub>1</sub>	12 /12=	0.65	(40)
Number of da	<del>-</del>	<u> </u>	le 1a)					1		1	<del></del>		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	rement:								kWh/ye	ar:	
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 (¯	TFA -13		33		(42)
Annual average Reduce the annual not more that 12st	ial average	hot water	usage by	5% if the a	welling is	designed t			se target o		.49		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage				,			_	1		1			
(44)m= 98.44	94.86	91.28	87.7	84.12	80.54	80.54	84.12	87.7	91.28	94.86	98.44		
. ,	!								I Total = Su	m(44) <sub>112</sub> =	=	1073.88	(44)
Energy content of	of hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m= 145.98	127.68	131.75	114.86	110.22	95.11	88.13	101.13	102.34	119.27	130.19	141.38		
			. ,						Total = Su	m(45) <sub>112</sub> =	= [	1408.03	(45)
If instantaneous	water heati	ng at point	of use (no	hot water	storage),	enter 0 ın	boxes (46)	to (61)					
(46)m= 21.9	19.15	19.76	17.23	16.53	14.27	13.22	15.17	15.35	17.89	19.53	21.21		(46)
Water storage Storage volum		) includir	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ല		0		(47)
If community	` '					_		a	001		0		(47)
Otherwise if n	•			_			' '	ers) ente	er '0' in (	(47)			
Water storage	e loss:												
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost from		•					(48) x (49)	) =		1	10		(50)
b) If manufac			-										(54)
Hot water sto	•			e z (KVVI	n/iitie/ua	iy)				0.	02		(51)
Volume factor	_		011 1.0							1.	03		(52)
Temperature	factor fro	m Table	2b							-	.6		(53)
Energy lost from	om watei	rstorage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	03		(55)
Water storage	e loss cal	culated t	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	ns 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	nual) fro	m Tahle	3		-	-	-			0		(58)
Primary circui	,	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified b				•		. ,	, ,		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	alculated	for each	month (	(61)m –	(60) · 3	265 v (41	\m							
(61)m= 0	0 0	0	0	0 1)111 =	00) + 3	000 x (41	0		0	0	0	0	1	(61)
						,		<u> </u>					(59)m + (61)m	(0.)
(62)m= 201.2	<del>-i</del>	187.03	168.36	165.49	148.6	143.41	156.4	_	55.83	174.54	183.68	196.65	(39)111 + (61)111	(62)
Solar DHW input											1			(02)
(add addition									no solai	CONTINU	lion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	<u>,, o, </u>	0	0	0	0	]	(63)
Output from	water hea	ter		<u> </u>				I	!		ļ			
(64)m= 201.2		187.03	168.36	165.49	148.6	143.41	156.4	41 1	55.83	174.54	183.68	196.65		
` ′	Į.	<u> </u>				_[		Output f	from wa	iter heate	.I er (annual)₁	12	2058.87	(64)
Heat gains f	rom water	heating.	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	1 + (6°	1)ml +	+ 0.8 x	[(46)m	+ (57)m	+ (59)m	1	_
(65)m= 92.76		88.03	80.99	80.87	74.42	73.52	77.8	<del></del> -	76.82	83.88	86.08	91.23		(65)
	L 7)m in cal	culation o	of (65)m	only if c	vlinder	is in the	dwelli	na or	hot wa	ater is f	rom com	munity h	ı Jeating	
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):														
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts														
Jar		Mar	Apr	May	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(66)m= 116.4	1 116.4	116.4	116.4	116.4	116.4	116.4	116.	.4 1	116.4	116.4	116.4	116.4		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	ılso se	ee Tal	ble 5		•	•	•	
(67)m= 18.3	16.26	13.22	10.01	7.48	6.32	6.83	8.87	7 1	11.91	15.12	17.65	18.81		(67)
Appliances (	gains (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a), a	also se	ee Tab	ole 5				
(68)m= 205.3	2 207.45	202.09	190.66	176.23	162.67	153.61	151.4	48 1	56.85	168.28	182.7	196.26		(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see	Table	5			•	
(69)m= 34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.6	3	34.64	34.64	34.64	34.64		(69)
Pumps and	fans gains	(Table 5	Ба)			•		•				•	•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•							•	
(71)m= -93.1	2 -93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.1	12 -9	93.12	-93.12	-93.12	-93.12		(71)
Water heating	ng gains (1	able 5)		•		•	•		•		•	•	•	
(72)m= 124.6	8 122.61	118.32	112.48	108.69	103.36	98.82	104.6	63 1	106.7	112.74	119.56	122.62		(72)
Total intern	al gains =				(66	6)m + (67)m	n + (68)	)m + (6	69)m + (	70)m + (7	71)m + (72)	)m	_	
(73)m= 406.2	<del>_</del>	391.55	371.07	350.32	330.26	317.18	322.	.9 3	33.37	354.05	377.83	395.62		(73)
6. Solar ga	ins:					·		_						
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	o conve	ert to the	e applica	ble orientat	tion.		
Orientation:			Area			ux		_ g_			FF		Gains	
	Table 6d		m²			able 6a	_	Tab	le 6b	_	able 6c		(W)	_
North 0.9	× 0.77	Х	2.2	24	x	10.63	_ x [	0	0.4	x	0.8	=	5.28	(74)
North 0.9	× 0.77	Х	9.2	25	x	10.63	_ x [	0	0.4	x [	0.8	=	21.81	(74)
North 0.9	× 0.77	X	2.2	24	x	20.32	] x	0	0.4	x [	0.8	=	10.09	(74)
North 0.9	× 0.77	X	9.2	25	x	20.32	] x	0	0.4	x [	0.8	=	41.68	(74)
North 0.9	× 0.77	X	2.2	24	X	34.53	X	0	0.4	x [	0.8	=	17.15	(74)

N I =4I=			7		1		1		1		1		٦
North	0.9x	0.77	X	9.25	X	34.53	X	0.4	X	0.8	=	70.83	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	9.25	X	55.46	X	0.4	X	0.8	=	113.77	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.4	X	0.8	=	37.11	(74)
North	0.9x	0.77	X	9.25	X	74.72	X	0.4	X	0.8	=	153.26	(74)
North	0.9x	0.77	X	2.24	X	79.99	X	0.4	X	0.8	=	39.73	(74)
North	0.9x	0.77	X	9.25	X	79.99	X	0.4	X	0.8	=	164.07	(74)
North	0.9x	0.77	X	2.24	X	74.68	X	0.4	X	0.8	=	37.1	(74)
North	0.9x	0.77	X	9.25	X	74.68	X	0.4	X	0.8	=	153.18	(74)
North	0.9x	0.77	X	2.24	X	59.25	X	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	X	9.25	X	59.25	X	0.4	X	0.8	=	121.53	(74)
North	0.9x	0.77	X	2.24	x	41.52	X	0.4	X	0.8	=	20.62	(74)
North	0.9x	0.77	X	9.25	x	41.52	x	0.4	x	0.8	=	85.16	(74)
North	0.9x	0.77	X	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	x	9.25	x	24.19	x	0.4	X	0.8	=	49.62	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	x	9.25	x	13.12	x	0.4	X	0.8	=	26.91	(74)
North	0.9x	0.77	x	2.24	x	8.86	x	0.4	X	0.8	=	4.4	(74)
North	0.9x	0.77	x	9.25	x	8.86	х	0.4	X	0.8	=	18.18	(74)
South	0.9x	0.77	х	4.47	x	46.75	x	0.4	x	0.8	] <b>=</b>	46.34	(78)
South	0.9x	0.77	x	2.24	x	46.75	x	0.4	x	0.8	=	23.22	(78)
South	0.9x	0.77	x	4.47	x	76.57	x	0.4	x	0.8	=	75.9	(78)
South	0.9x	0.77	x	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	x	4.47	x	97.53	x	0.4	x	0.8	] =	96.68	(78)
South	0.9x	0.77	x	2.24	x	97.53	x	0.4	x	0.8	=	48.45	(78)
South	0.9x	0.77	х	4.47	x	110.23	x	0.4	x	0.8	] <b>=</b>	109.27	(78)
South	0.9x	0.77	X	2.24	x	110.23	x	0.4	x	0.8	] =	54.76	(78)
South	0.9x	0.77	x	4.47	x	114.87	x	0.4	x	0.8	] =	113.87	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.4	x	0.8	] =	57.06	(78)
South	0.9x	0.77	x	4.47	x	110.55	x	0.4	x	0.8	j =	109.58	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.4	x	0.8	=	54.91	(78)
South	0.9x	0.77	х	4.47	х	108.01	х	0.4	х	0.8	j =	107.07	(78)
South	0.9x	0.77	x	2.24	х	108.01	x	0.4	х	0.8	j =	53.65	(78)
South	0.9x	0.77	x	4.47	x	104.89	x	0.4	х	0.8	j =	103.98	(78)
South	0.9x	0.77	X	2.24	x	104.89	x	0.4	x	0.8	j =	52.11	(78)
South	0.9x	0.77	x	4.47	x	101.89	x	0.4	x	0.8	j =	101	(78)
South	0.9x	0.77	×	2.24	x	101.89	x	0.4	х	0.8	=	50.61	(78)
South	0.9x	0.77	×	4.47	x	82.59	x	0.4	x	0.8	=	81.86	(78)
South	0.9x	0.77	X	2.24	X	82.59	X	0.4	X	0.8	=	41.02	(78)
South	0.9x	0.77	X	4.47	X	55.42	X	0.4	X	0.8	=	54.93	(78)
South	0.9x	0.77	X	2.24	X	55.42	X	0.4	X	0.8	=	27.53	(78)
	<u> </u>		_		1		1		1				

South	0.9x	0.77	x	4.4	17	x		40.4	X		0.4	×		0.8		=	40.05	(78)
South	0.9x	0.77	x	2.2	24	X		40.4	x		0.4	x	Ē	0.8		=	20.07	(78)
	_		_						•			_	_					_
Solar o	ains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)	m					
(83)m=	96.66	165.71	233.12	305.35	361.31	3	368.3	351	307	.05	257.39	184	.52	115.89	82.	7		(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (8	83)m	, watts										
(84)m=	502.89	569.96	624.66	676.42	711.63	6	98.56	668.18	629	.95	590.76	538	.58	493.72	478.	.32		(84)
7. Me	an inter	nal temp	perature	(heating	season	)												
Temp	Temperature during heating periods in the living area from Table 9, Th1 (°C)													21	(85)			
Utilisa	ation fac	tor for a	ains for I	iving are	ea, h1,m	(s	ee Ta	ble 9a)										_
	Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	A	ug	Sep	О	ct	Nov	De	ec		
(86)m=	0.99	0.98	0.93	0.81	0.62	(	0.43	0.31	0.3	Ť	0.55	0.8	5	0.98	0.9	9		(86)
Maan	intorno	l tompor	oturo in	living or	OO T4 /f/	الد	···· oto	no 2 to 7	 7 in T	الطت:	2 (10)	!					I	
(87)m=	20.56	20.68	ature in	20.96	20.99	JIIO	21	21	2		21	20.	05	20.74	20.5	52	1	(87)
(67)111=	20.50	20.00	20.03	20.90	20.99		21	21		<u>'</u>	21	20.	93	20.74	20.0	),	I	(01)
			neating p		1	_		i			`	ı					ı	
(88)m=	20.37	20.38	20.38	20.39	20.39	2	20.39	20.39	20.	.4	20.39	20.	39	20.38	20.3	38		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	,m (se	e Table	9a)									
(89)m=	0.99	0.97	0.92	0.78	0.58	(	0.39	0.27	0.3	3	0.5	0.8	32	0.97	0.9	9		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ina	T2 (f	ollow ste	ns 3	to 7	in Tahl	e 9c	١					
(90)m=	19.79	19.97	20.18	20.34	20.38	Ť	20.39	20.39	20.	-	20.39	20.		20.06	19.7	75		(90)
, ,		<u> </u>			<u> </u>	_		<u> </u>	<u> </u>		f	LA =	Livin	g area ÷ (4	4) =		0.33	(91)
							` .		,,	٠.	٠							`'
		<del></del>	ature (fo		i			i	<del>`</del>	_				00.00		2.4	1	(00)
(92)m=	20.04	20.2	20.39	20.54	20.58	<u> </u>	20.59	20.59	20.		20.59	20.		20.28	20.0	J1	l	(92)
		1	he mean		· ·	_		1				<del>-</del>		00.00	00.4	24	I	(02)
(93)m=	20.04	20.2	20.39	20.54	20.58	L 2	20.59	20.59	20.	59	20.59	20.	53	20.28	20.0	JT		(93)
			uirement					44 . (	T . I. I	- 01			. /-	70)			Late	
			ternal ter or gains			nea	at ste	ер 11 от	rabi	e yr	o, so tha	t II,r	n=(	76)m an	a re-	caic	ulate	
	Jan	Feb	Mar	Apr	May	Г	Jun	Jul	A	ug	Sep	0	ct	Nov	De	ec		
Utilisa		l	ains, hm	-	_ ·····ay		<u> </u>			<u> </u>	ООР		-	1101			I	
(94)m=	0.99	0.97	0.92	0.79	0.59		0.4	0.28	0.3	31	0.52	0.8	3	0.97	0.9	9		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (8	4)m			l .	<u> </u>			!					1	
(95)m=	496.79	552.51	574.26	531.97	420.71	2	81.42	187.57	196	.45	305.9	444	.38	477.31	474.	.07		(95)
Month	nly aver	age exte	ernal tem	perature	from Ta	abl	e 8	I	<u> </u>									
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16.	.4	14.1	10.	.6	7.1	4.2	2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm	ı , W =	=[(39)m :	x [(93	 3)m-	– (96)m	<u> </u>						
(97)m=	766.78	743.42	672.96	556.2	423.22	_	81.51	187.58	196		306.58	473	.27	631.53	761.	62		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	24 x [	(97)	m – (95	)m] >	(4 <sup>-</sup>	1)m				
(98)m=	200.87	128.29	73.43	17.45	1.87		0	0	0	ĺ	0	21.	.5	111.04	213.	.93		
						-			•	Tota	per year	(kWh/	year	) = Sum(9	8)15,9	12 =	768.39	(98)
Space	e heatin	a require	ement in	kWh/m²	2/vear												10.45	(99)
Spaoi		5 . oquii			, , 5001												10.40	

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 1	11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)	
The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See App	•		
Fraction of heat from Community heat pump	1	(303a)	
Fraction of total space heat from Community heat pump	1	(304a)	
Factor for control and charging method (Table 4c(3)) for community he	1	(305)	
Distribution loss factor (Table 12c) for community heating system	1.1	(306)	
Space heating Annual space heating requirement	<b>kWh/year</b> 768.39	7	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	845.23	(307a)
Efficiency of secondary/supplementary heating system in % (from Tab	le 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		2058.87	_ 7
If DHW from community scheme: Water heat from Community heat pump	2264.76	(310a)	
Electricity used for heat distribution 0.0	31.1	(313)	
Cooling System Energy Efficiency Ratio	0	(314)	
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	€	154.46	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	154.46	(331)
Energy for lighting (calculated in Appendix L)		323.27	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-622.67	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)
12b. CO2 Emissions – Community heating scheme			
	nergy Emission factor Wh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fue	els repeat (363) to (366) for the second fue	319	(367a)
•		010	(367a) (367)
Efficiency of heat source 1 (%)  If there is CHP using two fue		505.98	
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  [(307b)+(310b)] ×  Electrical energy for heat distribution  [(313) x	x 100 ÷ (367b) x 0.52 =	505.98	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  [(307b)+(310b)] ×  Electrical energy for heat distribution  [(313) x	(367b) x 0.52 = 0.52 = 0.52	505.98	(367)

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 522.12 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 80.16 CO2 associated with electricity for lighting (332))) x (379) 0.52 167.78 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380)0.52 -323.17 sum of (376)...(382) =Total CO2, kg/year 446.9 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)6.08 El rating (section 14) (385)94.95

			Hoor D	)otoilo:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20	12	User D	Strom Softwa			0006273 ion: 1.0.4.26			
	07.400.4			Address						
Address:	GT 106, Aspen Co	urt, Maitla	and Park	< Estate,	London	, NW3 2	2EH			
Overall dwelling dime	ensions:		Aro	n/m²\		۸۷ ۵۸	iaht/m\		Volume(m <sup>3</sup>	11
Ground floor				<b>a(m²)</b> 73.5	(1a) x		2.6	(2a) =	191.1	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) [	73.5	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	191.1	(5)
2. Ventilation rate:										
Number of chimneys		secondar heating	'y □ + □	other 0	] <sub>=</sub> [	total	x	40 =	m³ per hou	(6a)
Number of open flues			┧╻┝		」  L 1 = 「		x	20 =		=
•		0	J . L	0	J ¯ L	0			0	(6b)
Number of intermittent fa					L	3		10 =	30	(7a)
Number of passive vents	3					0	X '	10 =	0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	<sup>7</sup> a)+(7b)+(	7c) =	Г	30		÷ (5) =	0.16	(8)
If a pressurisation test has l					ontinue fr			( )	00	`
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0  if both types of wall are p	0.25 for steel or timber present, use the value corre				•	uction			0	(11)
deducting areas of openi	• / .	.	4 ( 1 -		0					<b>–</b>
If suspended wooden	•	alea) or U	.1 (seale	ea), eise	enter U				0	(12)
If no draught lobby, er Percentage of window		etrinned							0	(13)
Window infiltration	s and doors draught s	stripped		0.25 - [0.2	x (14) ÷ 1	00] =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then (18) = [	17) ÷ 20]+(	8), otherw	ise (18) = (	16)				0.41	(18)
Air permeability value applie	es if a pressurisation test h	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides shelter	ed			(20) = 1 -	'0 075 v /4	10)1 —			2	(19)
Shelter factor	ting aboltor factor			(20) = 12 (21) = (18)		9)] =			0.85	(20)
Infiltration rate incorpora	•	. ا		(21) = (10)	(20) =				0.35	(21)
Infiltration rate modified	<del></del>	1	1	Ι Δα	Con	Oct	Nov	Doo	1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.3   4.4   4.3	3.0	] 3.0	J.,	4	۲.۵	4.5	4.1	J	
Wind Factor $(22a)m = (2a)m =$	22)m ÷ 4								_	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41		
alculate effec		-	rate for t	he appli	cable ca	se	!	!		!		<b>-</b>	
If mechanical If exhaust air he			andiv N. (2	3h) - (22c	) v Emy (c	auation (	VEVV otho	rwico (22h	) - (222)			0	(
If balanced with									) = (23a)			0	(
		•	•	_					2h\ (	00h) [/	1 (00 a)	0	
a) If balance	o mecha	o o	0	o with ne	0		1K) (24a	$\frac{1}{0} = \frac{2}{2}$	0	230) <b>x</b> [	0	) <del>-</del> 100] ]	(
b) If balance												_	`
4b)m= 0	o mech	o 0	0	0	0	0	0	0	0	0	0	7	(
c) If whole h												_	`
if (22b)n				•	•				5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(
d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft				_	
if (22b)n				•	•				0.5]				
4d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(
Effective air	change	rate - er	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)	-	-	-		
5)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(
B. Heat losse	e and he	at lose r	aramete	or.								_	
. Heat losse LEMENT	Gros	·	Openin		Net Ar	A2	U-valı	IΩ	AXU		k-valu	Δ	ΑΧk
LEIVIENI	area	_	m	_	A,r		W/m2		(W/I		kJ/m <sup>2</sup> ·		kJ/K
indows Type	: 1				4.47	x1.	/[1/( 1.4 )+	0.04] =	5.93				(
indows Type	2				2.24	x1,	/[1/( 1.4 )+	0.04] =	2.97	Ħ			(
indows Type	3				9.25	x1.	/[1/( 1.4 )+	0.04] =	12.26	=			(
indows Type	4				2.24	x1.	/[1/( 1.4 )+	0.04] =	2.97	=			(
alls	46.2	28	18.2	,	28.08	=	0.18	L	5.05	=		$\neg$ $\vdash$	
otal area of e		i	10.2		46.28	_	0.10		0.00				
arty wall	1011101110	,				=				— г			
or windows and	roof wind	ows use e	effective wi	ndow I I-va	42.85		o formula 1		0 (e)+0 041 a	L as aiven in	naragrani		\
include the area						atou using	i Torritala 1	/[(	0,40.04, 0	is given in	paragrapi	1 3.2	
bric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				29.1	8
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K	n kJ/m²K Indicative Value: Medium							) (
or design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
n be used inste						_							
nermal bridge	•	,		• .	•	<						4.77	7
letails of therma Ital fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			22.0	6
entilation hea		alculator	l monthly	,						(25)m x (5)		33.9	<u>o</u> (
Jan	Feb	Mar			Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
37.67	37.43	37.19	Apr 36.1	May 35.89	34.94	34.94	34.76	35.3	35.89	36.31	36.74	1	(
		<u> </u>	50.1	55.05	J 34	J34	J 37.70	<u> </u>	<u> </u>	<u> </u>	30.74	J	`
eat transfer o		·						· · · · ·	= (37) + (3	·		1	
9)m= 71.62	71.39	71.15	70.06	69.85	68.9	68.9	68.72	69.26	69.85	70.27	70.7	1	

Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.97	0.97	0.97	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.96	0.96		
Number of dev	o in ma	nth /Tabl	lo 10)		<u> </u>	<u> </u>		,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.95	(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)
		•								•			
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	ΓFA -13.		33		(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 o		.49		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ii	n litres pei	r day for ea		Vd,m = fa	ctor from T	Table 1c x							
(44)m= 98.44	94.86	91.28	87.7	84.12	80.54	80.54	84.12	87.7	91.28	94.86	98.44		
Energy content of	hot water	used - cale	culated mo	onthly = 4	190 x Vd r	n x nm x F	Tm / 3600			m(44) <sub>112</sub> =	L	1073.88	(44)
(45)m= 145.98	127.68	131.75	114.86	110.22	95.11	88.13	101.13	102.34	119.27	130.19	141.38		
										m(45) <sub>112</sub> =	l	1408.03	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	) to (61)					
(46)m= 21.9	19.15	19.76	17.23	16.53	14.27	13.22	15.17	15.35	17.89	19.53	21.21		(46)
Water <del>storage</del> Storage volum		) includin	n anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	` '		•			_					100		(,
Otherwise if no	_			-			' '	ers) ente	er '0' in (	47)			
Nater storage													
a) If manufact				or is kno	wn (kWh	n/day):				1.	39		(48)
Temperature f										0.	54		(49)
Energy lost fro		_	-		!		(48) x (49)	) =		0.	75		(50)
b) If manufact Hot water stora			-								0		(51)
If community h	-			• (		77					<u> </u>		(- /
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	(54) in (5	55)								0.	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)
f cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
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				,	•	. ,	, ,						
(modified by					ı —	ı —				<u> </u>			(50)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss o	nalaulata d	for oach	month /	(61)m –	(60) · 2	65 × (41	\m						
Combi loss of (61)m= 0	0 0	0	0	0	0	05 × (41)	0	0	0	0	0		(61)
	<u> </u>			<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>	I (59)m + (61)m	
(62)m= 192.5	<del></del>	178.35	159.96	156.81	140.2	134.73	147.7		165.86	175.28	187.97		(62)
Solar DHW inpu	ut calculated	using App	endix G o	· Appendix	H (negati	ve quantity	y) (enter	'0' if no sola	r contribut	ion to wate	r heating)		
(add addition	nal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix	(G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter										-	
(64)m= 192.5	8 169.76	178.35	159.96	156.81	140.2	134.73	147.7	3 147.43	165.86	175.28	187.97		_
							0	utput from w	ater heate	r (annual) <sub>1</sub>	12	1956.65	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 85.82	76.12	81.08	74.27	73.92	67.7	66.58	70.9	70.1	76.93	79.36	84.28		(65)
include (5	7)m in cald	culation o	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	eating	
5. Internal	gains (see	Table 5	and 5a	):									
Metabolic ga	ins (Table	5), Wat	ts									_	
Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 116.4	1 116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4	116.4		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m= 18.3	16.26	13.22	10.01	7.48	6.32	6.83	8.87	11.91	15.12	17.65	18.81		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m= 205.3	2 207.45	202.09	190.66	176.23	162.67	153.61	151.4	156.85	168.28	182.7	196.26		(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5	-	-		
(69)m= 34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64		(69)
Pumps and	fans gains	(Table 5	5a)							-		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (negat	tive valu	es) (Tab	le 5)						-		
(71)m= -93.1	2 -93.12	-93.12	-93.12	-93.12	-93.12	-93.12	-93.12	93.12	-93.12	-93.12	-93.12		(71)
Water heating	ng gains (T	able 5)		-	-		-	-			-		
(72)m= 115.3	4 113.28	108.98	103.15	99.36	94.02	89.49	95.3	97.36	103.4	110.22	113.28		(72)
Total intern	al gains =	1			(66	)m + (67)m	n + (68)r	n + (69)m +	(70)m + (7	'1)m + (72)	)m		
(73)m= 399.8	9 397.91	385.21	364.73	343.99	323.93	310.84	316.5	327.04	347.72	371.5	389.28		(73)
6. Solar ga	ns:												
Solar gains ar		_					itions to	convert to th	ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	_	FF able 6c		Gains	
						DIE Ga	, –	Table 0b	_ '	able oc		(W)	,
North 0.9		X	2.2	24	X	10.63	X	0.63	x	0.7	=	7.28	(74)
North 0.9		X	9.2	25		10.63	x	0.63	x	0.7	=	30.06	<u> </u> (74)
North 0.9		X	2.2			20.32	] x [	0.63	x	0.7	=	13.91	<u> </u> (74)
North 0.9		X	9.2	25	-	20.32	x	0.63	x	0.7	=	57.45	<u> </u> (74)
North 0.9	0.77	X	2.2	24	x (	34.53	X	0.63	X	0.7	=	23.64	(74)

N I =4I=	_		1		1	Γ	1		ı	<b>-</b>	1		<b>-</b>
North	0.9x	0.77	X	9.25	Х	34.53	X	0.63	X	0.7	=	97.61	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.63	X	0.7	=	37.97	(74)
North	0.9x	0.77	X	9.25	X	55.46	X	0.63	X	0.7	=	156.79	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.63	X	0.7	=	51.15	(74)
North	0.9x	0.77	X	9.25	X	74.72	X	0.63	X	0.7	=	211.22	(74)
North	0.9x	0.77	X	2.24	X	79.99	x	0.63	X	0.7	=	54.76	(74)
North	0.9x	0.77	X	9.25	X	79.99	X	0.63	X	0.7	=	226.11	(74)
North	0.9x	0.77	X	2.24	X	74.68	X	0.63	X	0.7	=	51.12	(74)
North	0.9x	0.77	X	9.25	x	74.68	X	0.63	x	0.7	=	211.1	(74)
North	0.9x	0.77	X	2.24	X	59.25	X	0.63	x	0.7	=	40.56	(74)
North	0.9x	0.77	X	9.25	X	59.25	X	0.63	X	0.7	=	167.48	(74)
North	0.9x	0.77	X	2.24	X	41.52	x	0.63	X	0.7	=	28.42	(74)
North	0.9x	0.77	x	9.25	x	41.52	x	0.63	x	0.7	=	117.36	(74)
North	0.9x	0.77	x	2.24	X	24.19	x	0.63	x	0.7	=	16.56	(74)
North	0.9x	0.77	x	9.25	X	24.19	x	0.63	x	0.7	=	68.38	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.63	x	0.7	=	8.98	(74)
North	0.9x	0.77	x	9.25	X	13.12	x	0.63	x	0.7	=	37.08	(74)
North	0.9x	0.77	x	2.24	X	8.86	x	0.63	x	0.7	=	6.07	(74)
North	0.9x	0.77	x	9.25	X	8.86	x	0.63	x	0.7	=	25.06	(74)
South	0.9x	0.77	x	4.47	X	46.75	x	0.63	x	0.7	=	63.87	(78)
South	0.9x	0.77	X	2.24	X	46.75	X	0.63	X	0.7	=	32.01	(78)
South	0.9x	0.77	x	4.47	x	76.57	x	0.63	x	0.7	=	104.6	(78)
South	0.9x	0.77	x	2.24	X	76.57	x	0.63	x	0.7	=	52.42	(78)
South	0.9x	0.77	X	4.47	X	97.53	x	0.63	X	0.7	=	133.24	(78)
South	0.9x	0.77	X	2.24	X	97.53	x	0.63	X	0.7	=	66.77	(78)
South	0.9x	0.77	X	4.47	x	110.23	X	0.63	x	0.7	=	150.59	(78)
South	0.9x	0.77	X	2.24	x	110.23	X	0.63	x	0.7	=	75.46	(78)
South	0.9x	0.77	X	4.47	X	114.87	x	0.63	X	0.7	=	156.92	(78)
South	0.9x	0.77	X	2.24	x	114.87	X	0.63	x	0.7	=	78.64	(78)
South	0.9x	0.77	X	4.47	X	110.55	X	0.63	X	0.7	=	151.02	(78)
South	0.9x	0.77	X	2.24	X	110.55	X	0.63	X	0.7	=	75.68	(78)
South	0.9x	0.77	X	4.47	X	108.01	X	0.63	X	0.7	=	147.55	(78)
South	0.9x	0.77	X	2.24	X	108.01	X	0.63	X	0.7	=	73.94	(78)
South	0.9x	0.77	x	4.47	x	104.89	x	0.63	x	0.7	=	143.3	(78)
South	0.9x	0.77	X	2.24	X	104.89	X	0.63	X	0.7	=	71.81	(78)
South	0.9x	0.77	x	4.47	x	101.89	x	0.63	x	0.7	=	139.18	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.63	x	0.7	=	69.75	(78)
South	0.9x	0.77	X	4.47	x	82.59	x	0.63	x	0.7	=	112.82	(78)
South	0.9x	0.77	x	2.24	x	82.59	x	0.63	x	0.7	=	56.54	(78)
South	0.9x	0.77	x	4.47	x	55.42	x	0.63	x	0.7	=	75.7	(78)
South	0.9x	0.77	x	2.24	x	55.42	X	0.63	x	0.7	=	37.94	(78)

	_													_
South	0.9x	0.77	х	4.4	7	X	40.4	X	0.63	x	0.7	=	55.19	(78)
South	0.9x	0.77	X	2.2	24	x	40.4	X	0.63	x	0.7	=	27.66	(78)
Solar	gains in v	watts, ca	alculated	for eac	h month			(83)m = $8$	Sum(74)m .	(82)m				
(83)m=		228.37	321.26	420.82	497.93	507.5		423.15	354.72	254.3	159.7	113.97		(83)
Total (	gains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (83)	m , watts							
(84)m=	533.1	626.28	706.47	785.55	841.91	831.4	9 794.56	739.71	681.76	602.02	531.2	503.25		(84)
7. Me	ean interr	nal temp	erature	(heating	season	)								
Temp	perature	during h	eating p	eriods ir	the livi	ng are	a from Tal	ole 9, Th	n1 (°C)				21	(85)
Utilis	ation fac	tor for g	ains for I	iving are	ea, h1,m	ı (see	Table 9a)							
	Jan	Feb	Mar	Apr	May	Jui	n Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.96	0.88	0.73	0.52	0.38	0.43	0.67	0.92	0.99	1		(86)
Moor	internal	tompor	oturo in l	living or	00 T1 /f/	allow o	tono 2 to -	l 7 in Tab	Io (10)		<u> </u>	ļ		
	20.12	20.3	20.53	20.8	20.95	20.9	teps 3 to 7	21	20.97	20.77	20.4	20.09		(87)
(87)m=	20.12	20.3	20.53	20.8	20.95	20.9	21	21	20.97	20.77	20.4	20.09		(01)
Temp	erature	during h	eating p	eriods ir	rest of	dwelli	ng from Ta	able 9, T	h2 (°C)					
(88)m=	20.1	20.11	20.11	20.12	20.12	20.1	20.14	20.14	20.13	20.12	20.12	20.12		(88)
Utilis	ation fac	tor for g	ains for r	est of d	welling,	h2,m	see Table	9a)						
(89)m=	0.99	0.98	0.95	0.85	0.67	0.46	<u>`                                    </u>	0.35	0.6	0.89	0.98	0.99		(89)
Maar	ا مسامان				مد طبیرمال	in a TO	/fallaw ata		7 ::: Tabl	la ()a)	ļ.	ļ		
	18.94		1				(follow ste	i –	1	· ·	40.00	40.0		(90)
(90)m=	18.94	19.2	19.54	19.9	20.08	20.1	3 20.14	20.14	20.11	19.88	19.36	18.9		<b>`</b> ′
									'	fLA = Livin	y area - (4	+) =	0.33	(91)
Mear	ı internal	temper	ature (fo	r the wh	ole dwe	lling) =	= fLA × T1	+ (1 – fl	_A) × T2					
(92)m=	19.33	19.56	19.86	20.19	20.36	20.4	1 20.42	20.42	20.4	20.17	19.7	19.29		(92)
Apply	/ adjustm	nent to th	he mean	interna	temper	ature	from Table	4e, wh	ere appro	opriate				
(93)m=	19.33	19.56	19.86	20.19	20.36	20.4	1 20.42	20.42	20.4	20.17	19.7	19.29		(93)
8. Sp	ace heat	ting requ	uirement											
						ned at	step 11 of	Table 9	b, so tha	nt Ti,m=(	76)m an	d re-calc	ulate	
the u	tilisation	factor fo	or gains i	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec		
Utilis	ation fact	tor for g	ains, hm	:										
(94)m=	0.99	0.98	0.95	0.86	0.69	0.48	0.33	0.37	0.62	0.9	0.98	0.99		(94)
Usef	ul gains,	hmGm ,	W = (94)	l)m x (8	4)m									
(95)m=	528.33	612.83	668.87	673.38	577.87	397.8	6 262.84	275.73	424.35	538.95	520.12	499.87		(95)
Mont	hly avera	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	for mea	an intern	al tempe	erature,	Lm , V	V = [(39)m]	x [(93)m	n— (96)m	]				
(97)m=	1076.29	1046.35	950.8	791.2	605.19	400.5	9 263.09	276.22	436.08	668.53	885.3	1067.14		(97)
0	e heating	g require	ement fo	r each n	nonth, k	Wh/m	onth = 0.02	24 x [(97	')m – (95	)m] x (4	1)m			
Spac		204.22	209.76	84.83	20.32	0	0	0	0	96.41	262.93	422.05		
Spac (98)m=	407.68	291.33	203.70	000					•		•			
•	407.68	291.33	209.70			!		Tota	al per year	(kWh/year	) = Sum(9	8)15,912 =	1795.32	(98)
(98)m=			<u> </u>		!/vear			Tota	al per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =		=
(98)m=	e heating	g require	ement in	kWh/m²			<u>'</u>			(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	1795.32 24.43	(98)
(98)m= Space 9a. Er	ce heating	g require	ement in	kWh/m²		ystem	s including			(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =		=
(98)m= Space 9a. Er Space	e heating	g require uiremer	ement in	kWh/m² vidual h	eating s		s including	ı micro-(		(kWh/yeaı	r) = Sum(9	8)15,912 =		=

Francisco de la companya (a companya a compa			(202) 4	(204)					7(000)
Fraction of space heat from main system(s)			(202) = 1 - (204) = (20	, ,	(202)] _			1	(202)
Fraction of total heating from main system 1			(204) = (20	)2) <b>x</b> [1 – 1	(203)] =			1	(204)
Efficiency of main space heating system 1	a votom	0/						93.5	(206)
Efficiency of secondary/supplementary heating s	<del>.</del>		, 1					0	(208)
Jan Feb Mar Apr May Space heating requirement (calculated above)	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
407.68 291.33 209.76 84.83 20.32	0	0	0	0	96.41	262.93	422.05		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$	!		!						(211)
436.02 311.58 224.34 90.73 21.74	0	0	0	0	103.11	281.21	451.39		
	•		Tota	(kWh/yea	ar) =Sum(2	211),15,1012	=	1920.12	(211)
Space heating fuel (secondary), kWh/month							•		
$= \{[(98) \text{m x } (201)]\} \times 100 \div (208)$				0	_			1	
(215)m= 0 0 0 0 0	0	0	0 Total	0 (kWh/yea	0 ar) =Sum(2	0	0	0	(215)
Water heating			. • . •	(,	, •••••	715,1012		0	
Output from water heater (calculated above)								_	
	140.2	134.73	147.73	147.43	165.86	175.28	187.97		_
Efficiency of water heater								79.8	(216)
` '	79.8	79.8	79.8	79.8	83.43	85.89	86.91		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
	175.69	168.83	185.12	184.75	198.81	204.07	216.28		
			Total	= Sum(21	19a) <sub>112</sub> =			2347.63	(219)
Annual totals					k۱	Wh/year	•	kWh/year	
Charachapting final mand main quaters 1						•			7
Space heating fuel used, main system 1						•		1920.12	
Water heating fuel used						•			]
						·		1920.12	
Water heating fuel used						٠	30	1920.12	(230c)
Water heating fuel used Electricity for pumps, fans and electric keep-hot						•	30 45	1920.12	
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =			1920.12	(230c)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue			sum	of (230a).				1920.12 2347.63	(230c) (230e)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year	ns inclu	ding mid						1920.12 2347.63	(230c) (230e) (231)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting					(230g) =		45	1920.12 2347.63 75 323.27	(230c) (230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting	Ene	ding mid e <b>rgy</b> h/year			(230g) =	ion fac	45	1920.12 2347.63	(230c) (230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting	Ene	<b>ergy</b> h/year			(230g) =	ion fac 2/kWh	45	1920.12 2347.63 75 323.27	(230c) (230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	<b>En</b> e	ergy h/year			(230g) = <b>Emiss</b> kg CO2	ion fac 2/kWh	45	1920.12 2347.63  75 323.27  Emissions kg CO2/yea 414.75	(230c) (230e) (231) (232) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)	<b>Ene</b> kW (211	ergy h/year ) ×			(230g) =  Emiss kg CO2  0.5	<b>ion fac</b> 2/kWh 16	45 tor =	1920.12 2347.63  75 323.27  Emissions kg CO2/yea 414.75	(230c) (230e) (231) (232) (232) (261) (263)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating	Ene kW (211 (215 (219	ergy h/year ) × ) ×	cro-CHP		(230g) = <b>Emiss</b> kg CO2	<b>ion fac</b> 2/kWh 16	45 tor = =	1920.12 2347.63  75 323.27  Emissions kg CO2/yea 414.75 0 507.09	(230c) (230e) (231) (232) (232) (261) (263) (264)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating  Space and water heating	Ene kW (211 (215 (219	ergy h/year ) x ) x ) x			(230g) =  Emiss kg CO2  0.5'  0.2'	<b>ion fac</b> 2/kWh 16	45 tor = =	1920.12 2347.63  75 323.27  Emissions kg CO2/yea 414.75 0 507.09 921.83	(230c) (230e) (231) (232) (261) (263) (264) (265)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating	Ene kW (211 (215 (219	ergy h/year ) x ) x ) x ) + (262) -	cro-CHP		(230g) =  Emiss kg CO2  0.5	ion fac 2/kWh 16 19	45 tor = =	1920.12 2347.63  75 323.27  Emissions kg CO2/yea 414.75 0 507.09	(230c) (230e) (231) (232) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1128.54 (272)

TER = 22.25 (273)

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:36:26

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 50m2 Site Reference: Plot Reference: Maitland Park Estate GT 107

GT 107, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

26.66 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 8.52 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.3 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 39.9 kWh/m<sup>2</sup>

OK 2 Fabric U-values

**Element** 

**Average Highest** 0.12 (max. 0.70) External wall 0.12 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK** 

(no floor) Floor Roof (no roof)

**Openings** 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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:	0.5	
Maximum	1.5	ОК
MVHR efficiency:	90%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
ased on:		
Overshading:	Average or unknown	
Windows facing: North	2.24m²	
Windows facing: North	2.24m²	
Windows facing: North	9.25m²	
Windows facing: North	2.24m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	• • • • • • • • • • • • • • • • • • •	
The state of the s		

Photovoltaic array

			User D	etails:							
Assessor Name: Software Name:	Oftware Name: Stroma FSAP 2012 Software Version: Version: Property Address: GT 107										
		Р	roperty .	Address	GT 107	7					
Address :	GT 107, Aspen (	Court, Maitla	and Park	k Estate,	London	, NW3 2	2EH				
1. Overall dwelling dime	ensions:										
			Area	a(m²)		Av. He	ight(m)	,	Volume(m	<u> </u>	
Ground floor				50	(1a) x	2	2.6	(2a) =	130	(3a)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+	-(1e)+(1r	n)	50	(4)						
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	130	(5)	
2. Ventilation rate:											
	main heating	secondar heating	у	other		total			m³ per ho	ur	
Number of chimneys	0 +		<b>+</b> [	0	] = [	0	Х	40 =	0	(6a)	
Number of open flues	0 +	0		0	; ; = ;	0	X	20 =	0	(6b)	
Number of intermittent fa					J			10 =		=	
					Ļ	0			0	(7a)	
Number of passive vents	5				L	0	X	10 =	0	(7b)	
Number of flueless gas f	ires					0	X	40 =	0	(7c)	
								Δir ch	anges per h	our	
Infiltration due to chimne	wa fluor and fano	(6a) (6b) (7	'a) ı ( <b>7</b> b) ı (	7c) –	Г						
Infiltration due to chimne If a pressurisation test has a	•				ontinuo fr	0 (a) to		÷ (5) =	0	(8)	
Number of storeys in t		епава, ргосвы	u 10 (17), (	Juliel Wise C	orianae n	om (9) to	(10)		0	(9)	
Additional infiltration	are arrening (rie)						[(9)	-1]x0.1 =	0	(10)	
Structural infiltration: (	0.25 for steel or timb	oer frame or	0.35 for	r masonr	y constr	uction		•	0	(11)	
if both types of wall are p					•					` ^	
deducting areas of open			. , .							_	
If suspended wooden	•	•	.1 (seale	ed), else	enter 0				0	(12)	
If no draught lobby, er									0	(13)	
Percentage of window	s and doors draugr	it stripped		0.05 [0.0	(4.4)4	001			0	(14)	
Window infiltration				0.25 - [0.2			. (45)		0	(15)	
Infiltration rate		. 1.2		(8) + (10)	, , ,	, , ,			0	(16)	
Air permeability value	• •		•	•	•	etre of e	envelope	area	2	(17)	
If based on air permeabi	•					ia haina	and.		0.1	(18)	
Number of sides shelter	•	t rias been don	ie or a deg	gree air pei	пеаышу	is being u	seu		3	(19)	
Shelter factor	ou .			(20) = 1 -	0.075 x (1	19)] =			0.78	(20)	
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.08	(21)	
Infiltration rate modified	-	eed							1	` '	
Jan Feb	<del> </del>	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind sp		7 1	I	. 3	· · ·	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			
		L		I	<u> </u>	1	1	I	I		
Wind Factor (22a)m = (2	22)m ÷ 4										
(00-)   4.07   4.05	100   11   10	0 0 0 0	0.05	1		1 400	1 440	1 , , ,	I		

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.1	0.1	0.09	0.09	0.08	0.07	0.07	0.07	0.08	0.08	0.09	0.09		
Calculate effe		_	rate for t	he appli	cable ca	se	!	!		!	!	<u>-</u>	
If mechanical If exhaust air h			andiv N. (2	2h) _ (22c	a) v Emy (c	auation (	VEVV otho	nuico (22h	\ _ (222)			0.5	(2
If balanced with									) = (23a)			0.5	(2
		-	-	_					015 \ (1	00h) [	4 (00-	76.5	(2
a) If balance	0.21	anicai ve	0.2	0.2	0.19	0.19	HR) (248 0.19	0.2	2D)M + (. 0.2	23b) <b>x</b> [*	0.21	) ÷ 100] ]	(2
, L	<u> </u>		L				L	l			0.21	]	(2
b) If balance	i	1		without	i	overy (r	· · ·	i i			Ι ,	7	(2
,	0	0	0		0		0	0	0	0	0	_	(2
c) If whole h		tract ven < (23b), t		•	•				5 v (23h	<b>,</b> )			
4c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0	1	(2
	<u> </u>								0			_	(-
d) If natural if (22b)r		on or wn en (24d)							0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	ι κ (25)		ļ.	!	_	
5)m= 0.22	0.21	0.21	0.2	0.2	0.19	0.19	0.19	0.2	0.2	0.2	0.21	7	(2
	l		ı				1	1		ı		J	
. Heat losse		·											
LEMENT	Gros area		Openin m	_	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-valu kJ/m².		A X k kJ/K
indows Type		(111 )			2.24	<del></del>	/[1/( 1.4 )+		2.97		NO/III		(2
indows Type					2.24	╡,	/[1/( 1.4 )+	L	2.97	=			(2
indows Type						╡,	/[1/( 1.4 )+	L		=			•
,,					9.25	╡,		L	12.26	=			(2
indows Type	; 4 				2.24	=	/[1/( 1.4 )+	0.04] = [	2.97	ᆗ ,			(2
alls	32.5		15.9	7	16.61	X	0.12	= [	1.99				(:
otal area of e	lements	, m²			32.58	3							(;
arty wall					57.02	<u>x</u>	0	= [	0				(3
or windows and						ated using	g formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragrapi	h 3.2	
include the area abric heat los				s and par	นนอกร		(26)(30)	) + (32) =				00.47	
		,	U)				(20)(00)		(20) + (20	2) + (225)	(220) -	23.17	(;
eat capacity		` '	. C	T[	. l. 1/ma21/				.(30) + (32	, , ,	(32e) =	0	(;
nermal mass	•	•		,			raciaalı Abr		tive Value		abla 1f	250	(3
r design asses: n be used inste				CONSTRUCT	ion are noi	kriowri pr	ecisely trie	e maicalive	values of	TIVIP III T	аые п		
nermal bridg	es : S (L	x Y) cal	culated (	using Ap	pendix ł	<						5.46	(;
details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	11)								
otal fabric he	at loss							(33) +	(36) =			28.63	(:
	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (	25)m x (5)	)	_	_
entilation hea	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan							0.40	0.07	0.04	0.70	0.05	7	
Jan	9.2	9.11	8.7	8.61	8.2	8.2	8.12	8.37	8.61	8.78	8.95		(-
Jan	9.2		8.7	8.61	8.2	8.2	8.12	<u> </u>	= (37) + (37)	<u> </u>	8.95	]	(;

Heat loss pa	rameter (l	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.76	0.76	0.75	0.75	0.74	0.74	0.74	0.73	0.74	0.74	0.75	0.75		
	Į.		ı	ı					Average =	Sum(40) <sub>1</sub> .	12 /12=	0.75	(40)
Number of d	<del>-</del> i	nth (Tab	le 1a)		ı	·	1		1				
Jan	Feb 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 he	eating ene	rgy requ	irement:								kWh/ye	ar:	
Assumed oc if TFA > 13 if TFA £ 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		69		(42)
Annual avera Reduce the ann not more that 1.	nual average	hot water	usage by	5% if the $c$	lwelling is	designed t			se target o		.34		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usag								<u>'</u>					
(44)m= 81.77	7 78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77		
									Total = Su	m(44) <sub>112</sub> =		892.08	(44)
Energy content	of hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 121.2	7 106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44		
If in atomton a cur	. water boot	ing of point	s of woo /pa	hat water	r otorogol	antar O in	haves (46		Total = Su	m(45) <sub>112</sub> =	- [	1169.66	(45)
If instantaneous		· ·	· `	ı	, , , , , , , , , , , , , , , , , , ,	·	, ,	, , , ,	1	1	<del></del>		(40)
(46)m= 18.19 Water storage	1	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62		(46)
Storage volu		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	·	,				_							` ,
Otherwise if	_			-			. ,	ers) ente	er '0' in (	(47)			
Water storag													
a) If manufa				or is kno	wn (kWł	n/day):					0		(48)
Temperature											0		(49)
Energy lost f		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufa</li><li>Hot water stop</li></ul>			-							0	02		(51)
If community	•			10 2 (1111	11/11(10)(40	· <b>y</b> /				0.	02		(01)
Volume facto	_									1.	03		(52)
Temperature	e factor fro	m Table	2b							0	.6		(53)
Energy lost f	rom wate	r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) o	r (54) in (	55)								1.	03		(55)
Water storag	ge loss ca	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 conta	ins dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хH	
(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 circu	uit loss (ar	nnual) fro	om Table	e 3							0		(58)
Primary circu	•	,			59)m = (	(58) ÷ 36	65 × (41)	)m					
(modified				,	•	. ,	, ,		r thermo	stat)			
(59)m= 23.26	3 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) ÷ 365 × (41)m													
(61)m= 0	0	0	0	0	00) - (	0	)   0	0	0	0	Το	1	(61)
				alculated	for ea	ch month						J · (59)m + (61)m	, ,
(62)m= 176.5	<del>-</del>	164.72	148.91	146.83	132.5	128.49	139.2		<del></del>	<del>- i</del>	<del> </del>	]	(62)
Solar DHW inpo							v) (ente					]	, ,
(add addition											,		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from	water hea	ter				_ <b>!</b>	•	<u> </u>				1	
(64)m= 176.5		164.72	148.91	146.83	132.5	128.49	139.2	29 138.5	1 154.	35 161.64	172.72	]	
	Į.					_ <b>!</b>		output from	water he	ater (annual)	112	1820.5	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61	)m] + 0.8	3 x [(46)	m + (57)m	n + (59)m	 n ]	_
(65)m= 84.54	4 75.21	80.61	74.52	74.66	69.06	68.56	72.1	5 71.06	77.1	6 78.75	83.27	1	(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													
Jar	r Feb	Mar	Apr	May	Jun	Jul	Au	g Se <sub>l</sub>	00	t Nov	Dec	]	
(66)m= 84.5°	1 84.51	84.51	84.51	84.51	84.51	84.51	84.5	1 84.51	84.5	1 84.51	84.51	]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	ion L9	or L9a), a	ılso se	e Table	5			-	
(67)m= 13.13	3 11.66	9.48	7.18	5.37	4.53	4.89	6.36	8.54	10.8	4 12.66	13.49	]	(67)
Appliances (	gains (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	lso see 7	able 5	-		-	
(68)m= 147.2	3 148.76	144.91	136.72	126.37	116.64	110.15	108.6	32 112.4	7 120.0	67 131.01	140.74	]	(68)
Cooking gai	ns (calcula	ted in A	ppendix	L, equat	ion L1	or L15a	), also	see Tab	le 5	-		-	
(69)m= 31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.4	5 31.45	31.4	5 31.45	31.45	]	(69)
Pumps and	fans gains	(Table 5	5a)									-	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							-	
(71)m= -67.6	67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.0	6 -67.6	-67.	6 -67.6	-67.6	]	(71)
Water heating	ng gains (T	able 5)		_				-		-		-	
(72)m= 113.6	3 111.92	108.35	103.5	100.35	95.92	92.16	96.9	8 98.7	103.	71 109.38	111.92	]	(72)
Total intern	al gains =	•			(6	6)m + (67)m	n + (68)	m + (69)m	+ (70)m -	+ (71)m + (72	?)m	-	
(73)m= 322.3	4 320.69	311.09	295.75	280.44	265.45	255.55	260.3	32 268.0	6 283.	58 301.4	314.5	]	(73)
6. Solar ga	ins:												
Solar gains ar		•	r flux from	Table 6a		•	ations to	convert to	the appl		ation.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		g_ Table 6	h	FF Table 6c		Gains (W)	
N							, ,	T able 0	<del></del>	Table 60			,
North 0.9		X	2.2	24	x	10.63	] x [	0.4	×	0.8	=	5.28	(74)
North 0.9		X	2.2		X _	10.63	) X [	0.4	x	0.8	=	5.28	[(74)
North 0.9		X	9.2		X _	10.63	] X [	0.4	×	0.8	=	21.81	<u> </u> (74)
North 0.9		X	2.2	24	x	10.63	X	0.4	×	0.8	=	5.28	(74)
North 0.9	0.77	X	2.2	24	X	20.32	X	0.4	X	0.8	=	10.09	(74)

North			7		1		1		i		1		7
North	0.9x	0.77	∫ X ¬	2.24	X	20.32	X	0.4	X	0.8	=	10.09	(74)
North	0.9x	0.77	X	9.25	X	20.32	X	0.4	X	0.8	=	41.68	(74)
North	0.9x	0.77	X	2.24	X	20.32	X	0.4	X	0.8	=	10.09	<u> </u> (74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	9.25	X	34.53	X	0.4	X	0.8	=	70.83	(74)
North	0.9x	0.77	X	2.24	X	34.53	Х	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	9.25	X	55.46	X	0.4	X	0.8	=	113.77	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.4	X	0.8	=	37.11	(74)
North	0.9x	0.77	X	9.25	X	74.72	X	0.4	X	0.8	=	153.26	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	X	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	X	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	X	9.25	x	79.99	x	0.4	x	0.8	=	164.07	(74)
North	0.9x	0.77	X	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.4	x	0.8	] <b>=</b>	37.1	(74)
North	0.9x	0.77	X	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	x	9.25	x	74.68	x	0.4	х	0.8	=	153.18	(74)
North	0.9x	0.77	x	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	X	2.24	x	59.25	x	0.4	x	0.8	] =	29.43	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	9.25	x	59.25	x	0.4	x	0.8	] <b>=</b>	121.53	(74)
North	0.9x	0.77	X	2.24	x	59.25	x	0.4	x	0.8	j =	29.43	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	x	0.8	] =	20.62	(74)
North	0.9x	0.77	×	2.24	x	41.52	x	0.4	x	0.8	] =	20.62	(74)
North	0.9x	0.77	x	9.25	x	41.52	x	0.4	x	0.8	j =	85.16	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	x	2.24	x	24.19	х	0.4	x	0.8	j =	12.02	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.4	x	0.8	j =	12.02	(74)
North	0.9x	0.77	x	9.25	x	24.19	x	0.4	x	0.8	j =	49.62	(74)
North	0.9x	0.77	x	2.24	x	24.19	х	0.4	x	0.8	j =	12.02	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.4	x	0.8	j =	6.52	(74)
North	0.9x	0.77	×	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	×	9.25	×	13.12	x	0.4	x	0.8	=	26.91	(74)
North	0.9x	0.77	X	2.24	X	13.12	X	0.4	X	0.8	=	6.52	(74)
North	0.9x	0.77	X	2.24	X	8.86	X	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	X	2.24	X	8.86	X	0.4	x	0.8	, 	4.4	(74)
	L		1		1		1	-	I		1	<u>'</u>	<b>_</b> ' '

North	0.9x	0.77	x	9.2	25	x	8	8.86	x		0.4	x		0.8		= [	18.18	(74)
North	0.9x	0.77	x	2.2	24	X	8	8.86	x		0.4	X	Ē	0.8		= [	4.4	(74)
	_												_			•		_
Solar g	ains in	watts, ca	alculated	for eac	h month	ı			(83)m	= Sı	um(74)m .	(82)	m					
(83)m=	37.66	71.97	122.29	196.43	264.61	$\overline{}$	83.27	264.47	209.	.82	147.03	85.6	67	46.46	31.3	9		(83)
Total ga	ains – ii	nternal a	and solar	(84)m =	= (73)m	+ (	83)m	, watts	•									
(84)m=	360	392.65	433.38	492.17	545.05	5	48.72	520.02	470.	.14	415.09	369.	24	347.86	345.	9		(84)
7. Mea	an inter	nal temp	perature	(heating	season	)												
Tempe	erature	during h	neating p	eriods ir	n the livi	ng	area 1	from Tab	ole 9,	Th	1 (°C)					[	21	(85)
Utilisa	ition fac	tor for a	ains for I	iving are	ea, h1,m	1 (s	ee Ta	ble 9a)								L		
Γ	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Aı	ug	Sep	0	ct	Nov	De	С		
(86)m=	0.99	0.98	0.95	0.84	0.63	T	0.43	0.31	0.3	Ť	0.61	0.9	)	0.98	0.99	,		(86)
` ' L						. !! -	4-	0 to <del>-</del>			- 0-)							
Г		<del></del>	ature in		,	JIIC		i				20.6	20	20.64	20.4			(87)
(87)m=	20.44	20.55	20.73	20.92	20.99	_	21	21	21	' <u> </u>	20.99	20.8	39	20.64	20.4			(01)
Temp	erature	during h	eating p	eriods ir	rest of	dw	/elling	from Ta	able 9	), Th	12 (°C)							
(88)m=	20.29	20.29	20.29	20.3	20.3	2	20.31	20.31	20.3	31	20.31	20.	3	20.3	20.3	3		(88)
Utilisa	tion fac	tor for g	ains for i	est of d	welling,	h2	,m (se	e Table	9a)									
(89)m=	0.99	0.98	0.94	0.81	0.58	$\overline{}$	0.38	0.26	0.3	1	0.55	0.8	7	0.97	0.99	)		(89)
Moon	intorno	l tompor	ature in	the rest	of dwall	ina	T2 /f/	ollow oto	.no 2	+o 7	7 in Tabl	0.00						
(90)m=	19.55	19.71	19.96	20.21	20.29	Ť	20.31	20.31	20.3		20.3	20.		19.84	19.5	2		(90)
(30)111=	10.00	15.71	15.50	20.21	20.23	L_	20.01	20.01	20.					g area ÷ (4			0.5	(91)
														g area . (-	•, –	Į	0.5	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1	– fL	A) × T2							
(92)m=	20	20.13	20.35	20.57	20.64	2	20.66	20.66	20.6	66	20.65	20.	54	20.24	19.9	7		(92)
Apply	adjustn	nent to t	he mean	interna	temper	atu	ire fro	m Table	4e, \	whe	re appro	opria	te					
(93)m=	20	20.13	20.35	20.57	20.64	2	20.66	20.66	20.6	66	20.65	20.	54	20.24	19.9	7		(93)
8. Spa	ace hea	ting requ	uirement															
			ernal ter			nec	l at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti,n	n=(	76)m an	d re-c	alc	ulate	
the uti			or gains			_						_			_	_		
<u>[</u>	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	0	ct	Nov	De	С		
Г		<u> </u>	ains, hm			_	0.44				0.50			0.07	0.00	$\neg$		(04)
(94)m=	0.99	0.98	0.94	0.82	0.6		0.41	0.29	0.3	3	0.58	0.8	8	0.97	0.99	)		(94)
Г		i	, W = (94	, ·	r e	Τ.												(05)
(95)m=	355.94	384.11	408.48	402.71	329.28	_	22.81	149.35	156.	.36	240.23	324.	.64	338.86	342.8	31		(95)
г			rnal tem			$\overline{}$				. 1						_		(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16.		14.1	10.	6	7.1	4.2			(96)
г			an intern			_		<del>- `                                   </del>	<del>- `</del>	<del>_</del>	<u> </u>		00	404 ===	<b>500</b>			(07)
(97)m=	595.06	576.04	522.55	435.53	333.06	_	223	149.36	156		242.28	370.		491.56	592.5	8		(97)
. г		<del></del>	ement fo		i	Wr		l e		Ì	·	ŕ	<u> </u>	<del></del>		_		
(98)m=	177.91	128.98	84.87	23.63	2.81	L	0	0	0		0	33.7		109.95	185.8			<b>-</b>
										Total	l per year	(kWh/	year	r) = Sum(9	8)15,912	2 =	747.73	(98)
Space	heatin	g require	ement in	kWh/m²	<sup>2</sup> /year												14.95	(99)
																_ '		

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (	(Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	Ĭ	1	(302)
The community scheme may obtain heat from several sources. The procedure includes boilers, heat pumps, geothermal and waste heat from power stations.		ne latter	<b>-</b>
Fraction of heat from Community heat pump	Ĺ	1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for commu	unity heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	m [	1.1	(306)
Space heating Annual space heating requirement	[	<b>kWh/year</b> 747.73	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	822.51	(307a)
Efficiency of secondary/supplementary heating system in % (fro	om Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary syst	tem (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating	_		_
Annual water heating requirement		1820.5	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2002.55	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	28.25	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside	99.12	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	99.12	(331)
Energy for lighting (calculated in Appendix L)	Ī	231.81	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	Ī	-424.04	(333)
Electricity generated by wind turbine (Appendix M) (negative qu	antity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor I kWh/year kg CO2/kWh I	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	g two fuels repeat (363) to (366) for the second fuel	319	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x 0.52 =	459.62	(367)
Electrical energy for heat distribution	[(313) x 0.52 =	14.66	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372) =	474.29	(373)
CO2 associated with space heating (secondary)	(309) x 0 =	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x 0.52 =	0	(375)

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 474.29 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 51.45 CO2 associated with electricity for lighting (332))) x (379) 0.52 120.31 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380)0.52 -220.08 sum of (376)...(382) =Total CO2, kg/year 425.97 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)8.52 El rating (section 14) (385)93.99

			User D	Notoile:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20			Strom Softwa	are Vei	rsion:			0006273 on: 1.0.4.26	
Address :	GT 107, Aspen Co			Address k Estate.			PEH			
1. Overall dwelling dim		,		,		,				
Ground floor			Area	<b>a(m²)</b> 50	(1a) x		i <b>ght(m)</b> 2.6	(2a) =	Volume(m <sup>3</sup>	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	۱)	50	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	130	(5)
2. Ventilation rate:	<u> </u>								2 1	
Number of chimneys  Number of open flues  Number of intermittent fa	heating	secondar heating 0	y ] + [ ] + [	0 0	] = [	0 0	x 2	40 = 20 =	m³ per hou	(6a) (6b)
					L	2			20	(7a)
Number of passive vent	S					0	X '	10 =	0	(7b)
Number of flueless gas	fires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	′a)+(7b)+(	(7c) =	Г	20		÷ (5) =	0.15	(8)
	been carried out or is intend				ontinue fr	_		,		`
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
deducting areas of open	oresent, use the value corre ings); if equal user 0.35	sponding to	the great	ter wall are	a (after	ruction			0	(11)
·	floor, enter 0.2 (unsea nter 0.05, else enter 0	aled) of 0	. i (Seaie	ea), eise	enter o				0	(12)
Percentage of window		etrinned							0	(13)
Window infiltration	vs and doors draught t	мірреа		0.25 - [0.2	x (14) ÷ 1	001 =			0	(15)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
Air permeability value	, q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeab	ility value, then (18) = [(	17) ÷ 20]+(	8), otherw	ise (18) = (	16)				0.4	(18)
Air permeability value appli	ies if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides shelter	ed			(20) 1	10 07E v /4	10)1			3	(19)
Shelter factor	sting obolton footon			(20) = 1 -		9)] =			0.78	(20)
Infiltration rate incorpora	•	. ا		(21) = (18	) X (20) =				0.31	(21)
Infiltration rate modified  Jan Feb	<del> </del>	1	Jul	T Aug	Son	Oct	Nov	Dec	1	
		Jun	Jui	Aug	Sep	Oct	INOV	Dec	J	
Monthly average wind s (22)m= 5.1 5	peed from Table / 4.9	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)111= 3.1 3	4.4 4.3	3.8	3.6	3.1	4	4.3	4.0	4.1	J	
Wind Factor (22a)m = (2	22)m ÷ 4	_								
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.4	0.39	0.38	0.34	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37	1	
alculate effe		-	rate for t	he appli	cable ca	se	!			!	!	<u>,</u>	
If mechanical If exhaust air h			andiv N. (2	3h) _ (22c	a) × Emy (c	auation (N	VEVV othor	avica (22h	) - (222)			0	(2
If balanced with									) = (23a)			0	(2
		•	-	_					2h\ (	00h) [/	1 (00.0)	0	(2
a) If balance		o o	0	o with ries	0		1K) (248	0	0	230) <b>x</b> [	0	) <del>-</del> 100] ]	(2
b) If balance	<u> </u>		-	_								J	(-
4b)m= 0		o 0	0	0	0	0	0	0	0	0	0	1	(2
	<u> </u>											J	(-
c) If whole h if (22b)n				•	•				5 x (23h	n)			
1c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural	ventilatio	on or wh	ole hous	e nositiv	/e input	L ventilatio	n from l	oft				1	
if (22b)n				•	•				0.5]				
4d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(2
Effective air	change	rate - er	iter (24a	or (24k	o) or (24	c) or (24	d) in box	(25)			!	•	
5)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(2
		( )			•					•	•	_	
. Heat losse		·			Not Ar	••	Harali	10	AXU		le volu	•	ΑΧk
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		(W/I	K)	k-valu kJ/m²·		kJ/K
indows Type	e 1				1.75	x1.	/[1/( 1.4 )+	0.04] =	2.32	,			(
indows Type	2				1.75	x1.	/[1/( 1.4 )+	0.04] =	2.32	=			(:
indows Type	3				7.24		/[1/( 1.4 )+	0.04] =	9.6	=			(2
indows Type					1.75	= .	/[1/( 1.4 )+	L	2.32	=			(:
alls	32.5	:0	12.49	$\overline{}$	20.09	=	0.18		3.62	╡ ┌			(:
otal area of e		i	12.43	2		=	0.10	[	3.02				
	iements	, 111			32.58	=		r					(;
arty wall or windows and	roof wind	04/0 4/00 0	ffootivo wi	ndow II v	57.02		0 formula 1	/[/1/    vol	0		norograni		(
include the area						ateu using	i iOrriula I	/[( 1/ <b>U-</b> valu	le)+0.04j a	is giveri iri	parayrapi	1 3.2	
abric heat los	ss, W/K :	= S (A x	U)	·			(26)(30)	+ (32) =				20.1	7 (
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	^	,	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	===
r design assess	sments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		,
n be used inste	ad of a de	tailed calc	ulation.										
ermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						3.59	)
letails of therma		are not kn	own (36) =	= 0.05 x (3	11)			(00)	(00)				
tal fabric he									(36) =			23.7	6
entilation hea	i				l .		l .		= 0.33 × (			1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
3)m= 24.87	24.73	24.6	23.99	23.88	23.35	23.35	23.25	23.55	23.88	24.11	24.35	]	(
eat transfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	

leat lo	ss para	meter (H	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
10)m=	0.97	0.97	0.97	0.96	0.95	0.94	0.94	0.94	0.95	0.95	0.96	0.96		_
umba	r of do	o in mo	ath /Tab	lo 1o\					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.96	(4
umbe	Jan	Feb	nth (Tab Mar		May	Jun	Jul	Λιια	Sep	Oct	Nov	Dec		
l1)m=	31	28	31	Apr 30	31	30	31	Aug 31	30 30	31	30	31		(4
1)111=	31	20	<u> </u>	30	<u> </u>	30	J 31	31			] 30	01		( .
4. Wa	ter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
ccum	ad accu	ıpancy, İ	NI.											/ 4
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		69		(4
nnua	averag	e hot wa						(25 x N)				.34		(4
		_		usage by : day (all w		_	-	to achieve	a water us	se target o	of -			
		Feb			May	_		Λιια	Sep	Oct	Nov	Doc		
ot wate	Jan er usage in		Mar day for ea	Apr ach month		Jun ctor from 7	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
4)m=	81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77		
.,	<b>U</b>	7 0.0	. 0.00	. 2.00	00.00	00.01	00.01	00.00	<u> </u>		m(44) <sub>112</sub> =	<u> </u>	892.08	(4
nergy (	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	0Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
5)m=	121.27	106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44		
										Total = Su	m(45) <sub>112</sub> =	=	1169.66	(4
instant	aneous w	ater heatii		of use (no	hot water	storage),	enter 0 in	boxes (46)	) to (61)	i	,			
6)m=	18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62		(4
	storage e volum		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
_		, ,		nk in dw			_					100		(
	•	_			-			mbi boil	ers) ente	er '0' in (	(47)			
/ater	storage	loss:												
) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWh	n/day):				1.	39		(4
empe	rature fa	actor fro	m Table	2b							0.	54		(4
٠.			·	, kWh/ye				(48) x (49)	) =		0.	75		(5
•				cylinder l om Tabl										(5
		•	ee secti		e z (KVV	ii/iiti e/ua	iy <i>)</i>					0		(5
	-	from Tal		011 1.0								0		(5
empe	rature 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
Enter	(50) or (	54) in (5	55)	·							0.	75		(5
/ater	storage	loss cal	culated t	or each	month			((56)m = (	55) × (41)	m				
6)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		(5
cylinde	er 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 Appendi	хН	
7)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		(5
rimar	v circuit	loss (an	nual) fro	m Table	 e 3							0		(5
	•	•	,			59)m = (	(58) ÷ 36	65 × (41)	m					•
	•				,		. ,	ng and a		r thermo	stat)			
9)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		(!

Combi loss (	salculated	for oach	month (	(61)m –	(60) · 3	65 × (41	\m						
Combi loss of (61)m= 0	0 0	0	0	0	0	05 × (41)	0	0	0	0	0	1	(61)
	<u>l</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>	J (59)m + (61)m	
(62)m= 167.8	<del>-</del>	156.04	140.51	138.15	124.1	119.81	130.61		145.67	153.24	164.04	]	(62)
Solar DHW inpu	ut calculated	using App	endix G o	r Appendix	H (negati	ve quantity	y) (enter	'0' if no sola	r contribut	ion to wate	r heating)	1	
(add addition	nal lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter	-	-	-	-	-	-	-		-		
(64)m= 167.8	6 148.15	156.04	140.51	138.15	124.1	119.81	130.61	130.11	145.67	153.24	164.04		_
							Ot	itput from w	ater heate	r (annual)	12	1718.27	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m= 77.6	68.93	73.67	67.8	67.72	62.34	61.62	65.21	64.34	70.22	72.03	76.33		(65)
include (5	7)m in cald	culation o	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	gains (see	Table 5	and 5a	):									
Metabolic ga	ains (Table	5), Wat	ts										
Jar	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 84.5°	1 84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	84.51	]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				_	
(67)m= 13.13	3 11.66	9.48	7.18	5.37	4.53	4.89	6.36	8.54	10.84	12.66	13.49		(67)
Appliances (	gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5			_	
(68)m= 147.2	3 148.76	144.91	136.72	126.37	116.64	110.15	108.62	112.47	120.67	131.01	140.74		(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5			_	
(69)m= 31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	31.45	]	(69)
Pumps and	fans gains	(Table 5	5a)									_	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	_						-	
(71)m= -67.6	67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6	-67.6		(71)
Water heating	ng gains (T	able 5)										,	
(72)m= 104.3	3 102.58	99.01	94.17	91.02	86.59	82.82	87.65	89.36	94.38	100.05	102.59		(72)
Total intern	al gains =				(66	)m + (67)m	n + (68)n	n + (69)m +	(70)m + (7	(1)m + (72)	)m		
(73)m= 316.0		304.76	289.41	274.11	259.11	249.22	253.98	261.72	277.24	295.07	308.17		(73)
6. Solar ga													
Solar gains ar		•				•	itions to		ie applicat		tion.	0-1	
Orientation:	Table 6d		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
North 0.9				75			1 [				_		7,74)
		X	1.7		-	10.63	]	0.63		0.7	=	5.69	[(74)]
North 0.9		×	1.7			10.63	]	0.63		0.7	_ =	5.69	[74] (74)
North 0.9		×	7.2			10.63	]	0.63		0.7	=	23.53	$\begin{bmatrix} 1^{(74)} \\ 1^{(74)} \end{bmatrix}$
North 0.9		×	1.7		<b>=</b>	10.63	]	0.63	╡╞		<del> </del>	5.69	╡
140101 0.9	× 0.77	X	1.7	5	X	20.32	X	0.63	X	0.7	=	10.87	(74)

NI d	_		1		1		,		ı				_
North	0.9x	0.77	X	1.75	Х	20.32	X	0.63	X	0.7	=	10.87	(74)
North	0.9x	0.77	X	7.24	X	20.32	X	0.63	X	0.7	=	44.96	(74)
North	0.9x	0.77	X	1.75	X	20.32	X	0.63	X	0.7	=	10.87	(74)
North	0.9x	0.77	X	1.75	X	34.53	X	0.63	X	0.7	=	18.47	(74)
North	0.9x	0.77	X	1.75	X	34.53	X	0.63	X	0.7	=	18.47	(74)
North	0.9x	0.77	X	7.24	X	34.53	X	0.63	X	0.7	=	76.4	(74)
North	0.9x	0.77	X	1.75	X	34.53	X	0.63	X	0.7	=	18.47	(74)
North	0.9x	0.77	X	1.75	X	55.46	X	0.63	X	0.7	=	29.66	(74)
North	0.9x	0.77	X	1.75	X	55.46	X	0.63	X	0.7	=	29.66	(74)
North	0.9x	0.77	X	7.24	X	55.46	X	0.63	x	0.7	=	122.72	(74)
North	0.9x	0.77	X	1.75	X	55.46	X	0.63	x	0.7	=	29.66	(74)
North	0.9x	0.77	X	1.75	x	74.72	X	0.63	x	0.7	=	39.96	(74)
North	0.9x	0.77	X	1.75	x	74.72	x	0.63	x	0.7	=	39.96	(74)
North	0.9x	0.77	x	7.24	x	74.72	x	0.63	x	0.7	=	165.32	(74)
North	0.9x	0.77	X	1.75	x	74.72	x	0.63	x	0.7	=	39.96	(74)
North	0.9x	0.77	X	1.75	x	79.99	x	0.63	x	0.7	=	42.78	(74)
North	0.9x	0.77	x	1.75	x	79.99	x	0.63	x	0.7	=	42.78	(74)
North	0.9x	0.77	x	7.24	x	79.99	x	0.63	x	0.7	=	176.98	(74)
North	0.9x	0.77	X	1.75	x	79.99	x	0.63	x	0.7	=	42.78	(74)
North	0.9x	0.77	x	1.75	x	74.68	x	0.63	x	0.7	=	39.94	(74)
North	0.9x	0.77	X	1.75	x	74.68	x	0.63	x	0.7	=	39.94	(74)
North	0.9x	0.77	x	7.24	х	74.68	x	0.63	x	0.7	=	165.23	(74)
North	0.9x	0.77	X	1.75	x	74.68	X	0.63	x	0.7	=	39.94	(74)
North	0.9x	0.77	x	1.75	x	59.25	x	0.63	x	0.7	=	31.69	(74)
North	0.9x	0.77	X	1.75	x	59.25	x	0.63	x	0.7	=	31.69	(74)
North	0.9x	0.77	X	7.24	x	59.25	x	0.63	x	0.7	=	131.09	(74)
North	0.9x	0.77	X	1.75	x	59.25	x	0.63	x	0.7	=	31.69	(74)
North	0.9x	0.77	X	1.75	x	41.52	x	0.63	x	0.7	=	22.2	(74)
North	0.9x	0.77	X	1.75	x	41.52	x	0.63	x	0.7	=	22.2	(74)
North	0.9x	0.77	X	7.24	x	41.52	x	0.63	x	0.7	=	91.86	(74)
North	0.9x	0.77	X	1.75	x	41.52	x	0.63	x	0.7	=	22.2	(74)
North	0.9x	0.77	X	1.75	x	24.19	x	0.63	x	0.7	=	12.94	(74)
North	0.9x	0.77	X	1.75	x	24.19	x	0.63	x	0.7	=	12.94	(74)
North	0.9x	0.77	X	7.24	x	24.19	x	0.63	x	0.7	=	53.52	(74)
North	0.9x	0.77	X	1.75	x	24.19	x	0.63	x	0.7	=	12.94	(74)
North	0.9x	0.77	X	1.75	x	13.12	x	0.63	x	0.7	=	7.02	(74)
North	0.9x	0.77	x	1.75	x	13.12	x	0.63	x	0.7	=	7.02	(74)
North	0.9x	0.77	×	7.24	x	13.12	x	0.63	x	0.7	j =	29.02	(74)
North	0.9x	0.77	×	1.75	x	13.12	x	0.63	x	0.7	j =	7.02	(74)
North	0.9x	0.77	x	1.75	x	8.86	x	0.63	x	0.7	j =	4.74	(74)
North	0.9x	0.77	x	1.75	x	8.86	x	0.63	X	0.7	=	4.74	(74)
	_												

	_					_			. –						_
North	0.9x	0.77	X	7.2	24	X	8	3.86	X	0.63	×	0.7	=	19.61	(74)
North	0.9x	0.77	X	1.7	<b>7</b> 5	X	8	3.86	Х	0.63	Х	0.7	=	4.74	(74)
Solar	gains in	watts, ca	alculated	for eac	h month				(83)m =	Sum(74)m	(82)m			1	
(83)m=	40.59	77.57	131.81	211.71	285.2		5.31	285.05	226.1	158.47	92.33	50.07	33.84		(83)
Total (	gains – ii	nternal a	and solar	(84)m =	= (73)m	+ (8	3)m ,	, watts						•	
(84)m=	356.6	391.92	436.56	501.13	559.3	564	4.43	534.26	480.13	420.2	369.57	345.14	342		(84)
7. Me	ean inter	nal temp	perature	(heating	season	)									
Temp	perature	during h	neating p	eriods ir	n the livi	ng a	rea f	rom Tab	ole 9, 1	h1 (°C)				21	(85)
Utilis	ation fac	tor for g	ains for I	iving are	ea, h1,m	(se	е Та	ble 9a)							
	Jan	Feb	Mar	Apr	May	J	lun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.97	0.91	0.74	0.	.53	0.39	0.45	0.73	0.95	0.99	1		(86)
Moor	interna	l tomper	ature in	living ar	oa T1 /f/	سمالد	v stor	oc 3 to 7	in Tal	olo Oc)				ı	
(87)m=	20.11	20.24	20.46	20.76	20.94	1	0.99	21	21	20.96	20.72	20.37	20.09	1	(87)
		<u> </u>			<u> </u>		!				20.72	20.07	20.00	J	(=: /
			neating p		i	1	Ť			<del></del>				1	
(88)m=	20.11	20.11	20.11	20.12	20.12	20	).13	20.13	20.13	20.13	20.12	20.12	20.11	]	(88)
Utilis	ation fac	tor for g	ains for i	rest of d	welling,	h2,n	n (se	e Table	9a)						
(89)m=	0.99	0.99	0.97	0.88	0.69	0.	.46	0.31	0.36	0.65	0.93	0.99	0.99		(89)
Moor	interna	l tomper	ature in	the rest	of dwall	ina 7	T2 (fc	ollow etc	ne 3 t	7 in Tab	lo 9c)	!		ı	
(90)m=	18.93	19.11	19.44	19.85	20.07	Ť	).13	20.13	20.13	1	19.8	19.31	18.9	1	(90)
(50)111=	10.55	15.11	13.44	13.03	20.07		,. 13 <u> </u>	20.10	20.10		L .	g area ÷ (4		0.5	(91)
											127 ( — 21VII	ig area . (	., –	0.5	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	lling	) = fL	_A × T1	+ (1 –	fLA) × T2				•	
(92)m=	19.52	19.68	19.95	20.31	20.51	20	).56	20.57	20.57	20.53	20.26	19.84	19.5		(92)
Apply	/ adjustn	nent to t	he mean	interna	temper	atur	e fro	m Table	4e, w	nere appr	opriate	_		-	
(93)m=	19.52	19.68	19.95	20.31	20.51	20	).56	20.57	20.57	20.53	20.26	19.84	19.5		(93)
8. Sp	ace hea	ting requ	uirement												
						ned a	at ste	ep 11 of	Table	9b, so tha	at Ti,m=(	76)m an	d re-calc	culate	
the u			or gains			_						<u> </u>		1	
	Jan	Feb	Mar	Apr	May	J	lun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		i				1					1	
(94)m=	0.99	0.99	0.96	0.89	0.71	0.	.49	0.35	0.41	0.69	0.93	0.98	0.99	]	(94)
Usefu			, W = (94	<u> </u>	r e							т		1	
(95)m=	353.83	386.38	421.27	444.56	397.04	278	8.59	186.64	195.3	290.27	343.72	339.63	339.86	]	(95)
			ernal tem		r	_								1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern			_		=[(39)m		n– (96)m	]			1	
(97)m=	740.28	716.64	650.7	544.8	419.67	280	0.88	186.89	195.9	304.34	460.36	610.04	736.12		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh/r	mont	h = 0.02	24 x [(9	7)m – (95	)m] x (4	1)m		_	
(98)m=	287.52	221.94	170.69	72.17	16.84	(	0	0	0	0	86.78	194.7	294.81		
									To	tal per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	1345.45	(98)
Spac	e heatin	a require	ement in	kWh/m²	2/vear									26.91	(99)
•		• .			-					OLIE)				20.91	
			nts – Indi	vidual h	eating s	yste	ms ir	ncluding	micro	CHP)					
-	e heatir	_	at frame	2002da	w/ou 1 -	mo	oto == -	ovete ==							7,004
rract	ion of sp	ace nea	at from se	econdar	y/supple	mer	пагу	system						0	(201)

									_
Fraction of space heat from main system(s)		(2	202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1		(2	204) = (20	02) <b>×</b> [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating s	system,	%						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)	<u> </u>	<u> </u>		0	00.70	404.7	204.04	l	
287.52 221.94 170.69 72.17 16.84	0	0	0	0	86.78	194.7	294.81		(044)
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$ $307.51  237.37  182.56  77.19  18.01$	0	0	0	0	92.81	208.23	315.31	1	(211)
						211),5,1012		1438.99	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								_	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_
			Total	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water heating									
Output from water heater (calculated above)  167.86	124.1	119.81	130.61	130.11	145.67	153.24	164.04	]	
Efficiency of water heater								79.8	(216)
(217)m= 86.24 85.89 85.05 83.14 80.84	79.8	79.8	79.8	79.8	83.48	85.45	86.36		(217)
Fuel for water heating, kWh/month								-	
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 194.65  172.49  183.46  169.01  170.9  1	155.51	150.13	163.67	163.04	174.49	179.33	189.94	1	
				I = Sum(2				2066.62	(219)
Annual totals					k\	Wh/year	,	kWh/yea	<b>_</b>
Space heating fuel used, main system 1								1438.99	
Space heating fuel used, main system 1 Water heating fuel used									
,								1438.99	
Water heating fuel used							30	1438.99	(230c)
Water heating fuel used Electricity for pumps, fans and electric keep-hot							30 45	1438.99	
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =			1438.99	(230c)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue			sum	of (230a).	(230g) =			1438.99 2066.62	(230c) (230e)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue  Total electricity for the above, kWh/year	ns includ	ling mic		, ,	(230g) =			1438.99 2066.62 75	(230c) (230e) (231)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting				, ,			45	1438.99 2066.62 75 231.81	(230c) (230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting	Ene			, ,		ion fac	45	1438.99 2066.62 75	(230c) (230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting	Ene	<b>rgy</b> n/year		, ,	Emiss	ion fac	45	1438.99 2066.62 75 231.81 Emissions	(230c) (230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system	<b>Ene</b> kWh	<b>rgy</b> n/year x		, ,	Emiss kg CO	ion fact 2/kWh	45	1438.99 2066.62  75 231.81  Emissions kg CO2/ye	(230c) (230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	Ene kWh	rgy n/year ×		, ,	Emiss kg CO2	<b>ion fac</b> 2/kWh 16	45 tor =	1438.99 2066.62  75 231.81  Emissions kg CO2/ye 310.82	(230c) (230e) (231) (232) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)	Ene kWh (211) (215) (219)	rgy n/year ×	ro-CHP		Emiss kg CO2 0.2 0.5	<b>ion fac</b> 2/kWh 16	45 tor = =	1438.99 2066.62  75 231.81  Emissions kg CO2/ye 310.82 0	(230c) (230e) (231) (232) (232) (261) (263)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating	Ene kWh (211) (215) (219)	rgy n/year x x x + (262) +	ro-CHP		Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16 19 16	45 tor = =	1438.99 2066.62  75 231.81  Emissions kg CO2/ye 310.82 0 446.39	(230c) (230e) (231) (232) (261) (263) (264)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating  Space and water heating	Ene kWh (211) (215) (219) (261)	rgy n/year x x x + (262) +	ro-CHP		Emiss kg CO2 0.2 0.5 0.2	ion fact 2/kWh 16 19 16	45 tor = =	1438.99 2066.62  75 231.81  Emissions kg CO2/ye 310.82 0 446.39 757.21	(230c) (230e) (231) (232)  (261) (263) (264) (265)

Total CO2, kg/year sum of (265)...(271) = 916.44 (272)

 $TER = 26.66 \tag{273}$ 

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:36:34

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** 

Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 72.7m<sup>2</sup> Site Reference: Plot Reference: Maitland Park Estate GT 108

GT 108, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

24.86 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 6.83 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.1 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 37.1 kWh/m<sup>2</sup>

OK

2 Fabric U-values

**Element Average Highest** 0.12 (max. 0.70) External wall 0.12 (max. 0.30) OK Party wall 0.00 (max. 0.20) **OK** 

Floor (no floor) Roof (no roof)

**Openings** 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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:	0.53	
Maximum	1.5	ОК
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
ased on:		
Overshading:	Average or unknown	
Windows facing: East	2.24m²	
Windows facing: East	2.24m²	
Windows facing: North	9.25m²	
Windows facing: North	2.24m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump	O WITH IX	
To a second reading, float from clootile float pump		

Photovoltaic array

			User D	etails:									
Assessor Name: Software Name:	John Simpson Stroma FSAP 2	2012		Stroma Softwa					0006273 on: 1.0.4.26				
		Р	roperty .	Address	GT 108	}							
Address :	GT 108, Aspen (	Court, Maitla	and Park	k Estate,	London	, NW3 2	2EH						
1. Overall dwelling dime	ensions:												
			Area	a(m²)		Av. He	ight(m)	,	Volume(m	<u> </u>			
Ground floor				72.7	(1a) x	2	2.6	(2a) =	189.02	(3a)			
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+	-(1e)+(1r	n) 📑	72.7	(4)								
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	189.02	(5)			
2. Ventilation rate:													
	main heating	secondar heating	у	other		total			m³ per hoι	ır			
Number of chimneys	0 +		<b>]</b> + [	0	] = [	0	X	40 =	0	(6a)			
Number of open flues	0 +	0	┪╻┝	0	] <sub>=</sub> [	0	X	20 =	0	    (6b)			
Number of intermittent fa					J		<del>  </del> ,	10 =		= ``			
					Ļ	0			0	(7a)			
Number of passive vents	6					0	X	10 =	0	(7b)			
Number of flueless gas f	imber of flueless gas fires  0 x 40 =												
								A ir ah	angaa nar h	~			
1.69		(0-) · (0b) · (7	z - \ . /=l- \ . /	<b>7</b> -1	_				nanges per ho				
Infiltration due to chimne	•					0		÷ (5) =	0	(8)			
If a pressurisation test has a Number of storeys in t		enaea, procee	a to (17), (	otnerwise d	ontinue ir	om (9) to	(16)		0	(9)			
Additional infiltration	ine aweiling (113)						[(9)]	-1]x0.1 =	0	(10)			
Structural infiltration: (	).25 for steel or timb	oer frame or	0.35 for	r masonr	v constr	uction	[(0)	1]10.1	0	(11)			
if both types of wall are p					•				U U	(\.,			
deducting areas of open													
If suspended wooden	•	•	.1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, er									0	(13)			
Percentage of window	s and doors draugh	nt stripped							0	(14)			
Window infiltration				0.25 - [0.2					0	(15)			
Infiltration rate				(8) + (10)	, , ,	, , ,			0	(16)			
Air permeability value	• •		•	•	•	etre of e	envelope	area	2	(17)			
If based on air permeabi	•								0.1	(18)			
Air permeability value applie	•	t has been dor	ne or a deg	gree air pe	meability	is being u	sed			<b>—</b> ,,,,			
Number of sides shelter Shelter factor	ea			(20) = 1 -	0.075 x (1	19)1 =			1 0.00	(19)			
Infiltration rate incorpora	ting shelter factor			(21) = (18)		/1			0.92	(21)			
Infiltration rate modified	-	aad		(= :) ( : 0,	/				0.09	(21)			
Jan Feb	<del></del>	ay Jun	Jul	Aug	Sep	Oct	Nov	Dec					
L L		ay   Juli	Jui	<sub>L</sub> Aug	Geb	1 001	1100	l pec	I				
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3 3.8	3.8	3.7	4	4.3	4.5	4.7	]				
(22)11- 3.1 3	7.0 4.4 4.3	7   3.0	3.0	J 3.1	4	4.3	1 4.5	4.1	I				
Wind Factor (22a)m = (2	22)m ÷ 4												
(225) 75 4 27 4 25	122 11 10	0 0 0 5	0.05	0.00		4.00	1 4 40	1 4 40	l				

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.12	0.12	0.11	0.1	0.1	0.09	0.09	0.09	0.09	0.1	0.1	0.11		
Calculate effec		-	rate for t	he appli	cable ca	se	!	!	!		!		——] <i>"</i>
If mechanicate of the street o			andiv N (2	3h) - (23s	a) v Emy (e	aguation (1	NSN other	rwisa (23h	) <i>- (</i> 23a)			0.5	(2
If balanced with									) = (25a)			0.5	(2
		•		_					2h\m + /:	22h) v [4	1 (226)	76.5	(2
a) If balance	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23	] - 100j ]	(2
b) If balance		L					l				0.20	]	•
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h												]	•
if (22b)n				•	•				5 × (23b	))			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(:
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft	<u> </u>		<u> </u>	J	
if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	-	
5)m= 0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23		(
B. Heat losse	c and he	nat loce r	aramot	or:								-	
. Heat losse LEMENT	S and ne	·	Openin		Net Ar	A2	U-valı	IΩ	AXU		k-value	Δ	ΑΧk
LEWIEN	area	_	r		A,r		W/m2		(W/I	<b>〈</b> )	kJ/m <sup>2</sup> ·		kJ/K
indows Type	1				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(
indows Type	2				2.24	x1.	/[1/( 1.4 )+	0.04] =	2.97				(
indows Type	3				9.25	x1	/[1/( 1.4 )+	0.04] =	12.26				(
indows Type	e 4				2.24		/[1/( 1.4 )+	0.04] =	2.97				(
alls	67.0	18	15.9	7	51.11	_	0.12		6.13	=		$\neg$	· (
otal area of e	ь	i	10.0			=	0.12		0.10				(
	icincino	, 111			67.08	_							
arty wall or windows and	roof wind	04/0 4/00 0	ffootivo wi	ndow II v	28.21		0 formula 1	/[/1/    vol	0		norograni		(
include the area						ateu usirig	i iorriula i	/[( 1/ <b>U-</b> valu	1 <del>0</del> )+0.04] a	is giveri iri	parayrapi	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	) + (32) =				27.31	
eat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(
or design assess	ments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
n be used inste													
nermal bridge	es : S (L	x Y) cal	culated i	using Ap	pendix l	<						7.79	(
letails of therma		are not kn	own (36) =	= 0.05 x (3	11)			(22)	(26)				— <u>,</u>
tal fabric he		-1- 1-1-1							(36) =	05) (5)		35.09	(
entilation hea					1	11	۸		= 0.33 × (	<del>-                                    </del>		7	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	,
3)m= 14.69	14.54	14.4	13.68	13.53	12.81	12.81	12.67	13.1	13.53	13.82	14.11	J	(
eat transfer o	coefficie	nt, W/K			,	•		(39)m	= (37) + (37)	38)m		-	

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.68	0.68	0.68	0.67	0.67	0.66	0.66	0.66	0.66	0.67	0.67	0.68		
Nb		· () ( <b>T</b> - )	I - 4 - \						Average =	Sum(40) <sub>1</sub> .	12 /12=	0.67	(40)
Number of day	1			Movi	lun	1	۸۰۰۵	Con	Oct	Nov	Doo		
(41)m= 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
(+1)=													(,
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
													(15)
if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	TFA -13		31		(42)
Annual averag											.06		(43)
Reduce the annua not more that 125	•		•		-	-	to achieve	a water us	se target o	f			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i										1.01			
(44)m= 97.96	94.4	90.84	87.28	83.72	80.15	80.15	83.72	87.28	90.84	94.4	97.96		
										m(44) <sub>112</sub> =	L	1068.71	(44)
Energy content of													
(45)m= 145.28	127.06	131.12	114.31	109.68	94.65	87.71	100.64	101.85	118.69	129.56	140.69		<b></b>
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	= [	1401.24	(45)
(46)m= 21.79	19.06	19.67	17.15	16.45	14.2	13.16	15.1	15.28	17.8	19.43	21.1		(46)
Water storage	loss:	<u> </u>		<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>			
Storage volum	ne (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	-			_			, ,		(0) ! - (	(47)			
Otherwise if no Water storage		not wate	er (tnis ir	iciuaes i	nstantar	ieous co	iiod idmo	ers) ente	er o in (	47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m watei	storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact			-								1		(=4)
Hot water storal from the community has been storaged by the community has been storaged by the community of the community of the community has been storaged by the community of the community o	-			ie z (KVV	n/iitre/ua	iy)				0.	02		(51)
Volume factor	•									1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	` , ` `	,								1.	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5		/)m = (56)	m where (	H11) is fro	m Append	хH	
(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				,		` '	, ,		v 4la a	otot\			
(modified by							<del></del>	<u> </u>		<u> </u>	22.26		(59)
(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		(38)

Combi loss c	alculated	for each	month (	′61)m =	(60) -	- 365 × <i>(4</i> 1	)m							
(61)m= 0		0	0	0	00)	0	) 	)	0	0	0	0	1	(61)
` '		water he	eating ca	l	l for e	ach month			<u> </u>		Ļ	ļ	」 · (59)m + (61)m	, ,
(62)m= 200.56	<del>`</del>	186.39	167.8	164.96	148.		155	_	155.34	173.97	183.05	195.97	]	(62)
Solar DHW inpu		using App	endix G oı	Appendix	H (ne	I gative quantit	v) (ent	ter '0'	' if no sola	r contribu	tion to wate	er heating)	1	
(add addition												0,		
(63)m= 0	0	0	0	0	0	0		)	0	0	0	0	]	(63)
Output from v	water hea	ter				•					•	!	•	
(64)m= 200.56	176.99	186.39	167.8	164.96	148.	14 142.98	155	.92	155.34	173.97	183.05	195.97	]	
								Outp	out from wa	ater heat	er (annual)	112	2052.08	(64)
Heat gains from	om water	heating,	kWh/m	onth 0.2	5 ´ [0.	85 × (45)m	n + (6	31)m	n] + 0.8 x	(46)m	n + (57)m	+ (59)m	n ]	
(65)m= 92.53	82.19	87.82	80.8	80.69	74.2	7 73.38	77.	69	76.66	83.69	85.87	91	]	(65)
include (57	)m in calc	culation of	of (65)m	only if c	ylinde	er is in the	dwell	ling	or hot w	ater is	from com	munity h	neating	
5. Internal of	gains (see	Table 5	and 5a	):										
Metabolic gai	ins (Table	5). Wat	ts											
Jan	Feb	Mar	Apr	May	Ju	n Jul	А	ug	Sep	Oct	Nov	Dec	]	
(66)m= 115.49	115.49	115.49	115.49	115.49	115.4	115.49	115	.49	115.49	115.49	115.49	115.49	1	(66)
Lighting gains	s (calculat	ted in Ap	pendix	L, equat	ion L	or L9a), a	ılso s	ee -	Table 5		•		•	
(67)m= 18.14	16.11	13.11	9.92	7.42	6.20	6.77	8.7	79	11.8	14.99	17.49	18.65	]	(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uatior	n L13 or L1	3a),	also	see Tal	ble 5	•	•	•	
(68)m= 203.51	205.63	200.3	188.98	174.67	161.	23 152.25	150	.14	155.46	166.79	181.09	194.54	]	(68)
Cooking gain	s (calcula	ted in Ap	pendix	L, equat	ion L	15 or L15a	), als	o se	ee Table	5	•	•	•	
(69)m= 34.55	34.55	34.55	34.55	34.55	34.5	5 34.55	34.	55	34.55	34.55	34.55	34.55	]	(69)
Pumps and fa	ans gains	(Table 5	ia)		•	•	•				•	•	•	
(70)m= 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= -92.39	-92.39	-92.39	-92.39	-92.39	-92.3	39 -92.39	-92	.39	-92.39	-92.39	-92.39	-92.39	]	(71)
Water heating	g gains (T	able 5)				•					•		•	
(72)m= 124.36	122.31	118.03	112.23	108.46	103.	15 98.63	104	.42	106.47	112.48	119.27	122.32	]	(72)
Total interna	ıl gains =					(66)m + (67)n	n + (68	3)m +	+ (69)m + (	(70)m + (	71)m + (72)	)m	•	
(73)m= 403.67	401.7	389.09	368.77	348.19	328.	29 315.3	32	21	331.38	351.91	375.5	393.15	]	(73)
6. Solar gair	ns:													
Solar gains are	calculated	using sola	r flux from	Table 6a	and as	sociated equa	ations	to co	nvert to th	e applica		tion.		
Orientation:			Area			Flux		_	g_ Table 6b	-	FF		Gains	
	Table 6d		m²		_	Table 6a	-		able 6b	_ '	Table 6c		(W)	_
North 0.9x		X	9.2	25	x _	10.63	X		0.4	×	0.8	=	21.81	(74)
North 0.9x		X	2.2	24	x _	10.63	X		0.4	x [	0.8	=	5.28	(74)
North 0.9x	0.77	X	9.2	25	x _	20.32	X		0.4	x [	0.8	=	41.68	(74)
North 0.9x		X	2.2	24	x _	20.32	X	<u> </u>	0.4	x [	0.8	=	10.09	(74)
North 0.9x	0.77	X	9.2	25	X	34.53	X		0.4	X	0.8	=	70.83	(74)

<b>.</b>	_		,		,		,		ı		,		_
North	0.9x	0.77	X	2.24	X	34.53	X	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	9.25	X	55.46	X	0.4	X	0.8	=	113.77	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	9.25	x	74.72	X	0.4	X	0.8	=	153.26	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.4	X	0.8	=	37.11	(74)
North	0.9x	0.77	X	9.25	X	79.99	X	0.4	X	0.8	=	164.07	(74)
North	0.9x	0.77	X	2.24	X	79.99	X	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	X	9.25	X	74.68	X	0.4	X	0.8	=	153.18	(74)
North	0.9x	0.77	X	2.24	x	74.68	X	0.4	X	0.8	=	37.1	(74)
North	0.9x	0.77	X	9.25	X	59.25	X	0.4	x	0.8	=	121.53	(74)
North	0.9x	0.77	X	2.24	X	59.25	X	0.4	X	0.8	=	29.43	(74)
North	0.9x	0.77	X	9.25	x	41.52	X	0.4	X	0.8	=	85.16	(74)
North	0.9x	0.77	X	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	X	9.25	x	24.19	x	0.4	x	0.8	=	49.62	(74)
North	0.9x	0.77	x	2.24	x	24.19	x	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	X	9.25	x	13.12	x	0.4	x	0.8	=	26.91	(74)
North	0.9x	0.77	x	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	X	9.25	x	8.86	x	0.4	X	0.8	=	18.18	(74)
North	0.9x	0.77	X	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
East	0.9x	0.77	x	2.24	x	19.64	x	0.4	x	0.8	=	9.76	(76)
East	0.9x	0.77	X	2.24	x	19.64	X	0.4	X	0.8	=	9.76	(76)
East	0.9x	0.77	X	2.24	x	38.42	x	0.4	x	0.8	=	19.09	(76)
East	0.9x	0.77	X	2.24	x	38.42	x	0.4	x	0.8	=	19.09	(76)
East	0.9x	0.77	X	2.24	x	63.27	x	0.4	X	0.8	=	31.43	(76)
East	0.9x	0.77	X	2.24	x	63.27	x	0.4	X	0.8	=	31.43	(76)
East	0.9x	0.77	X	2.24	x	92.28	x	0.4	X	0.8	=	45.84	(76)
East	0.9x	0.77	X	2.24	x	92.28	X	0.4	X	0.8	=	45.84	(76)
East	0.9x	0.77	X	2.24	x	113.09	x	0.4	X	0.8	=	56.18	(76)
East	0.9x	0.77	X	2.24	x	113.09	x	0.4	X	0.8	=	56.18	(76)
East	0.9x	0.77	X	2.24	x	115.77	X	0.4	X	0.8	=	57.51	(76)
East	0.9x	0.77	X	2.24	X	115.77	X	0.4	X	0.8	=	57.51	(76)
East	0.9x	0.77	X	2.24	x	110.22	X	0.4	X	0.8	=	54.75	(76)
East	0.9x	0.77	X	2.24	x	110.22	x	0.4	X	0.8	=	54.75	(76)
East	0.9x	0.77	X	2.24	x	94.68	x	0.4	x	0.8	=	47.03	(76)
East	0.9x	0.77	X	2.24	x	94.68	x	0.4	x	0.8	=	47.03	(76)
East	0.9x	0.77	X	2.24	x	73.59	x	0.4	x	0.8	=	36.55	(76)
East	0.9x	0.77	X	2.24	x	73.59	х	0.4	X	0.8	=	36.55	(76)
East	0.9x	0.77	X	2.24	x	45.59	x	0.4	x	0.8	=	22.65	(76)
East	0.9x	0.77	X	2.24	x	45.59	x	0.4	x	0.8	=	22.65	(76)
East	0.9x	0.77	x	2.24	x	24.49	x	0.4	x	0.8	=	12.16	(76)
East	0.9x	0.77	x	2.24	x	24.49	x	0.4	x	0.8	=	12.16	(76)
													_

East	0.9x	0.77	х	2.2	4	хГ	16.15	x	0.4	x	0.8	=	8.02	(76)
East	0.9x	0.77	x	2.2	4	x $$	16.15	×	0.4	_ x [	0.8	╡ =	8.02	(76)
	_					_								
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m														
(83)m=	46.61	89.95	150.84	233										(83)
Total g	Total gains – internal and solar (84)m = (73)m + (83)m , watts											ı		
(84)m=	(84)m= 450.28 491.64 539.94 601.78 650.93 647.11 615.08 566.02 510.28 458.84 433.26 431.78											(84)		
7 Me	7. Mean internal temperature (heating season)												,	
	Temperature during heating periods in the living area from Table 9, Th1 (°C)													(85)
-	Utilisation factor for gains for living area, h1,m (see Table 9a)													
Otilise	Jan	Feb	Mar	Apr	May	r <del>`</del>	un Jul	Au	g Sep	Oct	Nov	Dec	]	
(86)m=	1	0.99	0.97	0.88	0.68	0.4	<del></del>	0.39	<del>-</del>	0.93	0.99	1		(86)
			<u> </u>			<u> </u>		<u> </u>	ļ	0.55	0.55		J	(33)
			1				steps 3 to 7	ı		ī		1	1	(O-)
(87)m=	20.46	20.56	20.73	20.91	20.99	2	1 21	21	20.99	20.89	20.64	20.44		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwe	lling from Ta	ble 9,	Th2 (°C)				_	
(88)m=	20.35	20.36	20.36	20.37	20.37	20.	38 20.38	20.38	3 20.37	20.37	20.36	20.36		(88)
Utilisa	ation fac	tor for g	ains for r	est of d	welling, l	h2,m	ı (see Table	9a)						
(89)m=	0.99	0.99	0.96	0.85	0.64	0.4	<u> </u>	0.34	0.59	0.9	0.99	1		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													J	
(90)m=	19.63	19.77	20.01	20.27	20.36	20.		20.38		20.24	19.91	19.61	1	(90)
(00)=	10.00	10.77	20.01	20.21	20.00		20.00			Į	<u> </u>		0.33	``
	$fLA = Living area \div (4) = 0.33 $ (91)													
			<del> </del>				$=$ fLA $\times$ T1	<del>`</del>		i e			1	(00)
(92)m=	19.9	20.03	20.25	20.48	20.56	20.		20.58		20.45	20.15	19.88		(92)
							from Table	ı	<del> </del>	·	1 00 45	1,000	1	(02)
(93)m=	19.9	20.03	20.25	20.48	20.56	20.	58 20.58	20.58	3 20.57	20.45	20.15	19.88		(93)
			uirement				1 -1 - 44 - 6	T-1.1.	Oh a sub a	( T' /	70)	dan and	. lata	
			ernai ten or gains i			ied a	it step 11 of	rabie	9b, so tha	it 11,m=(	76)m an	a re-caio	culate	
	Jan	Feb	Mar	Apr	May	Jı	un Jul	Au	g Sep	Oct	Nov	Dec	]	
Utilisa			ains, hm						9   00		1		J	
(94)m=	0.99	0.99	0.96	0.86	0.65	0.4	14 0.31	0.35	0.61	0.91	0.98	1	]	(94)
Usefu	ıl gains,	hmGm	, W = (94	l)m x (84	4)m			!		1		ļ.	ı	
(95)m=	447.5	485.21	518.82	516.06	425.35	286	.27 190.7	199.7	2 309.6	415.76	426.47	429.76		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able	8						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 mea	an intern	al tempe	erature,	Lm ,	W =[(39)m :	x [(93)	m– (96)m	]			•	
(97)m=	776.59	751.07	680.38	564.81	431.05	286	6.5 190.71	199.7	5 312.02	479.11	638.21	771.44		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/n	nonth = 0.02	24 x [(9	97)m – (95	)m] x (4	1)m		_	
(98)m=	244.84	178.66	120.2	35.1	4.24	C	0	0	0	47.13	152.45	254.21		
								Т	otal per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	1036.84	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								14.26	(99)
9 <u>b. En</u>	ergy rec	uiremer	nts – Con	nm <u>unitv</u>	heating	sche	eme							

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (	0	(301)											
Fraction of space heat from community system 1 – (301) =	1	(302)											
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.													
Fraction of heat from Community heat pump	(302) x (303a) =	1	(303a)										
Fraction of total space heat from Community heat pump	1	(304a)											
Factor for control and charging method (Table 4c(3)) for commu	1	(305)											
Distribution loss factor (Table 12c) for community heating system	1.1	(306)											
Space heating Annual space heating requirement	<b>kWh/year</b> 1036.84												
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1140.52	(307a)										
Efficiency of secondary/supplementary heating system in % (fro	m Table 4a or Appendix E)	0	(308										
Space heating requirement from secondary/supplementary syst	em (98) x (301) x 100 ÷ (308) =	0	(309)										
Water heating	-	0050.00	_ ¬										
Annual water heating requirement  If DHW from community scheme:	l	2052.08	_										
Water heat from Community heat pump	2257.29	(310a)											
Electricity used for heat distribution	33.98	(313)											
Cooling System Energy Efficiency Ratio	0	(314)											
Space cooling (if there is a fixed cooling system, if not enter 0)	0	(315)											
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	152.78	(330a)											
warm air heating system fans	Ī	0	(330b)										
pump for solar water heating		0	(330g)										
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	152.78	(331)										
Energy for lighting (calculated in Appendix L)	Ī	320.42	(332)										
Electricity generated by PVs (Appendix M) (negative quantity)	Ī	-615.76	(333)										
Electricity generated by wind turbine (Appendix M) (negative qu	antity)	0	(334)										
12b. CO2 Emissions – Community heating scheme													
	Energy Emission factor I kWh/year kg CO2/kWh I	Emissions kg CO2/year											
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	g two fuels repeat (363) to (366) for the second fuel	319	(367a)										
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x 0.52 =	552.81	(367)										
Electrical energy for heat distribution	[(313) x	17.63	(372)										
Total CO2 associated with community systems	(363)(366) + (368)(372) =	570.44	(373)										
CO2 associated with space heating (secondary)	(309) x 0 =	0	(374)										
CO2 associated with water from immersion heater or instantane	eous heater (312) x 0.52 =	0	(375)										

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 570.44 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 79.29 CO2 associated with electricity for lighting (332))) x (379) 0.52 166.3 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380)0.52 -319.58 sum of (376)...(382) =Total CO2, kg/year 496.45 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)6.83 El rating (section 14) (385)94.35

			User D	)otoilo:										
Assessor Name: Software Name:	John Simpson Stroma FSAP 20		Strom Softwa	are Vei	0006273 on: 1.0.4.26									
Property Address: GT 108  Address: GT 108, Aspen Court, Maitland Park Estate, London, NW3 2EH														
1. Overall dwelling dimensions:														
Ground floor				<b>a(m²)</b> 72.7	(1a) x		<b>ight(m)</b> 2.6	(2a) =	<b>Volume(m³</b> 189.02	(3a)				
Total floor area TFA = (1	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n) [	72.7	(4)									
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	189.02	(5)				
2. Ventilation rate:														
Number of chimneys  Number of open flues  Number of intermittent fa	heating	secondar heating 0	-y 	0 0	] = [	0 0	x 2	40 = 20 = 10 =	m³ per hou	(6a)				
Number of intermittent is	ans				L	3			30	(7a)				
Number of passive vents	S					0	X '	10 =	0	(7b)				
Number of flueless gas f	fires					0	X 4	40 =	0	(7c)				
	Air changes per hour													
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	′a)+(7b)+(	7c) =	Г	30		÷ (5) =	0.16	(8)				
If a pressurisation test has	been carried out or is intend	ded, procee	d to (17), (	otherwise o	ontinue fr	om (9) to	(16)			<b>_</b>				
Number of storeys in t	the dwelling (ns)								0	(9)				
Additional infiltration							[(9)	-1]x0.1 =	0	(10)				
deducting areas of open	oresent, use the value corre ings); if equal user 0.35	sponding to	the great	er wall are	a (after	ruction			0	(11)				
If suspended wooden	•	aled) or 0	. i (seale	ea), eise	enter 0				0	(12)				
If no draught lobby, er Percentage of window		etrinned							0	(13)				
Window infiltration	75 and doors draught s	stripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)				
Infiltration rate				(8) + (10)			+ (15) =		0	(16)				
Air permeability value	, q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)				
If based on air permeabi	ility value, then (18) = [(	17) ÷ 20]+(	8), otherw	ise (18) = (	16)				0.41	(18)				
Air permeability value appli	es if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			_				
Number of sides shelter	ed			(20) – 1	'0 075 v /4	10)1 —			1	(19)				
Shelter factor	ting aboltor factor			(20) = 1 - (21) = (18)		9)] =			0.92	(20)				
Infiltration rate incorpora	•	. ا		(21) = (10)	(20) =				0.38	(21)				
Infiltration rate modified  Jan Feb	<del></del>	1	Jul	L	Son	Oct	Nov	Dec	1					
	1 ' 1	Jun	Jui	Aug	Sep	Oct	INOV	Dec	J					
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1					
(22)111- 3.1 3	7.0 4.4 4.3	3.0	3.0	] 3.7	4	4.3	4.5	I 4.1	J					
Wind Factor (22a)m = (2	22)m ÷ 4	_							,					
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18						

0.48	0.47	0.46	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.43	0.44		
alculate effec		_	rate for t	he appli	cable ca	se	!				!		——— <i>"</i>
If mechanical If exhaust air he			andiv N. (2	3h) _ (22c	a) v Emy (c	auation (N	VEVV othor	avica (22h	) - (222)			0	(2
If balanced with									) = (25a)			0	(2
		•		_					2h\ //	00h) [/	1 (00.0)	0	(2
a) If balance	o mecha o	o lical ve	0	o with ries	0		1K) (248	0	0	230) <b>x</b> [	0	) <del>-</del> 100] ]	(2
b) If balance			-	_								]	(-
4b)m= 0	0	o lical ve	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h	-								Ů			]	\-
if (22b)n				•	•				5 x (23b	))			
1c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	n from l	oft				J	
if (22b)n				•	•				0.5]				
1d)m= 0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(
. Heat losse	e and he	at lose r	aramot	or.								-	
. Heat losse LEMENT	Gros	·	Openin		Net Ar	A2	U-valı	ام	AXU		k-value	Δ	ΑXk
_EIVIEIN I	area	-	m		A,r		W/m2		(W/I	۲)	kJ/m <sup>2</sup> ·		kJ/K
indows Type	: 1				2.24	x1.	/[1/( 1.4 )+	0.04] =	2.97				(
indows Type	2				2.24	x1.	/[1/( 1.4 )+	0.04] =	2.97				(:
indows Type	3				9.25	x1.	/[1/( 1.4 )+	0.04] =	12.26				(
indows Type	4				2.24	x1.	/[1/( 1.4 )+	0.04] =	2.97				(
alls	67.0	08	15.9	7	51.11	x	0.18	[	9.2	=		$\neg$ $\vdash$	(
otal area of e					67.08	=							) ` (;
arty wall		,			28.21	=	0		0	<b>—</b> [		¬ г	` (
or windows and	roof winde	ows, use e	ffective wi	ndow U-va						L ns aiven in	paragrapi		(
include the area						a.co a a.og		1( // 0 1 4 / 4	,	.c g	paragrap.	. 0.=	
bric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				30.3	7 (
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Medium		250	(
r design assess				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste						,							
ermal bridge	,	•			•	`						5.92	2 (
letails of therma Ital fabric he		are not kn	own (36) =	<i>0.05 x</i> (3	(1)			(33) +	(36) =			36.29	9 (
ntilation hea		alculated	l monthly	/					= 0.33 × (	25)m x (5)	)		(
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
38.43	38.15	37.88	36.58	36.34	35.21	35.21	35	35.65	36.34	36.83	37.34	†	(
	-			<u> </u>		l	L		I	<u> </u>		J	`
eat transfer o	oofficiar	nt \///✓						(30)~	=(37)+(37)	38)m			

Heat loss para	ameter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.03	1.02	1.02	1	1	0.98	0.98	0.98	0.99	1	1.01	1.01		
	ı					ı	ı		Average =	Sum(40) <sub>1</sub> .	12 /12=	1	(40)
Number of day	ys in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heating energy requirement: kWh/year:													
Assumed occupancy, N													
Reduce the annu	Annual average hot water usage in litres per day Vd,average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								- 1					
(44)m= 97.96	94.4	90.84	87.28	83.72	80.15	80.15	83.72	87.28	90.84	94.4	97.96		
	Į.	<u>!</u>		<u>!</u>	ļ.	<u> </u>	<u> </u>		Total = Su	m(44) <sub>112</sub> =	=	1068.71	(44)
Energy content of	Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)												
(45)m= 145.28	127.06	131.12	114.31	109.68	94.65	87.71	100.64	101.85	118.69	129.56	140.69		
16 ' 1 1			-6 (	- 1-1	( )		h (40		Total = Su	m(45) <sub>112</sub> =	= [	1401.24	(45)
If instantaneous v			,		· · ·	ı	, ,	, , , <del>,</del>	1	i			
(46)m= 21.79 Water storage	19.06	19.67	17.15	16.45	14.2	13.16	15.1	15.28	17.8	19.43	21.1		(46)
Storage volum		) includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•					_							( )
Otherwise if n	_			-			, ,	ers) ente	er '0' in (	47)			
Water storage													
a) If manufac	turer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	factor fro	m Table	2b							0.	54		(49)
Energy lost fro		Ū					(48) x (49)	) =		0.	75		(50)
b) If manufact Hot water stor			-								0		(51)
If community h	•			10 2 (1000)	11/11(10)(40	•97					0		(01)
Volume factor	_										0		(52)
Temperature f	factor fro	m Table	2b								0		(53)
Energy lost fro	om watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or	(54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	(55) × (41)	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 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	хН	
(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	t loss (ar	nnual) fro	m Table	 - 3							0		(58)
Primary circuit	,	•			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	y factor f	rom Tab	le H5 if t	here is s	solar 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)

Combi	Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m=	0	0	0	1 monun 1 0	0	00) +	0	)III   0		0	0	0	0	]	(61)
L							<u>ļ</u>	<u> </u>				ļ	<u> </u>	J (59)m + (61)m	` '
(62)m=	191.87	·	177.71	— <u> </u>	156.28	139.74	_	147.	_	146.94	165.29	174.65	187.29	]	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)												I			
		al lines if											0,		
(63)m=	0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output	from v	vater hea	ter	•	•	•	•					•	•	•	
(64)m=	191.87	169.15	177.71	159.4	156.28	139.74	134.3	147.	.24	146.94	165.29	174.65	187.29		
_		•					•		Outp	out from w	ater heate	r (annual) <sub>1</sub>	112	1949.86	(64)
Heat ga	ains fro	om water	heating	g, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	า + (6	1)m	1] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	]	
(65)m=	85.58	75.92	80.87	74.08	73.75	67.54	66.44	70.7	74	69.94	76.74	79.15	84.06		(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating															
5. Inte	ernal g	ains (see	Table	5 and 5a	a):										
Metabo	olic gai	ns (Table	5), Wa	itts											
[	Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(66)m=	115.49	115.49	115.49	115.49	115.49	115.49	115.49	115.	49	115.49	115.49	115.49	115.49		(66)
Lighting	Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
(67)m=	18.15	16.12	13.11	9.93	7.42	6.26	6.77	8.8	3	11.81	14.99	17.5	18.66		(67)
Applian	Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
(68)m=	203.51	205.63	200.3	188.98	174.67	161.23	152.25	150.	.14	155.46	166.79	181.09	194.54		(68)
Cookin	g gain:	s (calcula	ted in A	Appendix	L, equa	tion L1	or L15a	), also	o se	e Table	5		-		
(69)m=	34.55	34.55	34.55	34.55	34.55	34.55	34.55	34.5	55	34.55	34.55	34.55	34.55		(69)
Pumps	and fa	ans gains	(Table	5a)											
(70)m=	3	3	3	3	3	3	3	3		3	3	3	3		(70)
Losses	e.g. e	vaporatio	n (neg	ative val	ues) (Tab	le 5)									
(71)m=	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.39	-92.	39	-92.39	-92.39	-92.39	-92.39		(71)
Water h	neating	g gains (T	able 5)											_	
(72)m=	115.03	112.97	108.7	102.89	99.12	93.81	89.3	95.0	08	97.14	103.15	109.93	112.98		(72)
Total in	nterna	l gains =	:			(6	6)m + (67)n	n + (68	)m +	- (69)m +	(70)m + (7	'1)m + (72)	)m	_	
(73)m=	397.34	395.37	382.76	362.44	341.86	321.96	308.97	314.	.67	325.05	345.58	369.18	386.82		(73)
6. Sola	Ť														
_		calculated	_					ations t	0 CO	nvert to th	e applical		tion.		
Orienta		Access F Table 6d		Area m²	a		ux able 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
NI d								, r	- 1					. ,	,
North	0.9x	0.77	_	-	25	X _	10.63	X		0.63	x	0.7	=	30.06	[74]
North	0.9x	0.77	_		24	X	10.63	] X [		0.63	x	0.7	=	7.28	<b> 1</b> (74)
North	0.9x	0.77	_		25	×	20.32	]		0.63	_  ×	0.7	=	57.45	<b> 1</b> (74)
North	0.9x		<del></del>	_	24	x	20.32	] X [		0.63	x	0.7	=	13.91	<b> 1</b> (74)
North	0.9x	0.77		9.	25	X	34.53	X		0.63	X	0.7	=	97.61	(74)

	_		_		_						_		_
North	0.9x	0.77	X	2.24	X	34.53	X	0.63	X	0.7	=	23.64	(74)
North	0.9x	0.77	X	9.25	x	55.46	X	0.63	X	0.7	=	156.79	(74)
North	0.9x	0.77	X	2.24	X	55.46	x	0.63	X	0.7	=	37.97	(74)
North	0.9x	0.77	X	9.25	X	74.72	X	0.63	X	0.7	=	211.22	(74)
North	0.9x	0.77	X	2.24	x	74.72	X	0.63	X	0.7	=	51.15	(74)
North	0.9x	0.77	X	9.25	X	79.99	X	0.63	X	0.7	=	226.11	(74)
North	0.9x	0.77	X	2.24	x	79.99	X	0.63	X	0.7	=	54.76	(74)
North	0.9x	0.77	X	9.25	x	74.68	x	0.63	X	0.7	=	211.1	(74)
North	0.9x	0.77	X	2.24	x	74.68	X	0.63	X	0.7	=	51.12	(74)
North	0.9x	0.77	X	9.25	x	59.25	X	0.63	X	0.7	=	167.48	(74)
North	0.9x	0.77	X	2.24	x	59.25	X	0.63	X	0.7	=	40.56	(74)
North	0.9x	0.77	X	9.25	X	41.52	X	0.63	X	0.7	=	117.36	(74)
North	0.9x	0.77	X	2.24	x	41.52	x	0.63	X	0.7	=	28.42	(74)
North	0.9x	0.77	X	9.25	X	24.19	x	0.63	X	0.7	=	68.38	(74)
North	0.9x	0.77	X	2.24	X	24.19	x	0.63	X	0.7	=	16.56	(74)
North	0.9x	0.77	X	9.25	x	13.12	x	0.63	X	0.7	=	37.08	(74)
North	0.9x	0.77	X	2.24	X	13.12	x	0.63	X	0.7	=	8.98	(74)
North	0.9x	0.77	X	9.25	x	8.86	X	0.63	X	0.7	=	25.06	(74)
North	0.9x	0.77	X	2.24	x	8.86	x	0.63	X	0.7	=	6.07	(74)
East	0.9x	0.77	X	2.24	x	19.64	x	0.63	X	0.7	=	13.45	(76)
East	0.9x	0.77	X	2.24	x	19.64	x	0.63	X	0.7	=	13.45	(76)
East	0.9x	0.77	X	2.24	x	38.42	x	0.63	X	0.7	=	26.3	(76)
East	0.9x	0.77	X	2.24	x	38.42	x	0.63	X	0.7	=	26.3	(76)
East	0.9x	0.77	X	2.24	x	63.27	x	0.63	X	0.7	=	43.32	(76)
East	0.9x	0.77	X	2.24	x	63.27	x	0.63	X	0.7	=	43.32	(76)
East	0.9x	0.77	X	2.24	x	92.28	x	0.63	X	0.7	=	63.17	(76)
East	0.9x	0.77	X	2.24	x	92.28	x	0.63	X	0.7	=	63.17	(76)
East	0.9x	0.77	X	2.24	x	113.09	x	0.63	x	0.7	=	77.42	(76)
East	0.9x	0.77	X	2.24	x	113.09	x	0.63	x	0.7	=	77.42	(76)
East	0.9x	0.77	X	2.24	x	115.77	x	0.63	x	0.7	=	79.25	(76)
East	0.9x	0.77	X	2.24	x	115.77	X	0.63	X	0.7	=	79.25	(76)
East	0.9x	0.77	X	2.24	x	110.22	X	0.63	X	0.7	=	75.45	(76)
East	0.9x	0.77	X	2.24	x	110.22	X	0.63	X	0.7	=	75.45	(76)
East	0.9x	0.77	X	2.24	x	94.68	X	0.63	X	0.7	=	64.81	(76)
East	0.9x	0.77	X	2.24	x	94.68	X	0.63	X	0.7	=	64.81	(76)
East	0.9x	0.77	X	2.24	x	73.59	x	0.63	x	0.7	j =	50.38	(76)
East	0.9x	0.77	x	2.24	x	73.59	x	0.63	x	0.7	j =	50.38	(76)
East	0.9x	0.77	x	2.24	x	45.59	x	0.63	x	0.7	j =	31.21	(76)
East	0.9x	0.77	x	2.24	x	45.59	x	0.63	x	0.7	j =	31.21	(76)
East	0.9x	0.77	X	2.24	х	24.49	x	0.63	x	0.7	j =	16.76	(76)
East	0.9x	0.77	×	2.24	х	24.49	x	0.63	X	0.7	j =	16.76	(76)
	_		_								_		

	_													
East	0.9x	0.77	X	2.2	24	X	16.15	X	0.63	×	0.7	=	11.06	(76)
East	0.9x	0.77	X	2.2	24	x	16.15	X	0.63	×	0.7	=	11.06	(76)
Solar	gains in	watts, ca	alculated	for eac	h month	_		(83)m = $8$	Sum(74)m .	(82)m				
(83)m=	64.23	123.96	207.88	321.11	417.2	439.3	413.13	337.67	246.54	147.36	79.59	53.24		(83)
Total g	ains – ii	nternal a	and solar	(84)m =	= (73)m	+ (83)	m , watts			•	•			
(84)m=	461.57	519.33	590.65	683.55	759.07	761.3	33 722.1	652.34	571.59	492.94	448.77	440.06		(84)
7. Me	an inter	nal temp	erature	(heating	season	)								
Temp	erature	during h	neating p	eriods ir	n the livi	ng are	a from Tal	ole 9, Th	n1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(see	Table 9a)					1		_
	Jan	Feb	Mar	Apr	May	Jui		Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.8	0.59	-	0.5	0.78	0.97	0.99	1		(86)
			<u> </u>		<u> </u>	<u> </u>		<u> </u>	<u> </u>					, ,
Mean		· ·	1		· `	1	steps 3 to 7	1	<u> </u>			ı	1	
(87)m=	19.96	20.1	20.35	20.68	20.9	20.9	9 21	21	20.94	20.63	20.24	19.94	I	(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelli	ng from Ta	able 9, T	h2 (°C)					
(88)m=	20.06	20.06	20.07	20.08	20.08	20.1	<u> </u>	20.1	20.09	20.08	20.08	20.07		(88)
			. ,			<u> </u>			<u> </u>	<u> </u>	<u> </u>			
			1				(see Table		1			1 1	l	(22)
(89)m=	1	0.99	0.98	0.91	0.74	0.51	0.35	0.4	0.71	0.95	0.99	1	I	(89)
Mean	interna	l temper	ature in t	the rest	of dwelli	ing T2	(follow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m=	18.67	18.88	19.24	19.71	20	20.0	9 20.1	20.1	20.04	19.66	19.1	18.66		(90)
			!!		Į.				1	fLA = Livin	g area ÷ (4	4) =	0.33	(91)
														` ′
			<del>`</del>			<del></del>	= fLA × T1	<u> </u>	<del>1                                    </del>				1	
(92)m=	19.09	19.28	19.6	20.03	20.29	20.3	8 20.39	20.39	20.34	19.98	19.47	19.08	I	(92)
Apply	adjustn	nent to t	he mean	interna	temper	ature	from Table	4e, wh	ere appr	opriate				
(93)m=	19.09	19.28	19.6	20.03	20.29	20.3	8 20.39	20.39	20.34	19.98	19.47	19.08		(93)
8. Sp	ace hea	ting requ	uirement											
Set T	i to the r	mean int	ernal ter	nperatu	re obtair	ned at	step 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains i	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jui	n Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:						_	_			
(94)m=	1	0.99	0.97	0.91	0.76	0.54	0.37	0.43	0.73	0.95	0.99	1		(94)
Usefu	ıl gains,	hmGm	W = (94)	1)m x (8	4)m		•			•	•	•		
(95)m=	459.37	514.35	575.34	622.83	573.48	407.5	55 270.46	283.17	418.15	467.96	444.27	438.42		(95)
Month	hly avera	age exte	rnal tem	perature	from Ta	able 8						<u> </u>		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6		16.4	14.1	10.6	7.1	4.2		(96)
	loss rate	for me	ı	al tempe	ı erature	Im \	V =[(39)m	x [(93)m	ı (96)m	1	<u> </u>			
(97)m=		1070.16	971.5	810.8	624.13	413.4	<del></del>	284.57	448.54	680.9	904.77	1095.44		(97)
					l .	<u> </u>	onth = 0.02							(- /
•	480.63	373.51	294.75	135.34	37.69	0	0.02	0	0	158.42	331.56	488.83		
(98)m=	460.63	3/3.51	294.75	135.34	37.09							<u> </u>		7(00)
								Tota	al per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	2300.72	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								31.65	(99)
9a En	eray rec	uiremer	nts — Indi	vidual b	eating s	vstem	s including	micro-(	CHB)					
		•	<del>no-</del> mai	<del>vid</del> ual II	odany s	yoloni	<del>o inclu</del> dirig	<del>- mioro-</del> (	<del>51 11 )                                </del>					
-	e heatir	_	at from se	200ndar	v/sunnle	ment	ary system					ı	0	(201)
ı racı	ion or sp	400 HE	at ITOIII St	Journal	y/3uppie	<del></del>	ary Systeill							(201)

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)  480.63   373.51   294.75   135.34   37.69	0	0	0	0	158.42	331.56	488.83	l	
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$					100.42	331.30	400.00	l	(211)
514.05   399.47   315.24   144.75   40.31	0	0	0	0	169.44	354.61	522.81		(211)
			Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	2460.67	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0 ar) =Sum(2	0	0		7(245)
Water heating			TOla	i (KVVII/yea	ai) =Suiii(2	213) <sub>15,1012</sub>		0	(215)
Output from water heater (calculated above)									
, , , , , , , , , , , , , , , , , , , ,	39.74	134.3	147.24	146.94	165.29	174.65	187.29		
Efficiency of water heater								79.8	(216)
` '	79.8	79.8	79.8	79.8	84.7	86.5	87.26		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	75.11	168.3	184.51	184.13	195.14	201.91	214.64		
			Tota	I = Sum(21	19a) <sub>112</sub> =			2325.1	(219)
Annual totals					k\	Wh/year	•	kWh/year	¬
Space heating fuel used, main system 1								2460.67	_
Water heating fuel used								2325.1	
Electricity for pumps, fans and electric keep-hot									
								1	
central heating pump:							30		(230c)
central heating pump: boiler with a fan-assisted flue							30 45		(230c) (230e)
• • •			sum	of (230a).	(230g) =			75	
boiler with a fan-assisted flue			sum	of (230a).	(230g) =			75 320.55	(230e)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year	s inclu	ding mid		, ,	(230g) =				(230e) (231)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting				, ,			45	320.55	(230e) (231) (232)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting	Ene	ding mi e <b>rgy</b> h/year		, ,		ion fac	45		(230e) (231) (232)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting	Ene	<b>ergy</b> h/year		, ,	Emiss	ion fac 2/kWh	45	320.55	(230e) (231) (232)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system	<b>Ene</b> kWl	e <b>rgy</b> h/year		, ,	Emiss kg CO	ion fac 2/kWh	45	320.55  Emissions kg CO2/yea	(230e) (231) (232)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	<b>Ene</b> kWI (211)	ergy h/year ) x		, ,	Emiss kg CO2	ion fac 2/kWh 16	45 tor =	320.55  Emissions kg CO2/yes	(230e) (231) (232) (232) (261)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)	Ene kWl (211) (215) (219)	ergy h/year ) × ) ×			Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16	45 <b>tor</b> = =	Emissions kg CO2/yea 531.5	(230e) (231) (232) (232) (261) (263)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating  Space and water heating	Ene kWl (211) (215) (219)	ergy h/year ) x ) x ) x	cro-CHP		Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	45 <b>tor</b> = =	320.55  Emissions kg CO2/yea  531.5  0  502.22  1033.73	(230e) (231) (232) (232) (261) (263) (264) (265)
boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating	Ene kWl (211) (215) (219) (261)	ergy h/year ) x ) x ) x ) + (262) -	cro-CHP		Emiss kg CO2 0.2 0.5	ion fac 2/kWh 16 19 16	45 tor = =	320.55  Emissions kg CO2/yea  531.5  0  502.22	(230e) (231) (232) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1239.01 (272)

 $TER = 24.86 \tag{273}$ 

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:34:40

Project Information:

Assessed By: John Simpson (STRO006273) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 90.4m<sup>2</sup>

Site Reference: Maitland Park Estate

Plot Reference: GT 303

Address: GT 303, Aspen Court, Maitland Park Estate, London, NW3 2EH

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 20.47 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 5.57 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 33.4 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.12 (max. 0.30) 0.12 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK

Floor (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 2.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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
B Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	ОК
MVHR efficiency:	90%	
Minimum	70%	OK
Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
ased on:		
Overshading:	Average or unknown	
Windows facing: East	9.25m²	
Windows facing: East	1.5m <sup>2</sup>	
Windows facing: East	4.01m²	
Windows facing: South	3.95m²	
Windows facing: South	2.24m²	
Windows facing: East	1.5m²	
Windows facing: South	1.5m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
Roofs U-value	0.1 W/m²K	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

			lloor D	) otoilo						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20 <sup>-</sup>		User D	Strom Softwa	are Vei	rsion:			0006273 on: 1.0.4.26	
Address :	GT 303, Aspen Co			Address			PEH			
1. Overall dwelling dim	·	art, manie	and r dii	t Lotato,	London	, 14000 2				
Ground floor				a(m²)	(1a) x		ight(m) 2.6	(2a) =	Volume(m <sup>3</sup>	(3a)
Total floor area TFA = (	15) (16) (16) (16) (17)	a)ı (1r						]( 3)	200.01	(2.37)
	1a)+(1b)+(1c)+(1u)+(1t	<i>=)</i> +(11	')	90.4	(4)	· (a ) (a	n (o )	(5.)		_
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	235.04	(5)
2. Ventilation rate:	ain			04h o #		40401			ma3 m a m la a m	
Number of chimneys		econdar heating 0	у ] + [	other 0	] = [	total 0	x 4	40 =	m³ per hou	(6a)
Number of open flues	0 +	0		0	j = F	0	x	20 =	0	(6b)
Number of intermittent f	ans					0	x	10 =	0	(7a)
Number of passive vent					L			10 =		= ' '
·					Ļ	0			0	(7b)
Number of flueless gas	tires				L	0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimn	evs flues and fans = (6	Sa)+(6b)+(7	7a)+(7b)+(	(7c) =	Г	0		÷ (5) =	0	(8)
	been carried out or is intend				continue fr	_		<del>.</del> (3) =	0	(0)
Number of storeys in		.,	, ,,				, ,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timber	frame or	0.35 fo	r masonı	y constr	uction			0	(11)
	present, use the value corre nings); if equal user 0.35	sponding to	the great	ter wall are	a (after					
• .	ı floor, enter 0.2 (unsea	led) or 0	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0	,	`	,,					0	(13)
Percentage of window	ws and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
•	e, q50, expressed in cul		•	•	•	etre of e	envelope	area	2	(17)
If based on air permeab	•								0.1	(18)
Air permeability value appl Number of sides shelter	lies if a pressurisation test ha	s been dor	ne or a de	gree air pe	rmeability	is being u	sed			7(10)
Shelter factor	leu			(20) = 1 -	[0.075 x (1	[9)] <b>=</b>			0.85	(19) (20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	) x (20) =				0.08	(21)
Infiltration rate modified	-	d							0.00	(= - /
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind s	1 . 1 .	!	l .	<u> </u>	•	l .		l .	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	1	
		1	ı		<u> </u>	ı		I.	1	
Wind Factor (22a)m = (	<del>'</del>						_		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		

Adjusted infiltra	ation rate (allov	ving for sl	nelter an	ıd wind s	speed) =	: (21a) x	(22a)m					
0.11	0.11 0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1	]	
Calculate effec	_	rate for t	he appli	cable ca	se							
If mechanica		nandiy N. /	)2h) (22a	a) Fan. (	aguatian (	NEW atho	muiaa (22h	) (220)			0.5	(23a)
	eat pump using Ap							) = (23a)			0.5	(23b)
	heat recovery: eff		_					Ola \ (	00h) [4	4 (00-)	76.5	(23c)
a) if balance (24a)m= 0.23	d mechanical v	0.21	0.21	at recov	0.2	HR) (248	m = (2.0) $0.2$	2b)m + (. 0.21	23b) <b>x</b> [*	0.22	) ÷ 100] ]	(24a)
` ′	d mechanical v					<u> </u>	ļ		<u> </u>	0.22		(244)
(24b)m= 0		0	0	0	0	0	0	0	0	0	1	(24b)
( 1/	ouse extract ve										J	(=)
,	$0.5 \times (23b)$		•	•				.5 × (23b	o)			
(24c)m= 0	0 0	O	0	0	0	0	0	0	0	0	]	(24c)
d) If natural	ventilation or w	hole hous	se positiv	ve input	ventilati	on from	loft		l			
if (22b)n	n = 1, then (24d	d)m = (22)	b)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24d)
	change rate - e	<del></del>	<del>i ` </del>	<del>í ` ` </del>	c) or (24	ld) in bo	x (25)	1		1	1	
(25)m= 0.23	0.22 0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(25)
3. Heat losse	s and heat loss	paramet	er:									
ELEMENT	Gross area (m²)	Openir m		Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²-		A X k kJ/K
Windows Type	<u>:</u> 1			9.25	x1	/[1/( 1.4 )+	0.04] =	12.26				(27)
Windows Type	2			1.5	<u>x</u> 1	/[1/( 1.4 )+	0.04] =	1.99				(27)
Windows Type	3			4.01	<u>x</u> 1	/[1/( 1.4 )+	0.04] =	5.32				(27)
Windows Type	· 4			3.95	<u>x</u> 1	/[1/( 1.4 )+	0.04] =	5.24				(27)
Windows Type	5			2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(27)
Windows Type	6			1.5	x1	/[1/( 1.4 )+	0.04] =	1.99	=			(27)
Windows Type	· 7			1.5	x1	/[1/( 1.4 )+	0.04] =	1.99	=			(27)
Walls	54.86	23.9	5	30.9	x	0.12	i	3.71	<b>=</b>			(29)
Roof	14.8	0		14.8	x	0.1	<u> </u>	1.48	F i		7 F	(30)
Total area of e	lements, m <sup>2</sup>			69.66	<u> </u>							(31)
Party wall				54.86	3 x	0		0				(32)
* for windows and ** include the area					lated using	g formula 1	/[(1/U-valu	ıе)+0.04] а	as given in	paragrapl	n 3.2	
Fabric heat los						(26)(30	) + (32) =				36.94	(33)
Heat capacity	$Cm = S(A \times k)$						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parameter (TM	1P = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste			construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L x Y) ca	alculated	using Ap	pendix l	K						9.48	(36)
if details of therma	al bridging are not l	known (36) :	= 0.05 x (3	31)								
Total fabric he	at loss						(33) +	(36) =			46.42	(37)

Ventila	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.52	17.35	17.19	16.37	16.2	15.38	15.38	15.21	15.71	16.2	16.53	16.86		(38)
Heat tra	ansfer c	coefficier	nt, W/K					•	(39)m	= (37) + (37)	38)m			
(39)m=	63.94	63.78	63.61	62.79	62.62	61.8	61.8	61.63	62.13	62.62	62.95	63.28		
Heat lo	ss para	meter (H	HLP), W	m²K				•		Average = = (39)m ÷	Sum(39) <sub>1.</sub> · (4)	12 /12=	62.75	(39)
(40)m=	0.71	0.71	0.7	0.69	0.69	0.68	0.68	0.68	0.69	0.69	0.7	0.7		
Numbe	er of day	s in moi	nth (Tab	le 1a)				•		Average =	Sum(40) <sub>1.</sub>	12 /12=	0.69	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
•								•			•			
4. Wa	ter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum	ed occu	ıpancy, l	N								2.	63		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.	.9)			
			ater usaç	,	•	•	_	` ,				.69		(43)
		-	hot water person per	• •		-	-	to acnieve	a water us	se target o	Ι			
[	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						Оер	Oct	1404	Dec		
(44)m=	106.36	102.49	98.62	94.76	90.89	87.02	87.02	90.89	94.76	98.62	102.49	106.36		
` ′ [											<u> </u> m(44) <sub>112</sub> =	l	1160.28	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	157.73	137.95	142.35	124.11	119.08	102.76	95.22	109.27	110.57	128.86	140.66	152.75		
If instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1521.31	(45)
(46)m=	23.66	20.69	21.35	18.62	17.86	15.41	14.28	16.39	16.59	19.33	21.1	22.91		(46)
	storage							•			!			
•		` ,	includir	•			•		ame ves	sel		0		(47)
	-	_	ind no ta		-			. ,		(01.1 /	47)			
	rise ii no storage		hot wate	er (unis ir	iciudes i	nstantar	ieous cc	ווטט וטווזע	ers) ente	er o in (	47)			
	U		eclared I	oss facto	or is kno	wn (kWh	n/day):					0		(48)
,			m Table			,	• ,					0		(49)
•			· storage		ear			(48) x (49)	) =			10		(50)
b) If m	anufact	urer's de	eclared o	cylinder l	oss fact									` ,
		_	factor fr		e 2 (kW	h/litre/da	ıy)				0.	02		(51)
	-	leating s from Ta	ee secti	on 4.3								20		(50)
			m Table	2b								.6		(52) (53)
			storage		ear			(47) x (51)	) x (52) x (	53) =		03		(54)
		(54) in (5	_	,vii/yt	<i>-</i>			( ) A (O )	, ( <del>)</del>			03		(54)
	` ' '	. , .	culated f	for each	month			((56)m = (	55) × (41)	m	<u>'</u>	- <del>-</del>		(/
(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)
\/=	01		I	1 -0.00	I	1 -0.00	L	I'	1 -0.00	1 -2.01	1 -0.00	1 -2.0		()

If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix 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	loss (ar	nual) fro	m Table				•	•	•		0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m				•	
(modified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er 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)
Combi loss ca	lculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m					_	
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 213	187.88	197.63	177.6	174.36	156.25	150.5	164.54	164.07	184.14	194.16	208.03		(62)
Solar DHW input	calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add additiona	I lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter										•	
(64)m= 213	187.88	197.63	177.6	174.36	156.25	150.5	164.54	164.07	184.14	194.16	208.03		
		•					Outp	out from w	ater heate	r (annual)	12	2172.15	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 96.67	85.81	91.55	84.06	83.82	76.96	75.88	80.55	79.56	87.07	89.57	95.01		(65)
include (57)	m in cal	culation of	of (65)m	only if c	vlinder is	s in the o	dwelling	or hot w	ater is f	om com	munity h	i neating	
5. Internal ga					<u>,                                      </u>		<u> </u>				,	<u> </u>	
Metabolic gain	·			, .									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56		(66)
Lighting gains	(calcula	ted in Ar		L equat	ion I 9 oi	L rl0a)a	lso see '	L Tahle 5	<u> </u>	<u> </u>	<u> </u>		
(67)m= 21.38	18.99	15.44	11.69	8.74	7.38	7.97	10.36	13.91	17.66	20.61	21.97	]	(67)
Appliances ga	<u> </u>			ļ			ļ	<u> </u>	ļ				(- /
(68)m= 239.81	242.3	236.03	222.68	205.83	189.99	179.41	176.92	183.19	196.54	213.39	229.23	1	(68)
	<u> </u>			<u> </u>			<u> </u>	<u> </u>	ļ	213.39	229.23		(00)
Cooking gains	<del></del>							i e		00.40	L 00.40	1	(60)
(69)m= 36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16		(69)
Pumps and fair	ns gains	(Table 5	5a) 0	0	0	0	0	0	0	0	0	1	(70)
` '	<u> </u>			!		0	U						(10)
Losses e.g. ev (71)m= -105.25	·	,		-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25		(71)
` '	<u> </u>		100.20	100.20	100.20	100.20	100.20	100.20	100.20	100.20	100.20		()
Water heating	<del>~ `</del>		440.75	440.00	400.00	101.99	400.07	140.5	147.00	1044	107.7	1	(72)
(72)m= 129.93	127.69	123.06	116.75	112.66	106.89		108.27	110.5	117.03	124.4	127.7		(12)
Total internal			440.50					+ (69)m +	<del> </del>	<del> </del>	<del> </del>	1	(70)
(73)m= 453.59	451.45	436.99	413.59	389.69	366.73	351.84	358.02	370.07	393.69	420.87	441.37		(73)
6. Solar gains are		ueina cal-	r flux from	Table 6a	and assa	intod acce	tions to se	nvort to th	o appliact	olo orienta	tion		
Solar gains are o		_					uons to cc		ie applicat		uon.	Gaine	
Orientation: A	100622 F	aului	Area		Flu	٨		g_		FF		Gains	

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

Foot	Г		7		ı		1		ı		1		7
East	0.9x	0.77	X	9.25	X	19.64	X	0.4	X	0.8	] = 1	40.29	(76)
East	0.9x	0.77	X	1.5	X	19.64	X	0.4	X	0.8	] =	6.53	(76)
East	0.9x	0.77	X	4.01	X	19.64	X	0.4	X	0.8	] =	17.47	(76)
East	0.9x	0.77	X	1.5	X	19.64	X	0.4	X	0.8	=	6.53	(76)
East	0.9x	0.77	X	9.25	Х	38.42	X	0.4	X	0.8	=	78.81	(76)
East	0.9x	0.77	X	1.5	Х	38.42	X	0.4	X	0.8	=	12.78	(76)
East	0.9x	0.77	X	4.01	Х	38.42	X	0.4	X	0.8	=	34.17	(76)
East	0.9x	0.77	X	1.5	X	38.42	X	0.4	X	0.8	=	12.78	(76)
East	0.9x	0.77	X	9.25	X	63.27	X	0.4	X	0.8	=	129.79	(76)
East	0.9x	0.77	X	1.5	X	63.27	X	0.4	X	0.8	=	21.05	(76)
East	0.9x	0.77	X	4.01	X	63.27	X	0.4	X	0.8	=	56.27	(76)
East	0.9x	0.77	X	1.5	Х	63.27	X	0.4	X	0.8	=	21.05	(76)
East	0.9x	0.77	X	9.25	x	92.28	X	0.4	X	0.8	=	189.29	(76)
East	0.9x	0.77	X	1.5	x	92.28	X	0.4	X	0.8	=	30.7	(76)
East	0.9x	0.77	X	4.01	x	92.28	X	0.4	X	0.8	=	82.06	(76)
East	0.9x	0.77	X	1.5	X	92.28	X	0.4	X	0.8	=	30.7	(76)
East	0.9x	0.77	X	9.25	X	113.09	X	0.4	X	0.8	=	231.98	(76)
East	0.9x	0.77	X	1.5	X	113.09	X	0.4	x	0.8	=	37.62	(76)
East	0.9x	0.77	X	4.01	x	113.09	X	0.4	X	0.8	=	100.57	(76)
East	0.9x	0.77	X	1.5	X	113.09	X	0.4	X	0.8	=	37.62	(76)
East	0.9x	0.77	X	9.25	x	115.77	X	0.4	X	0.8	=	237.48	(76)
East	0.9x	0.77	X	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	X	4.01	X	115.77	X	0.4	X	0.8	=	102.95	(76)
East	0.9x	0.77	X	1.5	X	115.77	X	0.4	X	0.8	=	38.51	(76)
East	0.9x	0.77	X	9.25	X	110.22	X	0.4	X	0.8	=	226.09	(76)
East	0.9x	0.77	X	1.5	X	110.22	X	0.4	X	0.8	=	36.66	(76)
East	0.9x	0.77	X	4.01	x	110.22	X	0.4	X	0.8	=	98.01	(76)
East	0.9x	0.77	X	1.5	x	110.22	x	0.4	x	0.8	=	36.66	(76)
East	0.9x	0.77	X	9.25	X	94.68	X	0.4	x	0.8	=	194.21	(76)
East	0.9x	0.77	X	1.5	x	94.68	x	0.4	x	0.8	] =	31.49	(76)
East	0.9x	0.77	X	4.01	x	94.68	x	0.4	x	0.8	] =	84.19	(76)
East	0.9x	0.77	X	1.5	x	94.68	x	0.4	x	0.8	] =	31.49	(76)
East	0.9x	0.77	X	9.25	x	73.59	X	0.4	x	0.8	=	150.95	(76)
East	0.9x	0.77	X	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(76)
East	0.9x	0.77	X	4.01	x	73.59	x	0.4	x	0.8	] =	65.44	(76)
East	0.9x	0.77	X	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(76)
East	0.9x	0.77	X	9.25	x	45.59	x	0.4	x	0.8	<b>=</b>	93.52	(76)
East	0.9x	0.77	X	1.5	x	45.59	x	0.4	x	0.8	=	15.16	(76)
East	0.9x	0.77	X	4.01	x	45.59	x	0.4	x	0.8	=	40.54	(76)
East	0.9x	0.77	X	1.5	x	45.59	x	0.4	x	0.8	<b>=</b>	15.16	(76)
East	0.9x	0.77	X	9.25	x	24.49	x	0.4	x	0.8	j =	50.23	(76)
	_		_		-		- '		•		-		_

	_		,								,		_
East	0.9x	0.77	X	1.5	X	24.49	X	0.4	X	0.8	=	8.15	(76)
East	0.9x	0.77	X	4.01	X	24.49	X	0.4	X	0.8	=	21.78	(76)
East	0.9x	0.77	X	1.5	X	24.49	X	0.4	X	0.8	=	8.15	(76)
East	0.9x	0.77	X	9.25	X	16.15	X	0.4	X	0.8	=	33.13	(76)
East	0.9x	0.77	X	1.5	x	16.15	X	0.4	X	0.8	=	5.37	(76)
East	0.9x	0.77	X	4.01	X	16.15	X	0.4	X	0.8	=	14.36	(76)
East	0.9x	0.77	X	1.5	x	16.15	X	0.4	X	0.8	=	5.37	(76)
South	0.9x	0.77	X	3.95	x	46.75	x	0.4	x	0.8	=	40.95	(78)
South	0.9x	0.77	X	2.24	X	46.75	X	0.4	X	0.8	=	23.22	(78)
South	0.9x	0.77	X	1.5	x	46.75	X	0.4	X	0.8	=	15.55	(78)
South	0.9x	0.77	X	3.95	x	76.57	X	0.4	x	0.8	=	67.07	(78)
South	0.9x	0.77	X	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	X	1.5	x	76.57	X	0.4	x	0.8	=	25.47	(78)
South	0.9x	0.77	X	3.95	x	97.53	X	0.4	x	0.8	=	85.43	(78)
South	0.9x	0.77	X	2.24	x	97.53	x	0.4	X	0.8	=	48.45	(78)
South	0.9x	0.77	X	1.5	x	97.53	x	0.4	x	0.8	=	32.44	(78)
South	0.9x	0.77	X	3.95	x	110.23	X	0.4	x	0.8	=	96.56	(78)
South	0.9x	0.77	X	2.24	x	110.23	x	0.4	X	0.8	=	54.76	(78)
South	0.9x	0.77	X	1.5	x	110.23	X	0.4	x	0.8	=	36.67	(78)
South	0.9x	0.77	X	3.95	x	114.87	X	0.4	X	0.8	=	100.62	(78)
South	0.9x	0.77	X	2.24	х	114.87	x	0.4	x	0.8	=	57.06	(78)
South	0.9x	0.77	X	1.5	x	114.87	x	0.4	x	0.8	] =	38.21	(78)
South	0.9x	0.77	X	3.95	х	110.55	x	0.4	X	0.8	] =	96.83	(78)
South	0.9x	0.77	X	2.24	x	110.55	x	0.4	x	0.8	] =	54.91	(78)
South	0.9x	0.77	X	1.5	x	110.55	x	0.4	X	0.8	=	36.77	(78)
South	0.9x	0.77	X	3.95	x	108.01	x	0.4	X	0.8	=	94.61	(78)
South	0.9x	0.77	X	2.24	x	108.01	x	0.4	x	0.8	=	53.65	(78)
South	0.9x	0.77	X	1.5	x	108.01	x	0.4	X	0.8	=	35.93	(78)
South	0.9x	0.77	X	3.95	х	104.89	X	0.4	X	0.8	=	91.88	(78)
South	0.9x	0.77	X	2.24	х	104.89	x	0.4	x	0.8	=	52.11	(78)
South	0.9x	0.77	X	1.5	x	104.89	x	0.4	x	0.8	] =	34.89	(78)
South	0.9x	0.77	X	3.95	x	101.89	x	0.4	x	0.8	] =	89.25	(78)
South	0.9x	0.77	X	2.24	x	101.89	x	0.4	x	0.8	] =	50.61	(78)
South	0.9x	0.77	X	1.5	x	101.89	x	0.4	x	0.8	] =	33.89	(78)
South	0.9x	0.77	X	3.95	x	82.59	x	0.4	x	0.8	] =	72.34	(78)
South	0.9x	0.77	X	2.24	x	82.59	x	0.4	x	0.8	j =	41.02	(78)
South	0.9x	0.77	X	1.5	x	82.59	x	0.4	x	0.8	] =	27.47	(78)
South	0.9x	0.77	X	3.95	x	55.42	x	0.4	x	0.8	j =	48.54	(78)
South	0.9x	0.77	j×	2.24	x	55.42	x	0.4	x	0.8	j =	27.53	(78)
South	0.9x	0.77	X	1.5	x	55.42	x	0.4	x	0.8	j =	18.43	(78)
South	0.9x	0.77	X	3.95	x	40.4	x	0.4	x	0.8	j =	35.39	(78)
	L		_		1				•				_

South	0.9x	0.77	×	2.2	24	x		40.4	x		0.4		x [	0.8		=	20.07	(78)
South	0.9x	0.77	x	1.	5	X		40.4	x		0.4	╗;	х 🗏	0.8		=	13.44	(78)
	_		_										_					
Solar g	ains in	watts, ca	alculated	l for eac	h month				(83)m	= Sı	um(74)m .	(82	)m					
(83)m=		269.11	394.48	520.73	603.69	$\overline{}$	05.97	581.62	520	.26	439.1	305	5.22	182.81	127	.13		(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (	83)m	, watts	!	!		!						
(84)m=	604.13	720.56	831.47	934.32	993.38	9	72.69	933.46	878	.28	809.17	698	3.92	603.68	568	3.5		(84)
7. Me	an inter	nal temp	perature	(heating	season	)												
Temp	erature	during h	neating p	eriods ir	the livii	ng	area	from Tab	ole 9,	Th	1 (°C)						21	(85)
•		_	ains for l			-					` ,							_
	Jan	Feb	Mar	Apr	May	r	Jun	Jul	Aı	ug	Sep		Oct	Nov	D	ec		
(86)m=	0.99	0.98	0.92	0.78	0.58	$\vdash$	0.41	0.29	0.3	Ť	0.53	0.8	85	0.98	1			(86)
` '	·				T4 //-		4-	0 to <del>-</del>			- 0-1	<u> </u>		<u> </u>				
	20.47		ature in			JIIO		i		-		20	0.4	20.60	20	1.1	]	(87)
(87)m=	20.47	20.64	20.83	20.96	21		21	21	2	' <u> </u>	21	20	.94	20.68	20.4	44		(07)
Temp	erature	during h	neating p	eriods ir	rest of	dw	/elling	from Ta	able 9	), Th	n2 (°C)						•	
(88)m=	20.33	20.34	20.34	20.35	20.35	2	20.36	20.36	20.	36	20.35	20	.35	20.34	20.	34		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2.	,m (se	e Table	9a)									
(89)m=	0.99	0.97	0.91	0.74	0.54	$\overline{}$	0.37	0.25	0.2	8	0.48	0.8	82	0.98	0.9	9		(89)
Moon	intorno	Ltompor	ature in	the rest	of dwolli	ina	T2 (f	ollow sto	,nc 3	+0.7	7 in Tabl	0.00	·/					
(90)m=	19.63	19.87	20.13	20.3	20.34	Ť	20.36	20.36	20.		20.35	1	.) .28	19.94	19.	50	1	(90)
(50)111=	10.00	10.07	20.10	20.0	20.04	<u></u>	-0.00	20.00		30				g area ÷ (4			0.33	(91)
														g a. oa . (	•,		0.55	(31)
Mean			ature (fo			_	<u> </u>	i	<del>`</del>	_	A) × T2						•	
(92)m=	19.9	20.12	20.36	20.52	20.56	<u> </u>	20.56	20.56	20.		20.56		.49	20.18	19.8	86		(92)
Apply	adjustn		he mear	interna	temper	atu	ire fro	m Table	4e,	whe	re appro	opria	ate	1			•	
(93)m=	19.9	20.12	20.36	20.52	20.56	2	20.56	20.56	20.	57	20.56	20	.49	20.18	19.8	86		(93)
8. Spa	ace hea	ting requ	uirement															
			ternal ter			ned	l at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti,	m=(	76)m an	d re-	calc	culate	
the ut			or gains			_		·		_					_		1	
Lier	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep		)ct	Nov	D	ec		
1		<u>_</u>	ains, hm		0.50						0.5		00	0.07			1	(04)
(94)m=	0.99	0.97	0.91	0.75	0.56	Ľ	0.38	0.26	0.2	9	0.5	0.8	83	0.97	0.9	9		(94)
			, W = (94	<del>`</del>			00.40	0.45.00		I	100.51	l		507.57	504	05	1	(OE)
(95)m=	598.65	699.38	754.55	702.29	551.75		68.49	245.02	256	./6	400.54	5/6	6.65	587.57	564	.95		(95)
		_	ernal tem					40.0	10	4 1	444	10	٠. ۵	7.4	4.	,	1	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.		14.1		).6	7.1	4.2			(96)
			an intern					<del>- `                                   </del>	<del></del>	<del>_</del>	· ,	<del>-</del>		000.04	004	45	1	(07)
(97)m=	997.71	970.48	881.36	729.46	554.55	<u> </u>	68.61	245.03	256		401.44	619		823.34	991	.15		(97)
- 1		·	ement fo	1	1	vvh T		ī	一	Ì		ŕ			04-	00	1	
(98)m=	296.9	182.18	94.34	19.56	2.08	L	0	0	0		0	<u> </u>	.97	169.76	317.			٦,,,,,,
										Total	per year	(kWh	/year	) = Sum(9	8)15,9	12 =	1113.88	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year												12.32	(99)
																		_

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table	a 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	(11) O II Hone	1	(302)
The community scheme may obtain heat from several sources. The procedure allows f includes boilers, heat pumps, geothermal and waste heat from power stations. See App	•		_(002)
Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community h	neating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		kWh/year	¬
Annual space heating requirement	(00) (004-) (005) (000)	1113.88	] ](00 <b>7</b> -)
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1225.27	(307a)
Efficiency of secondary/supplementary heating system in % (from Tab		0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		2172.15	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2389.36	(310a)
Electricity used for heat distribution 0.	.01 × [(307a)(307e) + (310a)(310e)] =	36.15	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsic	de	189.97	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	189.97	(331)
Energy for lighting (calculated in Appendix L)		377.57	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-766.03	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)	)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fu	uels repeat (363) to (366) for the second fue	319	(367a)
CO2 associated with heat source 1 [(307b)+(310b)]	x 100 ÷ (367b) x 0.52	588.09	(367)
Electrical energy for heat distribution [(313) x		18.76	(372)
	0.52	10.70	(0) =/
Total CO2 associated with community systems (363)	0.52	= 606.85	(373)
Total CO2 associated with community systems (363)  CO2 associated with space heating (secondary) (309) x	.(366) + (368)(372)	10.70	_

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 606.85 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 98.59 CO2 associated with electricity for lighting (332))) x (379) 0.52 195.96 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380)0.52 -397.57 sum of (376)...(382) =Total CO2, kg/year 503.83 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)5.57 El rating (section 14) (385)95.01

			User D	Notoile:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20			Strom Softwa	are Vei	rsion:			0006273 on: 1.0.4.26	
Address :	GT 303, Aspen Co			Address k Estate			FH			
1. Overall dwelling dim		art, main	and r an	t Lotato,	London	, 14000 2	· <b>上</b> 11			
			Area	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	")
Ground floor				90.4	(1a) x	2	2.6	(2a) =	235.04	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	90.4	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	235.04	(5)
2. Ventilation rate:										
	heating	econdar heating	· 	other	, –	total		40	m³ per hou	_
Number of chimneys	0 +	0	_	0	] = <u>L</u>	0		40 =	0	(6a)
Number of open flues	0 +	0	+	0	_ = _	0	x 2	20 =	0	(6b)
Number of intermittent f	ans					3	X '	10 =	30	(7a)
Number of passive vent	ts					0	Χ.	10 =	0	(7b)
Number of flueless gas	fires				Ī	0	X 4	40 =	0	(7c)
					_			<b>A:</b> a.l.		<u> </u>
Letter Const. and a self-series	()	0-) · (0b) · (7	7-)./ <b>7</b> -)./	(7-)	_				nanges per ho	_
Infiltration due to chimn	eys, flues and fans = () been carried out or is intend				continue fr	30		÷ (5) =	0.13	(8)
Number of storeys in		ей, ргосее	u 10 (17), (	ourer wise (	onunue m	om ( <del>9)</del> to	(10)		0	(9)
Additional infiltration	g (e)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timber	frame or	0.35 fo	r masoni	y constr	uction	. ,		0	(11)
	present, use the value corre	sponding to	the great	ter wall are	a (after					
• .	nings); if equal user 0.35 I floor, enter 0.2 (unsea	ulad) ar O	1 (coole	ad) also	ontor O					7(40)
•	nter 0.05, else enter 0	ilea) or o	. i (Seale	eu), eise	enter o				0	(12)
•	ws and doors draught s	tripped							0	(14)
Window infiltration	we and deere draught e	шрроа		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value	e, q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeab	pility value, then (18) = [(	17) ÷ 20]+(8	B), otherw	ise (18) = (	16)				0.38	(18)
	lies if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelter	red			(20) = 1 -	in n75 v (1	0)1 -			2	(19)
Shelter factor Infiltration rate incorpora	ating shalter factor			$(20) = 1^{-2}$ (21) = (18)		3)] =			0.85	(20)
Infiltration rate modified	•	d		(21) = (10	/ X (20) =				0.32	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
L		Journ	Jul	Aug	ОСР	001	1407	Dec	J	
Monthly average wind s (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
, , , , , , , , , , , , , , , , , , , ,		1	<u> </u>	1	<u> </u>	L,	<u> </u>	<u> </u>	J	
Wind Factor (22a)m = (	<del></del>		<b>I</b>						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	]	

,	ation rate (all	owina ioi si	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.41	0.4 0.3	$\overline{}$	0.35	0.3	0.3	0.3	0.32	0.35	0.36	0.38	]	
Calculate effec		ge rate for	he appli	cable ca	se				<u> </u>	<u> </u>	J	
	al ventilation:				(1		. (22)	\			0	(23a)
	eat pump using A							) = (23a)			0	(23b)
	n heat recovery:	-	_								0	(23c)
	ed mechanica	1	1	1	<del>'                                    </del>	<del>,                                    </del>	<del>í `</del>	<del> </del>	<del>-                                    </del>	<del>` ` ´</del>	÷ 100]	(2.1.)
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24a)
· ·	ed mechanica		1	1	<del>-                                    </del>	<del>-                                    </del>	<del>í `</del>	<del> </del>	<del>-                                    </del>	ı	1	(5.41.)
(24b)m= 0	0 0	Ļ	0	0	0	0	0	0	0	0	]	(24b)
,	ouse extract			•				F (00h	.\			
	$0.5 \times (23 \text{ k})$	<del></del>	0 = (230)	o), other	0	$\frac{C}{C} = (22)$	0	5 × (23b	0	0	1	(24c)
( '')				<u> </u>			ļ	U	0		J	(240)
,	ventilation or n = 1, then (2			•				0.5]				
(24d)m= 0.58	0.58 0.5	8 0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air	change rate	enter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)	-	-	-		
(25)m= 0.58	0.58 0.5	8 0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57	]	(25)
3. Heat losse	s and heat lo	ss paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-l		A X k kJ/K
Windows Type	` '			8.73		- · · · · · · -/[1/( 1.4 )+		11.57		,	•	(27)
Windows Type				1.42	〓 ,	/[1/( 1.4 )+	L	1.88				(27)
Windows Type				3.78	=	/[1/( 1.4 )+	L	5.01				(27)
Windows Type					=  ,		· L		_			· /
Windows Type				1 3./3	χ1,	/[1/( 1.4 )+	0.04] =	4.95				(27)
71	e 5			2.11	=		L	4.95 2.8	$\exists$			(27) (27)
Windows Type				2.11	x1	/[1/( 1.4 )+	0.04] =	2.8				(27)
Windows Type	e 6			2.11	x1,	/[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = [	2.8				(27) (27)
Windows Type	e 6 e 7	22.6	<b>4</b> ]	2.11 1.42 1.42	x10	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$\begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	2.8 1.88 1.88			<b>-</b>	(27) (27) (27)
Windows Type	54.86	22.6	1	2.11 1.42 1.42 32.25	x1. x1. x1. 5 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 	$\begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	2.8 1.88 1.88 5.81				(27) (27) (27) (29)
Windows Type Walls Roof	54.86 14.8	22.6	1	2.11 1.42 1.42 32.25 14.8	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	$\begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	2.8 1.88 1.88				(27) (27) (27) (29) (30)
Windows Type Walls Roof Total area of e	54.86 14.8		1	2.11 1.42 1.42 32.25 14.8 69.66	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.8 1.88 1.88 5.81 1.92				(27) (27) (27) (29) (30) (31)
Windows Type Walls Roof Total area of e	54.86 14.8 14.8 14.8	0		2.11 1.42 1.42 32.25 14.8 69.66 54.86	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.8 1.88 1.88 5.81 1.92				(27) (27) (27) (29) (30)
Windows Type Walls Roof Total area of e	54.86 14.8 14.8 1 roof windows, u	0 se effective w	indow U-va	2.11 1.42 1.42 32.25 14.8 69.66 54.86 alue calcul	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13	0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.8 1.88 1.88 5.81 1.92	] ] [ ] [ss given in	paragraph	] [] ] 3.2	(27) (27) (27) (29) (30) (31)
Windows Type Walls Roof Total area of e Party wall * for windows and	54.86  14.8  lements, m²  roof windows, u as on both sides	0 se effective w	indow U-va	2.11 1.42 1.42 32.25 14.8 69.66 54.86 alue calcul	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13	0.04] = [ $0.04$ ] = [ $0.04$	2.8 1.88 1.88 5.81 1.92	as given in	paragraph	] [] ] 3.2	(27) (27) (27) (29) (30) (31)
Windows Type Walls Roof Total area of e Party wall * for windows and ** include the area	54.86  14.8  lements, m²  roof windows, u as on both sides ss, W/K = S (A	se effective woof internal was	indow U-va	2.11 1.42 1.42 32.25 14.8 69.66 54.86 alue calcul	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13	0.04] = [ $0.04$ ] = [ $0.04$	2.8 1.88 1.88 5.81 1.92				(27) (27) (27) (29) (30) (31) (32)
Windows Type Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los	54.86  14.8  14.8  Plements, m²  I roof windows, upon both sides as, W/K = S (// Cm = S(A x k)	se effective w of internal wa A x U)	indow U-va	2.11 1.42 1.42 32.25 14.8 69.66 54.86 salue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13	0.04] = [ $0.04$ ] = [ $0.04$	2.8 1.88 1.88 5.81 1.92 0	2) + (32a).		37.7	(27) (27) (27) (29) (30) (31) (32)
Windows Type Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity	54.86  14.8  14.8  Plements, m²  I roof windows, u as on both sides as, W/K = S (A x k)  Cm = S(A x k)  parameter (T)  sments where the	se effective w of internal wa. A x U)  MP = Cm	indow U-va lls and pan	2.11 1.42 1.42 32.25 14.8 69.66 54.86 alue calcul titions	x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0 g formula 1	0.04] = [ $0.04$ ] = [ $0.04$	2.8  1.88  1.88  5.81  1.92  0  re)+0.04] a  1.(30) + (32)  tive Value:	2) + (32a). : Medium	(32e) =	37.7	(27) (27) (27) (29) (30) (31) (32) (33) (34)
Windows Type Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess	54.86  14.8  14.8  elements, m²  froof windows, u as on both sides as, W/K = S (A x k parameter (Tements where the ad of a detailed of	se effective woof internal was A x U)  MP = Cm e details of the calculation.	indow U-ve lls and pan - TFA) ir construct	2.11 1.42 1.42 32.25 14.8 69.66 54.86 alue calcultitions	x1 x1 x1 x1 x1 x1 x1 xx xx xx xx xx xx x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0 g formula 1	0.04] = [ $0.04$ ] = [ $0.04$	2.8  1.88  1.88  5.81  1.92  0  re)+0.04] a  1.(30) + (32)  tive Value:	2) + (32a). : Medium	(32e) =	37.7	(27) (27) (27) (29) (30) (31) (32) (33) (34)
Windows Type Walls Roof Total area of e Party wall * for windows and ** include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste	54.86  14.8  14.8  Plements, m²  I roof windows, u as on both sides as, W/K = S (A x k parameter (T sments where the ad of a detailed of es : S (L x Y)	se effective w of internal wa. A x U)  MP = Cm e details of the calculation. calculated	indow U-va ils and pan :- TFA) ir construction	2.11 1.42 1.42 32.25 14.8 69.66 54.86 alue calcul titions  h kJ/m²K ppendix k	x1 x1 x1 x1 x1 x1 x1 xx xx xx xx xx xx x	/[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+ 0.18 0.13 0 g formula 1	0.04] = [ $0.04$ ] = [ $0.04$	2.8  1.88  1.88  5.81  1.92  0  re)+0.04] a  1.(30) + (32)  tive Value:	2) + (32a). : Medium	(32e) =	37.7 0 250	(27) (27) (27) (29) (30) (31) (32) (33) (34) (35)

'entila	tion hea	at loss ca	alculated	monthly	<u>/</u>	•			(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
88)m=	45.28	45.03	44.78	43.62	43.4	42.39	42.39	42.2	42.78	43.4	43.84	44.3		(3
leat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
89)m=	89.27	89.02	88.77	87.61	87.4	86.38	86.38	86.2	86.77	87.4	87.84	88.3		
								•		•	Sum(39) <sub>1</sub>	12 /12=	87.61	(3
		<u>`</u>	HLP), W/		0.07	0.00	0.00	0.05	` '	= (39)m ÷	<u> </u>	0.00		
10)m=	0.99	0.98	0.98	0.97	0.97	0.96	0.96	0.95	0.96	0.97	0.97	0.98	0.07	(4
lumbe	er of day	/s in mor	nth (Tab	le 1a)					,	4verage =	Sum(40) <sub>1</sub>	12 /12=	0.97	(4
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
11)m=	31	28	31	30	31	30	31	31	30	31	30	31		(4
		ļ	ļ	ļ		ļ		<u>!</u>			<u> </u>	<u> </u>		
4 Wa	iter heat	ting ener	rgy requi	irement:								kWh/ye	ar <sup>.</sup>	
T. VVA	itor ricat	ing crici	igy roqui	iromoni.								KVVII/ y C	ai.	
		ipancy, I		F.4		. 40 (TF	- 400	\ <b>0</b> \1 0 4	2040 /-	FF 4 40		63		(4
	A > 13.9 A £ 13.9		+ 1.76 X	[1 - ехр	(-0.0003	349 X (11	-A -13.9	)2)] + 0.0	)013 x (	IFA -13.	.9)			
		,	ater usad	ae in litre	s per da	av Vd.av	erage =	(25 x N)	+ 36		96	5.69		(
educe	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed	to achieve		se target o				`
t more	that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Γable 1c x	(43)						
4)m=	106.36	102.49	98.62	94.76	90.89	87.02	87.02	90.89	94.76	98.62	102.49	106.36		
•											m(44) <sub>112</sub> =		1160.28	(
nergy d	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x L	OTm / 3600	) kWh/mon	ith (see Ta	ables 1b, 1	c, 1d)		
5)m=	157.73	137.95	142.35	124.11	119.08	102.76	95.22	109.27	110.57	128.86	140.66	152.75		_
inetant	taneous w	ator hoatii	na at noint	of use (no	hot water	r storaga)	enter () in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	= <u>L</u>	1521.31	(
				,		, , , , , , , , , , , , , , , , , , ,		` '	, ,	40.00		00.04		,
6)m= /ater	23.66 storage	20.69	21.35	18.62	17.86	15.41	14.28	16.39	16.59	19.33	21.1	22.91		(-
	•		includin	ng anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(-
·		` ,		ınk in dw			ŭ					100		•
	•	•			•			mbi boil	ers) ente	er '0' in (	47)			
	storage			`					,	`	,			
) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(
empe	rature fa	actor fro	m Table	2b							0.	.54		(
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		0.	75		(
•				cylinder I										
ot wa		_		om Tabl	e 2 (kW	h/litre/da	ıy)					0		(
	-	•	ee secti	on 4.3										,
				2h								0		(
olume	iaiuie l							/ <b>/=</b> > /= :	· (==)	<b>-</b> 0)		0		(
olume empe		1	storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(
olume empe nergy	lost fro		-											
olume empe nergy enter	(50) or (	(54) in (5	55)					//=c:			0.	75		(
olume empe nergy enter	(50) or (	(54) in (5	55)	for each	month			((56)m = (	55) × (41)ı	m	0.	75		(

If cylinder conta	ins dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 23.33	3 21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circu	uit loss (ar	nual) fro	m Table	 e 3							0		(58)
Primary circu	•	•			59)m = (	(58) ÷ 36	65 × (41)	m				l	
(modified	by factor f	rom Tab	le H5 if t	here is s	olar wat	er 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)
Combi loss of	alculated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat re	quired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 204.3	2 180.03	188.95	169.2	165.68	147.85	141.82	155.86	155.66	175.46	185.75	199.35		(62)
Solar DHW inpu	ıt calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)	•	
(add addition	nal lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix (	€)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	iter	-				-	-	-	-			
(64)m= 204.3	2 180.03	188.95	169.2	165.68	147.85	141.82	155.86	155.66	175.46	185.75	199.35		
	•	•					Outp	out from wa	ater heate	r (annual)₁	12	2069.93	(64)
Heat gains fi	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	]	
(65)m= 89.72	79.54	84.61	77.34	76.87	70.24	68.94	73.61	72.84	80.12	82.84	88.07		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal	gains (see	e Table 5	and 5a	):									
Metabolic ga													
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 131.5	6 131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56	131.56		(66)
Lighting gair	ıs (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				l	
(67)m= 21.38	<u> </u>	15.44	11.69	8.74	7.38	7.97	10.36	13.91	17.66	20.61	21.97		(67)
Appliances of	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5			l	
(68)m= 239.8		236.03	222.68	205.83	189.99	179.41	176.92	183.19	196.54	213.39	229.23		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L. equat	ion L15	or L15a	. also se	ee Table	5	Į.			
(69)m= 36.16	<del>_`</del>	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16	36.16		(69)
Pumps and f	ans gains	(Table 5	 5а)									l	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)		ļ		ļ	ļ.		l	
	5 -105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25	-105.25		(71)
Water heating	a gains (1	rable 5)	ļ				<u> </u>		<u> </u>	<u> </u>		l	
(72)m= 120.5	<del></del>	113.72	107.41	103.32	97.56	92.66	98.93	101.17	107.69	115.06	118.37		(72)
Total intern	al gains =	<u>.                                    </u>			(66)	m + (67)m	ı + (68)m +	- (69)m + (	(70)m + (7	1)m + (72)	m		
(73)m= 447.2	<del>_</del>	430.66	407.25	383.35	360.39	345.5	351.68	363.73	387.36	414.53	435.04		(73)
6. Solar gai													
Solar gains ar		using sola	r flux from	Table 6a	and associ	ated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orientation:		_	Area		Flu			g_		FF		Gains	
	Table 6d		m²		Tal	ole 6a	Т	able 6b	T	able 6c		(W)	

East	0.9x	0.77	1 ,	0.70	l	40.04	l .	0.00	v	0.7	1 _	50.4	(76)
East	<u> </u>	0.77	] X ]	8.73	X	19.64	l x	0.63	X	0.7	] = 1	52.4	╡ .
East	0.9x	0.77	] X ]	1.42	X	19.64	X I	0.63	X	0.7	] = 	8.52	(76)
East	0.9x 0.9x	0.77	]	3.78	X	19.64	l x	0.63	X	0.7	] = 1 _	22.69	(76)
East	<u> </u>	0.77	] X ] .,	1.42	X	19.64	l x	0.63	X	0.7	] = 1	8.52	(76)
East	0.9x	0.77	] X ] ,	8.73	X	38.42	l x	0.63	X	0.7	] =   _	102.51	$\frac{1}{2} (76)$
East	0.9x 0.9x	0.77	] X ] ,	1.42	X	38.42	l x	0.63	X	0.7	] = 1 _	16.67	(76)
East	0.9x	0.77	] X ] ,	3.78	X	38.42	l x l ,	0.63	X	0.7	] = ] _	44.38	(76) (76)
East	0.9x C	0.77	]	1.42	x	38.42	l x	0.63	X	0.7	] = ] =	16.67	(76)
East	0.9x	0.77	] x ] x	1.42	_ ^   x	63.27 63.27	x x	0.63	X X	0.7	]	168.81 27.46	(76)
East	0.9x	0.77	」^ ] <sub>×</sub>	3.78	X	63.27	] ^   x	0.63	X	0.7	] - ] =	73.09	(76)
East	0.9x	0.77	」^ ]	1.42	^   x	63.27	] ^   x	0.63	X	0.7	] - ] =	27.46	(76)
East	0.9x	0.77	」 ^ ] <sub>×</sub>	8.73	x x	92.28	] ^ ] <sub>x</sub>	0.63	X	0.7	]	246.2	(76)
East	0.9x	0.77	」^ ] <sub>×</sub>	1.42	X	92.28	] ^   x	0.63	X	0.7	]	40.05	(76)
East	0.9x	0.77	] ^ ] x	3.78	x	92.28	] ^   x	0.63	X	0.7	]	106.6	(76)
East	0.9x	0.77	」 ^ ] <sub>×</sub>	1.42	x x	92.28	] ^ ] <sub>x</sub>	0.63	X	0.7	]	40.05	(76)
East	0.9x	0.77	] ^ ] x	8.73	x	113.09	] ^   x	0.63	X	0.7	]	301.73	(76)
East	0.9x	0.77	]	1.42	x	113.09	l ^ l x	0.63	X	0.7	]	49.08	(76)
East	0.9x	0.77	] x	3.78	x	113.09	] X	0.63	x	0.7	] ] <sub>=</sub>	130.65	(76)
East	0.9x	0.77	] x	1.42	x	113.09	X	0.63	x	0.7	] ]	49.08	(76)
East	0.9x	0.77	] ]	8.73	X	115.77	] 	0.63	x	0.7	] ]	308.88	(76)
East	0.9x	0.77	] ]	1.42	X	115.77	] 	0.63	x	0.7	,   _	50.24	(76)
East	0.9x	0.77	X	3.78	X	115.77	X	0.63	x	0.7	,   =	133.74	(76)
East	0.9x	0.77	X	1.42	x	115.77	X	0.63	x	0.7	)   =	50.24	(76)
East	0.9x	0.77	X	8.73	x	110.22	X	0.63	x	0.7	_	294.06	(76)
East	0.9x	0.77	X	1.42	x	110.22	X	0.63	X	0.7	=	47.83	(76)
East	0.9x	0.77	X	3.78	x	110.22	X	0.63	x	0.7	=	127.33	(76)
East	0.9x	0.77	j×	1.42	x	110.22	x	0.63	x	0.7	j   =	47.83	(76)
East	0.9x	0.77	x	8.73	x	94.68	x	0.63	x	0.7	j   =	252.6	(76)
East	0.9x	0.77	x	1.42	x	94.68	x	0.63	x	0.7	j =	41.09	(76)
East	0.9x	0.77	x	3.78	x	94.68	x	0.63	x	0.7	j =	109.37	(76)
East	0.9x	0.77	X	1.42	x	94.68	x	0.63	x	0.7	] =	41.09	(76)
East	0.9x	0.77	X	8.73	x	73.59	X	0.63	x	0.7	=	196.34	(76)
East	0.9x	0.77	x	1.42	x	73.59	x	0.63	x	0.7	=	31.94	(76)
East	0.9x	0.77	X	3.78	X	73.59	X	0.63	x	0.7	=	85.01	(76)
East	0.9x	0.77	X	1.42	x	73.59	x	0.63	X	0.7	=	31.94	(76)
East	0.9x	0.77	x	8.73	x	45.59	x	0.63	x	0.7	=	121.63	(76)
East	0.9x	0.77	X	1.42	x	45.59	x	0.63	x	0.7	] =	19.78	(76)
East	0.9x	0.77	X	3.78	x	45.59	x	0.63	x	0.7	] =	52.67	(76)
East	0.9x	0.77	X	1.42	x	45.59	X	0.63	x	0.7	] =	19.78	(76)
East	0.9x	0.77	x	8.73	X	24.49	×	0.63	X	0.7	=	65.34	(76)

	_												_
East	0.9x	0.77	X	1.42	X	24.49	X	0.63	X	0.7	=	10.63	(76)
East	0.9x	0.77	X	3.78	X	24.49	X	0.63	X	0.7	=	28.29	(76)
East	0.9x	0.77	X	1.42	X	24.49	x	0.63	X	0.7	=	10.63	(76)
East	0.9x	0.77	X	8.73	X	16.15	x	0.63	X	0.7	=	43.09	(76)
East	0.9x	0.77	X	1.42	X	16.15	X	0.63	X	0.7	=	7.01	(76)
East	0.9x	0.77	X	3.78	X	16.15	X	0.63	X	0.7	=	18.66	(76)
East	0.9x	0.77	X	1.42	X	16.15	x	0.63	X	0.7	] =	7.01	(76)
South	0.9x	0.77	x	3.73	X	46.75	x	0.63	X	0.7	=	53.29	(78)
South	0.9x	0.77	x	2.11	x	46.75	x	0.63	x	0.7	=	30.15	(78)
South	0.9x	0.77	x	1.42	x	46.75	x	0.63	X	0.7	=	20.29	(78)
South	0.9x	0.77	x	3.73	x	76.57	х	0.63	x	0.7	] =	87.28	(78)
South	0.9x	0.77	x	2.11	x	76.57	х	0.63	x	0.7	] =	49.37	(78)
South	0.9x	0.77	x	1.42	x	76.57	х	0.63	x	0.7	] =	33.23	(78)
South	0.9x	0.77	x	3.73	x	97.53	х	0.63	x	0.7	] =	111.18	(78)
South	0.9x	0.77	x	2.11	x	97.53	x	0.63	x	0.7	] =	62.89	(78)
South	0.9x	0.77	x	1.42	x	97.53	х	0.63	x	0.7	] =	42.33	(78)
South	0.9x	0.77	X	3.73	x	110.23	X	0.63	X	0.7	=	125.66	(78)
South	0.9x	0.77	X	2.11	x	110.23	X	0.63	X	0.7	=	71.08	(78)
South	0.9x	0.77	x	1.42	x	110.23	X	0.63	X	0.7	=	47.84	(78)
South	0.9x	0.77	x	3.73	x	114.87	X	0.63	X	0.7	=	130.95	(78)
South	0.9x	0.77	x	2.11	X	114.87	x	0.63	X	0.7	=	74.07	(78)
South	0.9x	0.77	x	1.42	x	114.87	X	0.63	X	0.7	=	49.85	(78)
South	0.9x	0.77	x	3.73	x	110.55	X	0.63	X	0.7	=	126.02	(78)
South	0.9x	0.77	x	2.11	x	110.55	x	0.63	X	0.7	=	71.29	(78)
South	0.9x	0.77	x	1.42	x	110.55	x	0.63	X	0.7	=	47.97	(78)
South	0.9x	0.77	x	3.73	x	108.01	X	0.63	X	0.7	=	123.13	(78)
South	0.9x	0.77	x	2.11	X	108.01	x	0.63	X	0.7	=	69.65	(78)
South	0.9x	0.77	x	1.42	X	108.01	x	0.63	X	0.7	=	46.87	(78)
South	0.9x	0.77	x	3.73	X	104.89	x	0.63	x	0.7	=	119.57	(78)
South	0.9x	0.77	x	2.11	X	104.89	x	0.63	X	0.7	=	67.64	(78)
South	0.9x	0.77	x	1.42	X	104.89	x	0.63	X	0.7	=	45.52	(78)
South	0.9x	0.77	X	3.73	X	101.89	x	0.63	X	0.7	=	116.14	(78)
South	0.9x	0.77	X	2.11	X	101.89	x	0.63	X	0.7	] =	65.7	(78)
South	0.9x	0.77	x	1.42	x	101.89	x	0.63	X	0.7	=	44.22	(78)
South	0.9x	0.77	x	3.73	x	82.59	X	0.63	X	0.7	=	94.14	(78)
South	0.9x	0.77	x	2.11	x	82.59	х	0.63	x	0.7	] =	53.25	(78)
South	0.9x	0.77	x	1.42	x	82.59	x	0.63	x	0.7	j =	35.84	(78)
South	0.9x	0.77	x	3.73	x	55.42	x	0.63	x	0.7	j =	63.17	(78)
South	0.9x	0.77	x	2.11	×	55.42	x	0.63	x	0.7	j =	35.74	(78)
South	0.9x	0.77	x	1.42	×	55.42	x	0.63	X	0.7	j =	24.05	(78)
South	0.9x	0.77	X	3.73	x	40.4	x	0.63	X	0.7	] <u>=</u>	46.05	(78)

0 4	_					-										_
South	0.9x	0.77	X	2.	11	x [	4	40.4	X		0.63	x	0.7	=	26.05	(78)
South	0.9x	0.77	X	1.4	12	X	-	40.4	X		0.63	X	0.7	=	17.53	(78)
_			alculated			-			<del>`                                    </del>	_	m(74)m .	• •			1	
(83)m=	195.87	350.12	513.23	677.48	785.41		88.38	756.7	676.8	37	571.28	397.1	237.84	165.4	]	(83)
Total g			and solar		<u>`                                    </u>	·									1	
(84)m=	643.12	795.24	943.89	1084.74	1168.76	114	48.77	1102.21	1028.	56	935.01	784.46	652.37	600.44	]	(84)
7. Me	an inter	nal temp	perature	(heating	season	)										
Temp	erature	during h	neating p	eriods ii	n the livi	ng a	area 1	from Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	ı (se	ee Ta	ıble 9a)								_
	Jan	Feb	Mar	Apr	May	Ť,	Jun	Jul	Au	g	Sep	Oct	Nov	Dec		
(86)m=	1	0.98	0.95	0.84	0.67	0	.48	0.34	0.38	3	0.62	0.91	0.99	1		(86)
Maan	intorno	tompor	otura in	living or	. T1 /f/	حالم،	u oto	no 2 to 7	lT	ماماد	. 00)		!		ı	
	20.09	20.3	ature in	20.84	20.96	1	w Ste 21	21	21		20.98	20.79	20.38	20.05	1	(87)
(87)m=	20.09	20.3	20.36	20.04	20.90		<u> </u>	21	21		20.96	20.79	20.36	20.05	J	(07)
Temp		during h	neating p	eriods ii	rest of	dwe	elling	from Ta	ble 9	, Th	2 (°C)				1	
(88)m=	20.09	20.1	20.1	20.11	20.11	20	0.12	20.12	20.1	2	20.12	20.11	20.11	20.1		(88)
Utilisa	ation fac	tor for g	ains for i	est of d	welling,	h2,ı	m (se	e Table	9a)							
(89)m=	0.99	0.98	0.93	0.81	0.61	0	).41	0.28	0.31		0.55	0.88	0.98	1	1	(89)
Moon	intorna	tompor	ature in	the rect	of dwall	ina	T2 (f	ollow sto	nc 2 :	<del></del>	in Tabl	0.00)			J	
(90)m=	18.88	19.2	19.59	19.94	20.08	Ť	0.12	20.12	20.1		20.1	19.88	19.32	18.84	1	(90)
(50)111=	10.00	10.2	15.55	10.04	20.00		0.12	20.12	20.1				ng area ÷ (4		0.22	(91)
												L/ ( - L/V)	ig area . (-	., –	0.33	(91)
Mean			ature (fo	r the wh		lling	g) = fl	LA × T1	+ (1 -	- fL/	4) × T2				1	
(92)m=	19.28	19.56	19.91	20.23	20.37	2	20.4	20.41	20.4	1	20.39	20.18	19.66	19.23		(92)
Apply	adjustn	nent to t	he mean	interna	l temper	atuı	re fro	m Table	4e, v	vhe	re appro	priate			•	
(93)m=	19.28	19.56	19.91	20.23	20.37	2	20.4	20.41	20.4	1	20.39	20.18	19.66	19.23		(93)
8. Spa	ace hea	ting requ	uirement													
						ned	at ste	ep 11 of	Table	9b	, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the ut			or gains			_							1		1	
1 14.11	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Au	g	Sep	Oct	Nov	Dec		
			ains, hm		0.00	Ι.	. 40	0.0			0.57	0.00	1 0 00	0.00	1	(04)
(94)m=	0.99	0.98	0.93	0.81	0.63	0	).43	0.3	0.34	+	0.57	0.88	0.98	0.99	J	(94)
			, W = (94	, ·	r	Ι.,	00.4	000.0	0.45 /	<u>Т</u>	505.05	000 47	000.44	500.00	1	(OE)
(95)m=	637.88	776.08	878.15	881.14	734.68		99.1	328.6	345.0	)2	535.65	689.47	639.11	596.96	J	(95)
			rnal tem		T T	_		40.0	40.		444	40.0	1 74	4.0	1	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7		4.6	16.6	16.4		14.1	10.6	7.1	4.2	J	(96)
			an intern			_		<del>- `                                   </del>	<del>`-</del>	<del>-</del>	<u> </u>		1		1	(07)
(97)m=	1337.02	1304.7	1190.46	993.04	757.55	<u> </u>	)1.32	328.8	345.		545.79	837.13	1103.55	1327.16	J	(97)
•			ement fo		I	Wh/			<del></del>	97)ı			Τ΄		1	
(98)m=	520.16	355.23	232.36	80.57	17.01		0	0	0		0	109.85	334.4	543.27		_
									Т	otal	per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	2192.85	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year										24.26	(99)
9a. En	ergy rec	uiremer	nts – Indi	vid <u>ual</u> h	eating s	yste	ems i	ncludina	micro	o-Cl	HP)					
	e heatir															
-		_	at from se	econdar	y/supple	me	ntary	system							0	(201)
	•						•	-							L	

							_
Fraction of space heat from main system(s)		(202) = 1 - (201)	=			1	(202)
Fraction of total heating from main system 1		$(204) = (202) \times [1$	- (203)] =			1	(204)
Efficiency of main space heating system 1						93.5	(206)
Efficiency of secondary/supplementary heating s	system, %					0	(208)
Jan Feb Mar Apr May	Jun Jul	Aug Se	p Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)	0 1 0		100.05	224.4	T 540 07	1	
520.16   355.23   232.36   80.57   17.01	0 0	0 0	109.85	334.4	543.27		(044)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ 556.32  379.92  248.51  86.17  18.19 $	0 0	0 0	117.49	357.65	581.04		(211)
			year) =Sum(2			2345.29	(211)
Space heating fuel (secondary), kWh/month							
$= \{[(98)\text{m} \times (201)]\} \times 100 \div (208)$							
(215)m= 0 0 0 0 0	0 0	0 0	0	0	0		_
		Total (kWh/	year) =Sum(2	215) <sub>15,1012</sub>	2=	0	(215)
Water heating							
Output from water heater (calculated above)  204.32   180.03   188.95   169.2   165.68   1	47.85 141.82	155.86 155.6	6 175.46	185.75	199.35		
Efficiency of water heater	<u> </u>	<u> </u>				79.8	(216)
(217)m= 87.2 86.59 85.37 82.96 80.69	79.8 79.8	79.8 79.8	83.61	86.36	87.36		(217)
Fuel for water heating, kWh/month							
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 234.31  207.91  221.34  203.94  205.33  1	85.28 177.71	195.32 195.0	7 209.86	215.08	228.2		
, ,		Total = Sum	n(219a) <sub>112</sub> =		1	2479.34	(219)
Annual totals			k!	Wh/year	r	kWh/yeaı	
Space heating fuel used, main system 1						2345.29	
Water heating fuel used						2479.34	
Electricity for pumps, fans and electric keep-hot							
central heating pump:					30		(230c)
boiler with a fan-assisted flue					45		(230e)
Total electricity for the above, kWh/year		sum of (230	a)(230g) =			75	(231)
Electricity for lighting						377.57	(232)
12a. CO2 emissions – Individual heating system	s including m	icro-CHP					
	Energy		Fmiss	ion fac	tor	Emissions	:
	kWh/year		kg CO			kg CO2/ye	
Space heating (main system 1)	(211) x		0.2	16	=	506.58	(261)
Space heating (secondary)	(215) x		0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	535.54	(264)
Space and water heating			N.				_
	(261) + (262)	+ (263) + (264) =				1042.12	(265)
Electricity for pumps, fans and electric keep-hot	(261) + (262) (231) x	+ (263) + (264) =	0.5	19	=	1042.12 38.93	(265)
•		+ (263) + (264) =	0.5		=		_

Total CO2, kg/year sum of (265)...(271) = 1277 (272)

 $TER = 20.47 \tag{273}$ 

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:35:00

Project Information:

Assessed By: John Simpson (STRO006273) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 72.3m<sup>2</sup>

Site Reference: Maitland Park Estate

Plot Reference: GT 304

Address: GT 304, Aspen Court, Maitland Park Estate, London, NW3 2EH

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 22.72 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 5.86 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 37.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 31.4 kWh/m²

OK
2 Fabric U-values

Element Average Highest

External wall 0.12 (max. 0.30) 0.12 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK

Floor (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 2.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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:	0.53	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ok
Based on:		
Overshading:	Average or unknown	
Windows facing: South	2.24m²	
Windows facing: North	2.24m²	
Windows facing: North	1.5m²	
Windows facing: North	6.73m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
Roofs U-value	0.1 W/m <sup>2</sup> K	
External Walls U-value	0.12 W/m <sup>2</sup> K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

			User E	Octoile:						
Access Names	John Circa		– USELL		_ NI	<b></b>		OTD A	0006070	
Assessor Name:	John Simps			Strom					006273	
Software Name:	Stroma FS/			Softwa				versic	n: 1.0.4.26	
			Property							
Address :		en Court, Mai	tland Pari	k Estate,	London	, NW3 2	2EH			
Overall dwelling dime	ensions:									
			Are	a(m²)	1	Av. He	ight(m)	_	Volume(m <sup>3</sup>	<u>-</u>
Ground floor				72.3	(1a) x		2.6	(2a) =	187.98	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1d)+(1e)+(	In)	72.3	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	187.98	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+	0	= [	0	х	40 =	0	(6a)
Number of open flues	0	+ 0	<b>-</b>   +	0		0	x	20 =	0	(6b)
Number of intermittent fa	ans	J [				0	x	10 =	0	(7a)
Number of passive vents	<b>S</b>				F	0	x	10 =	0	(7b)
Number of flueless gas f	ires				F	0	x	40 =	0	(7c)
•					L					`
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ns = (6a) + (6b) +	(7a)+(7b)+(	(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has b			ed to (17),	otherwise (	continue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns	)							0	(9)
Additional infiltration							[(9]	)-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber frame of	or 0.35 fo	r mason	ry consti	uction			0	(11)
if both types of wall are p deducting areas of openi			to the grea	ter wall are	a (after					
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	nter 0							0	(13)
Percentage of window	s and doors dra	aught 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)
Air permeability value,	q50, expresse	d in cubic met	es per ho	our per s	quare m	etre of e	envelope	area	2	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20] +$	-(8), otherw	ise (18) =	(16)				0.1	(18)
Air permeability value applie	es if a pressurisatio	n test has been d	one or a de	gree air pe	rmeability	is being u	sed			<b></b> ` ′
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x ( <sup>*</sup>	<b>19)]</b> =			0.85	(20)
Infiltration rate incorpora	ting shelter fact	or		(21) = (18	) x (20) =				0.08	(21)
Infiltration rate modified	for monthly win	d speed			_				_	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 7							_	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2\m <i>÷ 4</i>									
(202)	<i></i> /111 <del>7                                 </del>	1.00	0.05	1 0 02			1	T	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

0.11	0.11	0.1	0.09	0.09	d wind s	0.08	0.08	0.08	0.09	0.1	0.1	]	
Calculate effe		•	rate for t	he appli	cable ca	se	<u>ļ</u>				<u>!</u>		
If mechanic												0.5	(23
If exhaust air h		0 11		, ,	,	. `	,, .	,	) = (23a)			0.5	(23
If balanced wit		-		_								76.5	(2:
a) If balance							<del>- ^ `</del>	ŕ	<del> </del>	<del> </del>	<del>' '</del>	÷ 100]	
24a)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(2
b) If balance							<del></del>	<del>``</del>	<u> </u>	<u> </u>	1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	re input v o); otherv				5 v (22h	.\			
$\frac{11 (220)1}{24c)m=0}$	n < 0.5 x	(23b), t	nen (240	(230) = (230)	o); otnerv	vise (24	C) = (220)	0) m + 0.	5 × (230	0	0	l	(2
								<u> </u>	U	U	U U		(2
d) If natural if (22b)r					/e input v erwise (2				0.51				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (240	c) or (24	d) in box	· (25)			•	J	
25)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	]	(2
0 11(1		-11					•						
3. Heat losse		·			NI at A a		11 -1		A 37 L L		1 -1	- ^	V I
LEMENT	Gros area		Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²-l		X k J/K
Vindows Type		` ,			2.24		/[1/( 1.4 )+	0.04] =	2.97	,			(2
Vindows Type	e 2				2.24	x <sub>1</sub> ,	/[1/( 1.4 )+	0.04] =	2.97	=			(2
Vindows Type					1.5		/[1/( 1.4 )+	0.041 =	1.99	=			(2
Vindows Type					6.73		- /[1/( 1.4 )+	0.041 -	8.92	╡			(2
Valls	33.8	ıg	12.7		21.17	= "	0.12		2.54	╡ ┌			(2
Roof	14.9		0						1.49	<b>-</b>			(3
otal area of e					14.9	=	0.1	[	1.49				
	Herrieria	, 111-			48.78	=							(3
Party wall for windows and	l £		#		54.18		0	/// = [	0				(3
* include the are						ated using	i iorriiula i	/[(	e)+0.04j a	is given in	paragrapr	1 3.2	
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				20.88	(3
	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
leat capacity	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	<u> </u>
		ere the de	tails of the	construct	ion are not	known pr	ecisely the	indicative	values of	TMP in T	able 1f		
hermal mass	sments wh												_
Thermal mass For design assess an be used inste	ad of a de	tailed calc										6.78	(3
hermal mass for design asses an be used inste hermal bridg	ad of a de es : S (L	tailed calci x Y) cal	culated (		•	<							
Thermal mass for design asses an be used inste Thermal bridg details of therm	ad of a de es : S (L al bridging	tailed calci x Y) cal	culated (		•	<		(33) +	(36) =			27.66	
Thermal mass For design assess an be used inste Thermal bridg details of thermal Total fabric he	ad of a de es:S(L al bridging at loss	tailed calcu x Y) cal are not kn	culated ( own (36) =	= 0.05 x (3	•	<			(36) = = 0.33 × (	25)m x <i>(</i> 5	)	27.66	(3
Thermal mass for design assess an be used instead for thermal bridg details of thermal fotal fabric hermal fabric	ad of a deles: S (Leal bridging eat loss can	tailed calcu x Y) cal- are not kn	culated ( own (36) =	= 0.05 x (3	1)		Aug	(38)m	= 0.33 × (			27.66	(3
Thermal mass for design assessan be used instead for thermal bridg details of thermal fotal fabric hermal fabric h	ad of a decess: S (Leal bridging at loss at loss called	x Y) calconnected x Y) calconnected x Y) calconnected x Y) are mot kn	culated ( own (36) =	= 0.05 x (3 / May	Jun	Jul 12.3	Aug	(38)m Sep		Nov	Dec 13.48	27.66	
Thermal mass for design assess an be used instead for thermal bridg details of thermal fotal fabric hermal fabric	ad of a decess: S (Leal bridging at loss at loss called Feb	x Y) calconnected x Y) calconn	culated ( own (36) = I monthly Apr	= 0.05 x (3	1)	Jul	Aug 12.17	(38)m Sep 12.56	= 0.33 × ( Oct 12.96	Nov 13.22	Dec	27.66	(3
	ad of a decess: S (Leal bridging at loss at loss called Feb	x Y) calconnected x Y) calconn	culated ( own (36) = I monthly Apr	= 0.05 x (3 / May	Jun	Jul	⊢ <u> </u>	(38)m Sep 12.56	= 0.33 × (	Nov 13.22	Dec	27.66	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.58	0.57	0.57	0.56	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.57		
									Average =	Sum(40) <sub>1</sub>	12 /12=	0.56	(40)
Number of day	<u> </u>	<u> </u>	· ·					-					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	TFA -13		.3		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	` ,		se target o		.84		(43)
						·				<del></del>			
Jan Hot water usage i	Feb	Mar r day for ea	Apr	May	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	· ·		1	1				1 07 00	00.00	T 04.47	07.70		
(44)m= 97.72	94.17	90.62	87.06	83.51	79.96	79.96	83.51	87.06	90.62	94.17 m(44) <sub>112</sub> =	97.72	1066.08	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600			· /	L	1000.08	(44)
(45)m= 144.92	126.75	130.79	114.03	109.41	94.42	87.49	100.4	101.6	118.4	129.24	140.35		
										m(45) <sub>112</sub> =	<u> </u>	1397.8	(45)
If instantaneous v	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			, ,	L		
(46)m= 21.74	19.01	19.62	17.1	16.41	14.16	13.12	15.06	15.24	17.76	19.39	21.05		(46)
Water storage			Į	Į		ļ.	ļ.		ļ.				
Storage volum	ne (litres)	) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	-			-			, ,		(01)				
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	inod idmo	ers) ente	er 'O' in (	(47)			
Water storage  a) If manufact		eclared I	oss facto	or is kno	wn (kW/	n/day).					0		(48)
Temperature f				51 10 11110	**** (1.000)	"day).					0		(49)
Energy lost fro				ar			(48) x (49)	) -					(50)
b) If manufact		•			or is not		(40) X (40)	, –		'	10		(30)
Hot water stor			-							0.	02		(51)
If community h	•		on 4.3										
Volume factor			OI.							-	03		(52)
Temperature f										0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54)
Enter (50) or	` , ` `	,					((50)	(==) (44)		1.	03		(55)
Water storage	loss cai	culated 1	or each	montn		1	((56)m = (	(55) × (41)	m ·				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56) 	m where (	(H11) is fro	m Appendi	хН	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 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)

O			£		(04)	(00)	- 005 - /44	1.							
					ì	<del>`</del>	÷ 365 × (4°	<del>í –</del>			Ι.,	Ι.,	Ι ,	1	(64)
(61)m=	0	0	0	0	0	C			)	0	0	0	0		(61)
		<del>'                                    </del>		<del>,                                     </del>		_		<del>`</del>			<del>` ´                                   </del>	<del>`</del>	<del>`´</del>	· (59)m + (61)m 1	(00)
(62)m=	200.2	176.68	186.07		164.69	147			5.67	155.09	173.68	182.74	195.63	]	(62)
							egative quanti				r contribu	tion to wate	er heating)		
•	o O		rGHK	and/or 0	T 0	app	lies, see A	<del>i</del>	) XIL	) 0	0	0	0	7	(63)
(63)m=				0			,   0			U	0	0		J	(00)
	200.2	vater hea	ter 186.07	167.52	164.69	147	.91 142.77	155	. 67	155.09	173.68	182.74	195.63	1	
(64)m=	200.2	170.00	100.07	107.32	104.09	147	.91 142.77	155		l		er (annual) <sub>1</sub>		2048.64	(64)
114	-: <b>(</b>		l 4:	1-10/1-/		- ′ [C	) OF (4F)	(6							](04)
•		82.09	neating 87.71	80.71	80.6	5 [U	$0.85 \times (45)$ r $19 \qquad 73.31$	77		76.58	83.59	+ (57)m	90.89	1 J 1	(65)
(65)m=	92.41	l		ļ	l .	L								J	(03)
	· · ·	•				yıınd	ler is in the	awei	ııng	or not w	ater is t	rom com	munity r	neating	
		ains (see			1):										
Metabo		ns (Table					1	Ι,				T		1	
(00)	Jan	Feb	Mar	Apr	May	_	ın Jul	+	ug	Sep	Oct	Nov	Dec	<u> </u>	(66)
(66)m=	115.03		115.03		115.03	115		115		115.03	115.03	115.03	115.03	J	(66)
•		ì		<del></del>		_	.9 or L9a),	1		i	15.00	17.50	10.00	1	(67)
(67)m=	18.18	16.15	13.13	9.94	7.43	6.2	!	8.8		11.83	15.02	17.53	18.69	]	(67)
		<del></del>		<del>- · · · · · · - · · · · · · · · ·</del>	<del></del>	г —	n L13 or L	<del>T</del>			1	T	T	1	(00)
(68)m=	202.6	204.71	199.41	Ļ	173.89	160	!	149		154.77	166.05	180.28	193.67	]	(68)
		<del>`</del>		<del> </del>	<del></del>	_	_15 or L15a	<del>i                                     </del>					ī	7	(00)
(69)m=	34.5	34.5	34.5	34.5	34.5	34	.5 34.5	34	.5	34.5	34.5	34.5	34.5	]	(69)
•		ns gains	·	<del>-                                    </del>	1	_		_		i			1	7	
(70)m=	0	0	0	0	0	C		(	)	0	0	0	0	]	(70)
	_	vaporatio			<del> </del>	<del>-</del>				ı		1	1	7	
(71)m=	-92.03	<u> </u>	-92.03	-92.03	-92.03	-92	.03 -92.03	-92	2.03	-92.03	-92.03	-92.03	-92.03	]	(71)
		gains (T			•					i	<del></del>	<del>-</del>	<del> </del>	7	
(72)m=	124.2	122.15	117.89	112.1	108.34	103		104		106.35	112.35	119.12	122.16	]	(72)
		l gains =					(66)m + (67)	<u> </u>				71)m + (72)		7	
(73)m=	402.5	400.52	387.94	367.68	347.17	327	.33 314.4	320	0.1	330.46	350.93	374.44	392.02		(73)
	ar gain			fl fu	Tabla Ca		:	-4:	4			bla awiawta	.:		
_			•			and a	ssociated equ	ations	to cc		ie appiica	ble orlentar	ion.	Coina	
Orienta		Access F Table 6d	actor	Area m²	l		Flux Table 6a		Т	g_ able 6b	Т	able 6c		Gains (W)	
North	0.9x	0.77	<u> </u>	2.	24	хГ	10.63	7 x		0.4	x [	0.8		5.28	(74)
North	0.9x	0.77	<del></del>		.5	^   x	10.63	」^ ]	$\vdash$	0.4	^	0.8		3.54	](74)
North	0.9x	0.77	==		73	^ _	10.63	」^ ] ×	$\vdash$	0.4	-	0.8		15.87	
North	0.9x	0.77	_		24	^   ×	20.32	」^ ] <sub>×</sub>	$\vdash$	0.4	^ L	0.8	<del>-</del> -	10.09	](74)
North	0.9x	0.77			.5	^ _	20.32	」 ^ ] x	$\vdash$	0.4	^ L	0.8	= =	6.76	](74)
	0.01	0.77		`		^ _	20.32	」^		0.4	^ L	0.0		0.70	<b>1</b> (, -)

	_		_										_
North	0.9x	0.77	X	6.73	X	20.32	X	0.4	X	0.8	=	30.33	(74)
North	0.9x	0.77	X	2.24	x	34.53	x	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	1.5	X	34.53	X	0.4	X	0.8	=	11.49	(74)
North	0.9x	0.77	X	6.73	x	34.53	X	0.4	X	0.8	=	51.53	(74)
North	0.9x	0.77	X	2.24	x	55.46	x	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	1.5	x	55.46	X	0.4	X	0.8	=	18.45	(74)
North	0.9x	0.77	X	6.73	x	55.46	x	0.4	x	0.8	=	82.78	(74)
North	0.9x	0.77	X	2.24	x	74.72	x	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	X	1.5	x	74.72	X	0.4	X	0.8	=	24.85	(74)
North	0.9x	0.77	X	6.73	x	74.72	X	0.4	X	0.8	=	111.51	(74)
North	0.9x	0.77	X	2.24	x	79.99	x	0.4	x	0.8	=	39.73	(74)
North	0.9x	0.77	X	1.5	x	79.99	x	0.4	X	0.8	=	26.61	(74)
North	0.9x	0.77	X	6.73	x	79.99	x	0.4	x	0.8	=	119.37	(74)
North	0.9x	0.77	X	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	X	1.5	x	74.68	x	0.4	x	0.8	=	24.84	(74)
North	0.9x	0.77	X	6.73	x	74.68	x	0.4	x	0.8	=	111.45	(74)
North	0.9x	0.77	X	2.24	x	59.25	x	0.4	X	0.8	=	29.43	(74)
North	0.9x	0.77	X	1.5	x	59.25	x	0.4	x	0.8	=	19.71	(74)
North	0.9x	0.77	X	6.73	x	59.25	x	0.4	x	0.8	=	88.42	(74)
North	0.9x	0.77	X	2.24	x	41.52	x	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	X	1.5	x	41.52	x	0.4	x	0.8	=	13.81	(74)
North	0.9x	0.77	X	6.73	x	41.52	х	0.4	X	0.8	=	61.96	(74)
North	0.9x	0.77	X	2.24	x	24.19	x	0.4	X	0.8	=	12.02	(74)
North	0.9x	0.77	X	1.5	x	24.19	x	0.4	x	0.8	=	8.05	(74)
North	0.9x	0.77	X	6.73	x	24.19	x	0.4	x	0.8	=	36.1	(74)
North	0.9x	0.77	X	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	X	1.5	x	13.12	x	0.4	x	0.8	=	4.36	(74)
North	0.9x	0.77	X	6.73	x	13.12	x	0.4	x	0.8	=	19.58	(74)
North	0.9x	0.77	X	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	X	1.5	x	8.86	x	0.4	x	0.8	=	2.95	(74)
North	0.9x	0.77	X	6.73	x	8.86	x	0.4	x	0.8	=	13.23	(74)
South	0.9x	0.77	X	2.24	x	46.75	x	0.4	X	0.8	=	23.22	(78)
South	0.9x	0.77	X	2.24	x	76.57	x	0.4	x	0.8	=	38.03	(78)
South	0.9x	0.77	X	2.24	x	97.53	х	0.4	X	0.8	=	48.45	(78)
South	0.9x	0.77	X	2.24	x	110.23	X	0.4	X	0.8	=	54.76	(78)
South	0.9x	0.77	X	2.24	x	114.87	x	0.4	x	0.8	j =	57.06	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.4	x	0.8	j =	54.91	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.4	х	0.8	j =	53.65	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.4	x	0.8	j =	52.11	(78)
South	0.9x	0.77	×	2.24	x	101.89	x	0.4	x	0.8	j =	50.61	(78)
South	0.9x	0.77	×	2.24	x	82.59	x	0.4	x	0.8	j =	41.02	(78)
	_		_		-		-		-		•		_

Solar gains in watts, calculated for each month (83)m = \$\sum{0.4}\$ x \$ 0.4\$ x \$ 0.4\$ x \$ 0.4\$ x \$ 0.8\$ = \$ 20.07\$ (76)  Solar gains in watts, calculated for each month (83)m = \$\sum{0.74}m \to (82)m \to (82)m = \$\sum{0.74}m \to (82)m \to (82)m = \$\sum{0.74}m \to (82)m \to (82)m = \$\sum{0.74}m \to (82)m \to (82)m = \$\sum{0.74}m \to (82)m \to (82)m = \$\sum{0.74}m \to (82)m \to (82)m = \$\sum{0.74}m \to (82)m \to (82)m \to (82)m = \$\sum{0.74}m \to (82)m \to (8	South	0.9x	0.77	x	2.2	24	x	5	5.42	x		0.4	x		0.8		= [	27.53	(78)
(83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)me	South	0.9x	0.77	x	2.2	24	X		10.4	x		0.4	×	Γ	0.8		<u> </u>	20.07	(78)
(83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts  (84)me		_															_		
Total gains — internal and solar (84)m = (73)m + (83)m, watts  (84)m	Solar g	ains in	watts, ca	alculated	for eacl	n month				(83)m	= St	um(74)m .	(82)r	n					
(84)   (84)   (84)   (85,73   516,56   551,22   577,71   567,96   541,44   509,76   477,47   448,11   432,43   432,45   (84)     7.	(83)m=	47.91	85.22	128.62	183.54	230.54	2	40.63	227.04	189.	67	147.01	97.1	9	57.98	40.6	5		(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Similar Sep Oct Nov De	Total g	ains – ir	nternal a	and solar	(84)m =	(73)m ·	+ (	83)m ,	, watts										
Temperature during heating periods in the living area from Table 9, Th1 (°C)   21   (85)	(84)m=	450.41	485.73	516.56	551.22	577.71	5	67.96	541.44	509.	76	477.47	448.	11	432.43	432.6	67		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a)  Mean internal temperature in the rest of dwelling, h2,m (see Table 9a)  Mean internal temperature in the rest of dwelling from Table 9, Th2 (*C)  (88)m=	7. Me	an inter	nal temp	perature	(heating	season	)												
Second   S	Temp	erature	during h	neating p	eriods ir	the livii	ng	area f	rom Tab	ole 9,	Th	1 (°C)					Γ	21	(85)
Second   S	Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(s	ee Ta	ble 9a)								L		
(86)me							Ù		,	Αι	Ja T	Sep	Od	ct	Nov	De	С		
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)ms 20.64 20.72 20.84 20.96 21 21 21 21 21 20.95 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)ms 20.45 20.45 20.45 20.46 20.46 20.46 20.47 20.47 20.47 20.47 20.47 20.46 20.46 20.46 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)ms 0.99 0.98 0.94 0.82 0.61 0.41 0.29 0.32 0.54 0.84 0.97 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)ms 19.97 20.99 20.26 20.42 20.46 20.47 20.47 20.47 20.47 20.42 20.19 19.95 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2  (92)ms 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.62 20.42 20.2 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)ms 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.62 20.42 20.2 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hms.  (94)ms 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.3 0.33 0.55 0.85 0.97 0.99 (94)  Useful gains, hmsGm , W = (94)m x (84)m (95)ms 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (95)  Monthly average external temperature from Table 8 (96)ms 43.5 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (95)  Monthly average external temperature. Lm , W = [(39)m x ([93)m - (96)m)] (97)ms (68.36 641.1 579.08 477.84 364.15 2.0 0 0 0 0 18.25 89.29 170.48 (95) 1	(86)m=	0.99	0.98	0.95	· ·			0.45	0.32	<del>                                     </del>	<del>-  </del>		0.8	7	0.98	0.99			(86)
(87)ms 20.84 20.72 20.84 20.96 21 21 21 21 21 21 20.95 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)ms 20.45 20.45 20.45 20.46 20.46 20.46 20.47 20.47 20.47 20.47 20.47 20.46 20.46 20.46 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)ms 0.99 0.98 0.94 0.82 0.61 0.41 0.29 0.32 0.54 0.84 0.97 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)ms 19.97 20.09 20.26 20.42 20.46 20.47 20.47 20.47 20.47 20.47 20.42 20.19 19.95 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)ms 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.62 20.42 20.2 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (33)ms 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.62 20.42 20.2 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:  (94)ms 0.99 0.98 0.94 0.83 0.63 0.63 0.43 0.3 0.33 0.55 0.85 0.97 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)ms 445.95 475.58 487.68 455.62 382.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (95)  Monthly average external temperature. from Table 8  (96)ms 4.3 4.9 6.5 8.9 11.77 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)  Heat loss rate for mean internal temperature. Imp. W = (39)m x ((39)m x ((39)m - (96)m) (97)ms (66.65 64).1 57.90 8 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)ms 161.97 111.23 68 16 1.42 0 0 0 0 0 0 18.25 89.29 170.48						T4 //-			0 4			. 0-1		!		<u> </u>			
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)me   20.45   20.45   20.46   20.46   20.46   20.47   20.47   20.47   20.47   20.46   20.46   20.46   20.46   (88)    Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)me   0.99   0.98   0.94   0.92   0.61   0.41   0.29   0.32   0.54   0.84   0.97   0.99   (89)    Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)me   19.97   20.09   20.26   20.42   20.46   20.47   20.47   20.47   20.47   20.47   20.42   20.19   19.95   (90)    Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)me   20.22   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   (92)    Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me   20.22   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.67   20.62   20.42   20.2   (93)    8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a   Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   Utilisation factor for gains, hm:  (94)me   0.99   0.98   0.94   0.83   0.63   0.43   0.3   0.33   0.35   0.55   0.85   0.97   0.99   (94)   Useful gains, hmGm   W = (94)m x (84)m   (95)me   445.95   475.58   487.68   455.62   362.24   242.65   162.77   170.24   263.82   382.57   420.6   429.43   (95)   Monthly average external temperature from Table 8   (96)me   4.3   4.9   6.5   8.9   11.7   14.6   16.6   16.4   14.1   10.6   7.1   4.2   (96)   Heat loss rate for mean internal temperature, Lm   W = (39)m x   (93)m - (96)m   (97)me   (68.56   641.1   579.08   477.84   364.15   242.7   162.78   170.25   264.3   407.1   544.61   658.56   (97)   Space heating requirement for each month, kWh/month = 0.024 x   (97)m - (95)m   x (41)m   (98)m   (14)m   (14)m   (14)m   (14)m   (14)m   (14)m   (14)m   (14)m	ı					`	DIIO	i		1			20.0	<u>.                                     </u>	00.70	20.0	$\overline{}$		(97)
(88)m=	(87)m=	20.64	20.72	20.84	20.96	21		21	21	21		21	20.9	5	20.79	20.6			(87)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.98 0.94 0.82 0.61 0.41 0.29 0.32 0.54 0.84 0.97 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.97 20.09 20.26 20.42 20.46 20.47 20.47 20.47 20.47 20.42 20.19 19.95 (90)  ### ItA = Living area ÷ (4) = 0.38 (91)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.67 20.62 20.42 20.2 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.67 20.62 20.42 20.2 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.3 0.33 0.55 0.85 0.97 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m (95)m= 445.95 475.86 475.86 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (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 - (95)m ] (97)m = 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 0 18.25 89.29 170.48  Total per year ((kWh)/year) = Sum(88). a.s. z 636.63 (98)	Temp	erature	during h	neating p	eriods ir	rest of	dw	/elling	from Ta	ble 9	), Th	n2 (°C)							
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for Table 4e, where appropriate (93)m = 20.22   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.2   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.33   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.33   20.66   20.47   20.67   20.67   20.67   20.67   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.2   20.33   20.66   20.47   2	(88)m=	20.45	20.45	20.45	20.46	20.46	2	20.47	20.47	20.4	17	20.47	20.4	6	20.46	20.4	6		(88)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2   Mean internal temperature (for Table 4e, where appropriate (93)m = 20.22   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.2   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.33   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.33   20.66   20.47   20.67   20.67   20.67   20.67   20.67   20.67   20.67   20.67   20.62   20.42   20.2   20.2   20.2   20.33   20.66   20.47   2	Utilisa	ation fac	tor for g	ains for i	est of d	welling,	h2.	,m (se	e Table	9a)									
(90)m= 19.97   20.09   20.26   20.42   20.46   20.47   20.47   20.47   20.47   20.42   20.19   19.95   (90)      ILA = Living area ÷ (4) =   0.38   (91)     Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2     (92)m=   20.22   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.67   20.62   20.42   20.2   (92)     Apply adjustment to the mean internal temperature from Table 4e, where appropriate     (93)m=   20.22   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   (93)     S. Space heating requirement	I									r –	2	0.54	0.84	4	0.97	0.99	)		(89)
(90)m= 19.97   20.09   20.26   20.42   20.46   20.47   20.47   20.47   20.47   20.42   20.19   19.95   (90)      ILA = Living area ÷ (4) =   0.38   (91)     Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2     (92)m=   20.22   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.67   20.62   20.42   20.2   (92)     Apply adjustment to the mean internal temperature from Table 4e, where appropriate     (93)m=   20.22   20.33   20.48   20.63   20.66   20.67   20.67   20.67   20.67   20.62   20.42   20.2   (93)     S. Space heating requirement	Maan	intorno	ltompor	oturo in i	the reet	of dwalli	ina	T2 /fc	ollow etc	no 2	+o 7	7 in Tabl	o 0o)	!		<u>!</u>			
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2	ı						Ť			r –	-			-	20.10	10.0			(90)
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.67 20.62 20.42 20.2  Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.67 20.62 20.42 20.2  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.33 0.55 0.85 0.97 0.99 (94)  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 0 18.25 89.29 170.48	(90)111=	19.91	20.03	20.20	20.42	20.40	<u>_</u>	20.47	20.47	20.5	*′						+	0.20	``
(92)m= 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.62 20.42 20.2 (92)  Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.67 20.62 20.42 20.2 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.3 0.33 0.55 0.85 0.97 0.99 0.99  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 0 18.25 89.29 170.48													L/ ( - L	•	g aroa . (-	•, –	L	0.36	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (93)m= 20.22 20.33 20.48 20.63 20.66 20.67 20.67 20.67 20.67 20.62 20.42 20.2 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.3 0.55 0.85 0.97 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 0 18.25 89.29 170.48	Mean		temper	ature (fo	r the wh	ole dwe	llin	g) = fL	_A × T1	+ (1 -	– fL	A) × T2					_		
8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.33 0.55 0.85 0.97 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43  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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 0 18.25 89.29 170.48	(92)m=	20.22	20.33	20.48	20.63	20.66	2	20.67	20.67	20.6	67	20.67	20.6	2	20.42	20.2	2		(92)
8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.30 0.55 0.85 0.97 0.99 (94)  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 0 18.25 89.29 170.48	Apply	adjustn	nent to t	he mean	interna	temper	atu	ıre fro	m Table	4e, \	whe	re appro	priat	e_			_		
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= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.33 0.55 0.85 0.97 0.99  Useful gains, hmGm, W = (94)m x (84)m  (95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43  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  Heat loss rate for mean internal temperature, Lm, W = ((39)m x ((93)m - (96)m)]  (97)m= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98)isa.12 = 636.63 (98)	(93)m=	20.22	20.33	20.48	20.63	20.66	2	20.67	20.67	20.6	57	20.67	20.6	2	20.42	20.2			(93)
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.33 0.55 0.85 0.97 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43  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  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>1.49.12</sub> 636.63 (98)	8. Spa	ace hea	ting requ	uirement															
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Utilisation factor for gains, hm:           (94)m=         0.99         0.98         0.94         0.83         0.63         0.43         0.3         0.33         0.55         0.85         0.97         0.99         (94)           Useful gains, hmGm, W = (94)m x (84)m           (95)m=         445.95         475.58         487.68         455.62         362.24         242.65         162.77         170.24         263.82         382.57         420.6         429.43         (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         42 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>ned</td> <td>l at ste</td> <td>ep 11 of</td> <td>Table</td> <td>e 9b</td> <td>, so tha</td> <td>t Ti,m</td> <td>1=(7</td> <td>76)m an</td> <td>d re-c</td> <td>alcı</td> <td>ulate</td> <td></td>							ned	l at ste	ep 11 of	Table	e 9b	, so tha	t Ti,m	1=(7	76)m an	d re-c	alcı	ulate	
Utilisation factor for gains, hm:  (94)m= 0.99  0.98  0.94  0.83  0.63  0.43  0.3  0.33  0.55  0.85  0.97  0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 445.95  475.58  487.68  455.62  362.24  242.65  162.77  170.24  263.82  382.57  420.6  429.43  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  Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m]	the ut						_	. 1					_	. 1		_	$\neg$		
(94)m= 0.99 0.98 0.94 0.83 0.63 0.43 0.3 0.33 0.55 0.85 0.97 0.99  Useful gains, hmGm , W = (94)m x (84)m  (95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43  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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>1.5.9.12</sub> = 636.63 (98)						May		Jun	Jul	Αι	ng	Sep	Oc	t	Nov	De	С		
Useful gains, hmGm , W = (94)m x (84)m (95)m= $445.95$ $475.58$ $487.68$ $455.62$ $362.24$ $242.65$ $162.77$ $170.24$ $263.82$ $382.57$ $420.6$ $429.43$ (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 = $663.65$ $641.1$ $579.08$ $477.84$ $364.15$ $242.7$ $162.78$ $170.25$ $264.3$ $407.1$ $544.61$ $658.56$ (97) Space heating requirement for each month, kWh/month = $0.024$ x $[(97)m - (95)m]$ x $(41)m$ (98)m= $161.97$ $111.23$ $68$ $16$ $1.42$ $0$ $0$ $0$ $0$ $18.25$ $89.29$ $170.48$	ı			· ·		0.00		1			_ 1	0.55	0.0		0.07		$\neg$		(04)
(95)m= 445.95 475.58 487.68 455.62 362.24 242.65 162.77 170.24 263.82 382.57 420.6 429.43 (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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>15912</sub> 636.63 (98)							L'	0.43	0.3	0.3	3	0.55	0.8	2	0.97	0.99			(94)
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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>15812</sub> = 636.63 (98)	I				, ·		Γ.	40.05	100.77	470	<u> </u>	000 00	000	T	100.0	400			(05)
(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= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>15812</sub> = 636.63 (98)									162.77	170.	24	263.82	382.	5/	420.6	429.4	13		(95)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]  (97)m= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 636.63 (98)	ı	_							40.0	40	. 1	444	40.4		7.4	1.0	$\neg$		(06)
(97)m= 663.65 641.1 579.08 477.84 364.15 242.7 162.78 170.25 264.3 407.1 544.61 658.56 (97)  Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>15812</sub> = 636.63 (98)							_			L				9	7.1	4.2			(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 161.97 111.23 68 16 1.42 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>15912</sub> = 636.63 (98)	ı						_							, 1	F44.04	050			(07)
(98)m= 161.97 111.23 68 16 1.42 0 0 0 0 18.25 89.29 170.48  Total per year (kWh/year) = Sum(98) <sub>15812</sub> = 636.63 (98)							<u> </u>									658.5	ю		(97)
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> = 636.63 (98)	· I		· · ·				vvh T			r – -	ì		<u> </u>	ÌТ		470			
	(98)m=	161.97	111.23	68	16	1.42	L	U	U	<u> </u>						<u> </u>	-		<b>—</b> (65)
Space heating requirement in kWh/m²/year 8.81 (99)											Total	per year	(kWh/y	/ear)	) = Sum(9	8)15,912	= [	636.63	(98)
	Space	e heatin	g require	ement in	kWh/m²	/year												8.81	(99)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (	Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	Ĭ	1	(302)
The community scheme may obtain heat from several sources. The procedure a includes boilers, heat pumps, geothermal and waste heat from power stations.			<b>⊐</b>
Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for commu	L	1	(305)
Distribution loss factor (Table 12c) for community heating system	m [	1.1	(306)
Space heating Annual space heating requirement	[	kWh/year	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	700.3	(307a)
Efficiency of secondary/supplementary heating system in % (fro	m Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary syst	em (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating	-		_
Annual water heating requirement	L	2048.64	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2253.51	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	29.54	(313)
Cooling System Energy Efficiency Ratio	[	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside	151.93	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	151.93	(331)
Energy for lighting (calculated in Appendix L)		321.08	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-612.31	(333)
Electricity generated by wind turbine (Appendix M) (negative qu	antity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor I kWh/year kg CO2/kWh I	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using	g two fuels repeat (363) to (366) for the second fuel	319	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x 0.52 =	480.57	(367)
Electrical energy for heat distribution	[(313) x	15.33	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372) =	495.9	(373)
CO2 associated with space heating (secondary)	(309) x 0 =	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x 0.52 =	0	(375)

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 495.9 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 78.85 CO2 associated with electricity for lighting (332))) x (379) 0.52 166.64 Energy saving/generation technologies (333) to (334) as applicable x = 0.01 =Item 1 (380)0.52 -317.79 sum of (376)...(382) =Total CO2, kg/year 423.61 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)5.86 El rating (section 14) (385)95.16

			User D	) etaile.						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20		Strom Softwa	are Vei	rsion:		STRO006273 Version: 1.0.4.26			
Address :	GT 304, Aspen Co			Address			PEH			
1. Overall dwelling din		ort, marti	and r dii	t Lotato,	London	, 14000 2	· ·			
			Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor				72.3	(1a) x	2	2.6	(2a) =	187.98	(3a)
Total floor area TFA =	(1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	72.3	(4)			_		
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	187.98	(5)
2. Ventilation rate:										
Z. Vertilation rate.	main s	secondar	у	other		total			m³ per hou	ır
Number of chimneys	heating 0 +	heating 0	<b>]</b> + [	0	] = [	0	X -	40 =	0	(6a)
Number of open flues	0 +	0	i + F	0	j = F	0	x	20 =	0	(6b)
Number of intermittent	fans					3	x	10 =	30	(7a)
Number of passive ven					L		x	10 =		Ⅎ``
•					Ļ	0		40 =	0	(7b)
Number of flueless gas	Tires					0		+0 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimn	neys, flues and fans = (	(6a)+(6b)+(7	′a)+(7b)+(	7c) =	Г	30		÷ (5) =	0.16	(8)
	s been carried out or is inten				continue fr			( )	0.10	`
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	uction			0	(11)
	present, use the value corre nings); if equal user 0.35	esponaing to	trie great	er wall are	a (arter					
If suspended wooder	n floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	enter 0.05, else enter 0								0	(13)
ŭ	ws and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate	50			(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeal	e, q50, expressed in cu		•	•	•	etre of e	envelope	area	5	(17)
•	ollies if a pressurisation test h					is beina u	sed		0.41	(18)
Number of sides shelte				, ,	,	3			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpor	ating shelter factor			(21) = (18	x (20) =				0.35	(21)
Infiltration rate modified	for monthly wind spee	ed		,				,	•	
Jan Feb	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind	speed from Table 7							-		
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (	′22)m ∸ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	
			<u> </u>			<u> </u>			J	

0.44	ation rat	e (allowi	ng for sh 0.38	o.37	0.33	0.33 =	(21a) x 0.32	(22a)m 0.35	0.37	0.39	0.41	1	
Calculate effec	•						0.32	0.35	0.37	0.39	0.41		
If mechanica	al ventila	ition:										0	(23
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(2:
a) If balance	ı —	1				<del>- ` `                                 </del>	<del>-                                    </del>	<u> </u>	<del> </del>	<del></del>	1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b	m = (22)	2b)m + (	23b)		Ī	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n		tract ven (23b), t		•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n		on or wh en (24d)							0.5]				
24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(2
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)		-		-	
25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(2
3. Heat losse	s and he	eat loss r	paramete	ėr.									
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	9 /	ΑΧk
	area	$(m^2)$	' m		A ,r	n²	W/m2	K	(W/	K)	kJ/m²-l	K I	kJ/K
Vindows Type	1				2.24	х1	/[1/( 1.4 )+	0.04] =	2.97				(2
Vindows Type	2				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(2
Vindows Type	3				1.5	x1.	/[1/( 1.4 )+	0.04] =	1.99				(2
Vindows Type	<b>4</b>				6.73	x1	/[1/( 1.4 )+	0.04] =	8.92				(2
Valls	33.8	38	12.7	1	21.17	X	0.18	=	3.81				(2
Roof	14.9	9	0		14.9	х	0.13	= [	1.94				(3
otal area of e	lements	, m²			48.78	3							(3
Party wall					54.18	3 x	0	= [	0				(3
for windows and						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	3.2	
* include the area				ls and pan	titions		(20) (20)	(22)					<del></del>
abric heat los	•	`	U)				(26)(30)		(00) - (0)	0) - (00-)	(00-)	22.6	(3
leat capacity	^	` ,		TEA) :	. 1. 1/ 21/			***	` , `	2) + (32a).	(32e) =	0	(3
hermal mass	•	`		,			ooioolu tha		tive Value		abla 1f	250	(3
or design assess an be used inste				CONSTRUCT	ion are noi	kriowri pr	ecisery trie	rindicative	values of	TIVIP III T	арте тт		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						4.95	(3
details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he	at loss							(33) +	(36) =			27.55	(3
entilation hea	i	1	monthly	/		-	1	(38)m	= 0.33 × (	(25)m x (5)	)	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 37.13	36.89	36.66	35.57	35.36	34.41	34.41	34.23	34.78	35.36	35.77	36.21		(3
leat transfer of	oefficie	nt, W/K						(39)m	= (37) + (	38)m		-	
leat transfer of 64.68	64.44	nt, W/K 64.21	63.11	62.91	61.96	61.96	61.78	(39)m 62.32	62.91	38)m 63.32	63.75		(3

leat lo	ss para	meter (F	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
0)m=	0.89	0.89	0.89	0.87	0.87	0.86	0.86	0.85	0.86	0.87	0.88	0.88		
umbe	or of dov	o in moi	nth (Tab	lo 1o\					1	Average =	Sum(40) <sub>1</sub>	12 /12=	0.87	(40
umbe	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		(4
,										<u> </u>				`
4 Wa	ter heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
													, di i	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	TFA -13		.3		(4)
nnua	l averag	e hot wa						(25 x N)				3.84		(4
		_		usage by : day (all w		-	-	to achieve	a water us	se target d	)Ť			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot wate							Table 1c x	•						
4)m=	97.72	94.17	90.62	87.06	83.51	79.96	79.96	83.51	87.06	90.62	94.17	97.72		
							·				m(44) <sub>112</sub> =		1066.08	(4
nergy (					· ·		<del> </del>		) kWh/mor	·	ables 1b, 1			
5)m=	144.92	126.75	130.79	114.03	109.41	94.42	87.49	100.4	101.6	118.4	129.24	140.35		<b>—</b> ,,
instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		Total = Su	m(45) <sub>112</sub> =	=	1397.8	(4
6)m=	21.74	19.01	19.62	17.1	16.41	14.16	13.12	15.06	15.24	17.76	19.39	21.05		(4
*	storage	loss:	ļ	ļ	ļ	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>!</u>			
torag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
	•	_			-		litres in	' '		(0) ! - (	· 4 ¬ \			
	rise it no storage		not wate	er (tnis ir	iciuaes i	nstantar	ieous co	mbi boil	ers) ente	er o in (	(47)			
	_		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(4
empe	rature fa	actor fro	m Table	2b			• •				0.	54		(4
nergy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		0.	75		(5
•				cylinder l										
		•	tactor fr ee secti	om Tabl	e 2 (KVV	n/litre/da	ıy)					0		(5
	-	from Tal		011 4.5								0		(5
empe	rature 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
Enter	(50) or (	(54) in (5	55)	-							0.	75		(5
/ater	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)	m				
6)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		(5
cylinde	er 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	x H	
57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
rimar	v circuit	loss (an	nual) fro	m Table	- <del></del>							0		(5
	•	•				59)m = (	(58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
9)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		(!

Combi loss o	Combi loss calculated for each month $(61)$ m = $(60) \div 365 \times (41)$ m $  \begin{array}{c cccccccccccccccccccccccccccccccccc$													
			1	<del>` ´                                     </del>	<del>`                                    </del>	· ` `	<del>`                                      </del>	T 0	0	Ιο	0	1	(61)	
	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>	ļ				<u> </u>	J · (59)m + (61)m		
(62)m= 191.5	<del></del>	177.39	159.12	156.01	139.51	134.09	146.99		165	174.33	186.94	]	(62)	
Solar DHW inpu	ut calculated	using App	endix G o	r Appendix	H (negat	ive quantity	y) (enter	'0' if no sola	r contribut	tion to wate	r heating)	,		
(add addition	nal lines if	FGHRS	and/or \	NWHRS	applies	s, see Ap	pendix	(G)						
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)	
Output from	water hea	ter												
(64)m= 191.5	2 168.84	177.39	159.12	156.01	139.51	134.09	146.99	146.69	165	174.33	186.94		_	
							O	utput from w	ater heate	r (annual)	112	1946.42	(64)	
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)	m] + 0.8	k [(46)m	+ (57)m	+ (59)m	<u>.</u> ]		
(65)m= 85.46	75.81	80.77	73.99	73.66	67.47	66.37	70.66	69.85	76.64	79.05	83.94	]	(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 Sep	Oct	Nov	Dec			
(66)m= 115.0	3 115.03	115.03	115.03	115.03	115.03	115.03	115.03	3 115.03	115.03	115.03	115.03	]	(66)	
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				_		
(67)m= 18.52	16.45	13.38	10.13	7.57	6.39	6.91	8.98	12.05	15.3	17.86	19.03		(67)	
Appliances of	gains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), al	so see Ta	ble 5	_		_		
(68)m= 202.6	204.71	199.41	188.13	173.89	160.51	151.57	149.4	7 154.77	166.05	180.28	193.67	]	(68)	
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5			_		
(69)m= 34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	]	(69)	
Pumps and f	fans gains	(Table 5	5a)									_		
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)	
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_		
(71)m= -92.0	3 -92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03	-92.03		(71)	
Water heating	ng gains (T	able 5)										-		
(72)m= 114.8	7 112.82	108.56	102.76	99	93.7	89.2	94.97	97.02	103.02	109.79	112.83		(72)	
Total intern	al gains =				(66	)m + (67)m	n + (68)n	n + (69)m +	(70)m + (7	71)m + (72)	)m			
(73)m= 396.5		381.85	361.53	340.97	321.12	308.19	313.93	324.35	344.87	368.44	386.03		(73)	
6. Solar gai														
Solar gains ar		_					ations to		ie applicat		tion.	0-1		
Orientation:	Table 6d		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)		
North 0.9							1 , , _				_		7,74)	
		X	2.2		-	10.63	]	0.63		0.7	=	7.28	[(74)]	
North 0.93		X	1.			10.63	]	0.63		0.7	_ =	4.87	[74] (74)	
North 0.93			6.7			10.63	」 ×	0.63		0.7	=	21.87	$\begin{bmatrix} 1^{(74)} \\ 1^{(74)} \end{bmatrix}$	
North 0.93		×	2.2		=	20.32	]	0.63	╡╞		=	13.91	╡	
(1.9)	0.77	Х	1.	5	X	20.32	X	0.63	X	0.7	=	9.32	(74)	

North	۰.۰.۲		1		1		1 1				1		7(74)
	0.9x	0.77	X	6.73	X	20.32	X	0.63	X	0.7	] = 1	41.8	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.63	X	0.7	] = 1	23.64	(74)
North	0.9x	0.77	X	1.5	X	34.53	X	0.63	X	0.7	] = 1	15.83	(74)
North	0.9x	0.77	X	6.73	X	34.53	X	0.63	X	0.7	] = 1	71.02	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.63	X	0.7	] =	37.97	(74)
North	0.9x	0.77	X	1.5	Х	55.46	X	0.63	X	0.7	=	25.43	(74)
North	0.9x	0.77	X	6.73	Х	55.46	X	0.63	X	0.7	=	114.08	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.63	X	0.7	=	51.15	(74)
North	0.9x	0.77	X	1.5	X	74.72	X	0.63	X	0.7	=	34.25	(74)
North	0.9x	0.77	X	6.73	Х	74.72	X	0.63	X	0.7	=	153.67	(74)
North	0.9x	0.77	X	2.24	X	79.99	X	0.63	X	0.7	=	54.76	(74)
North	0.9x	0.77	X	1.5	X	79.99	X	0.63	X	0.7	=	36.67	(74)
North	0.9x	0.77	X	6.73	X	79.99	X	0.63	X	0.7	=	164.51	(74)
North	0.9x	0.77	X	2.24	x	74.68	x	0.63	X	0.7	=	51.12	(74)
North	0.9x	0.77	X	1.5	X	74.68	X	0.63	X	0.7	=	34.23	(74)
North	0.9x	0.77	X	6.73	X	74.68	X	0.63	X	0.7	=	153.59	(74)
North	0.9x	0.77	X	2.24	X	59.25	x	0.63	X	0.7	=	40.56	(74)
North	0.9x	0.77	X	1.5	X	59.25	X	0.63	X	0.7	=	27.16	(74)
North	0.9x	0.77	X	6.73	x	59.25	x	0.63	x	0.7	=	121.86	(74)
North	0.9x	0.77	X	2.24	x	41.52	x	0.63	x	0.7	=	28.42	(74)
North	0.9x	0.77	X	1.5	x	41.52	x	0.63	x	0.7	=	19.03	(74)
North	0.9x	0.77	X	6.73	x	41.52	X	0.63	x	0.7	=	85.39	(74)
North	0.9x	0.77	X	2.24	X	24.19	X	0.63	X	0.7	=	16.56	(74)
North	0.9x	0.77	X	1.5	x	24.19	X	0.63	X	0.7	=	11.09	(74)
North	0.9x	0.77	X	6.73	х	24.19	X	0.63	x	0.7	=	49.75	(74)
North	0.9x	0.77	X	2.24	x	13.12	X	0.63	x	0.7	=	8.98	(74)
North	0.9x	0.77	X	1.5	x	13.12	x	0.63	x	0.7	=	6.01	(74)
North	0.9x	0.77	X	6.73	x	13.12	X	0.63	x	0.7	=	26.98	(74)
North	0.9x	0.77	X	2.24	x	8.86	X	0.63	x	0.7	=	6.07	(74)
North	0.9x	0.77	X	1.5	x	8.86	X	0.63	x	0.7	=	4.06	(74)
North	0.9x	0.77	X	6.73	х	8.86	X	0.63	x	0.7	=	18.23	(74)
South	0.9x	0.77	X	2.24	x	46.75	X	0.63	x	0.7	=	32.01	(78)
South	0.9x	0.77	X	2.24	x	76.57	X	0.63	x	0.7	=	52.42	(78)
South	0.9x	0.77	x	2.24	x	97.53	x	0.63	x	0.7	] =	66.77	(78)
South	0.9x	0.77	X	2.24	x	110.23	x	0.63	x	0.7	] =	75.46	(78)
South	0.9x	0.77	x	2.24	x	114.87	x	0.63	x	0.7	=	78.64	(78)
South	0.9x	0.77	x	2.24	x	110.55	x	0.63	x	0.7	] =	75.68	(78)
South	0.9x	0.77	x	2.24	x	108.01	x	0.63	x	0.7	=	73.94	(78)
South	0.9x	0.77	x	2.24	x	104.89	x	0.63	x	0.7	j =	71.81	(78)
South	0.9x	0.77	x	2.24	x	101.89	x	0.63	x	0.7	] =	69.75	(78)
South	0.9x	0.77	×	2.24	x	82.59	x	0.63	X	0.7	] =	56.54	(78)
	_												

South	0.9x	0.77	Х	2.2	24	x	55.42	x	0.63	x	0.7	=	37.94	(78)
South	0.9x	0.77	x	2.2	24	x	40.4	x	0.63	x	0.7		27.66	(78)
	_							· <u> </u>						_
Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = 5	Sum(74)m .	(82)m				
(83)m=	66.03	117.44	177.26	252.94	317.71	331.61	312.89	261.38	202.59	133.94	79.91	56.02		(83)
Total g	ains – iı	nternal a	and solar	(84)m =	= (73)m	+ (83)m	, watts		•	•	•		•	
(84)m=	462.53	511.92	559.11	614.47	658.68	652.73	621.08	575.31	526.94	478.81	448.35	442.05		(84)
7. Me	an inter	nal temp	perature	(heating	season	)								
							from Tal	ole 9, Th	n1 (°C)				21	(85)
Utilisa	ation fac	tor for a	ains for I	iving are	ea. h1.m	(see T	able 9a)		` ,					_
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.94	0.81	0.6	0.44	0.49	0.76	0.96	0.99	1		(86)
` ′			<u> </u>		<u> </u>	<u> </u>		<u>!</u>	Ļ	1				, ,
1		· ·			· `	1	eps 3 to 7	I	i '	1 00 70	00.44	00.44	1	(07)
(87)m=	20.16	20.28	20.48	20.74	20.93	20.99	21	21	20.96	20.73	20.41	20.14		(87)
Temp	erature	during h	neating p	eriods ii	n rest of	dwellin	g from Ta	able 9, T	h2 (°C)				<u>.</u>	
(88)m=	20.17	20.17	20.18	20.19	20.19	20.2	20.2	20.21	20.2	20.19	20.19	20.18		(88)
Utilisa	ation fac	tor for a	ains for i	rest of d	welling,	h2,m (s	ee Table	9a)						
(89)m=	1	0.99	0.98	0.92	0.76	0.53	0.36	0.41	0.69	0.94	0.99	1		(89)
	intorno	l tompor	otura in	the rest	of dwell	na To /	follow etc	no 2 to	I 7 in Tabl	I			I	
(90)m=	19.04	19.22	19.51	19.89	20.12	20.2	follow ste	20.21	20.17	19.89	19.42	19.03	]	(90)
(90)111=	19.04	19.22	19.51	19.09	20.12	20.2	20.2	20.21	ļ	fLA = Livin			0.00	<b></b> ` ′
										ILA - LIVIII	ig area - (-	<del>-</del> ) –	0.38	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1 – fl	_A) × T2				•	
(92)m=	19.47	19.62	19.88	20.22	20.43	20.5	20.51	20.51	20.47	20.21	19.79	19.45		(92)
Apply	adjustn	nent to t	he mean	interna	l temper	ature fr	om Table	4e, who	ere appr	opriate	_		-	
(93)m=	19.47	19.62	19.88	20.22	20.43	20.5	20.51	20.51	20.47	20.21	19.79	19.45		(93)
8. Spa	ace hea	ting requ	uirement											
				•		ned at s	tep 11 of	Table 9	b, so tha	at Ti,m=(	76)m an	d re-cald	culate	
the ut	_		or gains				1						1	
1.14.11	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		<u>_</u>	ains, hm		l	0.55	1	T	1 0.70				1	(0.4)
(94)m=	0.99	0.99	0.97	0.92	0.77	0.55	0.39	0.44	0.72	0.94	0.99	1		(94)
		1	W = (94)	· ·	r -		1		T	T			1	(05)
(95)m=	460.17	506.7	544.94	564.6	509.85	361.56	241.67	252.98	378.67	450.93	443.22	440.3		(95)
1	_		ernal tem		1	r e	1		1		T		1	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
1							=[(39)m	<del>- `                                   </del>	<del>' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' </del>	<del>i                                     </del>	1		Ī	(a=)
(97)m=	980.91	948.84	859.18	714.22	549.17	365.54		253.72	397.1	604.46	803.76	972.24		(97)
· ·		<del></del>				I	$\frac{1}{1}$ = 0.02		i i	<del>i                                    </del>	r e		1	
(98)m=	387.43	297.12	233.8	107.73	29.25	0	0	0	0	114.23	259.59	395.76		_
Total per year (kWh/year) = $Sum(98)_{15,912}$ = 1824.91 (98)														
Space heating requirement in kWh/m²/year 25.24 (99)														
9a. En	9a. Energy requirements – Individual heating systems including micro-CHP)													
	e heatir	•												
-		•	at from se	econdar	y/supple	mentar	y system						0	(201)

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating	system	ı, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above)								1	
387.43 297.12 233.8 107.73 29.25	0	0	0	0	114.23	259.59	395.76		,
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$ $414.37  317.77  250.05  115.22  31.28$	0	0	0	0	122.17	277.64	423.27	1	(211)
11.107   01.117   250.00   110.22   01.20						211),5.10,12		1951.77	(211)
Space heating fuel (secondary), kWh/month						10, 1012			` ′
= {[(98)m x (201)] } x 100 ÷ (208)								_	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		_
	0	(215)							
Water heating Output from water heater (calculated above)									
191.52 168.84 177.39 159.12 156.01	186.94	]							
Efficiency of water heater		79.8	(216)						
(217)m= 86.66 86.31 85.55 83.8 81.32	86.77		(217)						
Fuel for water heating, kWh/month									
$(219)$ m = $(64)$ m x $100 \div (217)$ m	7								
(219)m= 221.01   195.62   207.35   189.88   191.85	174.82	168.03	184.2	183.82	196.76	203.01	215.45		
(219)m= 221.01   195.62   207.35   189.88   191.85	174.82	168.03		183.82 I = Sum(2		203.01	215.45	2331.81	(219)
Annual totals	174.82	168.03			19a) <sub>112</sub> =	203.01 Wh/year		2331.81 <b>kWh/yea</b> i	
	174.82	168.03			19a) <sub>112</sub> =				
Annual totals	174.82	168.03			19a) <sub>112</sub> =			kWh/yea	
Annual totals Space heating fuel used, main system 1	174.82	168.03			19a) <sub>112</sub> =			kWh/yeai 1951.77	
Annual totals Space heating fuel used, main system 1 Water heating fuel used	174.82	168.03			19a) <sub>112</sub> =			kWh/yeai 1951.77	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	174.82	168.03			19a) <sub>112</sub> =			kWh/yeai 1951.77	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:	174.82	168.03	Tota		19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30	kWh/yeai 1951.77	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue	174.82	168.03	Tota	I = Sum(2	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30	kWh/year 1951.77 2331.81	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Tota	I = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30	kWh/year 1951.77 2331.81	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	uding mi	Tota	I = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30 45	kWh/year 1951.77 2331.81 75 327.07	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	uding mid	Tota	I = Sum(2: of (230a).	19a) <sub>112</sub> = k¹(230g) =	Wh/year	30 45	kWh/year 1951.77 2331.81 75 327.07	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu <b>En</b> kW	uding mi	Tota	I = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k</b> 1	ion fac	30 45	kWh/year 1951.77 2331.81 75 327.07 Emissions kg CO2/ye	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1)	ns inclu En kW (211	uding mid <b>ergy</b> /h/year	Tota	I = Sum(2: of (230a).	(230g) =  Emiss kg CO:	ion fact	30 45 <b>tor</b>	kWh/year 1951.77 2331.81 75 327.07 Emissions kg CO2/ye	(230c) (230e) (231) (232) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	ns inclu En kW (211	ergy /h/year	Tota	I = Sum(2: of (230a).	(230g) =  Emiss kg CO:  0.2	ion fact 2/kWh	30 45 <b>tor</b> =	kWh/year 1951.77 2331.81 75 327.07 Emissions kg CO2/ye 421.58	(230c) (230e) (231) (232) (232) (261) (263)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	ns inclu En kW (211 (215	ergy /h/year	sum	I = Sum(2:	(230g) =  Emiss kg CO:	ion fact 2/kWh	30 45 <b>tor</b>	kWh/year 1951.77 2331.81 75 327.07 Emissions kg CO2/ye 421.58 0	(230c) (230e) (231) (232) (232) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system Space heating (main system 1) Space heating Space and water heating	ns inclu En kW (211 (215 (219 (261	uding midergy /h/year 1) x 5) x 2) x	Tota	I = Sum(2:	19a) <sub>112</sub> = k1	ion fact 2/kWh	30 45 <b>tor</b> = =	kWh/year 1951.77 2331.81 75 327.07 Emissions kg CO2/ye 421.58 0 503.67 925.25	(230c) (230e) (231) (232) (232) (261) (263) (264) (265)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1) Space heating (secondary) Water heating	ns inclu En kW (211 (215 (219 (261 (231	ergy /h/year	sum	I = Sum(2:	(230g) =  Emiss kg CO:  0.2	ion fact 2/kWh	30 45 <b>tor</b> =	kWh/year 1951.77 2331.81 75 327.07 Emissions kg CO2/ye 421.58 0	(230c) (230e) (231) (232) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1133.93 (272)

TER = 22.72 (273)

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:35:11

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** 

Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 76.4m<sup>2</sup> Site Reference: Plot Reference: Maitland Park Estate GT 305

GT 305, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

25.8 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 7.50 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 49.3 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 41.6 kWh/m<sup>2</sup>

OK

2 Fabric U-values

**Element Highest Average** 0.12 (max. 0.70) External wall 0.12 (max. 0.30) OK Party wall 0.00 (max. 0.20) OK Floor (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)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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

OK

# **Regulations Compliance Report**

Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
sed on:		
Overshading:	Average or unknown	
Windows facing: South	4.47m²	
Windows facing: North	4.48m²	
Windows facing: North	1.7m²	
Windows facing: North	3.28m²	
Windows facing: North	2.24m²	
Windows facing: South	2.24m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
) Key features		
Air permeablility	2.0 m³/m²h	
Roofs U-value	0.1 W/m <sup>2</sup> K	
External Walls U-value	0.12 W/m <sup>2</sup> K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

			User D	otaile:										
Assessor Name:	John Simps	200	- <del>036</del> 1 L	Strom	a Nives	bor		QTD()	006273					
Software Name:	Stroma FS			Softwa					on: 1.0.4.26					
Software Name:	Stioilia FSF							versio	JII. 1.U.4.20					
A 1.1	OT OOF Ass		·	Address			\							
Address:		en Court, Maitla	and Pari	C Estate,	London	, INVV3 2	ZEH							
Overall dwelling dime	HISIOHS.		A = 0.	n/m²\		Av. Ua	iaht/m\		Valuma/m³	n\				
Ground floor				a(m²)	(1a) x		eight(m)	(2a) =	Volume(m <sup>3</sup>	(3a)				
				76.4			2.6	(2a) =	198.64	(3a)				
Total floor area TFA = (1	a)+(1b)+(1c)+(1	1d)+(1e)+(1ı	ገ)	76.4	(4)									
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	198.64	(5)				
2. Ventilation rate:														
	main heating	secondar heating	у	other		total			m³ per hou	ır				
Number of chimneys	0	+ 0	<b>]</b> + [	0	] = [	0	Х	40 =	0	(6a)				
Number of open flues	0	] + 0	i + F	0	i	0	x	20 =	0	(6b)				
Number of intermittent fa					J	0	x	10 =		(7a)				
					Ļ				0	$\frac{1}{1}$ (7b)				
•	imber of passive vents  0 x 10 =													
Number of flueless gas f	umber of flueless gas fires  0 × 40 =													
								A : I-						
					_			Air cn	nanges per ho	our —				
Infiltration due to chimne	•					0		÷ (5) =	0	(8)				
If a pressurisation test has be			d to (17), (	otherwise (	continue fr	om (9) to	(16)			<b>–</b>				
Number of storeys in t Additional infiltration	ne aweiling (ns)	)					[(0)	1100 1	0	(9)				
Structural infiltration: 0	25 for stool or	timbor frama a	. 0. 25 for	r macani	v constr	ruction	[(9)	)-1]x0.1 =	0	(10)				
if both types of wall are p					•	uction			0	(11)				
deducting areas of openi			<b>3</b>		- (									
If suspended wooden	floor, enter 0.2	(unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)				
If no draught lobby, en	iter 0.05, else e	nter 0							0	(13)				
Percentage of window	s and doors dra	aught stripped							0	(14)				
Window infiltration				0.25 - [0.2	. ,	_			0	(15)				
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)				
Air permeability value,			•	•	•	etre of e	envelope	area	2	(17)				
If based on air permeabi	,								0.1	(18)				
Air permeability value applie		n test has been doi	ne or a deg	gree air pe	rmeability	is being u	sed			<b>–</b>				
Number of sides sheltere Shelter factor	ea .			(20) = 1 -	0.075 x (1	19)1 =			2	(19)				
Infiltration rate incorpora	ting shelter fact	or .		(21) = (18		/1			0.85	= (20)				
Infiltration rate modified				,=./ (10	, (=0) =				0.08	(21)				
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
L		· .	ı oui	ı /lug	ССР	1 000	1 1407	1 500	I					
Monthly average wind sp (22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]					
(22):11- 0.1 0	7.0	7.0 0.0	I 5.0	J 5.7		I 7.5	1 7.0	7.7						
Wind Factor (22a)m = (2	2)m ÷ 4													
(00.)		1.00 0.05	0.05	0.00			T		1					

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

	ation rate (	,	<del></del>			<del>i ´</del>	<del>r` ´</del>	<del>ì ´</del>	I	T 0.4	T	1	
0.11 Calculate effec	0.11 ctive air cha	0.1 <b>anae</b> i	0.09 rate for t	0.09 <b>he appl</b> i	0.08 cable ca	0.08 se	0.08	0.08	0.09	0.1	0.1	]	
If mechanica		-										0.5	(23
If exhaust air he	eat pump usir	ng Appe	endix N, (2	3b) = (23a	a) × Fmv (	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat recover	ry: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h	) =				76.5	(23
a) If balance	d mechani	ical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	) ÷ 100]	
4a)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(24
b) If balance	d mechani	ical ve	entilation	without	heat red	covery (I	MV) (24b	p)m = (22)	2b)m + (	23b)	1	1	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
c) If whole h if (22b)n	ouse extra n < 0.5 <b>x</b> (2			•	•				.5 × (23b	o)		_	
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilation n = 1, then			•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
Effective air	change rat	te - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in box	x (25)				_	
5)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(2
3. Heat losse	s and heat	loss	paramet	er:									
LEMENT	Gross area (m	·	Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I		k-valu kJ/m²-		A X k kJ/K
/indows Type	<del>:</del> 1				4.47	<sub>x</sub> 1	/[1/( 1.4 )+	0.04] =	5.93				(2
/indows Type	2				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(2
/indows Type	3				1.7	x1	/[1/( 1.4 )+	0.04] =	2.25				(2
/indows Type	<b>4</b>				3.28	<sub>x</sub> 1	/[1/( 1.4 )+	0.04] =	4.35				(2
/indows Type	5				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(2
/indows Type	6				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(2
/alls	61.91		18.4	1	43.5	x	0.12	<b>-</b>	5.22	$\overline{}$ [			(2
oof	76.4		0		76.4	. X	0.1	=	7.64				(3
otal area of e	lements, m	ր²			138.3	1							(3
arty wall					42.7	7 X	0		0				(3
for windows and include the area						lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	h 3.2	
abric heat los				s anu pai	uuons		(26)(30)	) + (32) =				37.27	(3
eat capacity		,	<b>O</b> )				, , , ,		(30) + (32	2) + (32a).	(32e) =	0	(3
hermal mass	,	,	P = Cm -	- TFA) ir	n kJ/m²K			., ,	tive Value	, , ,	,	250	(3
or design assess an be used inste	sments where	the de	tails of the	•			recisely the	e indicative	e values of	TMP in Ta	able 1f	200	\
hermal bridge	es : S (L x `	Y) cal	culated (	using Ap	pendix	K						9.79	(3
details of therma	al bridging are	e not kn	own (36) =	= 0.05 x (3	31)								`
otal fabric he	at loss							(33) +	(36) =			47.06	(3
entilation hea	at loss calc	ulated	monthly	/				(38)m	= 0.33 × (	(25)m x (5)	)	,	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ī	

(2.2)	l	T	l	l			T						(00)
(38)m= 14.81	14.67	14.53	13.83	13.69	13	13	12.86	13.27	13.69	13.97	14.25		(38)
Heat transfer (		· ·		00.75	00.05	00.05	T 50.04	· · · ·	= (37) + (37)	<del></del>			
(39)m= 61.86	61.72	61.58	60.89	60.75	60.05	60.05	59.91	60.33	60.75	61.03	61.31	60.85	(39)
Heat loss para	meter (l	HLP), W	/m²K						= (39)m ÷	Sum(39)₁ · (4)	12 / 12=	00.03	(00)
(40)m= 0.81	0.81	0.81	0.8	0.8	0.79	0.79	0.78	0.79	0.8	0.8	0.8		_
Number of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.8	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
	•	•					•						
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Accumed coo	ID OD OV	N I											(40)
Assumed occu	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.39		(42)
if TFA £ 13.9 Annual average	,	ater usad	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		90	),99		(43)
Reduce the annua	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o				, ,
not more that 125						<u> </u>		_			T _ 1		
Jan Hot water usage i	Feb	Mar r day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
	· ·		ı	· ·	1	1	· <i>'</i>	89.17	02.04	96.45	100.09		
(44)m= 100.09	96.45	92.81	89.17	85.53	81.89	81.89	85.53	l	92.81 Fotal – Su	96.45 m(44) <sub>112</sub> =	<del></del>	1091.84	(44)
Energy content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			· /	L	1001.04	(/
(45)m= 148.42	129.81	133.95	116.78	112.06	96.7	89.6	102.82	104.05	121.26	132.37	143.74		
If instantaneous v	votor booti	ing of noint	of upo /po	hot water	r otorogo)	antar O in	hoves (46		Total = Su	m(45) <sub>112</sub> =	=	1431.57	(45)
If instantaneous w	1		,	ı		1		` '			T		(40)
(46)m= 22.26 Water storage	19.47 loss:	20.09	17.52	16.81	14.5	13.44	15.42	15.61	18.19	19.85	21.56		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage a) If manufact		oclared I	occ foct	or ic kno	wo (k\\/k	2/d2x/):					. 1		(40)
Temperature f				JI IS KIIU	wii (Kvvi	i/uay).					0		(48) (49)
Energy lost fro				ear			(48) x (49)	) =			10		(50)
b) If manufact		_	-		or is not		(10) X (10)	_		'	10		(30)
Hot water stor	•			le 2 (kW	h/litre/da	ıy)				0.	.02		(51)
If community he Volume factor	_		on 4.3										(50)
Temperature f			2b							<b>—</b>	.6		(52) (53)
Energy lost fro				ear			(47) x (51)	) x (52) x (	53) =		.03		(54)
Enter (50) or		_	,y				( · · / / (O · )	, ( <del>=</del> ) A (	- <del>-</del> /	-	.03		(55)
Water storage	loss cal	culated t	for 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	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	ĸН	
(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 loss (annual) from Table 3	0 (58)													
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m														
(modified by factor from Table H5 if there is solar water heating and a cylinder the	rmostat)													
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.	.26 22.51 23.26 (59)													
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m														
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 0 (61)													
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ r	m + (46)m + (57)m + (59)m + (61)m													
(62)m= 203.7 179.74 189.23 170.28 167.33 150.19 144.88 158.1 157.54 176														
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar cont														
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)														
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (63														
Output from water heater														
Output from water neater (64)m= 203.7 179.74 189.23 170.28 167.33 150.19 144.88 158.1 157.54 176.54 185.86 199.02														
(64)m= 203.7   179.74   189.23   170.28   167.33   150.19   144.88   158.1   157.54   176.54   185.86   199.02   Output from water heater (annual) <sub>112</sub>   2082.41   (64)														
Output from water heater (annual) $_{112}$														
Heat gains from water heating, kWh/month $0.25  ilde{ } [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m] $ $ (65)m = 93.57  ext{ } 83.1  ext{ } 88.76  ext{ } 81.63  ext{ } 81.48  ext{ } 74.95  ext{ } 74.01  ext{ } 78.41  ext{ } 77.39  ext{ } 84.54  ext{ } 86.81  ext{ } 92.01  ext{ } (65)m = 10.85  ex$														
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	N. D.													
	Oct Nov Dec													
(66)m= 119.55   119.5	0.55 119.55 119.55 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	(07)													
(67)m= 18.88 16.77 13.64 10.32 7.72 6.51 7.04 9.15 12.28 15.														
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	<del></del>													
(68)m= 211.75 213.95 208.41 196.62 181.74 167.76 158.42 156.22 161.76 173	3.54 188.42 202.41 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
(69)m= 34.96 34.96 34.96 34.96 34.96 34.96 34.96 34.96 34.96 34.96 34.96	.96 34.96 34.96 (69)													
Pumps and fans gains (Table 5a)														
(70)m =	0 0 (70)													
Losses e.g. evaporation (negative values) (Table 5)														
(71)m= -95.64 -95.64 -95.64 -95.64 -95.64 -95.64 -95.64 -95.64 -95.64 -95.64 -95.64	6.64 -95.64 -95.64 (71)													
Water heating gains (Table 5)														
(72)m= 125.77 123.67 119.3 113.37 109.52 104.09 99.48 105.39 107.49 113	3.63 120.56 123.68 (72)													
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m$	ı + (71)m + (72)m													
(73)m= 415.26 413.25 400.22 379.18 357.84 337.23 323.8 329.62 340.39 361	.63 386.05 404.35 (73)													
6. Solar gains:														
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the app	olicable orientation.													
Orientation: Access Factor Area Flux g_	FF Gains													
Table 6d m <sup>2</sup> Table 6a Table 6b	Table 6c (W)													
North 0.9x 0.77 x 2.24 x 10.63 x 0.4	x 0.8 = 10.56 (74)													
North 0.9x 0.77 x 1.7 x 10.63 x 0.4	x 0.8 = 4.01 (74)													

<b>N</b> 1 41	_		,		,		1		ı		,		_
North	0.9x	0.77	X	3.28	X	10.63	X	0.4	X	0.8	=	7.73	(74)
North	0.9x	0.77	X	2.24	X	10.63	X	0.4	X	0.8	=	5.28	(74)
North	0.9x	0.77	X	2.24	X	20.32	X	0.4	X	0.8	=	20.19	(74)
North	0.9x	0.77	X	1.7	X	20.32	X	0.4	X	0.8	=	7.66	(74)
North	0.9x	0.77	X	3.28	X	20.32	X	0.4	X	0.8	=	14.78	(74)
North	0.9x	0.77	X	2.24	X	20.32	X	0.4	X	0.8	=	10.09	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.4	X	0.8	=	34.31	(74)
North	0.9x	0.77	X	1.7	X	34.53	X	0.4	X	0.8	=	13.02	(74)
North	0.9x	0.77	X	3.28	X	34.53	X	0.4	X	0.8	=	25.12	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	55.1	(74)
North	0.9x	0.77	X	1.7	X	55.46	X	0.4	x	0.8	=	20.91	(74)
North	0.9x	0.77	X	3.28	x	55.46	x	0.4	x	0.8	=	40.34	(74)
North	0.9x	0.77	X	2.24	x	55.46	x	0.4	x	0.8	=	27.55	(74)
North	0.9x	0.77	X	2.24	x	74.72	x	0.4	X	0.8	=	74.23	(74)
North	0.9x	0.77	x	1.7	x	74.72	x	0.4	x	0.8	<b>=</b>	28.17	(74)
North	0.9x	0.77	x	3.28	x	74.72	x	0.4	x	0.8	] <b>=</b>	54.35	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.4	x	0.8	] =	37.11	(74)
North	0.9x	0.77	x	2.24	x	79.99	x	0.4	x	0.8	] =	79.46	(74)
North	0.9x	0.77	X	1.7	x	79.99	x	0.4	x	0.8	=	30.15	(74)
North	0.9x	0.77	X	3.28	x	79.99	x	0.4	x	0.8	=	58.18	(74)
North	0.9x	0.77	X	2.24	x	79.99	x	0.4	x	0.8	j =	39.73	(74)
North	0.9x	0.77	X	2.24	x	74.68	x	0.4	x	0.8	=	74.19	(74)
North	0.9x	0.77	X	1.7	x	74.68	x	0.4	x	0.8	j =	28.15	(74)
North	0.9x	0.77	X	3.28	x	74.68	x	0.4	x	0.8	j =	54.32	(74)
North	0.9x	0.77	X	2.24	x	74.68	x	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	X	2.24	x	59.25	x	0.4	x	0.8	j =	58.86	(74)
North	0.9x	0.77	x	1.7	x	59.25	х	0.4	х	0.8	j =	22.34	(74)
North	0.9x	0.77	x	3.28	x	59.25	х	0.4	х	0.8	j =	43.09	(74)
North	0.9x	0.77	X	2.24	x	59.25	x	0.4	x	0.8	j =	29.43	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	х	0.8	j =	41.25	(74)
North	0.9x	0.77	X	1.7	x	41.52	x	0.4	x	0.8	j =	15.65	(74)
North	0.9x	0.77	x	3.28	x	41.52	x	0.4	х	0.8	j =	30.2	(74)
North	0.9x	0.77	x	2.24	x	41.52	x	0.4	х	0.8	j   =	20.62	(74)
North	0.9x	0.77	X	2.24	x	24.19	x	0.4	x	0.8	=	24.03	(74)
North	0.9x	0.77	X	1.7	X	24.19	X	0.4	X	0.8	=	9.12	(74)
North	0.9x	0.77	X	3.28	X	24.19	X	0.4	X	0.8	=	17.59	(74)
North	0.9x	0.77	X	2.24	X	24.19	)   x	0.4	X	0.8	, 	12.02	(74)
North	0.9x	0.77	)     x	2.24	X	13.12	) ] x	0.4	X	0.8	, 	13.03	(74)
North	0.9x	0.77	X	1.7	X	13.12	) ] x	0.4	X	0.8	,   =	4.95	(74)
North	0.9x	0.77	X	3.28	X	13.12	) ] x	0.4	X	0.8	,   =	9.54	(74)
			1		1		ı	· ·	1		1		<b>_</b> ` ′

North	0.9x	0.77	$\overline{}$	x	2.24	T x		3.12	7 x	0.4	$\overline{}$	ν Г	0.8		=	6.52	(74)
North	0.9x	0.77	$\equiv$	x	2.24	╡ ×		8.86	] ]	0.4	=	ζĖ	0.8		_	8.81	(74)
North	0.9x	0.77		x	1.7	╡ ×	-	8.86	] ]	0.4	=	ζĖ	0.8		=	3.34	(74)
North	0.9x	0.77		x	3.28	i x		8.86	] x	0.4	=	ζĖ	0.8		=	6.45	(74)
North	0.9x	0.77		x	2.24	i x		8.86	X	0.4	╡,	ζĖ	0.8	$\exists$	=	4.4	(74)
South	0.9x	0.77		x	4.47	╡ ×		16.75	X	0.4	= :	κĒ	0.8		=	46.34	(78)
South	0.9x	0.77		x	2.24	i x		16.75	j×	0.4		ζĪ	0.8		=	23.22	(78)
South	0.9x	0.77		x	4.47	٦ ×	7	76.57	X	0.4	┪,	·Γ	0.8		=	75.9	(78)
South	0.9x	0.77		x	2.24	×	7	76.57	X	0.4		ΚĒ	0.8		=	38.03	(78)
South	0.9x	0.77		x	4.47	X	9	97.53	X	0.4		ΚĒ	0.8		=	96.68	(78)
South	0.9x	0.77		x	2.24	X		97.53	X	0.4		ΚĒ	0.8		=	48.45	(78)
South	0.9x	0.77		x	4.47	x	1	10.23	X	0.4		< [	0.8		=	109.27	(78)
South	0.9x	0.77		x	2.24	x	1	10.23	X	0.4		< [	0.8		=	54.76	(78)
South	0.9x	0.77		x	4.47	x	1	14.87	X	0.4		< [	0.8		=	113.87	(78)
South	0.9x	0.77		x	2.24	X	1	14.87	X	0.4		<b>·</b> [	0.8		=	57.06	(78)
South	0.9x	0.77		x	4.47	X	1	10.55	X	0.4		< [	0.8		=	109.58	(78)
South	0.9x	0.77		X	2.24	X	1	10.55	X	0.4		<b>·</b> [	0.8		=	54.91	(78)
South	0.9x	0.77		X	4.47	x	1	08.01	X	0.4		< [	0.8		=	107.07	(78)
South	0.9x	0.77		X	2.24	X	1	08.01	X	0.4		< [	0.8		=	53.65	(78)
South	0.9x	0.77		x	4.47	X	1	04.89	X	0.4		· [	0.8		=	103.98	(78)
South	0.9x	0.77		X	2.24	X	1	04.89	X	0.4		· [	0.8		=	52.11	(78)
South	0.9x	0.77		X	4.47	x	1	01.89	X	0.4		٠ <u>[</u>	0.8		=	101	(78)
South	0.9x	0.77		X	2.24	x	1	01.89	X	0.4		٠ <u>[</u>	0.8		=	50.61	(78)
South	0.9x	0.77		X	4.47	×	8	32.59	X	0.4	:	٠ <u>[</u>	0.8		=	81.86	(78)
South	0.9x	0.77		X	2.24	×	8	32.59	X	0.4	:	٠ <u>[</u>	0.8		=	41.02	(78)
South	0.9x	0.77		X	4.47	x	Ę	55.42	X	0.4	:	٠ <u>[</u>	0.8		=	54.93	(78)
South	0.9x	0.77		X	2.24	_ x		55.42	X	0.4	:	· L	0.8		=	27.53	(78)
South	0.9x	0.77		X	4.47	×		40.4	X	0.4	:	· [	0.8		=	40.05	(78)
South	0.9x	0.77		X	2.24	X		40.4	X	0.4	:	× L	0.8		=	20.07	(78)
Solar g	97.16	watts, ca	1culat 234.7	$\overline{}$	for each mo 307.94 364	$\overline{}$	372.03	354.48	(83)m 309	n = Sum(74)m 9.8 259.33	_		116.5	83	.11	1	(83)
L		LI			$\frac{307.94}{(84)m} = (73)$			L	1 308	209.00	1 100		1 110.0			J	(00)
(84)m=	512.42	579.91	634.9	_	687.12 722		709.26	678.28	639	.43 599.72	547	.28	502.55	487	7.47	]	(84)
7 Me	an inter	nal temp	eratu	ra (	heating sea	son)		<u> </u>									
					eriods in the		n area	from Tal	ble 9	Th1 (°C)						21	(85)
•		_			ving area, h				0.00	, ( 3)							
[	Jan	Feb	Ma	-		ay	Jun	Jul	A	ug Sep	С	ct	Nov		)ec	]	
(86)m=	1	0.99	0.97	$\rightarrow$	0.9 0.7	<del>-</del>	0.54	0.39	0.4		0.9		0.99		1		(86)
เ Mean	ean internal temperature in living area T1 (follow steps						ps 3 to 7	7 in T	able 9c)	-		•					
(87)m=	20.31	20.45	20.6	$\overline{}$	20.84 20.9	Ť	21	21	2	<del></del>	20	84	20.54	20	.29	]	(87)
Temp	Temperature during heating periods in rest of dwelling from							from Ta	able (	9 Th2 (°C)			1			1	
(88)m=	20.24	20.25	20.2	<del>' ' '</del>	20.26 20.3	_	20.27	20.27	20.	<del></del>	20	26	20.25	20	.25	]	(88)
· ′ [		<u> </u>			<u> </u>			1	1				1			J	

Litilio	ation for	tor for a	ains for i	roct of d	wolling	h2 m (ca	o Tabla	00)						
(89)m=	0.99	0.99	0.96	0.87	0.7	0.48	0.32	0.36	0.61	0.9	0.98	1		(89)
, ,		ļ	ature in	ļ	ļ	ļ	<u> </u>	<u> </u>						, ,
(90)m=	19.33	19.52	19.79	20.08	20.23	20.26	20.27	20.27	20.25	20.08	19.66	19.29		(90)
, ,		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	L	LA = Livin	g area ÷ (4	1) =	0.38	(91)
Maan	:	l 40 man o m		ماند ممائد	میرام مام	II:a.\ f	I A <b>T</b> 4	. /4 - £1	Λ) Το					``
(92)m=	19.71	19.88	ature (fo	20.37	20.51	20.54	20.55	+ (1 – 1L 20.55	20.53	20.37	20	19.67		(92)
			he mean								20	10.07		(02)
(93)m=	19.71	19.88	20.11	20.37	20.51	20.54	20.55	20.55	20.53	20.37	20	19.67		(93)
	ace hea	ting requ	uirement											
Set T	i to the i	mean int	ternal ter	mperatu	re obtain	ed at st	ep 11 of	Table 9l	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	r	or gains	using Ta	ble 9a	ī							ı	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm						0.04		0.00	0.00	1	(0.4)
(94)m=	0.99	0.98	0.96	0.88	0.71	0.5	0.35	0.39	0.64	0.9	0.98	0.99		(94)
(95)m=	508.72	570.28	, W = (9 <sup>2</sup> 608.19	4)M X (84 604.01	4)m 515.31	355.35	236.85	248.22	380.92	495.02	493.67	484.84		(95)
			ernal tem		<u> </u>	<u> </u>	230.03	240.22	300.92	490.02	493.07	404.04		(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		e for me	an intern	al tempe										
(97)m=	953.05	924.5	838.44	698.59	535.07	356.92	236.96	248.44	388.06	593.31	787.04	948.54		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m		l	
(98)m=	330.58	238.03	171.31	68.1	14.7	0	0	0	0	73.13	211.23	344.99		
		-		-	-	-	-	Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1452.07	(98)
Space	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								19.01	(99)
9b. En	erav red	uiremer	nts – Cor	mmunity	heating	scheme								
			ace hea	· ·				ting prov	ided by	a comm	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary	/supplen	nentary l	heating (	(Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The con	nmunity 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	_
			s, geotherr			rom powe	r stations.	See Appe	ndix C.			1		_
Fractio	n of hea	at from (	Commun	ity heat	pump								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump	)			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for o	commun	ity heati	ng syste	m					1.1	(306)
Space	heating	g										'	kWh/year	
Annua	space	heating	requiren	nent									1452.07	
Space	heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) =	=	1597.27	(307a)
Efficier	Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  0 (308)													
Space	heating	require	ment fro	m secon	dary/sur	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
•	3	•			, ,	•			•		-			

Water heating Annual water heating requirement		ſ	2082.41	٦
If DHW from community scheme:		l r		<b>⊣</b> ¬
Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2290.65	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	7e) + (310a)(310e)] =	38.88	(313)
Cooling System Energy Efficiency Ratio		l	0	(314)
Space cooling (if there is a fixed cooling system, if not enter	$= (107) \div (314)$	) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	om outside	[	160.55	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	160.55	(331)
Energy for lighting (calculated in Appendix L)			333.39	(332)
Electricity generated by PVs (Appendix M) (negative quantity	<b>'</b> )		-647.71	(333)
Electricity generated by wind turbine (Appendix M) (negative	quantity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)  If there is CHP to	kWh/year	_		(367a)
Efficiency of heat source 1 (%)  If there is CHP to	<b>kWh/year</b> P)	_		(367a) (367)
Efficiency of heat source 1 (%)  If there is CHP to	kWh/year  P) using two fuels repeat (363) to	(366) for the second fuel	319	_
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  [(307)	kWh/year  P) using two fuels repeat (363) to  (b)+(310b)] x 100 ÷ (367b) x	0.52 = 0.52 =	319 632.55	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	kWh/year  P) sing two fuels repeat (363) to (367b) x (313) x	0.52 = 0.52 =	319 632.55 20.18	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	kWh/year  P) using two fuels repeat (363) to  (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(376)  (309) x	0.52 = 0.52 = 2) =	319 632.55 20.18 652.73	(367) (372) (373)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)	kWh/year  P) using two fuels repeat (363) to  (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(376)  (309) x	0.52 = 0.52 = 0.52 = 0.52 = 0 = 0.52	319 632.55 20.18 652.73	(367) (372) (373) (374)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantal	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] × 100 ÷ (367b) ×  [(313) ×  (363)(366) + (368)(373)  (309) ×  aneous heater (312) ×  (373) + (374) + (375) =	0.52 = 0.52 = 0.52 = 0.52 = 0 = 0.52	319 632.55 20.18 652.73 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantation  Total CO2 associated with space and water heating	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] × 100 ÷ (367b) ×  [(313) ×  (363)(366) + (368)(373)  (309) ×  aneous heater (312) ×  (373) + (374) + (375) =	0.52 = 0.	319 632.55 20.18 652.73 0	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantated total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dward control con	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(373)  (309) x  aneous heater (312) x  (373) + (374) + (375) = (elling (331)) x  (332))) x	0.52 = 0.	319 632.55 20.18 652.73 0 0 652.73 83.33	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantated total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dward co2 associated with electricity for lighting  Energy saving/generation technologies (333) to (334) as approximately associated with electricity for lighting	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(373)  (309) x  aneous heater (312) x  (373) + (374) + (375) = (elling (331)) x  (332))) x	0.52 = 0.	319 632.55 20.18 652.73 0 0 652.73 83.33 173.03	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantated total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dward co2 associated with electricity for lighting  Energy saving/generation technologies (333) to (334) as applied to the condition of the con	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(373)  (309) x  aneous heater (312) x  (373) + (374) + (375) = (elling (331)) x  (332))) x	0.52 = 0.	319 632.55 20.18 652.73 0 0 652.73 83.33 173.03	(367) (372) (373) (374) (375) (376) (378) (379) (380)

			U <u>ser I</u>	Details:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20	012		Strom Softwa					0006273 on: 1.0.4.26	
	07.007.4			Address						
Address:	GT 305, Aspen Co	ourt, Maitla	and Par	k Estate,	London	, NW3 2	EH.			
1. Overall dwelling dim	ensions.		۸ro	a(m²)		۸۷ ۵۰	ight(m)		Volume(m <sup>3</sup>	`
Ground floor					(1a) x		2.6	(2a) =	198.64	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(	1e)+(1r	n)	76.4	(4)			_		_
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	198.64	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	] + [	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans					3	x -	10 =	30	(7a)
Number of passive vents	S				Ē	0	x -	10 =	0	(7b)
Number of flueless gas	fires				F	0	x 4	40 =	0	(7c)
					L					
					_			Air ch	nanges per ho	ur
Infiltration due to chimne						30		÷ (5) =	0.15	(8)
If a pressurisation test has  Number of storeys in		ided, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			(9)
Additional infiltration	ine aweiling (113)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or timbe	er frame or	0.35 fo	r masoni	ry constr	ruction	1(0)		0	(11)
• • • • • • • • • • • • • • • • • • • •	oresent, use the value corr	esponding to	the grea	ter wall are	a (after					
deducting areas of open If suspended wooden	• / .	aled) or 0	1 (seal	عوام (امد	enter ()					(12)
If no draught lobby, er	•	,	. i (Scal	eu), eise	enter o				0	(13)
Percentage of window									0	(14)
Window infiltration				0.25 - [0.2	? x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value	, q50, expressed in co	ubic metre	s per h	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeab	ility value, then (18) = I	$[(17) \div 20] + (8)$	8), otherw	rise (18) = (	(16)				0.4	(18)
Air permeability value appli		nas been dor	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelter Shelter factor	ed			(20) = 1 -	[0 075 x (1	19)1 =			2	(19)
Infiltration rate incorpora	iting shelter factor			(21) = (18	•	. •/1			0.85	(20)
Infiltration rate modified	•	ed		(= :)	)				0.34	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind s		- 1		, 3	1	1		1	4	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
		-	•	•		1	•	1	4	
Wind Factor $(22a)m = (2a)m =$	<del>'</del>	1 00-		1 000	· ·	I 400			7	
(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 infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.43	
Calculate effective air change rate for the applicable case	
If mechanical ventilation:  [0]  [1]  [1]  [1]  [2]  [2]  [3]  [4]  [4]  [5]  [6]  [6]  [6]  [7]  [6]  [7]  [6]  [7]  [7	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	(23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 – (23c) ÷ 100]	(24a)
	(24a)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	(24b)
	(240)
c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$ ; otherwise $(24c) = (22b)m + 0.5 \times (23b)$	
	(24c)
d) If natural ventilation or whole house positive input ventilation from loft	
if $(22b)m = 1$ , then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	
(24d)m= 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.56 0.57 0.57 0.58	(24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.56 0.57 0.57 0.58	(25)
3. Heat losses and heat loss parameter:	
ELEMENT Gross Openings Net Area U-value A X U k-value A X I	<
area (m²) m² A ,m² W/m2K (W/K) kJ/m²·K kJ/K	
Windows Type 1 $4.47$ $x^{1/[1/(1.4) + 0.04]} = 5.93$	(27)
Windows Type 2 $2.24   x1/[1/(1.4) + 0.04] = 2.97$	(27)
Windows Type 3 $1.7   x^{1/[1/(1.4) + 0.04]} = 2.25$	(27)
Windows Type 4 $3.28   x^{1/[1/(1.4) + 0.04]} = 4.35$	(27)
Windows Type 5 $2.24   x^{1/[1/(1.4) + 0.04]} = 2.97$	(27)
Windows Type 6 $2.24$ $x^{1/[1/(1.4)+0.04]} = 2.97$	(27)
Walls 61.91 18.41 43.5 x 0.18 = 7.83	(29)
Roof 76.4 0 76.4 × 0.13 = 9.93	(30)
Total area of elements, m <sup>2</sup>	(31)
Party wall 42.77 x 0 = 0	(32)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2  ** include the areas on both sides of internal walls and partitions	
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$ 42.17	(33)
Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 0	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250	(35)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.	
Thermal bridges: S (L x Y) calculated using Appendix K	(36)
if details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss $(33) + (36) = 49.44$	(37)
Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$	. ,
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	

(22)	T	l		l			T						(00)
(38)m= 38.97	38.73	38.49	37.38	37.18	36.21	36.21	36.03	36.58	37.18	37.6	38.03		(38)
Heat transfer of				00.04	05.05	05.05	l 05 47	· · · ·	= (37) + (3	<del>_</del>	07.47		
(39)m= 88.4	88.16	87.93	86.82	86.61	85.65	85.65	85.47	86.02	86.61	87.03	87.47	86.82	(39)
Heat loss para	meter (l	HLP), W	m²K						Average = = (39)m ÷		12 / 12=	00.02	(00)
(40)m= 1.16	1.15	1.15	1.14	1.13	1.12	1.12	1.12	1.13	1.13	1.14	1.14		<b>_</b>
Number of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁	12 /12=	1.14	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		•					•						
4. Water heat	ting ene	rgy requi	irement:								kWh/ye	ar:	
A sourmed soor	in an air	N I											(40)
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.		.39		(42)
Annual average	•	ater usad	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		90	),99		(43)
Reduce the annua	al average	hot water	usage by	5% if the $c$	lwelling is	designed t			se target o				, ,
not more that 125		· ·				<u> </u>	Ι.	_					
Jan Hot water usage i	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	,		1	· ·	1	1	· <i>'</i>	00.47	00.04	00.45	1400.00		
(44)m= 100.09	96.45	92.81	89.17	85.53	81.89	81.89	85.53	89.17	92.81	96.45	100.09	1091.84	(44)
Energy content of	hot water	used - cal	culated m	onthly = $4$ .	190 x Vd,r	n x nm x D	OTm / 3600		Fotal = Su oth (see Ta	· /	L	1091.04	(44)
(45)m= 148.42	129.81	133.95	116.78	112.06	96.7	89.6	102.82	104.05	121.26	132.37	143.74		
									Γotal = Su	m(45) <sub>112</sub> =	=	1431.57	(45)
If instantaneous w	/ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					
(46)m= 22.26 Water storage	19.47	20.09	17.52	16.81	14.5	13.44	15.42	15.61	18.19	19.85	21.56		(46)
Storage volum		) includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	` '		•			•					100		(11)
Otherwise if no	_			-			. ,	ers) ente	er '0' in (	47)			
Water storage													
a) If manufact				or is kno	wn (kWh	n/day):				1.	.39		(48)
Temperature f										0.	.54		(49)
Energy lost fro b) If manufact		-	-		or is not		(48) x (49)	) =		0.	.75		(50)
Hot water stor			-								0		(51)
If community h	•			•		• ,							, ,
Volume factor											0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	. , .	•								0.	.75		(55)
Water storage		culated 1	or each	month	T	T	((56)m = (	55) × (41)ı	n	ı			
(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	. 11	(56)
If cylinder contains	s dedicate	a solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	υ), else (5	/)m = (56)	m where (	H11) IS fro	m Appendi	(H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)

Primary circuit loss (annual) from Table 3	0	(58)										
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$	m											
(modified by factor from Table H5 if there is solar water heating and a	cylinder thermostat)											
(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 x (41)m												
(61)m= 0 0 0 0 0 0 0 0	0 0 0 0	(61)										
Total heat required for water heating calculated for each month (62)m =	0.85 × (45)m + (46)m + (57)m + (59)m + (61)m											
(62)m= 195.02 171.9 180.55 161.88 158.65 141.79 136.2 149.42	149.14 167.86 177.46 190.33	(62)										
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0'	' if no solar contribution to water heating)											
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G	G)											
(63)m= 0 0 0 0 0 0 0	0 0 0 0	(63)										
Output from water heater												
(64)m= 195.02 171.9 180.55 161.88 158.65 141.79 136.2 149.42	149.14 167.86 177.46 190.33											
Outp	out from water heater (annual) <sub>112</sub> 1980.19	(64)										
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m	n] + 0.8 x [(46)m + (57)m + (59)m ]											
(65)m= 86.63 76.83 81.82 74.9 74.54 68.23 67.07 71.46		(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= 119.55 119.55 119.55 119.55 119.55 119.55 119.55	119.55 119.55 119.55	(66)										
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see	Table 5											
(67)m= 18.88 16.77 13.64 10.32 7.72 6.51 7.04 9.15		(67)										
Appliances gains (calculated in Appendix L, equation L13 or L13a), also	o see Table 5											
(68)m= 211.75 213.95 208.41 196.62 181.74 167.76 158.42 156.22		(68)										
Cooking gains (calculated in Appendix L, equation L15 or L15a), also se	ee Table 5											
(69)m= 34.96 34.96 34.96 34.96 34.96 34.96 34.96 34.96		(69)										
Pumps and fans gains (Table 5a)												
(70)m= 3 3 3 3 3 3 3 3 3 3	3 3 3 3	(70)										
Losses e.g. evaporation (negative values) (Table 5)												
(71)m= -95.64 -95.64 -95.64 -95.64 -95.64 -95.64 -95.64 -95.64	-95.64 -95.64 -95.64	(71)										
Water heating gains (Table 5)												
(72)m= 116.43 114.33 109.97 104.03 100.18 94.76 90.15 96.05	98.15 104.29 111.23 114.34	(72)										
	L L L L L L L L L L L L L L L L L L L											
(73)m= 408.93 406.91 393.88 372.85 351.51 330.9 317.47 323.29	<del> </del>	(73)										
6. Solar gains:												
Solar gains are calculated using solar flux from Table 6a and associated equations to co	onvert to the applicable orientation.											
Orientation: Access Factor Area Flux	g_ FF Gains											
Table 6d m² Table 6a Table 6a	able 6b Table 6c (W)											
North 0.9x 0.77 x 2.24 x 10.63 x	0.63 × 0.7 = 14.56	(74)										
North 0.9x 0.77 x 1.7 x 10.63 x	0.63 × 0.7 = 5.52	(74)										

North	NI = mtls	_		1		1		1				1		٦
North		<b>-</b>	0.77	X	3.28	X	10.63	X	0.63	X	0.7	=	10.66	=
North		0.9x	0.77	X	2.24	Х	10.63	X	0.63	X	0.7	=	7.28	=
North		0.9x	0.77	X	2.24	Х	20.32	X	0.63	X	0.7	=	27.82	=
North		0.9x	0.77	X	1.7	X	20.32	X	0.63	X	0.7	=	10.56	(74)
North		0.9x	0.77	X	3.28	X	20.32	X	0.63	X	0.7	=	20.37	(74)
North	North	0.9x	0.77	X	2.24	X	20.32	X	0.63	X	0.7	=	13.91	(74)
North	North	0.9x	0.77	X	2.24	X	34.53	X	0.63	X	0.7	<u> </u>	47.28	(74)
North	North	0.9x	0.77	X	1.7	X	34.53	X	0.63	X	0.7	=	17.94	(74)
North	North	0.9x	0.77	X	3.28	X	34.53	x	0.63	X	0.7	=	34.61	(74)
North 0.9x 0.77 x 3.28 x 55.46 x 0.63 x 0.7 = 28.82 (74)  North 0.9x 0.77 x 3.28 x 55.46 x 0.63 x 0.7 = 37.97 (74)  North 0.9x 0.77 x 2.24 x 74.72 x 0.63 x 0.7 = 102.3 (74)  North 0.9x 0.77 x 1.7 x 74.72 x 0.63 x 0.7 = 102.3 (74)  North 0.9x 0.77 x 1.7 x 74.72 x 0.63 x 0.7 = 102.3 (74)  North 0.9x 0.77 x 1.7 x 74.72 x 0.63 x 0.7 = 102.3 (74)  North 0.9x 0.77 x 1.7 x 74.72 x 0.63 x 0.7 = 102.3 (74)  North 0.9x 0.77 x 2.24 x 74.72 x 0.63 x 0.7 = 74.9 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 109.51 (74)  North 0.9x 0.77 x 3.28 x 79.99 x 0.63 x 0.7 = 109.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 109.51 (74)  North 0.9x 0.77 x 1.7 x 79.99 x 0.63 x 0.7 = 109.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 109.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 109.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 100.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 100.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 100.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 100.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 100.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 100.51 (74)  North 0.9x 0.77 x 2.24 x 79.99 x 0.63 x 0.7 = 100.51 (74)  North 0.9x 0.77 x 2.24 x 74.68 x 0.63 x 0.7 = 100.24 (74)  North 0.9x 0.77 x 2.24 x 74.68 x 0.63 x 0.7 = 100.24 (74)  North 0.9x 0.77 x 2.24 x 74.68 x 0.63 x 0.7 = 100.24 (74)  North 0.9x 0.77 x 2.24 x 59.25 x 0.63 x 0.7 = 51.12 (74)  North 0.9x 0.77 x 2.24 x 59.25 x 0.63 x 0.7 = 50.99 (74)  North 0.9x 0.77 x 2.24 x 59.25 x 0.63 x 0.7 = 50.99 (74)  North 0.9x 0.77 x 2.24 x 14.52 x 0.63 x 0.7 = 50.99 (74)  North 0.9x 0.77 x 2.24 x 44.52 x 0.63 x 0.7 = 24.25 (74)  North 0.9x 0.77 x 2.24 x 44.52 x 0.63 x 0.7 = 24.25 (74)  North 0.9x 0.77 x 2.24 x 2.4 x 24.19 x 0.63 x 0.7 = 24.25 (74)  North 0.9x 0.77 x 2.24 x 2.4 x 24.19 x 0.63 x 0.7 = 10.56 (74)  North 0.9x 0.77 x 2.24 x 2.4 x 24.19 x 0.63 x 0.7 = 10.56 (74)  North 0.9x 0.77 x 2.24 x 2.4 x 24.19 x 0.63 x 0.7 = 10.56 (74)  North 0.9x 0.77 x 2.24 x 2.4 x 24.19 x 0	North	0.9x	0.77	X	2.24	X	34.53	X	0.63	X	0.7	=	23.64	(74)
North	North	0.9x	0.77	X	2.24	x	55.46	x	0.63	x	0.7	=	75.94	(74)
North	North	0.9x	0.77	X	1.7	x	55.46	X	0.63	x	0.7	=	28.82	(74)
North	North	0.9x	0.77	X	3.28	x	55.46	x	0.63	X	0.7	=	55.6	(74)
North	North	0.9x	0.77	X	2.24	X	55.46	x	0.63	X	0.7	=	37.97	(74)
North	North	0.9x	0.77	X	2.24	X	74.72	x	0.63	X	0.7	=	102.3	(74)
North	North	0.9x	0.77	X	1.7	x	74.72	x	0.63	x	0.7	=	38.82	(74)
North	North	0.9x	0.77	X	3.28	X	74.72	x	0.63	X	0.7	=	74.9	(74)
North	North	0.9x	0.77	X	2.24	x	74.72	x	0.63	X	0.7	=	51.15	(74)
North	North	0.9x	0.77	X	2.24	X	79.99	x	0.63	X	0.7	=	109.51	(74)
North	North	0.9x	0.77	X	1.7	X	79.99	x	0.63	X	0.7	=	41.56	(74)
North	North	0.9x	0.77	X	3.28	X	79.99	x	0.63	x	0.7	=	80.18	(74)
North	North	0.9x	0.77	X	2.24	x	79.99	x	0.63	x	0.7	=	54.76	(74)
North	North	0.9x	0.77	X	2.24	X	74.68	x	0.63	x	0.7	=	102.24	(74)
North	North	0.9x	0.77	X	1.7	X	74.68	x	0.63	X	0.7	=	38.8	(74)
North	North	0.9x	0.77	X	3.28	X	74.68	X	0.63	X	0.7	=	74.86	(74)
North	North	0.9x	0.77	X	2.24	X	74.68	x	0.63	X	0.7	=	51.12	(74)
North	North	0.9x	0.77	X	2.24	x	59.25	X	0.63	x	0.7	=	81.12	(74)
North 0.9x 0.77 x 2.24 x 41.52 x 0.63 x 0.7 = 40.56 (74)  North 0.9x 0.77 x 3.28 x 41.52 x 0.63 x 0.7 = 56.84 (74)  North 0.9x 0.77 x 3.28 x 41.52 x 0.63 x 0.7 = 21.57 (74)  North 0.9x 0.77 x 3.28 x 41.52 x 0.63 x 0.7 = 41.62 (74)  North 0.9x 0.77 x 2.24 x 41.52 x 0.63 x 0.7 = 41.62 (74)  North 0.9x 0.77 x 2.24 x 41.52 x 0.63 x 0.7 = 28.42 (74)  North 0.9x 0.77 x 2.24 x 24.19 x 0.63 x 0.7 = 33.12 (74)  North 0.9x 0.77 x 1.7 x 24.19 x 0.63 x 0.7 = 12.57 (74)  North 0.9x 0.77 x 3.28 x 24.19 x 0.63 x 0.7 = 12.57 (74)  North 0.9x 0.77 x 3.28 x 24.19 x 0.63 x 0.7 = 12.57 (74)  North 0.9x 0.77 x 3.28 x 24.19 x 0.63 x 0.7 = 12.57 (74)  North 0.9x 0.77 x 2.24 x 24.19 x 0.63 x 0.7 = 16.56 (74)  North 0.9x 0.77 x 2.24 x 13.12 x 0.63 x 0.7 = 16.56 (74)  North 0.9x 0.77 x 2.24 x 13.12 x 0.63 x 0.7 = 17.96 (74)  North 0.9x 0.77 x 1.7 x 13.12 x 0.63 x 0.7 = 6.82 (74)	North	0.9x	0.77	X	1.7	X	59.25	X	0.63	X	0.7	=	30.78	(74)
North	North	0.9x	0.77	X	3.28	X	59.25	X	0.63	X	0.7	=	59.39	(74)
North 0.9x 0.77 x 1.7 x 41.52 x 0.63 x 0.7 = 21.57 (74)  North 0.9x 0.77 x 3.28 x 41.52 x 0.63 x 0.7 = 41.62 (74)  North 0.9x 0.77 x 2.24 x 41.52 x 0.63 x 0.7 = 28.42 (74)  North 0.9x 0.77 x 2.24 x 24.19 x 0.63 x 0.7 = 33.12 (74)  North 0.9x 0.77 x 1.7 x 24.19 x 0.63 x 0.7 = 12.57 (74)  North 0.9x 0.77 x 3.28 x 24.19 x 0.63 x 0.7 = 12.57 (74)  North 0.9x 0.77 x 3.28 x 24.19 x 0.63 x 0.7 = 24.25 (74)  North 0.9x 0.77 x 2.24 x 24.19 x 0.63 x 0.7 = 16.56 (74)  North 0.9x 0.77 x 2.24 x 13.12 x 0.63 x 0.7 = 17.96 (74)  North 0.9x 0.77 x 1.7 x 13.12 x 0.63 x 0.7 = 6.82 (74)	North	0.9x	0.77	X	2.24	X	59.25	x	0.63	x	0.7	=	40.56	(74)
North	North	0.9x	0.77	X	2.24	X	41.52	X	0.63	X	0.7	=	56.84	(74)
North         0.9x         0.77         x         2.24         x         41.52         x         0.63         x         0.7         =         28.42         (74)           North         0.9x         0.77         x         2.24         x         24.19         x         0.63         x         0.7         =         33.12         (74)           North         0.9x         0.77         x         1.7         x         24.19         x         0.63         x         0.7         =         12.57         (74)           North         0.9x         0.77         x         3.28         x         24.19         x         0.63         x         0.7         =         24.25         (74)           North         0.9x         0.77         x         2.24         x         24.19         x         0.63         x         0.7         =         16.56         (74)           North         0.9x         0.77         x         2.24         x         13.12         x         0.63         x         0.7         =         17.96         (74)           North         0.9x         0.77         x         1.7         x         13.12	North	0.9x	0.77	X	1.7	X	41.52	x	0.63	X	0.7	=	21.57	(74)
North	North	0.9x	0.77	X	3.28	X	41.52	x	0.63	x	0.7	=	41.62	(74)
North         0.9x         0.77         x         1.7         x         24.19         x         0.63         x         0.7         =         12.57         (74)           North         0.9x         0.77         x         3.28         x         24.19         x         0.63         x         0.7         =         24.25         (74)           North         0.9x         0.77         x         2.24         x         24.19         x         0.63         x         0.7         =         16.56         (74)           North         0.9x         0.77         x         2.24         x         13.12         x         0.63         x         0.7         =         17.96         (74)           North         0.9x         0.77         x         1.7         x         13.12         x         0.63         x         0.7         =         6.82         (74)	North	0.9x	0.77	X	2.24	X	41.52	X	0.63	X	0.7	=	28.42	(74)
North 0.9x 0.77	North	0.9x	0.77	X	2.24	X	24.19	X	0.63	X	0.7	=	33.12	(74)
North 0.9x 0.77 x 2.24 x 24.19 x 0.63 x 0.7 = 16.56 (74)  North 0.9x 0.77 x 2.24 x 13.12 x 0.63 x 0.7 = 17.96 (74)  North 0.9x 0.77 x 1.7 x 13.12 x 0.63 x 0.7 = 6.82 (74)	North	0.9x	0.77	X	1.7	x	24.19	x	0.63	x	0.7	] =	12.57	(74)
North 0.9x 0.77 x 2.24 x 13.12 x 0.63 x 0.7 = 17.96 (74)  North 0.9x 0.77 x 1.7 x 13.12 x 0.63 x 0.7 = 6.82 (74)	North	0.9x	0.77	X	3.28	x	24.19	x	0.63	x	0.7	=	24.25	(74)
North 0.9x 0.77 x 1.7 x 13.12 x 0.63 x 0.7 = 6.82 (74)	North	0.9x	0.77	X	2.24	x	24.19	x	0.63	x	0.7	=	16.56	(74)
	North	0.9x	0.77	X	2.24	x	13.12	x	0.63	x	0.7	] =	17.96	(74)
North 0.9x 0.77 x 3.28 x 13.12 x 0.63 x 0.7 = 13.15 (74)	North	0.9x	0.77	X	1.7	x	13.12	x	0.63	x	0.7	] =	6.82	(74)
	North	0.9x	0.77	X	3.28	X	13.12	X	0.63	x	0.7	=	13.15	(74)

North	۵. ۲		_						1 1		_				<b>—</b>
North	0.9x	0.77	X	2.2		X		3.12	X	0.63	→   ×	0.7	=	8.98	(74)
North	0.9x	0.77	X	2.2	_	X	8	3.86	X	0.63	×	0.7	=	12.14	(74)
North	0.9x	0.77	X	1.	7	X	8	3.86	X	0.63	X	0.7	ᆗ =	4.61	(74)
North	0.9x	0.77	X	3.2	8	X	8	3.86	X	0.63	X	0.7	_ =	8.89	(74)
North	0.9x	0.77	X	2.2	4	X	8	3.86	X	0.63	X	0.7	=	6.07	(74)
South	0.9x	0.77	X	4.4	7	X	4	6.75	X	0.63	X	0.7	=	63.87	(78)
South	0.9x	0.77	X	2.2	4	X	4	6.75	X	0.63	X	0.7	=	32.01	(78)
South	0.9x	0.77	X	4.4	7	X	7	6.57	X	0.63	X	0.7	=	104.6	(78)
South	0.9x	0.77	X	2.2	4	X	7	6.57	X	0.63	X	0.7	=	52.42	(78)
South	0.9x	0.77	X	4.4	.7	X	9	7.53	X	0.63	X	0.7	=	133.24	(78)
South	0.9x	0.77	X	2.2	4	X	9	7.53	X	0.63	X	0.7	=	66.77	(78)
South	0.9x	0.77	X	4.4	.7	X	11	10.23	X	0.63	X	0.7	=	150.59	(78)
South	0.9x	0.77	X	2.2	4	X	11	10.23	x	0.63	X	0.7	=	75.46	(78)
South	0.9x	0.77	X	4.4	7	X	11	14.87	X	0.63	X	0.7	=	156.92	(78)
South	0.9x	0.77	X	2.2	4	X	11	14.87	X	0.63	X	0.7	=	78.64	(78)
South	0.9x	0.77	X	4.4	.7	X	11	10.55	x	0.63	X	0.7	=	151.02	(78)
South	0.9x	0.77	x	2.2	4	x	11	10.55	x	0.63	x	0.7		75.68	(78)
South	0.9x	0.77	x	4.4	7	X	10	08.01	x	0.63	x	0.7	_ =	147.55	(78)
South	0.9x	0.77	x	2.2	4	X	10	08.01	x	0.63	×	0.7	=	73.94	(78)
South	0.9x	0.77	x	4.4	7	X	10	04.89	X	0.63	x	0.7	=	143.3	(78)
South	0.9x	0.77	x	2.2	4	X	10	04.89	X	0.63	x	0.7	=	71.81	(78)
South	0.9x	0.77	x	4.4	7	X	10	01.89	x	0.63	×	0.7		139.18	(78)
South	0.9x	0.77	x	2.2	4	X	10	)1.89	x	0.63	×	0.7	_ =	69.75	(78)
South	0.9x	0.77	x	4.4	7	X	8	2.59	X	0.63	×	0.7	<del>-</del>	112.82	(78)
South	0.9x	0.77	x	2.2	4	X	8	2.59	X	0.63	= x	0.7		56.54	(78)
South	0.9x	0.77	x	4.4	7	X	5	5.42	X	0.63	×	0.7	=	75.7	(78)
South	0.9x	0.77	x	2.2	4	X	5	5.42	X	0.63	×	0.7		37.94	(78)
South	0.9x	0.77	X	4.4		X		10.4	X	0.63	×	0.7		55.19	(78)
South	0.9x	0.77	X	2.2	4	X	4	10.4	X	0.63	×	0.7		27.66	(78)
	L								<b>J</b> 1						
Solar g	ains in	watts, cal	lculated	for eacl	n montl	า			(83)m	= Sum(74)m	(82)m				
(83)m=	133.89	229.68	323.48	424.38	502.72	5	12.7	488.51	426	95 357.38	255.8	160.55	114.54	]	(83)
Total g	ains – i	nternal ar	nd solar	(84)m =	(73)m	+ (8	83)m ,	watts						_	
(84)m=	542.82	636.59	717.36	797.22	854.23	8	43.59	805.98	750.	24 691.44	611.1	5 540.27	512.56		(84)
7. Me	an inter	nal tempe	erature	(heating	seaso	n)									
Temp	erature	during he	eating p	eriods ir	the liv	ing	area f	rom Tab	ole 9,	Th1 (°C)				21	(85)
Utilisa	ation fac	tor for ga	ins for I	iving are	a, h1,r	n (s	ee Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.97	0.93	0.81	7	0.62	0.46	0.5	1 0.77	0.95	0.99	1		(86)
Mean	interna	l tempera	iture in	living are	ea T1 (1	follo	w ste	os 3 to 7	in T	able 9c)				=	
(87)m=	19.85	20.03	20.29	20.62	20.86	_	20.97	20.99	20.9	<del>- i</del>	20.61	20.17	19.82	]	(87)
Temp	erature	during h	eating n	eriode ir	rest o	f dw	elling	from Ta	hle C	), Th2 (°C)		1	I	1	
(88)m=	19.95	19.96	19.96	19.97	19.97	$\overline{}$	9.98	19.98	19.9	<del></del>	19.97	19.97	19.96	]	(88)
()		1						2.20	L	1	1	1	l	]	<b>V</b> = /

Litilicat	tion foo	tor for a	ains for I	ract of du	volling k	2 m (cc	o Tablo	00)						
(89)m=	0.99	0.99	0.97	0.9	0.75	0.54	0.36	9a) 0.41	0.68	0.93	0.99	1		(89)
` ′ L											0.99	'		(00)
Mean (90)m=	18.44	temper	19.08	the rest	of dwellii 19.84	ng 12 (fo	ollow ste	ps 3 to 1	7 in Tabl	e 9c)	18.91	18.4		(90)
(90)111=	10.44	10.7	19.00	19.54	19.04	19.91	19.90	19.90	!	LA = Livin	!	ļ	0.38	(91)
											g a.oa . (	.,	0.30	(01)
г			ature (fo		1			<u> </u>				1		(0.0)
(92)m=	18.98	19.21	19.54	19.95	20.23	20.35	20.37	20.37	20.3	19.94	19.39	18.94		(92)
									ere appro	·				(00)
(93)m=	18.98	19.21	19.54	19.95	20.23	20.35	20.37	20.37	20.3	19.94	19.39	18.94		(93)
		·	uirement					<b>-</b>		. —	<b>-</b> ~ \			
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9	o, so tha	t II,m=(	/6)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm											
(94)m=	0.99	0.98	0.96	0.9	0.77	0.57	0.4	0.45	0.71	0.93	0.98	0.99		(94)
Г			W = (94)	<u> </u>										
` ' L	538.76	626.18	690.29	719.19	657.54	479.07	321.04	335.98	492.88	567.3	531.72	509.6		(95)
Г			rnal tem	i			ı		ı	ı	ı	1		(0.0)
(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)
					-		<del>- `                                   </del>	- ,	– (96)m	<del>-</del>	4000 77	4000 54		(07)
` ' L		1261.44		959.23	739	492.54	322.82	339.15	533.65	809.22	1069.77	1289.54		(97)
Space (98)m=	564.53	g require 426.89	339.59	172.83	60.6	vn/mon	$\ln = 0.02$	24 X [(97)	)m – (95 0	179.99	387.4	580.27		
(90)111=	304.33	420.09	339.59	172.03	00.0	U	U			<u> </u>	<u> </u>	L	0740.4	(98)
Space	hootin	a roquir	ement in	k\\/h/m2	hoor			Tota	l per year	(Kvvn/year	) = Sum(9	0)15,912 =	2712.1	](98) ](99)
		• ,			•							l	35.5	
			nts – Indi	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
•	e heating	_	at from s	econdary	//supple	mentarv	svstem					ı	0	(201)
	•		at from m			,	•	(202) = 1 -	- (201) =				1	(202)
	•		ng from	•	` ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	•									93.5	(206)
	•	•	ry/supple	•		g system	າ, %						0	(208)
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊒ ar
Space			ement (c					- 3					,,,,	
Ė	564.53	426.89	339.59	172.83	60.6	0	0	0	0	179.99	387.4	580.27		
(211)m	= {[(98	)m x (20	4)] } x 1	00 ÷ (20	)6)									(211)
(= ι ι /	603.77	456.57	363.2	184.85	64.82	0	0	0	0	192.5	414.33	620.61		( )
L					!			Tota	L I (kWh/yea	ar) =Sum(2	L 211) <sub>15.1012</sub>	=	2900.64	(211)
Snace	heatin	a fuel (s	econdar	v), kWh/	month						, 1012	l		<b>」</b> ` ′
-			00 ÷ (20	-										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
L					·			Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
												·		_

Water heating Output from water heater (calculated above)								
	41.79 136.2	149.42	149.14	167.86	177.46	190.33		
Efficiency of water heater		•					79.8	(216
(217)m= 87.49 87.15 86.48 84.99 82.5	79.8 79.8	79.8	79.8	85	86.84	87.6		(217
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
` '	77.68 170.68	187.24	186.89	197.48	204.35	217.28		
	•	Tota	I = Sum(2	19a) <sub>112</sub> =		•	2353.32	(219
Annual totals				k\	Wh/year	•	kWh/year	-
Space heating fuel used, main system 1							2900.64	
Water heating fuel used							2353.32	]
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230
boiler with a fan-assisted flue						45		(230
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231
Electricity for lighting							333.39	(232
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP						
	<b>Energy</b> kWh/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/yea	ı <b>r</b>
Space heating (main system 1)	(211) x			0.2	16	=	626.54	(261
Space heating (secondary)	(215) x			0.5	19	=	0	(263
Water heating	(219) x			0.2	16	=	508.32	(264
Space and water heating	(261) + (262)	+ (263) + (	264) =				1134.86	(265
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267
Electricity for lighting	(232) x			0.5	19	=	173.03	(268
Total CO2, kg/year			sum o	of (265)(2	271) =		1346.81	_ ](272

TER =

(273)

25.8

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:35:22

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 75.8m<sup>2</sup> Site Reference: Plot Reference: Maitland Park Estate GT 306

GT 306, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

28.64 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 8.70 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.6 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 48.2 kWh/m<sup>2</sup>

OK 2 Fabric U-values

**Element Average** 

**Highest** 0.12 (max. 0.70) External wall 0.12 (max. 0.30) OK Party wall 0.00 (max. 0.20) OK

Floor (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

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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:	0.53	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North	2.47m²	
Windows facing: North	2.24m²	
Windows facing: North	2.24m²	
Windows facing: North	6.73m²	
Windows facing: North	2.24m²	
Windows facing: East	2.24m²	
Windows facing: South	1.5m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
Roofs U-value	0.1 W/m <sup>2</sup> K	
External Walls U-value	0.12 W/m²K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

			User D	Notaile:						
Access Names	John Circan	20	– <del>USE</del> ITL		_ NI	<b>Lau</b> -		CTDA	0006070	
Assessor Name:	John Simps			Strom					006273	
Software Name:	Stroma FSA			Softwa				versic	n: 1.0.4.26	
	<b></b>		Property							
Address :		en Court, Mait	land Parl	k Estate,	London	, NW3 2	2EH			
1. Overall dwelling dime	ensions:									
			Are	a(m²)		Av. He	ight(m)	_	Volume(m <sup>3</sup>	<u>^</u>
Ground floor				75.8	(1a) x	:	2.6	(2a) =	197.08	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1	ld)+(1e)+(1	n)	75.8	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	197.08	(5)
2. Ventilation rate:										
	main heating	seconda heating	ry	other		total			m³ per hou	ır
Number of chimneys	0	+ 0	+ [	0	_ = _	0	x	40 =	0	(6a)
Number of open flues	0	+ 0	<b></b>	0	j = [	0	x	20 =	0	(6b)
Number of intermittent fa	ans	J L				0	x	10 =	0	(7a)
Number of passive vents	5				F	0	x	10 =	0	(7b)
Number of flueless gas f	ires				F	0	×	40 =	0	(7c)
•					L					
								Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fa	ns = (6a) + (6b) + (6b)	7a)+(7b)+(	(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has l			ed to (17),	otherwise o	continue fr	om (9) to	(16)			
Number of storeys in t	he dwelling (ns)	1							0	(9)
Additional infiltration							[(9]	)-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or	timber frame o	r 0.35 fo	r masoni	ry consti	uction			0	(11)
if both types of wall are p deducting areas of openi			to the great	ter wall are	a (after					
If suspended wooden	floor, enter 0.2 (	(unsealed) or 0	).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	nter 0.05, else ei	nter 0							0	(13)
Percentage of window	s and doors dra	ught 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)
Air permeability value,	q50, expressed	d in cubic metro	es per ho	our per s	quare m	etre of e	envelope	e area	2	(17)
If based on air permeabi	•		•	•	•		·		0.1	(18)
Air permeability value applie	,					is being u	sed		<b></b>	( - /
Number of sides sheltered	ed			-	-				1	(19)
Shelter factor				(20) = 1 -	[0.075 x (	19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter facto	or		(21) = (18	) x (20) =				0.09	(21)
Infiltration rate modified	for monthly wind	d 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										
vviilu i aciti (22a)iii = (2	. <i></i> /111 <del>- 4</del>	1.00 0.05	0.05	1 0 00			T	1	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infilt	ration rate	e (allowi	ng for st	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
0.12	0.12	0.11	0.1	0.1	0.09	0.09	0.09	0.09	0.1	0.1	0.11	]	
Calculate effe		•	rate for t	he appli	cable ca	se	!	!			ļ.		
If mechanic				al.) (aa				. (22)	\			0.5	(23a)
If exhaust air h									) = (23a)			0.5	(23b)
If balanced wit		-	•	_								76.5	(23c)
a) If balance						<del>- ` ` </del>	<del>- ^ ` </del>	<del>í `</del>	<del> </del>	<del></del>	<del>- ` ` '</del>	) ÷ 100] T	(0.4-)
(24a)m= 0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23		(24a)
b) If balance	1				1	<del>, , ,</del>	<del> </del>	<del>i `</del>	<del> </del>		ı	٦	(= 41.)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	_	(24b)
c) If whole I if (22b)	nouse ext m < 0.5 ×			•	•				5 × (23b	)		_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)	ventilatio m = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	r change i	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	x (25)	-	-	-		
(25)m= 0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.2	0.21	0.22	0.22	0.23		(25)
3. Heat losse	es and he	at loss p	paramet	er:									
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-valu kJ/m²·		A X k kJ/K
Windows Typ	e 1				2.47	x1.	/[1/( 1.4 )+	0.04] =	3.27				(27)
Windows Typ	e 2				2.24	x1.	/[1/( 1.4 )+	0.04] =	2.97				(27)
Windows Typ	e 3				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(27)
Windows Typ	e 4				6.73	x1.	/[1/( 1.4 )+	0.04] =	8.92				(27)
Windows Typ	e 5				2.24	x1,	/[1/( 1.4 )+	0.04] =	2.97				(27)
Windows Typ	e 6				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(27)
Windows Typ	e 7				1.5	x1,	/[1/( 1.4 )+	0.04] =	1.99				(27)
Walls	80.34	4	19.60	6	60.68	3 x	0.12		7.28	=			(29)
Roof		_		_						_		<b>=                                    </b>	(30)
	I /5 X		1 0		75.8	×	0.1		7 58				
Total area of	75.8 elements.		0		75.8	=	0.1	=	7.58				
Total area of	L		0		156.1	4							(31)
Party wall  * for windows and	elements,	m² ws, use e	effective wi		156.1 27.72 alue calcul	4 x	0	= [	0	s given in	paragrapi	h 3.2	
Party wall  * for windows and ** include the are	elements,  d roof windo  eas on both s	m² ws, use e	effective wi		156.1 27.72 alue calcul	4 x	0 g formula 1	= [ /[(1/U-valu	0	s given in	ı paragrapı		(31)
Party wall  * for windows and ** include the are Fabric heat lo	elements,  d roof windo eas on both s ss, W/K =	m²  ws, use esides of ir S (A x	effective wi		156.1 27.72 alue calcul	4 x	0	= [ /[(1/U-valu ) + (32) =	0 re)+0.04] a			40.93	(31)
Party wall  * for windows and ** include the are Fabric heat lo Heat capacity	elements,  d roof windo eas on both s ss, W/K =	m²  ws, use esides of ir S (A x A x k)	effective wi nternal wal	ls and par	156.1 27.72 alue calcul titions	4 x	0 g formula 1	= [ /[(1/U-valu ) + (32) = ((28)	0	2) + (32a).		40.93	(31) (32) (33) (34)
Party wall  * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design assess	elements,  d roof windo eas on both s ss, W/K = Cm = S(A s paramet ssments whe	m² ws, use esides of ir S (A x A x k) ter (TMF	effective winternal walk U)  P = Cm :	ls and par - TFA) ir	156.1 27.72 alue calcul titions	4 x	0 g formula 1 (26)(30)	= [ /[(1/U-valu ) + (32) = ((28) Indica	0  ne)+0.04] a  .(30) + (32)  tive Value:	2) + (32a). : Medium	(32e) =	40.93	(31)
Party wall  * for windows and  ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste	elements,  d roof windo  eas on both s  ss, W/K =  Cm = S(A  s paramet  esments whe  ead of a deta	m² sides of ir S (A x A x k) ser (TMF) ere the de	effective winternal wall  U)  P = Cm - etails of the ulation.	s and par - TFA) ir construct	156.1 27.72 alue calcul titions  n kJ/m²K	4 x lated using	0 g formula 1 (26)(30)	= [ /[(1/U-valu ) + (32) = ((28) Indica	0  ne)+0.04] a  .(30) + (32)  tive Value:	2) + (32a). : Medium	(32e) =	40.93	(31) (32) (33) (34) (35)
Party wall  * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design assess	elements,  d roof windo eas on both s ss, W/K = Cm = S(A s paramet esments whe ead of a deta ges : S (L	m² ws, use esides of ir S (A x A x k) ter (TMF) ere the de ailed calco x Y) cal	effective winternal walk U)  P = Cm : tails of the ulation. culated to	- TFA) ir construct	156.1 27.72 alue calcul titions  n kJ/m²K tion are no	4 x lated using	0 g formula 1 (26)(30)	= [ /[(1/U-valu ) + (32) = ((28) Indica	0  ne)+0.04] a  .(30) + (32)  tive Value:	2) + (32a). : Medium	(32e) =	40.93	(31) (32) (33) (34)

Ventila	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.31	15.16	15.01	14.26	14.11	13.36	13.36	13.21	13.66	14.11	14.41	14.71		(38)
Heat tra	ansfer c	oefficier	nt, W/K	-	-	-	-	-	(39)m	= (37) + (3	38)m	-		
(39)m=	67.25	67.1	66.95	66.19	66.04	65.29	65.29	65.14	65.59	66.04	66.34	66.64		
Heat lo	ss para	meter (H	HLP), W/	/m²K				-		Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	66.16	(39)
(40)m=	0.89	0.89	0.88	0.87	0.87	0.86	0.86	0.86	0.87	0.87	0.88	0.88		
Numbe	er of day	s in moi	nth (Tab	le 1a)				•		Average =	Sum(40) <sub>1</sub> .	12 /12=	0.87	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
A cours	ad again	nanay l	NI.											(40)
if TF			ч + 1.76 х	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		38		(42)
Reduce	the annua	al average	ater usag hot water person per	usage by	$5\%$ if the $\alpha$	lwelling is	designed i	` ,		se target o		0.69		(43)
1								Ι	0	0.1	NI.	<b>D</b>		
Hot wate	Jan er usage ir	Feb	Mar day for ea	Apr ach month	May $Vd.m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	99.75	96.13	92.5	88.87	85.24	81.62	81.62	85.24	88.87	92.5	96.13	99.75		
(44)111–	99.73	30.13	92.0	00.07	03.24	01.02	01.02	03.24			m(44) <sub>112</sub> =	l	1088.23	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600					1000.20	(\.,
(45)m=	147.93	129.38	133.51	116.4	111.69	96.38	89.31	102.48	103.71	120.86	131.93	143.26		
If instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		1426.84	(45)
(46)m=	22.19	19.41	20.03	17.46	16.75	14.46	13.4	15.37	15.56	18.13	19.79	21.49		(46)
	storage													
•		` ,	includin	•			•		ame ves	sel		0		(47)
Otherw	-	stored	nd no ta		_			. ,	ers) ente	er '0' in (	47)			
	•		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
			storage	-				(48) x (49)	) =		1	10		(50)
Hot wa	ter stora	age loss	eclared of factor fr	om Tabl							0.	02		(51)
	-	•	ee secti	on 4.3										(50)
		from Ta	bie 2a m Table	2b								.6		(52) (53)
			storage		ar			(47) x (51)	) y (52) y (	53) –				
		54) in (5	_	, KVVII/ yt	-ai			( <del>1</del> 1) X (31)	,	JJ) –		.03		(54) (55)
	` ' '	, ,	culated f	for each	month			((56)m = (	55) × (41)	m	<u>'</u>			(50)
(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)
()=			1 -2.01	L - 5.55	L -2.01	L -0.00	L	L'	L - 0.00	1 -2.01	L -0.00	I		(-3)

	o acaicaio	a solal sto	rage, (57)	m = (56)m	x [(50) – (	⊓ i i)] ÷ (ɔ	0), 6136 (3	<i>i</i> )iii = (36)	m wnere (	mii) is iid	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 circui	t loss (ar	nual) fro	m Table	 3				•	•		0		(58)
Primary circui	`	,			59)m = (	(58) ÷ 36	55 × (41)	m				•	
(modified by	factor f	rom Tabl	le H5 if t	here is s	olar wat	er 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)
Combi loss ca	lculated	for each	month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat req	uired for	water he	eating ca	alculated	for each	n month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 203.21	179.31	188.79	169.89	166.96	149.87	144.58	157.76	157.2	176.14	185.42	198.54		(62)
Solar DHW input	calculated	using App	endix G oı	Appendix	H (negativ	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add additiona	I lines if	FGHRS	and/or \	VWHRS	applies,	, see Ap	pendix (	3)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter											
(64)m= 203.21	179.31	188.79	169.89	166.96	149.87	144.58	157.76	157.2	176.14	185.42	198.54		
	•						Outp	out from w	ater heate	r (annual) <sub>1</sub>	12	2077.68	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 93.41	82.96	88.61	81.5	81.36	74.84	73.92	78.3	77.28	84.41	86.66	91.86		(65)
include (57)	m in cal	culation o	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal g	ains (see	e Table 5	and 5a	):							•	-	
Metabolic gair	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 118.92	118.92	118.92	118.92	118.92	118.92	118.92	118.92	<del></del>	_	118.92	118.92		
Lighting gains	(calcula					1.0.02	110.92	118.92	118.92	110.92	110.92		(66)
· ·		ted in Ap	pendix	L, equati	on L9 oı			<u> </u>	118.92	110.92	110.92		(66)
(67)m= 18.76	16.66	13.55	pendix 10.26	_, equati 7.67	on L9 oı 6.47			<u> </u>	15.5	18.09	19.28		<ul><li>(66)</li><li>(67)</li></ul>
` '	16.66	13.55	10.26	7.67	6.47	r L9a), a	lso see	Table 5	15.5	<u> </u>			, ,
Appliances ga	16.66	13.55	10.26	7.67	6.47	r L9a), a	lso see	Table 5	15.5	<u> </u>			, ,
Appliances ga	16.66 ins (calc 212.62	13.55 ulated in 207.12	10.26 Append 195.41	7.67 dix L, equ	6.47 uation L <sup>2</sup>	1 L9a), a 7 13 or L1 157.43	9.09 3a), also	Table 5 12.21 see Ta 160.75	15.5 ble 5	18.09	19.28		(67)
Appliances ga (68)m= 210.44 Cooking gains	16.66 ins (calc 212.62 c (calcula	13.55 ulated in 207.12 ted in Ap	10.26 Append 195.41	7.67 dix L, equ	6.47 uation L <sup>2</sup>	1 L9a), a 7 13 or L1 157.43	9.09 3a), also	Table 5 12.21 see Ta 160.75 ee Table	15.5 ble 5	18.09	19.28		(67) (68)
Appliances ga (68)m= 210.44 Cooking gains (69)m= 34.89	16.66 ins (calc 212.62 (calcula 34.89	13.55 ulated in 207.12 ted in Ap 34.89	10.26 Append 195.41 opendix 34.89	7.67 dix L, equal 180.62 L, equal	6.47 uation L <sup>2</sup> 166.72 ion L15	r L9a), a 7 13 or L1 157.43 or L15a)	9.09 3a), also 155.25	Table 5 12.21 see Ta 160.75	15.5 ble 5 172.47	18.09	19.28		(67)
Appliances ga (68)m= 210.44 Cooking gains	16.66 ins (calc 212.62 (calcula 34.89	13.55 ulated in 207.12 ted in Ap 34.89	10.26 Append 195.41 opendix 34.89	7.67 dix L, equal 180.62 L, equal	6.47 uation L <sup>2</sup> 166.72 ion L15	r L9a), a 7 13 or L1 157.43 or L15a)	9.09 3a), also 155.25	Table 5 12.21 see Ta 160.75 ee Table	15.5 ble 5 172.47	18.09	19.28		(67) (68)
Appliances ga (68)m= 210.44 Cooking gains (69)m= 34.89 Pumps and fa	16.66 ins (calc 212.62 (calcula 34.89 ns gains 0	13.55 ulated in 207.12 tted in Ap 34.89 (Table 5	10.26 Append 195.41 Appendix 34.89 5a) 0	7.67 dix L, equal 180.62 L, equal 34.89	6.47  uation L  166.72  ion L15  34.89	r L9a), a 7 13 or L1 157.43 or L15a) 34.89	9.09 3a), also 155.25 , also se 34.89	Table 5 12.21 See Ta 160.75 See Table 34.89	15.5 ble 5 172.47 5 34.89	18.09 187.26 34.89	19.28 201.15 34.89		(67) (68) (69)
Appliances ga (68)m= 210.44 Cooking gains (69)m= 34.89 Pumps and fa (70)m= 0	16.66 ins (calc 212.62 (calcula 34.89 ns gains 0	13.55 ulated in 207.12 tted in Ap 34.89 (Table 5	10.26 Append 195.41 Appendix 34.89 5a) 0	7.67 dix L, equal 180.62 L, equal 34.89	6.47  uation L  166.72  ion L15  34.89	r L9a), a 7 13 or L1 157.43 or L15a) 34.89	9.09 3a), also 155.25 , also se 34.89	Table 5 12.21 See Ta 160.75 See Table 34.89	15.5 ble 5 172.47 5 34.89	18.09 187.26 34.89	19.28 201.15 34.89		(67) (68) (69)
Appliances ga (68)m= 210.44 Cooking gains (69)m= 34.89 Pumps and fa (70)m= 0 Losses e.g. ev	16.66 ins (calculation 212.62) ins (calculation 34.89) ins gains 0 vaporation -95.13	13.55  ulated in 207.12  ted in Ap 34.89  (Table 5 0 on (negat -95.13	10.26 Appendix 195.41 Opendix 34.89 Sa) 0 tive valu	7.67 dix L, equal 180.62 L, equal 34.89  0 es) (Tab	6.47  uation L' 166.72  ion L15 34.89  0  le 5)	r L9a), a 7 13 or L1 157.43 or L15a) 34.89	9.09 3a), also 155.25 , also se 34.89	Table 5 12.21 2 see Ta 160.75 2 ee Table 34.89	15.5 ble 5 172.47 5 34.89	18.09 187.26 34.89	19.28 201.15 34.89		(67) (68) (69) (70)
Appliances ga (68)m= 210.44  Cooking gains (69)m= 34.89  Pumps and fa (70)m= 0  Losses e.g. ev (71)m= -95.13	16.66 ins (calculation 212.62) ins (calculation 34.89) ins gains 0 vaporation -95.13	13.55  ulated in 207.12  ted in Ap 34.89  (Table 5 0 on (negat -95.13	10.26 Appendix 195.41 Opendix 34.89 Sa) 0 tive valu	7.67 dix L, equal 180.62 L, equal 34.89  0 es) (Tab	6.47  uation L' 166.72  ion L15 34.89  0  le 5)	r L9a), a 7 13 or L1 157.43 or L15a) 34.89	9.09 3a), also 155.25 , also se 34.89	Table 5 12.21 2 see Ta 160.75 2 ee Table 34.89	15.5 ble 5 172.47 5 34.89	18.09 187.26 34.89	19.28 201.15 34.89		(67) (68) (69) (70)
Appliances ga (68)m= 210.44 Cooking gains (69)m= 34.89 Pumps and fa (70)m= 0 Losses e.g. ev (71)m= -95.13 Water heating	16.66 ins (calculation 212.62) ins (calculation 34.89) ins gains 0 /aporation -95.13 gains (Tal. 123.45)	13.55  ulated in 207.12  tted in Ap 34.89  (Table 5 0 on (negat -95.13)  Table 5)  119.1	10.26 Appendix 195.41 Opendix 34.89 5a) 0 tive valu -95.13	7.67 dix L, equat 180.62 L, equat 34.89 0 es) (Tab -95.13	6.47  uation L  166.72  ion L15  34.89  0  le 5)  -95.13	r L9a), a 7 13 or L1 157.43 or L15a) 34.89 0 -95.13	9.09 3a), also 155.25 , also se 34.89  0  -95.13	Table 5 12.21 See Ta 160.75 See Table 34.89 0 -95.13	15.5 ble 5 172.47 5 34.89 0 -95.13	18.09 187.26 34.89 0 -95.13	19.28 201.15 34.89 0 -95.13		(67) (68) (69) (70)
Appliances ga (68)m= 210.44 Cooking gains (69)m= 34.89 Pumps and fa (70)m= 0 Losses e.g. ev (71)m= -95.13 Water heating (72)m= 125.55	16.66 ins (calculation 212.62) (calculation 34.89) ns gains 0 /aporation -95.13 gains (Tal. 123.45) gains =	13.55  ulated in 207.12  tted in Ap 34.89  (Table 5 0 on (negat -95.13)  Table 5)  119.1	10.26 Appendix 195.41 Opendix 34.89 5a) 0 tive valu -95.13	7.67 dix L, equat 180.62 L, equat 34.89 0 es) (Tab -95.13	6.47  uation L  166.72  ion L15  34.89  0  le 5)  -95.13	r L9a), a 7 13 or L1 157.43 or L15a) 34.89 0 -95.13	9.09 3a), also 155.25 , also se 34.89  0  -95.13	Table 5 12.21 2 see Ta 160.75 2 ee Table 34.89  0  -95.13	15.5 ble 5 172.47 5 34.89 0 -95.13	18.09 187.26 34.89 0 -95.13	19.28 201.15 34.89 0 -95.13		(67) (68) (69) (70)
Appliances ga (68)m= 210.44 Cooking gains (69)m= 34.89 Pumps and fa (70)m= 0 Losses e.g. ev (71)m= -95.13 Water heating (72)m= 125.55 Total internal	16.66 ins (calc 212.62 c (calcula 34.89 ns gains 0 /aporatic -95.13 gains (T 123.45 gains =	13.55  ulated in 207.12  ted in Ap 34.89  (Table 5 0 on (negat -95.13  Table 5)  119.1	10.26 Append 195.41 Dependix 34.89 To a) 0 Detive valu -95.13	7.67 dix L, equal 180.62 L, equal 34.89  0 es) (Tab -95.13	6.47  uation L  166.72  ion L15  34.89  0  le 5)  -95.13  103.95  (66)	r L9a), a 7 13 or L1 157.43 or L15a) 34.89 0 -95.13 99.35 m + (67)m	9.09 3a), also 155.25 , also se 34.89  0  -95.13	Table 5 12.21 2 see Ta 160.75 34.89 0 -95.13 107.33 + (69)m + 1	15.5 ble 5 172.47 5 34.89 0 -95.13 113.45 (70)m + (7	18.09 187.26 34.89 0 -95.13 120.36 1)m + (72)	19.28 201.15 34.89 0 -95.13		(67) (68) (69) (70) (71)
Appliances ga (68)m= 210.44 Cooking gains (69)m= 34.89 Pumps and fa (70)m= 0 Losses e.g. ev (71)m= -95.13 Water heating (72)m= 125.55 Total internal (73)m= 413.43	16.66 ins (calculations) (calculatio	13.55 ulated in 207.12 tted in Ap 34.89 (Table 5 0 on (negat -95.13 Table 5) 119.1	10.26 Appendix 195.41 Appendix 34.89 To a control of the control o	7.67 dix L, equal 180.62 L, equal 34.89  0 es) (Tab -95.13  109.35	6.47  uation L  166.72  ion L15  34.89  0  le 5)  -95.13  103.95  (66)  335.81	r L9a), a 7 13 or L1 157.43 or L15a) 34.89 0 -95.13 99.35 m + (67)m 322.45	9.09 3a), also 155.25 , also se 34.89  0  -95.13  105.24 1+ (68)m+ 328.26	Table 5 12.21 2 see Ta 160.75 2 ee Table 34.89  0  -95.13  107.33 + (69)m + 1 338.96	15.5 ble 5 172.47 5 34.89 0 -95.13 113.45 (70)m + (7 360.09	18.09 187.26 34.89 0 -95.13 120.36 1)m + (72) 384.38	19.28 201.15 34.89 0 -95.13 123.46 m 402.58		(67) (68) (69) (70) (71)

Table 6a

Table 6b

Table 6c

m²

Table 6d

(W)

	_		_		,		,						_
North	0.9x	0.77	X	2.47	X	10.63	X	0.4	X	0.8	=	5.82	(74)
North	0.9x	0.77	X	2.24	X	10.63	X	0.4	X	0.8	=	5.28	(74)
North	0.9x	0.77	X	2.24	X	10.63	X	0.4	X	0.8	=	5.28	(74)
North	0.9x	0.77	X	6.73	X	10.63	X	0.4	X	0.8	=	15.87	(74)
North	0.9x	0.77	X	2.24	X	10.63	X	0.4	X	0.8	=	5.28	(74)
North	0.9x	0.77	X	2.47	X	20.32	X	0.4	X	0.8	=	11.13	(74)
North	0.9x	0.77	X	2.24	X	20.32	X	0.4	x	0.8	=	10.09	(74)
North	0.9x	0.77	X	2.24	X	20.32	X	0.4	X	0.8	=	10.09	(74)
North	0.9x	0.77	X	6.73	X	20.32	X	0.4	X	0.8	=	30.33	(74)
North	0.9x	0.77	X	2.24	X	20.32	X	0.4	X	0.8	=	10.09	(74)
North	0.9x	0.77	x	2.47	X	34.53	X	0.4	X	0.8	=	18.91	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	x	2.24	x	34.53	x	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	6.73	X	34.53	X	0.4	X	0.8	=	51.53	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	x	2.47	x	55.46	x	0.4	X	0.8	=	30.38	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	6.73	X	55.46	X	0.4	X	0.8	=	82.78	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	2.47	X	74.72	X	0.4	X	0.8	=	40.93	(74)
North	0.9x	0.77	X	2.24	X	74.72	x	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	x	2.24	X	74.72	X	0.4	x	0.8	=	37.11	(74)
North	0.9x	0.77	X	6.73	X	74.72	X	0.4	X	0.8	=	111.51	(74)
North	0.9x	0.77	x	2.24	x	74.72	x	0.4	X	0.8	=	37.11	(74)
North	0.9x	0.77	X	2.47	X	79.99	X	0.4	X	0.8	=	43.81	(74)
North	0.9x	0.77	x	2.24	X	79.99	x	0.4	X	0.8	=	39.73	(74)
North	0.9x	0.77	X	2.24	X	79.99	X	0.4	X	0.8	=	39.73	(74)
North	0.9x	0.77	X	6.73	X	79.99	X	0.4	X	0.8	=	119.37	(74)
North	0.9x	0.77	x	2.24	X	79.99	x	0.4	X	0.8	=	39.73	(74)
North	0.9x	0.77	x	2.47	x	74.68	x	0.4	X	0.8	=	40.9	(74)
North	0.9x	0.77	X	2.24	X	74.68	X	0.4	X	0.8	=	37.1	(74)
North	0.9x	0.77	X	2.24	X	74.68	X	0.4	X	0.8	=	37.1	(74)
North	0.9x	0.77	x	6.73	x	74.68	x	0.4	x	0.8	=	111.45	(74)
North	0.9x	0.77	x	2.24	X	74.68	X	0.4	x	0.8	=	37.1	(74)
North	0.9x	0.77	x	2.47	x	59.25	x	0.4	x	0.8	=	32.45	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	x	6.73	x	59.25	x	0.4	x	0.8	=	88.42	(74)
North	0.9x	0.77	x	2.24	x	59.25	x	0.4	x	0.8	] =	29.43	(74)
North	0.9x	0.77	x	2.47	x	41.52	x	0.4	x	0.8	] =	22.74	(74)

	_		_										_
North	0.9x	0.77	X	2.24	X	41.52	X	0.4	X	0.8	=	20.62	(74)
North	0.9x	0.77	X	2.24	X	41.52	X	0.4	X	0.8	=	20.62	(74)
North	0.9x	0.77	X	6.73	X	41.52	x	0.4	x	0.8	=	61.96	(74)
North	0.9x	0.77	X	2.24	x	41.52	X	0.4	x	0.8	=	20.62	(74)
North	0.9x	0.77	X	2.47	X	24.19	X	0.4	X	0.8	=	13.25	(74)
North	0.9x	0.77	X	2.24	X	24.19	X	0.4	X	0.8	=	12.02	(74)
North	0.9x	0.77	X	2.24	x	24.19	X	0.4	X	0.8	=	12.02	(74)
North	0.9x	0.77	X	6.73	x	24.19	x	0.4	x	0.8	=	36.1	(74)
North	0.9x	0.77	X	2.24	X	24.19	X	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	X	2.47	x	13.12	x	0.4	x	0.8	] =	7.19	(74)
North	0.9x	0.77	X	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	X	2.24	x	13.12	x	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	X	6.73	x	13.12	x	0.4	x	0.8	=	19.58	(74)
North	0.9x	0.77	X	2.24	x	13.12	X	0.4	x	0.8	=	6.52	(74)
North	0.9x	0.77	X	2.47	x	8.86	X	0.4	x	0.8	=	4.86	(74)
North	0.9x	0.77	X	2.24	x	8.86	X	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	X	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	X	6.73	x	8.86	x	0.4	x	0.8	=	13.23	(74)
North	0.9x	0.77	X	2.24	x	8.86	X	0.4	x	0.8	=	4.4	(74)
East	0.9x	0.77	X	2.24	x	19.64	x	0.4	x	0.8	=	9.76	(76)
East	0.9x	0.77	X	2.24	x	38.42	x	0.4	x	0.8	=	19.09	(76)
East	0.9x	0.77	X	2.24	x	63.27	X	0.4	x	0.8	=	31.43	(76)
East	0.9x	0.77	X	2.24	x	92.28	X	0.4	X	0.8	=	45.84	(76)
East	0.9x	0.77	X	2.24	x	113.09	x	0.4	x	0.8	=	56.18	(76)
East	0.9x	0.77	X	2.24	x	115.77	x	0.4	x	0.8	=	57.51	(76)
East	0.9x	0.77	X	2.24	x	110.22	x	0.4	x	0.8	=	54.75	(76)
East	0.9x	0.77	X	2.24	x	94.68	x	0.4	x	0.8	=	47.03	(76)
East	0.9x	0.77	X	2.24	x	73.59	x	0.4	x	0.8	=	36.55	(76)
East	0.9x	0.77	X	2.24	x	45.59	x	0.4	x	0.8	=	22.65	(76)
East	0.9x	0.77	X	2.24	x	24.49	x	0.4	x	0.8	=	12.16	(76)
East	0.9x	0.77	X	2.24	x	16.15	X	0.4	x	0.8	=	8.02	(76)
South	0.9x	0.77	X	1.5	x	46.75	X	0.4	x	0.8	<b>=</b>	15.55	(78)
South	0.9x	0.77	X	1.5	x	76.57	X	0.4	x	0.8	] =	25.47	(78)
South	0.9x	0.77	X	1.5	x	97.53	x	0.4	x	0.8	<b>=</b>	32.44	(78)
South	0.9x	0.77	X	1.5	x	110.23	X	0.4	x	0.8	<b>=</b>	36.67	(78)
South	0.9x	0.77	X	1.5	x	114.87	x	0.4	x	0.8	<b>=</b>	38.21	(78)
South	0.9x	0.77	X	1.5	x	110.55	x	0.4	x	0.8	<b>=</b>	36.77	(78)
South	0.9x	0.77	X	1.5	x	108.01	X	0.4	x	0.8	<b>=</b>	35.93	(78)
South	0.9x	0.77	x	1.5	x	104.89	x	0.4	x	0.8	] =	34.89	(78)
South	0.9x	0.77	x	1.5	х	101.89	x	0.4	x	0.8	j =	33.89	(78)
South	0.9x	0.77	X	1.5	х	82.59	x	0.4	x	0.8	j =	27.47	(78)
	_		_		-		- '				-		_

South	0.9x	0.77	x	1.5	5	X	5	5.42	х		0.4	x		0.8		- [	18.43	(78)
South	0.9x	0.77	x	1.	5	x	4	10.4	х		0.4	= x	F	0.8		- F	13.44	(78)
	_						<u> </u>		'				_			_		
Solar q	ains in	watts, ca	alculated	for eac	h month				(83)m	= St	um(74)m .	(82)r	n					
(83)m=	62.85	116.3	185.78	278.32	358.17	$\overline{}$	76.66	354.32	291	.09	217.02	135.	52	76.91	52.76	3		(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m ·	+ (8	83)m ,	watts										
(84)m=	476.27	527.71	584.23	655.85	714.48	7	12.48	676.77	619	.34	555.98	495.	61	461.29	455.3	3		(84)
7. Mea	an inter	nal temp	perature	(heating	season	)												
Temp	erature	during h	neating p	eriods ir	n the livii	ng	area f	rom Tab	ole 9,	Th	1 (°C)					Г	21	(85)
Utilisa	tion fac	tor for a	ains for I	iving are	ea. h1.m	(s	ee Ta	ble 9a)			, ,					L		
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Αι	ug	Sep	0	ct	Nov	Dec	С		
(86)m=	1	0.99	0.98	0.93	0.79	7	0.58	0.42	0.4	<del>-  </del>	0.76	0.9	6	0.99	1	$\exists$		(86)
L	:				. T4 //	<u></u>		2 2 42 7		ا ا	. 00)			<u>l</u>				
r	20.16	20.28	ature in	20.75	20.94	_	0.99	21	2 <sup>2</sup>	$\neg$	20.96	20.7	72	20.39	20.13			(87)
(87)m=	20.16	20.28	20.46	20.75	20.94		20.99	21		<u>'</u>	20.96	20.7	3	20.39	20.13	<u>`</u>		(07)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	), Tr	12 (°C)					_		
(88)m=	20.18	20.18	20.18	20.19	20.19	_ :	20.2	20.2	20.	2	20.2	20.1	19	20.19	20.19	9		(88)
Utilisa	ation fac	tor for g	ains for ı	est of d	welling,	h2,	,m (se	e Table	9a)									
(89)m=	1	0.99	0.98	0.91	0.74	(	0.51	0.35	0.4	4	0.69	0.9	4	0.99	1			(89)
Mean	intorna	l temper	ature in	the rest	of dwelli	na	T2 (fc	ollow etc	ne 3	+0.7	in Tabl	0.00				_		
(90)m=	19.05	19.22	19.52	19.91	20.13	Ť	20.2	20.2	20.		20.17	19.8		19.4	19.02	$\overline{}$		(90)
(00)=	10.00	10.22	10.02	10.01	20.10			20.2						g area ÷ (4		╁	0.39	(91)
														`	,	L	0.00	(0.)
Г		<del> </del>	ature (fo		i	_	<del>-                                    </del>		<del>`</del>							_		4
(92)m=	19.48	19.63	19.9	20.24	20.44		20.51	20.51	20.		20.48	20.2		19.79	19.45	5		(92)
			he mean		i	$\overline{}$	i			-		•		i		_		(22)
(93)m=	19.48	19.63	19.9	20.24	20.44	2	20.51	20.51	20.	51	20.48	20.2	21	19.79	19.45			(93)
•			uirement															
			ernal ter or gains			ed	l at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti,n	)=(	76)m an	d re-ca	alcu	late	
	Jan	Feb	Mar	Apr	May	Г	Jun	Jul	٨	ug	Sep	0	nt .	Nov	Dec	$\Box$		
] seilitl l		l	ains, hm	-	Iviay		Juli	Jui		ug [	Sep	00	Jι	INOV	Det			
(94)m=	1	0.99	0.97	0.91	0.76	Γ.	0.54	0.38	0.4	.3	0.72	0.9	4	0.99	1	$\neg$		(94)
L	l nains	!	, W = (9 <sup>4</sup>		!			0.00			<u> </u>	0.0		0.00	· ·			, ,
(95)m=	474.05		569.55	599.33	540.91	3	82.02	255.04	267	'.1 T	398.88	468.	31	456.49	453.6	9		(95)
L			rnal tem		<u> </u>					!								, ,
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16.	4	14.1	10.	6	7.1	4.2	$\neg$		(96)
L		e for mea	an intern	al tempe	L erature.													, ,
г	1020.76		896.89	750.35	577.51	_	85.59	255.36	267	<del>_</del>	418.28	634.	44	841.85	1016.4	18		(97)
` ' L			ement fo		l .	Ь										_		
(98)m=	406.75	313.03	243.55	108.73	27.23	<u> </u>	0	0	0	Ì	0	123	<u> </u>	277.46	418.7	2		
. [	<u> </u>		ı	<u> </u>	<u> </u>		!	<u> </u>		Total	per year			) = Sum(9		+	1919.07	(98)
Snace	heatin	a require	ement in	kWh/m²	2/vear											F	25.32	(99)
Space		y roquire	5411O11t III		, y Jui											L	20.02	

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (	Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	Ī	1	(302)
The community scheme may obtain heat from several sources. The procedure includes boilers, heat pumps, geothermal and waste heat from power stations.			<b>–</b>
Fraction of heat from Community heat pump	Ļ	1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for commu	unity heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	m [	1.1	(306)
Space heating Annual space heating requirement	[	<b>kWh/year</b> 1919.07	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2110.98	(307a)
Efficiency of secondary/supplementary heating system in % (fro	m Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary syst	em (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			_
Annual water heating requirement		2077.68	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2285.45	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	43.96	(313)
Cooling System Energy Efficiency Ratio	Ī	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside	159.29	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	159.29	(331)
Energy for lighting (calculated in Appendix L)	Ī	331.32	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	Ī	-642.53	(333)
Electricity generated by wind turbine (Appendix M) (negative qu	antity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor E kWh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	g two fuels repeat (363) to (366) for the second fuel	319	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x 0.52 =	715.28	(367)
Electrical energy for heat distribution	[(313) x 0.52 =	22.82	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372) =	738.1	(373)
CO2 associated with space heating (secondary)	(309) x 0 =	0	(374)
CO2 associated with water from immersion heater or instantane	eous heater (312) x 0.52 =	0	(375)

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 738.1 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 82.67 CO2 associated with electricity for lighting (332))) x (379) 0.52 171.96 Energy saving/generation technologies (333) to (334) as applicable x = 0.01 =Item 1 (380)0.52 -333.47 sum of (376)...(382) =Total CO2, kg/year 659.25 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)8.7 El rating (section 14) (385)92.69

		User	Details:						
Assessor Name:	John Simpson		Stroma	Num	hor:		STRO	006273	
Software Name:	Stroma FSAP 201	2	Softwa					n: 1.0.4.26	
Continuite Nume:	5.10111a 1 57 11 20 1		y Address:				7 01010	11. 1.0. 1.20	
Address :	GT 306, Aspen Cou	· · · · · · · · · · · · · · · · · · ·				EH			
Overall dwelling dime	<u> </u>	,	,		,				
J		Ar	ea(m²)		Av. Hei	ght(m)		Volume(m <sup>3</sup>	3)
Ground floor			75.8	1a) x	2	.6	(2a) =	197.08	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	75.8	(4)			_		
Dwelling volume				(3a)+(3b)	)+(3c)+(3d	)+(3e)+	(3n) =	197.08	(5)
2. Ventilation rate:									
		econdary	other		total			m³ per hou	ır
Number of chimneys	heating h	neating +	0	=	0	X	40 =	0	(6a)
Number of open flues	0 +	0 +	0	i = [	0	x	20 =	0	(6b)
Number of intermittent fa	ans			, <u> </u>	3	x	10 =	30	(7a)
Number of passive vents	3			Ē	0	x	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X	40 =	0	(7c)
							L		
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6	a)+(6b)+(7a)+(7b)	+(7c) =		30		÷ (5) =	0.15	(8)
If a pressurisation test has b	peen carried out or is intende	ed, proceed to (17)	), otherwise co	ontinue fr	om (9) to (	16)			_
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0			•		uction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corres nas): if equal user 0.35	ponding to the gre	ater wall area	(after					
If suspended wooden		ed) or 0.1 (sea	ıled), else e	enter 0			[	0	(12)
If no draught lobby, en	iter 0.05, else enter 0						İ	0	(13)
Percentage of window	s and doors draught st	ripped					İ	0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =		Ì	0	(15)
Infiltration rate			(8) + (10) +	(11) + (1	2) + (13) +	- (15) =		0	(16)
Air permeability value,	q50, expressed in cub	oic metres per l	nour per so	uare m	etre of e	nvelope	area	5	(17)
If based on air permeabi	lity value, then (18) = [(1	7) ÷ 20]+(8), other	wise (18) = (1	6)				0.4	(18)
Air permeability value applie	es if a pressurisation test has	s been done or a c	legree air peri	meability	is being us	sed	_		
Number of sides sheltered	ed		(22)					1	(19)
Shelter factor			(20) = 1 - [0		9)] =		إ	0.92	(20)
Infiltration rate incorpora	-		(21) = (18)	x (20) =				0.37	(21)
Infiltration rate modified t	<del></del>	<del>                                     </del>	1 . 1						
Jan Feb	Mar   Apr   May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		<del> </del>							
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	_,··· ·	т т					1 1		

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rate (allo	wing for sl	nelter an	nd wind s	speed) =	: (21a) x	(22a)m					
0.47	0.47 0.46	<del></del>	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44	]	
Calculate effec	-	e rate for	he appli	cable ca	se	!	!		<u> </u>	<u>!</u>	J	
If mechanica		anandiy N. /	)2h) (22	a) [m, /	aguatian (I	NEW atho	muiaa (22h	) (225)			0	(23a)
	eat pump using A							) = (23a)			0	(23b)
	heat recovery: e	-	_					21.)	001) [	4 (00.)	0	(23c)
	d mechanical			at recove	<del>-                                    </del>	<del>- ´ ` -</del>	$\frac{a)m = (2)}{a}$	<del> </del>	23b) × [	<del>``</del>	) ÷ 100] ]	(24a)
(24a)m= 0	0 0	0	0		0	0		0		0	]	(24a)
(24b)m= 0	d mechanical	ventilation 0	Without	neat red	overy (i	VIV) (241 1 0	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (2x)^{2}$	2b)m + (2 0	23b) 0	0	1	(24b)
( '')									0		J	(240)
,	ouse extract vn $< 0.5 \times (23b)$		•	•				5 × (23h	<b>)</b>			
(24c)m = 0	0 0	0	0	0	0	0	0	0	0	0	1	(24c)
	ventilation or v	vhole hous	se positi	ve input	ventilatio	on from	I loft			<u> </u>	J	
	n = 1, then (24)							0.5]				
(24d)m= 0.61	0.61 0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24d)
Effective air	change rate -	enter (24a	) or (24l	o) or (24	c) or (24	d) in bo	x (25)					
(25)m= 0.61	0.61 0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. Heat losse	s and heat los	s paramet	er:									
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-		A X k kJ/K
Windows Type	` ′			2.38	x1	/[1/( 1.4 )+	0.04] =	3.16	<u></u>			(27)
Windows Type	2			2.16	x1	/[1/( 1.4 )+	0.04] =	2.86				(27)
Windows Type	3			2.16	x1	/[1/( 1.4 )+	0.04] =	2.86				(27)
Windows Type	<del>.</del> 4			6.49	x1	/[1/( 1.4 )+	0.04] =	8.6				(27)
Windows Type	5			2.16	<u>x</u> 1	/[1/( 1.4 )+	0.04] =	2.86				(27)
Windows Type	6			2.16	x1	/[1/( 1.4 )+	0.04] =	2.86				(27)
Windows Type	e 7			1.45	x1	/[1/( 1.4 )+	0.04] =	1.92				(27)
Walls	80.34	18.9	6	61.38	3 x	0.18	i	11.05	<b>=</b>		$\neg$ $\vdash$	(29)
Roof	75.8	0		75.8	x	0.13	<u> </u>	9.85	F i		i i	(30)
Total area of e	lements, m <sup>2</sup>			156.1	4							(31)
Party wall				27.72	2 X	0		0			$\neg$	(32)
* for windows and ** include the area					lated using	g formula 1	 I/[(1/U-valu	ıe)+0.04] a	ns given in	paragrapl	n 3.2	
Fabric heat los	ss, W/K = S (A	x U)				(26)(30	) + (32) =				46.04	(33)
Heat capacity	Cm = S(A x k)	)					((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	parameter (TI	MP = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assess can be used instead			construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L x Y) o	alculated	using Ap	pendix l	K						8.6	(36)
if details of therma		known (36) :	= 0.05 x (3	31)								
Total fabric he	at loss						(33) +	(36) =			54.63	(37)

√entila <sup>•</sup>	tion hea	at loss ca	alculated	l monthly	<u>/</u>				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	39.84	39.55	39.27	37.96	37.72	36.58	36.58	36.37	37.02	37.72	38.22	38.73		(38)
Heat tra	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	94.47	94.19	93.91	92.6	92.35	91.21	91.21	91	91.65	92.35	92.85	93.37		
- Heat lo	ss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	92.6	(39)
(40)m=	1.25	1.24	1.24	1.22	1.22	1.2	1.2	1.2	1.21	1.22	1.22	1.23		
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.22	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ener	rgy requi	irement:								kWh/ye	ar:	
Assum	ed occu	ıpancy, İ	N								2	38		(42)
if TF		9, N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		30		(42)
								(25 x N)				.69		(43)
		_		usage by : <sup>·</sup> day (all w		_	_	to achieve	a water us	se target o	f			
Ī						_		Λ	Con	0-4	Nav	Daa		
 Hot wate	Jan er usage in	Feb	Mar dav for ea	Apr ach month	May Vd.m = fa	Jun	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	99.75	96.13	92.5	88.87	85.24	81.62	81.62	85.24	88.87	92.5	96.13	99.75		
44)111–	99.73	90.13	92.0	00.07	05.24	01.02	01.02	03.24			m(44) <sub>112</sub> =	L	1088.23	(44)
Energy c	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600					1000.20	(```
(45)m=	147.93	129.38	133.51	116.4	111.69	96.38	89.31	102.48	103.71	120.86	131.93	143.26		
lf instant	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =		1426.84	(45)
(46)m=	22.19	19.41	20.03	17.46	16.75	14.46	13.4	15.37	15.56	18.13	19.79	21.49		(46)
	storage													
_		` ,		•			•	within sa	ame ves	sel		150		(47)
Otherw	-	stored		ink in dw er (this in	•			(47) ombi boil	ers) ente	er '0' in (	47)			
	•		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Tempe	rature fa	actor fro	m Table	2b			• •				0.	54		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		0.	75		(50)
•				cylinder I										
				om Tabl	e 2 (kWl	n/litre/da	ıy)					0		(51)
	-	eating s from Tal	ee section	on 4.3										(52)
			m Table	2b								0		(52) (53)
•				, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
=nerav	.550 110		-	,y				() ~ (01)	, ( <del>5_</del> ) A (	,				(55)
•	(50) or (	54) in (5	55)								().	75 I		(55
Enter (	` ' '	. , .	•	for each	month			((56)m = (	55) × (41)ı	m	0.	75		(33)

(57)m= $\begin{bmatrix} 23.33 & 21.07 & 23.33 & 22.58 & 23.$														
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m														
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m														
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)														
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59)														
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26 (59)														
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m														
(61)m =														
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$														
(62)m= 194.53 171.47 180.11 161.49 158.28 141.47 135.9 149.08 148.8 167.45 177.02 189.86 (62)														
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)														
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)														
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$														
Output from water heater														
(64)m= 194.53 171.47 180.11 161.49 158.28 141.47 135.9 149.08 148.8 167.45 177.02 189.86														
Output from water heater (annual) <sub>112</sub> 1975.46 (64)														
Heat gains from water heating, kWh/month 0.25 $(0.85 \times (45))$ m + $(61)$ m] + 0.8 $\times (46)$ m + $(57)$ m + $(59)$ m]														
(65)m= 86.46 76.69 81.67 74.78 74.41 68.12 66.97 71.35 70.56 77.46 79.94 84.91 (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= 118.92 118.92 118.92 118.92 118.92 118.92 118.92 118.92 118.92 118.92 118.92 118.92 (66)														
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
(67)m= 18.76 16.66 13.55 10.26 7.67 6.47 7 9.09 12.21 15.5 18.09 19.28 (67)														
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
(68)m= 210.44 212.62 207.12 195.41 180.62 166.72 157.43 155.25 160.75 172.47 187.26 201.15 (68)														
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
(69)m= 34.89 34.89 34.89 34.89 34.89 34.89 34.89 34.89 34.89 34.89 (69)														
Pumps and fans gains (Table 5a)														
(70)m= 3 3 3 3 3 3 3 3 3 3 3 (70)														
Losses e.g. evaporation (negative values) (Table 5)														
(71)m= -95.13 -95.13 -95.13 -95.13 -95.13 -95.13 -95.13 -95.13 -95.13 -95.13 -95.13 (71)														
Water heating gains (Table 5)														
(72)m= 116.21 114.12 109.77 103.86 100.02 94.61 90.01 95.9 97.99 104.12 111.03 114.13 (72)														
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$														
(73)m= 407.09 405.08 392.12 371.2 349.98 329.48 316.12 321.92 332.63 353.76 378.05 396.24 (73)														
6. Solar gains:														
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.														
Orientation: Access Factor Area Flux g_ FF Gains Table 6d m² Table 6a Table 6b Table 6c (W)														

	_		_		_						_		
North	0.9x	0.77	X	2.38	X	10.63	X	0.63	X	0.7	=	7.73	(74)
North	0.9x	0.77	X	2.16	X	10.63	X	0.63	X	0.7	=	7.02	(74)
North	0.9x	0.77	X	2.16	X	10.63	x	0.63	X	0.7	=	7.02	(74)
North	0.9x	0.77	X	6.49	X	10.63	X	0.63	x	0.7	=	21.09	(74)
North	0.9x	0.77	X	2.16	X	10.63	X	0.63	X	0.7	=	7.02	(74)
North	0.9x	0.77	X	2.38	X	20.32	X	0.63	X	0.7	=	14.78	(74)
North	0.9x	0.77	X	2.16	X	20.32	X	0.63	X	0.7	=	13.41	(74)
North	0.9x	0.77	X	2.16	X	20.32	x	0.63	x	0.7	=	13.41	(74)
North	0.9x	0.77	X	6.49	X	20.32	X	0.63	X	0.7	=	40.31	(74)
North	0.9x	0.77	X	2.16	X	20.32	X	0.63	X	0.7	=	13.41	(74)
North	0.9x	0.77	X	2.38	X	34.53	x	0.63	x	0.7	=	25.12	(74)
North	0.9x	0.77	X	2.16	X	34.53	x	0.63	x	0.7	=	22.79	(74)
North	0.9x	0.77	X	2.16	x	34.53	x	0.63	x	0.7	=	22.79	(74)
North	0.9x	0.77	X	6.49	x	34.53	x	0.63	x	0.7	=	68.49	(74)
North	0.9x	0.77	X	2.16	x	34.53	x	0.63	x	0.7	=	22.79	(74)
North	0.9x	0.77	X	2.38	x	55.46	X	0.63	x	0.7	=	40.34	(74)
North	0.9x	0.77	X	2.16	x	55.46	X	0.63	X	0.7	=	36.61	(74)
North	0.9x	0.77	X	2.16	x	55.46	x	0.63	x	0.7	=	36.61	(74)
North	0.9x	0.77	X	6.49	x	55.46	X	0.63	x	0.7	=	110.01	(74)
North	0.9x	0.77	X	2.16	x	55.46	X	0.63	x	0.7	=	36.61	(74)
North	0.9x	0.77	X	2.38	x	74.72	X	0.63	x	0.7	=	54.35	(74)
North	0.9x	0.77	x	2.16	x	74.72	x	0.63	x	0.7	] =	49.32	(74)
North	0.9x	0.77	X	2.16	x	74.72	x	0.63	x	0.7	] =	49.32	(74)
North	0.9x	0.77	X	6.49	x	74.72	x	0.63	x	0.7	] =	148.19	(74)
North	0.9x	0.77	X	2.16	x	74.72	x	0.63	x	0.7	] =	49.32	(74)
North	0.9x	0.77	X	2.38	x	79.99	x	0.63	x	0.7	] =	58.18	(74)
North	0.9x	0.77	X	2.16	x	79.99	X	0.63	x	0.7	=	52.8	(74)
North	0.9x	0.77	X	2.16	x	79.99	X	0.63	x	0.7	=	52.8	(74)
North	0.9x	0.77	X	6.49	x	79.99	x	0.63	x	0.7	] =	158.65	(74)
North	0.9x	0.77	X	2.16	x	79.99	X	0.63	x	0.7	=	52.8	(74)
North	0.9x	0.77	x	2.38	x	74.68	x	0.63	x	0.7	] =	54.32	(74)
North	0.9x	0.77	X	2.16	x	74.68	x	0.63	x	0.7	] =	49.3	(74)
North	0.9x	0.77	X	2.16	x	74.68	x	0.63	x	0.7	] =	49.3	(74)
North	0.9x	0.77	X	6.49	x	74.68	x	0.63	x	0.7	] =	148.12	(74)
North	0.9x	0.77	X	2.16	x	74.68	x	0.63	x	0.7	] =	49.3	(74)
North	0.9x	0.77	X	2.38	x	59.25	x	0.63	x	0.7	j =	43.09	(74)
North	0.9x	0.77	x	2.16	x	59.25	x	0.63	x	0.7	] =	39.11	(74)
North	0.9x	0.77	X	2.16	x	59.25	x	0.63	x	0.7	j =	39.11	(74)
North	0.9x	0.77	X	6.49	x	59.25	x	0.63	x	0.7	] =	117.51	(74)
North	0.9x	0.77	x	2.16	x	59.25	x	0.63	x	0.7	] =	39.11	(74)
North	0.9x	0.77	X	2.38	x	41.52	x	0.63	x	0.7	] =	30.2	(74)
	_		-		•		•		•		•		_

N I =4I-	_		1		,	<b>_</b>	1			<b>_</b>	1		٦
North	0.9x	0.77	X	2.16	X	41.52	X	0.63	X	0.7	=	27.41	(74)
North	0.9x	0.77	X	2.16	X	41.52	X	0.63	X	0.7	=	27.41	(74)
North	0.9x	0.77	X	6.49	x	41.52	X	0.63	X	0.7	=	82.35	(74)
North	0.9x	0.77	X	2.16	X	41.52	X	0.63	X	0.7	=	27.41	(74)
North	0.9x	0.77	x	2.38	x	24.19	X	0.63	X	0.7	=	17.59	(74)
North	0.9x	0.77	X	2.16	x	24.19	x	0.63	X	0.7	=	15.97	(74)
North	0.9x	0.77	X	2.16	X	24.19	X	0.63	X	0.7	=	15.97	(74)
North	0.9x	0.77	X	6.49	X	24.19	X	0.63	X	0.7	=	47.98	(74)
North	0.9x	0.77	x	2.16	x	24.19	x	0.63	X	0.7	=	15.97	(74)
North	0.9x	0.77	X	2.38	X	13.12	X	0.63	x	0.7	=	9.54	(74)
North	0.9x	0.77	X	2.16	X	13.12	X	0.63	X	0.7	=	8.66	(74)
North	0.9x	0.77	X	2.16	X	13.12	X	0.63	X	0.7	=	8.66	(74)
North	0.9x	0.77	x	6.49	x	13.12	x	0.63	x	0.7	=	26.02	(74)
North	0.9x	0.77	X	2.16	x	13.12	x	0.63	x	0.7	=	8.66	(74)
North	0.9x	0.77	X	2.38	x	8.86	x	0.63	x	0.7	=	6.45	(74)
North	0.9x	0.77	x	2.16	x	8.86	x	0.63	x	0.7	=	5.85	(74)
North	0.9x	0.77	X	2.16	x	8.86	x	0.63	x	0.7	=	5.85	(74)
North	0.9x	0.77	X	6.49	x	8.86	X	0.63	X	0.7	=	17.58	(74)
North	0.9x	0.77	x	2.16	x	8.86	x	0.63	x	0.7	=	5.85	(74)
East	0.9x	0.77	X	2.16	X	19.64	X	0.63	X	0.7	=	12.97	(76)
East	0.9x	0.77	x	2.16	x	38.42	x	0.63	X	0.7	=	25.36	(76)
East	0.9x	0.77	x	2.16	x	63.27	x	0.63	x	0.7	=	41.77	(76)
East	0.9x	0.77	X	2.16	x	92.28	x	0.63	x	0.7	=	60.92	(76)
East	0.9x	0.77	X	2.16	x	113.09	x	0.63	X	0.7	=	74.66	(76)
East	0.9x	0.77	X	2.16	X	115.77	X	0.63	X	0.7	=	76.42	(76)
East	0.9x	0.77	x	2.16	x	110.22	x	0.63	X	0.7	=	72.76	(76)
East	0.9x	0.77	X	2.16	X	94.68	X	0.63	x	0.7	=	62.5	(76)
East	0.9x	0.77	X	2.16	x	73.59	X	0.63	X	0.7	=	48.58	(76)
East	0.9x	0.77	X	2.16	X	45.59	X	0.63	X	0.7	=	30.09	(76)
East	0.9x	0.77	X	2.16	x	24.49	x	0.63	X	0.7	=	16.17	(76)
East	0.9x	0.77	X	2.16	X	16.15	X	0.63	X	0.7	=	10.66	(76)
South	0.9x	0.77	x	1.45	x	46.75	x	0.63	X	0.7	=	20.72	(78)
South	0.9x	0.77	x	1.45	x	76.57	x	0.63	X	0.7	=	33.93	(78)
South	0.9x	0.77	X	1.45	X	97.53	X	0.63	X	0.7	=	43.22	(78)
South	0.9x	0.77	x	1.45	x	110.23	x	0.63	x	0.7	=	48.85	(78)
South	0.9x	0.77	x	1.45	x	114.87	x	0.63	x	0.7	=	50.9	(78)
South	0.9x	0.77	x	1.45	x	110.55	x	0.63	x	0.7	=	48.99	(78)
South	0.9x	0.77	x	1.45	x	108.01	x	0.63	x	0.7	=	47.86	(78)
South	0.9x	0.77	x	1.45	x	104.89	x	0.63	x	0.7	=	46.48	(78)
South	0.9x	0.77	x	1.45	x	101.89	x	0.63	x	0.7	=	45.15	(78)
South	0.9x	0.77	x	1.45	x	82.59	X	0.63	x	0.7	=	36.6	(78)

	_															
South	0.9x	0.77	X	1.4	15	X	5	5.42	X		0.63	X	0.7	=	24.56	(78)
South	0.9x	0.77	X	1.4	15	X	4	40.4	x		0.63	x	0.7	=	17.9	(78)
Solar g	gains in	watts, ca	alculated	for eac	h month				(83)m	= Sui	m(74)m .	(82)m				
(83)m=	83.57	154.62	246.98	369.96	476.06	50	00.64	470.94	386.9	91	288.49	180.17	102.26	70.15		(83)
Total g	ains – ii	nternal a	and solar	(84)m =	= (73)m	+ (8	33)m	, watts							_	
(84)m=	490.66	559.7	639.09	741.15	826.04	83	30.11	787.06	708.8	84	621.12	533.92	480.31	466.39		(84)
7. Me	an inter	nal temp	perature	(heating	season	)										
Temp	erature	during h	neating p	eriods ir	n the livi	ng a	area f	from Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	(se	ee Ta	ble 9a)								_
	Jan	Feb	Mar	Apr	May	Ι,	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.99	0.95	0.84	0	).66	0.5	0.57	7	0.84	0.97	0.99	1		(86)
Moan	intorna	l tompor	ature in l	living ar	oa T1 /f/	ساد	w cto	ne 3 to 7	l 7 in Tr	L	Oc)		1	<u>I</u>	I	
(87)m=	19.67	19.83	20.11	20.49	20.8	1	0.96	20.99	20.9	-	20.86	20.46	20.01	19.65	l	(87)
			!		<u> </u>			<u> </u>	<u> </u>			20.40	20.01	13.03	İ	(0.)
Temp			neating p		i	1		i e	1	-	<u> </u>		1	ı	1	
(88)m=	19.88	19.89	19.89	19.9	19.91	19	9.92	19.92	19.9	2	19.91	19.91	19.9	19.89		(88)
Utilisa	ation fac	tor for g	ains for r	est of d	welling,	h2,	m (se	e Table	9a)							
(89)m=	1	0.99	0.98	0.93	0.79	0	).57	0.38	0.45	5	0.76	0.96	0.99	1		(89)
Mean	interna	l tampar	ature in t	the rest	of dwell	ina	T2 (f	ollow etc	ne 3	<u> </u>	in Tahl		<u>.</u>	Į.	I	
(90)m=	18.13	18.36	18.76	19.31	19.72	Ť	9.89	19.91	19.9	-	19.8	19.28	18.63	18.11		(90)
(50)111=	10.10	10.00	10.70	10.01	10.72	L.,	0.00	10.01	10.0	<u>.                                     </u>			ng area ÷ (4		0.39	(91)
											·		.g a. oa . (	•,	0.39	(01)
Mean	interna	temper	ature (fo	r the wh	ole dwe	lling	g) = fl	LA × T1	+ (1 -	- fL/	A) × T2				,	
(92)m=	18.73	18.93	19.29	19.77	20.14	2	20.3	20.33	20.3	3	20.21	19.74	19.16	18.71		(92)
Apply	adjustn	nent to t	he mean	interna	temper	atu	re fro	m Table	4e, v	vher	e appro	priate			,	
(93)m=	18.73	18.93	19.29	19.77	20.14	2	20.3	20.33	20.3	3	20.21	19.74	19.16	18.71		(93)
8. Sp	ace hea	ting requ	uirement													
			ternal ter			ned	at ste	ep 11 of	Table	9b,	, so tha	t Ti,m=(	76)m an	d re-cald	culate	
the ut			or gains u			_				_		_	1	I _	1	
	Jan	Feb	Mar	Apr	May	_ \	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
			ains, hm		<u> </u>	_		I	<del></del>	_			1	I .	1	(0.4)
(94)m=	0.99	0.99	0.98	0.93	0.8	(	0.6	0.43	0.5		0.78	0.96	0.99	1		(94)
			, W = (94	, ·	r e	_		1		_			1	1	1	(05)
(95)m=	488.11	554.1	623.6	686.81	663.03		98.74	337.15	351.0	07	486.5	510.51	475.47	464.47		(95)
			rnal tem		r	_		1		_			1	1	1	(0.0)
(96)m=	4.3	4.9	6.5	8.9	11.7	_	4.6	16.6	16.4		14.1	10.6	7.1	4.2	j	(96)
			an intern			_		<del>- `                                   </del>	<del></del>	<del></del>	<u> </u>		i	<del> </del>	1	
(97)m=		1321.54	1200.64		l .		20.32	340.51	357.		560.44	844.19	1120.03	1354.58		(97)
•		·	ement fo		nonth, k	Wh/	/mont	th = 0.02	24 x [(	97)r	n – (95)	)m] x (4	T .		1	
(98)m=	651.13	515.72	429.32	230.22	86.55		0	0	0		0	248.26	464.08	662.24		
									Т	otal	per year (	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	3287.53	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year										43.37	(99)
·		• .	nts – Indi		-	vete	eme i	ncluding	mier	n-C1	HP)					
	e heatir	•	<del>113 111</del> 01	<del>vid</del> ual 11	canny s	you	omio II	Helaaling	-milci (	<i>3</i> -01	-n-)					
-		_	at from se	econdar	v/sunnle	me	ntarv	system							0	(201)
	.o., o, op	.400 1100		Josephali	, oappic		. itai y	3,000111							<u> </u>	(

Fraction of space heat from main system(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (20	02) <b>×</b> [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating	system	, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above) 651.13 515.72 429.32 230.22 86.55				0	0.40.00	404.00	662.24	1	
	0	0	0	0	248.26	464.08	662.24		(044)
$ (211)m = \{[(98)m \times (204)] \} \times 100 \div (206) $ $ 696.39  551.58  459.17  246.22  92.57 $	0	0	0	0	265.52	496.34	708.28		(211)
3333   3333   3333   2332   3233				-		211),5,1012		3516.07	(211)
Space heating fuel (secondary), kWh/month									_
$= \{[(98)m \times (201)] \} \times 100 \div (208)$								•	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		7
			Total	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	F	0	(215)
Water heating Output from water heater (calculated above)									
	141.47	135.9	149.08	148.8	167.45	177.02	189.86		
Efficiency of water heater								79.8	(216)
(217)m= 87.79 87.57 87.05 85.76 83.28	79.8	79.8	79.8	79.8	85.86	87.27	87.87		(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$									
` '	[							1	
(219)m= 221.58   195.81   206.9   188.31   190.06	177.28	170.3	186.81	186.46	195.03	202.84	216.06		
(219)m= 221.58   195.81   206.9   188.31   190.06	177.28	170.3		186.46 I = Sum(2		202.84	216.06	2337.44	(219)
Annual totals	177.28	170.3			19a) <sub>112</sub> =	202.84 Wh/year		kWh/year	(219)
Annual totals Space heating fuel used, main system 1	177.28	170.3			19a) <sub>112</sub> =				(219)
Annual totals	1/7.28	170.3			19a) <sub>112</sub> =			kWh/year	(219)
Annual totals Space heating fuel used, main system 1	1/7.28	170.3			19a) <sub>112</sub> =			<b>kWh/year</b> 3516.07	(219)
Annual totals Space heating fuel used, main system 1 Water heating fuel used	1/7.28	170.3			19a) <sub>112</sub> =			<b>kWh/year</b> 3516.07	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	1/7.28	170.3			19a) <sub>112</sub> =			<b>kWh/year</b> 3516.07	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:	1/7.28	170.3	Total	I = Sum(2	19a) <sub>112</sub> =	Wh/year	30	<b>kWh/year</b> 3516.07	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue	1/7.28	170.3	Total	I = Sum(2	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30	kWh/year 3516.07 2337.44	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30	kWh/year 3516.07 2337.44	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	ding mi	Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30 45	kWh/year 3516.07 2337.44 75 331.32	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ms inclu		Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = <b>k</b> 1	Wh/year	30 45	kWh/year 3516.07 2337.44	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ms inclu	ding mi <b>ergy</b> h/year	Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = k¹(230g) = Emiss kg CO	ion fac	30 45	kWh/year 3516.07 2337.44 75 331.32 Emissions kg CO2/yea	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system	ns inclu Ene kWl	ding mi ergy h/year	Total	l = Sum(2: of (230a).	19a) <sub>112</sub> = k¹(230g) =	ion fac 2/kWh	30 45 <b>tor</b>	kWh/year 3516.07 2337.44 75 331.32	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	ns inclu Ene kWl	ding mi ergy h/year ) ×	Total	l = Sum(2: of (230a).	(230g) =  Emiss kg CO:  0.2	ion fac 2/kWh	30 45 <b>tor</b>	kWh/year 3516.07 2337.44 75 331.32 Emissions kg CO2/year 759.47	(230c) (230e) (231) (232) (261) (263)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ns inclu Ene kWi (211) (215)	ding mi ergy h/year ) × ) ×	sum	of (230a).	19a) <sub>112</sub> = k1(230g) = Emiss kg CO:	ion fac 2/kWh	30 45 <b>tor</b> =	kWh/year 3516.07 2337.44 75 331.32 Emissions kg CO2/yea 759.47 0	(230c) (230e) (231) (232) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating Space and water heating	ns inclu Ene kWl (211) (215) (219) (261)	ding mi ergy h/year ) x ) x ) x	Total	of (230a).	19a) <sub>112</sub> = k1 (230g) =  Emiss kg CO:  0.2  0.5	ion fac 2/kWh	30 45 <b>tor</b> = =	kWh/year 3516.07 2337.44 75 331.32 Emissions kg CO2/yea 759.47 0 504.89 1264.36	(230c) (230e) (231) (232) (261) (263) (264) (265)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	ns inclu Ene kWi (211) (215)	ding mi ergy h/year ) x ) x ) + (262)	sum	of (230a).	(230g) =  Emiss kg CO:  0.2	ion fac 2/kWh 16 19	30 45 <b>tor</b> =	kWh/year 3516.07 2337.44 75 331.32 Emissions kg CO2/yea 759.47 0	(230c) (230e) (231) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1475.24 (272)

 $TER = 28.64 \tag{273}$ 

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:33:59

Project Information:

Assessed By: John Simpson (STRO006273) **Building Type:** 

Flat

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 76m2 Site Reference: Plot Reference: Maitland Park Estate GT 403

GT 403, Aspen Court, Maitland Park Estate, London, NW3 2EH 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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 23.91 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 7.12 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 43.6 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 39.0 kWh/m<sup>2</sup>

OK

2 Fabric U-values

**Element Highest Average** 0.12 (max. 0.70) External wall 0.12 (max. 0.30) OK Party wall 0.00 (max. 0.20) OK Floor (no floor) Roof 0.10 (max. 0.20) 0.10 (max. 0.35) OK **Openings** 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

Air permeability at 50 pascals 2.00 (design value)

Maximum **OK** 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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**

ow energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ОК
lechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.53	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	ОК
Summertime temperature		
Overheating risk (Thames valley):	Medium	ОК
ed on:		
Overshading:	Average or unknown	
Windows facing: East	1.5m²	
Windows facing: East	9.95m²	
Windows facing: South	1.5m²	
Windows facing: East	1.5m²	
Windows facing: South	5.34m²	
Windows facing: South	2.24m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
Key features		
Air permeablility	2.0 m³/m²h	
Roofs U-value	0.1 W/m²K	
External Walls U-value	0.12 W/m <sup>2</sup> K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump Photovoltaic array		

			User D	) otoilo:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20			Strom Softwa	are Vei	rsion:			0006273 on: 1.0.4.26	
Address :	GT 403, Aspen Co			Address k Estate.			EH			
1. Overall dwelling dim		J. 1, 111 G. 11.				,				
Ground floor			Are	<b>a(m²)</b> 76	(1a) x		<b>ight(m)</b> 2.6	(2a) =	<b>Volume(m³</b> 197.6	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	۱)	76	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	197.6	(5)
2. Ventilation rate:				- 41		4-4-1			2	
Number of chimneys  Number of open flues  Number of intermittent f	heating	secondar heating 0	-y   +	0 0	] = [	0 0	x 2	40 = 20 =	0 0 0	(6a) (6b) (7a)
					Ļ			10 =		= ' '
Number of passive vent					L	0			0	(7b)
Number of flueless gas	fires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	ded, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			<u>-</u>
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 ( , , , , , , , , ,		0.05 (				[(9)	-1]x0.1 =	0	(10)
if both types of wall are deducting areas of open	• / .	sponding to	the great	ter wall are	a (after	uction			0	(11)
·	floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0 vs and doors draught s	stripped							0	(13)
Window infiltration	vs and doors draught s	siripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
	, q50, expressed in cu	bic metre	s per ho	our per s	guare m	etre of e	envelope	area	2	(17)
If based on air permeab	• • •		•	•	•		'		0.1	(18)
Air permeability value appl	ies if a pressurisation test ha	as been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides shelter	ed			(00)		10)1			2	(19)
Shelter factor				(20) = 1 -		[9)] =			0.85	(20)
Infiltration rate incorpora	-			(21) = (18	) x (20) =				0.08	(21)
Infiltration rate modified	<del></del>	1		T .			T		1	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	·	1 00	0.0	0.7		4.0	1 45	4 7	1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor (22a)m = (2	22)m ÷ 4								_	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infilti	ration rate	e (allowi	ing for sl	nelter ar	nd wind s	speed) =	(21a) x	(22a)m					
0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1	]	
Calculate effe		•	rate for t	the appli	cable ca	ise						0.5	(23a
If exhaust air h			endix N, (2	23b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23b
If balanced wit	h heat reco	very: effic	eiency in %	allowing	for in-use f	actor (fron	n Table 4h	ı) =				76.5	(23c
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	]	(24a
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (I	MV) (24b	o)m = (22	2b)m + (2	23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h				•					<b>5</b> (00)	`			
	m < 0.5 x		· `	ŕ	<del>i</del>	· ` `	ŕ	ŕ	· ` ·	ŕ	Ι ,	1	(24c
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(240
d) If natural if (22b)r	ventilation = 1, the								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24d
Effective air	r change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	d) in bo	x (25)	•	•	•	•	
(25)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(25)
3. Heat losse	es and he	at loss i	paramet	er:									
ELEMENT	Gros area	ss	Openir		Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²·		A X k kJ/K
Windows Type	e 1				1.5	<sub>x</sub> 1	/[1/( 1.4 )+	0.04] =	1.99				(27)
Windows Type	e 2				9.95	x1	/[1/( 1.4 )+	0.04] =	13.19				(27)
Windows Type	e 3				1.5	x1	/[1/( 1.4 )+	0.04] =	1.99				(27)
Windows Type	e 4				1.5	x1	/[1/( 1.4 )+	0.04] =	1.99				(27)
Windows Type	e 5				5.34	x1	/[1/( 1.4 )+	0.04] =	7.08				(27)
Windows Type	e 6				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(27)
Walls	48.1	8	22.0	3	26.15	5 X	0.12	= i	3.14				(29)
Roof	76		0		76	x	0.1	<del>-</del>	7.6	F i			(30)
Total area of	elements	, m²			124.1	8							(31)
Party wall					48.28	3 X	0		0				(32)
* for windows and ** include the are						lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	n 3.2	
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30	) + (32) =				39.94	(33)
Heat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	s parame	ter (TMF	= Cm -	÷ TFA) iı	n kJ/m²K	•		Indica	tive Value	: Medium		250	(35)
For design asses can be used inste				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Thermal bridg	jes : S (L	x Y) cal	culated	using Ap	pendix I	K						9.61	(36)
if details of therm		are not kn	own (36) :	= 0.05 x (3	31)			(22)	(0.0)				
Total fabric he		و عاديما	J wa = = 41-1					. ,	(36) =	(DE) (E)		49.55	(37)
Ventilation he	_		· ·	_	lı	1, ,1		<del>- `                                   </del>	= 0.33 × (			1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

										1				(0.0)
(38)m=	14.73	14.59	14.45	13.76	13.62	12.93	12.93	12.79	13.2	13.62	13.9	14.17		(38)
	ansfer c								· · · ·	= (37) + (	<del></del>			
(39)m=	64.28	64.14	64	63.31	63.17	62.48	62.48	62.34	62.76	63.17	63.45	63.73	62.20	(39)
Heat Ic	oss para	meter (H	HLP), W	m²K						= (39)m ÷	Sum(39) <sub>1</sub> .	12 / 1 Z=	63.28	(39)
(40)m=	0.85	0.84	0.84	0.83	0.83	0.82	0.82	0.82	0.83	0.83	0.83	0.84		_
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.83	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
								!						
4. Wa	ater heat	ing ener	gy requi	rement:								kWh/ye	ear:	
Assum	ned occu	nancy I	N									38		(42)
if TF		0, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.50		(42)
		,	ater usaç	ge in litre	es per da	ıy Vd,av	erage =	(25 x N)	+ 36		90	.79		(43)
		•		0,	5% if the a rater use, I	•	Ū	to achieve	a water us	se target o	f			
not more			· ·	,		_	<u> </u>	۸۰۰۵	Con	Oct	Nov	Doo		
Hot wate	Jan er usage ir	Feb in litres per	Mar day for ea	Apr ach month	May Vd,m = fa	Jun ctor from 7	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	99.87	96.23	92.6	88.97	85.34	81.71	81.71	85.34	88.97	92.6	96.23	99.87		
(11)	00.07	00.20	02.0	00.07	00.01	01.71	01.71	00.01	l		m(44) <sub>112</sub> =	L	1089.44	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	148.1	129.53	133.66	116.53	111.81	96.48	89.41	102.6	103.82	120.99	132.07	143.42		
If instan	taneous w	ater heatii	na at noint	of use (no	hot water	· storage)	enter () in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1428.42	(45)
		19.43	20.05	17.48		,	1	` ′	, , ,	10.15	10.01	04.54		(46)
(46)m= Water	22.21 storage		20.05	17.48	16.77	14.47	13.41	15.39	15.57	18.15	19.81	21.51		(40)
Storag	e volum	e (litres)	includir	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	munity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage		aclared I	nee facto	or is kno	wn (k\//k	v(qəv).							(48)
•			m Table		JI 13 KI10	vvii (icvvi	ı, day).					0		(49)
•			storage		ear			(48) x (49)	) <u>=</u>			10		(50)
			_	-	oss fact	or is not		(10) x (10)	_		'	10		(30)
		_			e 2 (kWl	h/litre/da	ıy)				0.	02		(51)
	-	•	ee secti	on 4.3										
	e factor		oie ∠a m Table	2h							<b>—</b>	03		(52) (53)
•					oor			(47) v (51)	\ v ( <b>E</b> 2) v (I	E2) _		.6		(53)
• • • • • • • • • • • • • • • • • • • •	(50) or (		storage	, KVVII/yt	zai			(47) x (51)	) X (32) X (	55) =		03		(54) (55)
	. , ,	, ,	culated t	or each	month			((56)m = (	55) × (41)ı	m	'	.00		(00)
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
												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 loss (annual) from Table 3	0 (58)	)									
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m											
(modified by factor from Table H5 if there is solar water heating and a cylinder thermo	ostat)										
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)	)									
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m											
(61)m= 0 0 0 0 0 0 0 0 0	0 0 (61)	)									
Total heat required for water heating calculated for each month $(62)$ m = $0.85 \times (45)$ m +	· (46)m + (57)m + (59)m + (61)m										
(62)m= 203.37 179.45 188.94 170.02 167.09 149.98 144.68 157.87 157.32 176.27		)									
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	ution to water heating)										
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	3,										
(63)m= 0 0 0 0 0 0 0 0 0	0 0 (63)	)									
Output from water heater											
(64)m= 203.37 179.45 188.94 170.02 167.09 149.98 144.68 157.87 157.32 176.27	185.57 198.7										
Output from water heate	<del></del>	)									
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m	, ,										
(65)m= 93.46 83.01 88.66 81.54 81.4 74.88 73.95 78.33 77.32 84.45	86.71 91.91 (65)	)									
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is f											
. , . , . , . , . , . , . , . , . , . ,	morn community neating										
5. Internal gains (see Table 5 and 5a):											
Metabolic gains (Table 5), Watts	T T 5 ]										
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec	`									
(66)m= 119.13   119.13   119.13   119.13   119.13   119.13   119.13   119.13   119.13   119.13	119.13   119.13   (66)	,									
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
(67)m= 18.8 16.7 13.58 10.28 7.68 6.49 7.01 9.11 12.23 15.53	18.13 19.32 (67)	1									
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
(68)m= 210.88 213.07 207.55 195.81 180.99 167.07 157.76 155.57 161.09 172.83	187.65 201.57 (68)	)									
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	<u></u>										
(69)m= 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91	34.91 34.91 (69)	)									
Pumps and fans gains (Table 5a)											
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)	)									
Losses e.g. evaporation (negative values) (Table 5)	·										
(71)m= -95.3 -95.3 -95.3 -95.3 -95.3 -95.3 -95.3 -95.3 -95.3 -95.3	-95.3 -95.3 (71)	)									
Water heating gains (Table 5)	<del></del>										
(72)m= 125.62 123.53 119.17 113.25 109.41 103.99 99.39 105.29 107.38 113.51	120.43 123.53 (72)	)									
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m$	71)m + (72)m										
(73)m= 414.04 412.03 399.04 378.08 356.82 336.29 322.91 328.71 339.44 360.61	384.94 403.17 (73)	)									
6. Solar gains:											
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applica	able orientation.										
Orientation: Access Factor Area Flux g_	FF Gains										
Table 6d m² Table 6a Table 6b Table 6c (W)											
East 0.9x 0.77 x 1.5 x 19.64 x 0.4 x	0.8 = 6.53 (76)	)									
East 0.9x 0.77 x 9.95 x 19.64 x 0.4 x	0.8 = 43.34 (76)	)									

_	_		_								,		_
East	0.9x	0.77	X	1.5	X	19.64	X	0.4	X	0.8	=	6.53	(76)
East	0.9x	0.77	X	1.5	X	38.42	X	0.4	X	0.8	=	12.78	(76)
East	0.9x	0.77	X	9.95	X	38.42	X	0.4	X	0.8	=	84.78	(76)
East	0.9x	0.77	X	1.5	X	38.42	X	0.4	X	0.8	=	12.78	(76)
East	0.9x	0.77	X	1.5	X	63.27	X	0.4	X	0.8	=	21.05	(76)
East	0.9x	0.77	X	9.95	X	63.27	X	0.4	X	0.8	=	139.61	(76)
East	0.9x	0.77	X	1.5	x	63.27	X	0.4	X	0.8	=	21.05	(76)
East	0.9x	0.77	X	1.5	x	92.28	x	0.4	x	0.8	=	30.7	(76)
East	0.9x	0.77	X	9.95	x	92.28	X	0.4	X	0.8	=	203.62	(76)
East	0.9x	0.77	X	1.5	x	92.28	X	0.4	X	0.8	] =	30.7	(76)
East	0.9x	0.77	X	1.5	x	113.09	X	0.4	x	0.8	=	37.62	(76)
East	0.9x	0.77	X	9.95	x	113.09	x	0.4	x	0.8	=	249.54	(76)
East	0.9x	0.77	X	1.5	x	113.09	X	0.4	x	0.8	=	37.62	(76)
East	0.9x	0.77	X	1.5	x	115.77	X	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	X	9.95	x	115.77	x	0.4	X	0.8	=	255.45	(76)
East	0.9x	0.77	X	1.5	x	115.77	x	0.4	x	0.8	=	38.51	(76)
East	0.9x	0.77	X	1.5	x	110.22	X	0.4	x	0.8	=	36.66	(76)
East	0.9x	0.77	X	9.95	x	110.22	x	0.4	x	0.8	=	243.2	(76)
East	0.9x	0.77	X	1.5	x	110.22	X	0.4	x	0.8	=	36.66	(76)
East	0.9x	0.77	X	1.5	x	94.68	X	0.4	X	0.8	=	31.49	(76)
East	0.9x	0.77	X	9.95	x	94.68	x	0.4	x	0.8	=	208.9	(76)
East	0.9x	0.77	X	1.5	x	94.68	x	0.4	x	0.8	] =	31.49	(76)
East	0.9x	0.77	x	1.5	x	73.59	x	0.4	x	0.8	] =	24.48	(76)
East	0.9x	0.77	X	9.95	x	73.59	x	0.4	x	0.8	] =	162.38	(76)
East	0.9x	0.77	X	1.5	x	73.59	x	0.4	x	0.8	=	24.48	(76)
East	0.9x	0.77	X	1.5	x	45.59	x	0.4	X	0.8	=	15.16	(76)
East	0.9x	0.77	X	9.95	x	45.59	x	0.4	x	0.8	=	100.59	(76)
East	0.9x	0.77	X	1.5	x	45.59	X	0.4	x	0.8	=	15.16	(76)
East	0.9x	0.77	X	1.5	x	24.49	x	0.4	X	0.8	=	8.15	(76)
East	0.9x	0.77	X	9.95	x	24.49	x	0.4	X	0.8	=	54.04	(76)
East	0.9x	0.77	X	1.5	x	24.49	x	0.4	X	0.8	=	8.15	(76)
East	0.9x	0.77	X	1.5	x	16.15	X	0.4	X	0.8	=	5.37	(76)
East	0.9x	0.77	X	9.95	x	16.15	x	0.4	x	0.8	=	35.64	(76)
East	0.9x	0.77	x	1.5	x	16.15	x	0.4	x	0.8	] =	5.37	(76)
South	0.9x	0.77	x	1.5	x	46.75	x	0.4	x	0.8	] =	15.55	(78)
South	0.9x	0.77	X	5.34	x	46.75	x	0.4	x	0.8	] =	55.36	(78)
South	0.9x	0.77	x	2.24	x	46.75	x	0.4	x	0.8	j =	23.22	(78)
South	0.9x	0.77	X	1.5	x	76.57	x	0.4	x	0.8	j =	25.47	(78)
South	0.9x	0.77	x	5.34	x	76.57	x	0.4	x	0.8	] =	90.67	(78)
South	0.9x	0.77	X	2.24	x	76.57	x	0.4	x	0.8	j =	38.03	(78)
South	0.9x	0.77	x	1.5	x	97.53	x	0.4	x	0.8	] =	32.44	(78)
	_		_		-		-		•		-		_

South	ا م م								1		_				(70)
	0.9x	0.77	X	5.3	==	X		7.53	] X ]	0.4	×	0.8	=	115.5	(78)
South	0.9x	0.77	X	2.2		X		7.53	] X ]	0.4	×	0.8	_	48.45	(78)
South	0.9x	0.77	X	1.5		X		10.23	] X ]	0.4	×	0.8	=	36.67	(78)
South	0.9x	0.77	X	5.3	4	X	1	10.23	X	0.4	×	0.8	=	130.54	(78)
South	0.9x	0.77	Х	2.2	4	X	1	10.23	X	0.4	×	0.8	=	54.76	(78)
South	0.9x	0.77	X	1.5	5	X	1	14.87	X	0.4	X	0.8	=	38.21	(78)
South	0.9x	0.77	X	5.3	4	X	1	14.87	X	0.4	X	0.8	=	136.03	(78)
South	0.9x	0.77	X	2.2	4	X	1	14.87	X	0.4	X	0.8	=	57.06	(78)
South	0.9x	0.77	X	1.5	5	X	1	10.55	X	0.4	×	0.8	=	36.77	(78)
South	0.9x	0.77	X	5.3	4	X	1	10.55	X	0.4	X	0.8	=	130.91	(78)
South	0.9x	0.77	X	2.2	4	X	1	10.55	X	0.4	X	0.8	=	54.91	(78)
South	0.9x	0.77	X	1.5	5	X	10	08.01	X	0.4	X	0.8	=	35.93	(78)
South	0.9x	0.77	X	5.3	4	X	10	08.01	X	0.4	X	0.8	=	127.91	(78)
South	0.9x	0.77	X	2.2	4	X	10	08.01	X	0.4	X	0.8	=	53.65	(78)
South	0.9x	0.77	X	1.5	5	X	10	04.89	x	0.4	X	0.8	=	34.89	(78)
South	0.9x	0.77	X	5.3	4	X	10	04.89	x	0.4	x	0.8	=	124.22	(78)
South	0.9x	0.77	X	2.2	4	X	10	04.89	x	0.4	x	0.8	=	52.11	(78)
South	0.9x	0.77	X	1.5	5	X	10	01.89	x	0.4	X	0.8	=	33.89	(78)
South	0.9x	0.77	x	5.3	4	X	10	01.89	x	0.4	×	0.8		120.65	(78)
South	0.9x	0.77	x	2.2	4	X	10	01.89	x	0.4	x	0.8	=	50.61	(78)
South	0.9x	0.77	x	1.5	5	X	8	2.59	х	0.4	x	0.8	=	27.47	(78)
South	0.9x	0.77	x	5.3	4	X	8	2.59	x	0.4	x	0.8	=	97.8	(78)
South	0.9x	0.77	x	2.2	4	X	8	2.59	x	0.4	x	0.8	=	41.02	(78)
South	0.9x	0.77	x	1.5	5	X	5	5.42	x	0.4	x	0.8	=	18.43	(78)
South	0.9x	0.77	x	5.3	4	X	5	5.42	x	0.4	×	0.8		65.62	(78)
South	0.9x	0.77	x	2.2	4	X	5	5.42	x	0.4	x	0.8	=	27.53	(78)
South	0.9x	0.77	x	1.5	5	X		10.4	x	0.4	×	0.8		13.44	(78)
South	0.9x	0.77	x	5.3	4	X		10.4	x	0.4	x	0.8		47.84	(78)
South	0.9x	0.77	x	2.2	4	X		10.4	x	0.4	×	0.8		20.07	(78)
	L														
Solar g	jains in	watts, ca	lculated	for each	n month	1			(83)m	= Sum(74)m	ı(82)r	n		_	
(83)m=	150.54	264.51	378.1	486.98	556.08	5	55.07	534.01	483	3.1 416.49	297.	22 181.91	127.73		(83)
Total g	ains – i	nternal ar	nd solar	(84)m =	(73)m	+ (8	83)m	, watts			_			_	
(84)m=	564.58	676.54	777.14	865.06	912.91	8	91.35	856.92	811	.82 755.93	657.	32 566.85	530.9		(84)
7. Me	an inter	nal temp	erature	(heating	seasoi	า)									
Temp	erature	during he	eating p	eriods in	the liv	ing	area f	rom Tal	ole 9	Th1 (°C)				21	(85)
Utilisa	ation fac	tor for ga	ins for I	iving are	a, h1,n	n (s	ee Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Sep	Od	t Nov	Dec	_	
(86)m=	0.99	0.98	0.93	0.81	0.63	(	0.45	0.32	0.3	0.57	0.8	7 0.98	0.99		(86)
Mean	interna	l tempera	ature in	living are	ea T1 (1	ollo	w ste	ps 3 to 7	7 in T	able 9c)					
(87)m=	20.33	20.51	20.73	20.91	20.98		21	21	2	<del></del>	20.8	9 20.57	20.29	7	(87)
Temp	erature	durina he	eating n	eriods in	rest of	f dw	ellina	from Ta	able <sup>9</sup>	), Th2 (°C)	•		•	_	
(88)m=	20.21	20.22	20.22	20.22	20.23	_	20.23	20.23	20.	<del> </del>	20.2	3 20.22	20.22	7	(88)
• •		1									1		1	_	

l Itilie	ation fac	tor for a	aine for	rest of d	welling	h2 m (sa	ee Table	02)						
(89)m=	0.99	0.97	0.91	0.77	0.58	0.39	0.26	0.29	0.51	0.83	0.97	0.99		(89)
, ,		<u> </u>	<u> </u>	ļ	ļ	ļ	ollow ste	<u> </u>	ļ					
(90)m=	19.33	19.59	19.89	20.13	20.21	20.23	20.23	20.24	20.23	20.11	19.68	19.27		(90)
, ,		!	!					l	L	LA = Livin	g area ÷ (4	1) =	0.36	(91)
Moon	intorno	l tompor	oturo (fo	r tho wh	olo dwo	lling) – f	LA × T1	ı /1 fl	۸) <b>ب</b> T2			ļ		_
(92)m=	19.69	19.92	20.2	20.42	20.49	20.51	20.51	20.51	20.5	20.39	20	19.64		(92)
							m Table							,
(93)m=	19.69	19.92	20.2	20.42	20.49	20.51	20.51	20.51	20.5	20.39	20	19.64		(93)
8. Sp	ace hea	ting requ	uirement											
						ed at st	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
the u		î .	or gains	<u>_</u>	1		<u> </u>		_	_		_	I	
1 14:11: -	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.97	ains, hm 0.91	0.78	0.6	0.41	0.29	0.32	0.53	0.84	0.97	0.99		(94)
		l	. W = (94	l	l	0.41	0.29	0.32	0.55	0.04	0.91	0.99		(34)
(95)m=	558.06	654.66	709.33	677.57	546.84	368.58	244.26	256.21	398.93	552.31	550.09	526.48		(95)
		<u> </u>	rnal tem	<u> </u>										
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al temp	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m=	989.07	963.63	876.6	729.02	555.34	369.2	244.31	256.29	401.85	618.4	818.71	983.89		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	320.68	207.63	124.45	37.05	6.33	0	0	0	0	49.17	193.41	340.31		_
								Tota	l per year	(kWh/year	r) = Sum(9	8) <sub>15,912</sub> =	1279.01	(98)
Spac	e heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								16.83	(99)
9b. En	ergy red	quiremer	nts – Cor	mmunity	heating	scheme	)							
				• .		-	ater heat	• .	-		unity sch	neme.		_
Fraction	n of spa	ace heat	from se	condary	/supplen	nentary l	heating (	(Table 1	1) '0' if n	one			0	(301)
Fraction	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
	-						orocedure			up to four	other heat	sources; ti	he latter	_
			-			rom powe	r stations.	See Appe	ndix C.				4	7(2020)
			Commun	•	•								1	(303a)
Fraction	on of tota	al space	heat fro	m Comn	nunity he	eat pump	p			(3	02) x (303	a) =	1	(304a)
Factor	for conf	trol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for o	commun	ity heati	ng syste	m					1.1	(306)
Space	heating	g											kWh/yeaı	<u>.                                    </u>
Annua	l space	heating	requiren	nent									1279.01	
Space	heat fro	m Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) =	=	1406.91	(307a)
Efficie	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
	_						-					ļ		

Water heating Annual water heating requirement		ĺ	2079.26	٦
If DHW from community scheme:				<b>⊣</b> ¬
Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2287.19	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	7e) + (310a)(310e)] =	36.94	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter	$= (107) \div (314)$	) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	om outside	[	159.71	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	0b) + (330g) =	159.71	(331)
Energy for lighting (calculated in Appendix L)		j	332.01	(332)
Electricity generated by PVs (Appendix M) (negative quantity	<b>'</b> )		-644.26	(333)
Electricity generated by wind turbine (Appendix M) (negative	quantity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy	Emission factor	Emissions	
			kg CO2/vear	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)  If there is CHP to	kWh/year	kg CO2/kWh	kg CO2/year	(367a)
Efficiency of heat source 1 (%)  If there is CHP to	kWh/year  P) using two fuels repeat (363) to	kg CO2/kWh	319	(367a)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  [(307)	kWh/year  P) using two fuels repeat (363) to  (b)+(310b)] x 100 ÷ (367b) x	kg CO2/kWh  (366) for the second fuel  0.52 =	319	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	kWh/year  P) using two fuels repeat (363) to (367b) x (313) x	kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =	319 601.02 19.17	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	kWh/year  P) using two fuels repeat (363) to  P(b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(378)	kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =	319 601.02 19.17 620.19	(367) (372) (373)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)	kWh/year  P) using two fuels repeat (363) to  (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(376)  (309) x	kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0 =	319 601.02 19.17 620.19	(367) (372) (373) (374)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantal	kWh/year  P) using two fuels repeat (363) to  (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(37)  (309) x  aneous heater (312) x	kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0.52 =  0 =	319 601.02 19.17 620.19 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantation  Total CO2 associated with space and water heating	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] × 100 ÷ (367b) ×  [(313) ×  (363)(366) + (368)(373)  (309) ×  aneous heater (312) ×  (373) + (374) + (375) =	kg CO2/kWh  (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =	319 601.02 19.17 620.19 0 0	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantated total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dward control con	kWh/year  P) using two fuels repeat (363) to  (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(373)  (309) x  aneous heater (312) x  (373) + (374) + (375) =  yelling (331)) x	kg CO2/kWh  0 (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =  0 =  0.52 =	319 601.02 19.17 620.19 0 0 620.19	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantated to the control of the contr	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(373)  (309) x  aneous heater (312) x  (373) + (374) + (375) = (elling (331)) x  (332))) x	kg CO2/kWh  0 (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =  0 =  0.52 =	319 601.02 19.17 620.19 0 0	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantated total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dward control con	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(373)  (309) x  aneous heater (312) x  (373) + (374) + (375) = (elling (331)) x  (332))) x	kg CO2/kWh  0 (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =  0 =  0.52 =	319 601.02 19.17 620.19 0 0 620.19	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantated total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dward co2 associated with electricity for lighting  Energy saving/generation technologies (333) to (334) as approximately associated with electricity for lighting	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(373)  (309) x  aneous heater (312) x  (373) + (374) + (375) = (elling (331)) x  (332))) x	kg CO2/kWh  0 (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =	319 601.02 19.17 620.19 0 620.19 82.89 172.31	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or instantated total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within dward co2 associated with electricity for lighting  Energy saving/generation technologies (333) to (334) as applied to the condition of the con	kWh/year  P) using two fuels repeat (363) to (b)+(310b)] x 100 ÷ (367b) x  [(313) x  (363)(366) + (368)(373)  (309) x  aneous heater (312) x  (373) + (374) + (375) = (elling (331)) x  (332))) x	kg CO2/kWh  0 (366) for the second fuel  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =  0.52 =	319 601.02 19.17 620.19 0 620.19 82.89 172.31	(367) (372) (373) (374) (375) (376) (378) (379) (380)

			User D	otoile:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20	)12	USEI L	Strom Softwa					0006273 on: 1.0.4.26	
Adduses	CT 402 Appen Co		i í	Address			) FLI			
Address: 1. Overall dwelling dim	GT 403, Aspen Co	ourt, Maitia	and Pari	CEState,	London	, INVV3 Z	EH			
1. Overall dwelling diff	ensions.		Δros	a(m²)		Δν Ηρ	ight(m)		Volume(m³	1
Ground floor			Ale		(1a) x		2.6	(2a) =	197.6	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	le)+(1r	۱)	76	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	197.6	(5)
2. Ventilation rate:		_								
Number of chimneys	main heating	secondar heating	.y □ + □	other 0	] = [	total 0	x 4	40 =	m³ per hou	r (6a)
Number of open flues	0 +	0	- - - -	0	] <sub>=</sub> [	0	x	20 =	0	(6b)
Number of intermittent fa					J  -	3	x	10 =	30	(7a)
					Ļ			10 =		=
Number of passive vents					Ļ	0			0	(7b)
Number of flueless gas	fires					0	X 4	40 =	0	(7c)
								Air cl	hanges per ho	our
Infiltration due to chimne	evs_flues and fans =	(6a)+(6b)+(7	′a)+(7b)+(	7c) =	Г	30	_	÷ (5) =	0.15	(8)
If a pressurisation test has	•				ontinue fr			. (0) –	0.13	(0)
Number of storeys in			, ,			, ,	,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or timbe	r frame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are p deducting areas of open	oresent, use the value corre ings): if equal user 0.35	esponding to	the great	er wall are	a (after					
If suspended wooden	• / .	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0		,	·					0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value	•		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeab	•								0.4	(18)
Air permeability value appli  Number of sides shelter		as been dor	ne or a deg	gree air pe	meability	is being u	sed			(19)
Shelter factor	eu			(20) = 1 -	0.075 x (1	9)] =			0.85	$-\frac{(19)}{(20)}$
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.34	(21)
Infiltration rate modified		ed								` ′
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	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	22)m · 4						•		_	
Wind Factor $(22a)m = (2(22a)m = 1.27)$ 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	7	
(220)11- 1.21 1.23	1.20 1.1 1.00	0.95	0.90	0.92	'	1.00	1.14	1.10	J	

Adjusted infilti	ation rate	e (allowi	ing for sl	nelter ar	nd wind s	speed) =	(21a) x	(22a)m					
0.44	0.43	0.42	0.38	0.37	0.32	0.32	0.32	0.34	0.37	0.38	0.4	]	
Calculate effe		•	rate for t	пе арри	cable ca	ise						0	(23a)
If exhaust air h	eat pump u	using Appe	endix N, (2	23b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced wit	h heat reco	very: effic	eiency in %	allowing	for in-use f	actor (fron	n Table 4h	ı) =				0	(23c)
a) If balance	ed mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (N	ИV) (24b	p)m = (22)	2b)m + (2	23b)	1	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•					E v (22h	.\			
(24c)m = 0	$n < 0.5 \times 10^{-6}$	0	nen (24)	$\frac{(2)}{0} = \frac{(2)}{0}$		0 0 Wise	$\frac{C}{C} = (22)$	0) III + 0.	5 × (23b	0	0	1	(24c)
d) If natural	لــــــــــا											J	(= 15)
,	n = 1, the								0.5]				
(24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	]	(24d)
Effective air	change	rate - er	nter (24a	) or (24l	o) or (24	c) or (24	d) in bo	x (25)			-	_	
(25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. Heat losse	es and he	at loss	paramet	er:									
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²·		A X k kJ/K
Windows Type	e 1				1.29	x1	/[1/( 1.4 )+	0.04] =	1.71				(27)
Windows Type	e 2				8.58	x1	/[1/( 1.4 )+	0.04] =	11.37				(27)
Windows Type	e 3				1.29	x1.	/[1/( 1.4 )+	0.04] =	1.71				(27)
Windows Type	e 4				1.29	x1.	/[1/( 1.4 )+	0.04] =	1.71				(27)
Windows Type	e 5				4.61	x1.	/[1/( 1.4 )+	0.04] =	6.11				(27)
Windows Type	e 6				1.93	x1.	/[1/( 1.4 )+	0.04] =	2.56				(27)
Walls	48.1	8	18.9	9	29.19	) x	0.18		5.25				(29)
Roof	76		0		76	X	0.13	<u> </u>	9.88				(30)
Total area of	elements,	, m²			124.1	8							(31)
Party wall					48.28	3 x	0	=	0				(32)
* for windows and						lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	1 3.2	
** include the are Fabric heat lo				is and par	titions		(26)(30	) + (32) =				40.24	(33)
Heat capacity		•	0)				(20)(00)	, , ,	(30) + (32	2) + (32a)	(32e) =	40.31	(33)
Thermal mass	•	,	⊃ = Cm -	- TFA) iı	n kJ/m²K			., ,	tive Value:	, , ,	(020) =	250	(35)
For design asses	-						ecisely the				able 1f	230	(00)
can be used inste						-							
Thermal bridg					-	K						6.99	(36)
if details of therm  Total fabric he		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	(36) =			47.3	(37)
Ventilation he		alculated	d monthly	V				. ,	$= 0.33 \times ($	25)m x (5)	)	47.3	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
			<u> </u>					<del>'</del>		·		1	

(00)			07.04		00.04	00.04	05.00	00.44		07.40	07.00		(20)
(38)m= 38.7		38.31	37.21	37	36.04	36.04	35.86	36.41	37	37.42	37.86		(38)
Heat transfe		<del>_</del>	04.54	04.0	00.04	00.04	00.40	· · · ·	= (37) + (3	<del>_</del>	05.40		
(39)m= 86.0	9 85.85	85.61	84.51	84.3	83.34	83.34	83.16	83.71	84.3 Average =	84.72 Sum(39)	85.16	84.51	(39)
Heat loss pa	arameter (l	HLP), W/	m²K						= (39)m ÷		12 / 12=	04.51	
(40)m= 1.13	1.13	1.13	1.11	1.11	1.1	1.1	1.09	1.1	1.11	1.11	1.12		_
Number of o	lave in mo	nth (Tabi	lo 1a)					/	Average =	Sum(40) <sub>1</sub>	12 /12=	1.11	(40)
Jai	<u> </u>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	_	31	30	31	30	31	31	30	31	30	31		(41)
. /	!												
4. Water h	eating ene	rav regui	irement:								kWh/ye	ear:	
	<u> </u>		nomont.								TXVVIII y X	our.	
Assumed or	ccupancy, 3.9, N = 1		[1 - evn	( <u>-</u> 0 0003	240 v (TF	-Δ <b>-</b> 13 0	)2)] <b>+</b> 0 (	)013 v (1	Γ <b>Γ</b> Δ <b>-</b> 13		.38		(42)
if TFA £ 1		1 1.70 X	ι υλρ	( 0.0000	7-3 X (11	A 10.5	/2/] 1 0.0	) X 6100	11 A 15.	3)			
Annual aver											).79		(43)
Reduce the an not more that 1	_				_	_	to achieve	a water us	se target o	t			
Jai	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usag			<u> </u>					Эер	Oct	INOV	Dec		
(44)m= 99.8	7 96.23	92.6	88.97	85.34	81.71	81.71	85.34	88.97	92.6	96.23	99.87		
(1.)	. 1 00:20		00.0.		•	•	00.01		Total = Su		<u> </u>	1089.44	(44)
Energy conten	t of hot water	used - cale	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mon	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 148.	1 129.53	133.66	116.53	111.81	96.48	89.41	102.6	103.82	120.99	132.07	143.42		
<u> </u>	•								Γotal = Su	m(45) <sub>112</sub> =	-	1428.42	(45)
If instantaneou	s water heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,	) to (61)		1	1		
(46)m= 22.2 Water stora		20.05	17.48	16.77	14.47	13.41	15.39	15.57	18.15	19.81	21.51		(46)
Storage volu	•	) includin	ng any so	olar or W	/WHRS	storage	within sa	me ves	sel		150		(47)
If community	` ′	•	•			Ū					150		(41)
Otherwise if				-			. ,	ers) ente	er '0' in (	47)			
Water stora	ge loss:												
a) If manufa	acturer's d	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	.39		(48)
Temperatur	e factor fro	m Table	2b							0.	.54		(49)
Energy lost		_	-				(48) x (49)	=		0.	.75		(50)
b) If manufa Hot water st			-								0		(51)
If community	•			<b>-</b> ()	,	.,,					O .		(0.)
Volume fact	or from Ta	ble 2a									0		(52)
Temperatur	e factor fro	m Table	2b								0		(53)
Energy lost		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		0		(54)
Enter (50) o	or (54) in (5	55)								0.	.75		(55)
Water stora	ge loss cal	culated f	for each	month			((56)m = (	55) × (41)r	m 				
(56)m= 23.3		23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
	aine dadicata	d color eta	rogo (57)	m = (56)m	v [(50) _ (	H11\1 · /5	0) also (F	7\m - (FG)	m where (	H11) is fro	m Annend	ix H	
If cylinder conta	airis dedicate	u solai sio		11 = (30)111	x [(30) – (		U), else (5	(36)	iii wiieie (		літ Аррсії с		

modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)  m= 23.26		
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m		
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)	
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		
	0 0 (61)	
	- (46)m + (57)m + (59)m + (61)m	
	, ,	
	and to water realing)	
	0 0 (63)	
	177 17 190 02	
	<del></del>	
· · · · · · · · · · · · · · · · · · ·		
	<del></del>	
	, ,	
	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= 119.13 119.13 119.13 119.13 119.13 119.13 119.13 119.13 119.13 119.13 119.13	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(67)m= 18.8 16.7 13.58 10.28 7.68 6.49 7.01 9.11 12.23 15.53	18.13 19.32 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 210.88 213.07 207.55 195.81 180.99 167.07 157.76 155.57 161.09 172.83	187.65 201.57 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	<u> </u>	
(69)m= 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91 34.91	34.91 34.91 (69)	
Pumps and fans gains (Table 5a)		
(70)m= 3 3 3 3 3 3 3 3 3 3 3	3 3 (70)	
Losses e.g. evaporation (negative values) (Table 5)		
(71)m= -95.3 -95.3 -95.3 -95.3 -95.3 -95.3 -95.3 -95.3 -95.3 -95.3	-95.3 -95.3 (71)	
Water heating gains (Table 5)		
(72)m= 116.29 114.19 109.84 103.92 100.07 94.66 90.06 95.95 98.05 104.18	111.09 114.2 (72)	
	, ,	
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (89)m + (80)m$	· · · · · ·	
(73)m= 407.7 405.69 392.71 371.75 350.49 329.95 316.57 322.38 333.1 354.27	378.61 396.83 (73)	
6. Solar gains:	ble evienteties	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applica		
Orientation: Access Factor Area Flux g_ Table 6d m <sup>2</sup> Table 6a Table 6b	FF Gains Table 6c (W)	
East 0.9x 0.77 x 1.29 x 19.64 x 0.63 x	0.7 = 7.74 (76)	
East 0.9x 0.77 x 8.58 x 19.64 x 0.63 x	0.7 = 51.5 (76)	

	_		,		,						,		_
East	0.9x	0.77	X	1.29	X	19.64	X	0.63	X	0.7	=	7.74	(76)
East	0.9x	0.77	X	1.29	X	38.42	X	0.63	X	0.7	=	15.15	(76)
East	0.9x	0.77	X	8.58	X	38.42	X	0.63	X	0.7	=	100.74	(76)
East	0.9x	0.77	X	1.29	X	38.42	X	0.63	X	0.7	=	15.15	(76)
East	0.9x	0.77	X	1.29	X	63.27	X	0.63	X	0.7	=	24.94	(76)
East	0.9x	0.77	X	8.58	X	63.27	X	0.63	X	0.7	=	165.91	(76)
East	0.9x	0.77	X	1.29	X	63.27	X	0.63	X	0.7	=	24.94	(76)
East	0.9x	0.77	X	1.29	X	92.28	x	0.63	x	0.7	=	36.38	(76)
East	0.9x	0.77	X	8.58	X	92.28	x	0.63	x	0.7	=	241.97	(76)
East	0.9x	0.77	X	1.29	X	92.28	x	0.63	x	0.7	=	36.38	(76)
East	0.9x	0.77	X	1.29	x	113.09	X	0.63	x	0.7	=	44.59	(76)
East	0.9x	0.77	X	8.58	X	113.09	x	0.63	x	0.7	=	296.55	(76)
East	0.9x	0.77	X	1.29	X	113.09	x	0.63	x	0.7	=	44.59	(76)
East	0.9x	0.77	X	1.29	x	115.77	x	0.63	x	0.7	=	45.64	(76)
East	0.9x	0.77	X	8.58	x	115.77	x	0.63	x	0.7	=	303.57	(76)
East	0.9x	0.77	X	1.29	x	115.77	x	0.63	x	0.7	=	45.64	(76)
East	0.9x	0.77	X	1.29	X	110.22	x	0.63	x	0.7	=	43.45	(76)
East	0.9x	0.77	X	8.58	x	110.22	x	0.63	x	0.7	=	289.01	(76)
East	0.9x	0.77	X	1.29	x	110.22	x	0.63	x	0.7	=	43.45	(76)
East	0.9x	0.77	X	1.29	x	94.68	x	0.63	x	0.7	=	37.33	(76)
East	0.9x	0.77	X	8.58	x	94.68	x	0.63	x	0.7	=	248.26	(76)
East	0.9x	0.77	x	1.29	x	94.68	x	0.63	x	0.7	] =	37.33	(76)
East	0.9x	0.77	x	1.29	x	73.59	x	0.63	x	0.7	] =	29.01	(76)
East	0.9x	0.77	X	8.58	x	73.59	x	0.63	x	0.7	] =	192.96	(76)
East	0.9x	0.77	x	1.29	x	73.59	x	0.63	x	0.7	] =	29.01	(76)
East	0.9x	0.77	x	1.29	x	45.59	x	0.63	x	0.7	] =	17.97	(76)
East	0.9x	0.77	X	8.58	x	45.59	x	0.63	x	0.7	] =	119.54	(76)
East	0.9x	0.77	x	1.29	x	45.59	x	0.63	x	0.7	] =	17.97	(76)
East	0.9x	0.77	x	1.29	x	24.49	x	0.63	x	0.7	] =	9.65	(76)
East	0.9x	0.77	X	8.58	x	24.49	x	0.63	x	0.7	] =	64.21	(76)
East	0.9x	0.77	x	1.29	x	24.49	x	0.63	x	0.7	] =	9.65	(76)
East	0.9x	0.77	x	1.29	x	16.15	x	0.63	x	0.7	] =	6.37	(76)
East	0.9x	0.77	X	8.58	x	16.15	x	0.63	x	0.7	j =	42.35	(76)
East	0.9x	0.77	X	1.29	x	16.15	x	0.63	x	0.7	] =	6.37	(76)
South	0.9x	0.77	X	1.29	x	46.75	x	0.63	x	0.7	] =	18.43	(78)
South	0.9x	0.77	x	4.61	x	46.75	x	0.63	x	0.7	j =	65.87	(78)
South	0.9x	0.77	x	1.93	x	46.75	x	0.63	x	0.7	] =	27.58	(78)
South	0.9x	0.77	x	1.29	x	76.57	x	0.63	x	0.7	j =	30.19	(78)
South	0.9x	0.77	X	4.61	x	76.57	x	0.63	x	0.7	j =	107.87	(78)
South	0.9x	0.77	X	1.93	x	76.57	x	0.63	x	0.7	] =	45.16	(78)
South	0.9x	0.77	X	1.29	x	97.53	x	0.63	x	0.7	j =	38.45	(78)
	_		-		•		•				•		_

South	۵. ۲								1		_				( <b>7</b> 0)
South	0.9x	0.77	×	4.0		X		7.53	] X ]	0.63	×	0.7	=	107.41	(78)
South	0.9x	0.77	×	1.9	93	X	9	7.53	X	0.63	×	0.7	=	57.53	(78)
South	0.9x	0.77	×	1.3	29	X	1	10.23	X	0.63	×	0.7	=	43.46	(78)
South	0.9x	0.77	X	4.0	61	X	1	10.23	X	0.63	X	0.7	=	155.31	(78)
South	0.9x	0.77	X	1.9	93	X	1	10.23	X	0.63	X	0.7	=	65.02	(78)
South	0.9x	0.77	х	1.2	29	X	1	14.87	X	0.63	X	0.7	=	45.29	(78)
South	0.9x	0.77	х	4.0	61	X	1	14.87	X	0.63	X	0.7	=	161.84	(78)
South	0.9x	0.77	X	1.9	93	X	1	14.87	X	0.63	X	0.7	=	67.75	(78)
South	0.9x	0.77	X	1.2	29	X	1	10.55	X	0.63	X	0.7	=	43.58	(78)
South	0.9x	0.77	X	4.0	61	X	1	10.55	X	0.63	X	0.7	=	155.75	(78)
South	0.9x	0.77	Х	1.9	93	X	1	10.55	X	0.63	X	0.7	-	65.2	(78)
South	0.9x	0.77	Х	1.3	29	X	10	08.01	X	0.63	X	0.7	=	42.58	(78)
South	0.9x	0.77	X	4.0	61	x	10	08.01	X	0.63	X	0.7		152.18	(78)
South	0.9x	0.77	X	1.9	93	x	10	08.01	X	0.63	X	0.7	_	63.71	(78)
South	0.9x	0.77	X	1.3	29	x	10	04.89	X	0.63	X	0.7	-	41.35	(78)
South	0.9x	0.77	х	4.0	61	x	10	04.89	x	0.63	X	0.7	=	147.78	(78)
South	0.9x	0.77	х	1.9	93	x	10	04.89	x	0.63	X	0.7	-	61.87	(78)
South	0.9x	0.77	х	1.3	29	x	10	01.89	x	0.63	X	0.7	-	40.17	(78)
South	0.9x	0.77	х	4.0	61	x	10	01.89	X	0.63	X	0.7	-	143.54	(78)
South	0.9x	0.77	х	1.9	93	x	10	01.89	X	0.63	X	0.7	-	60.1	(78)
South	0.9x	0.77	х	1.3	29	x	8	2.59	X	0.63	X	0.7		32.56	(78)
South	0.9x	0.77	X	4.0	61	x	8	2.59	x	0.63	X	0.7		116.35	(78)
South	0.9x	0.77	X	1.9	93	x	8	2.59	x	0.63	X	0.7		48.71	(78)
South	0.9x	0.77	x	1.3	29	x	5	55.42	X	0.63	X	0.7		21.85	(78)
South	0.9x	0.77	х	4.0	61	x	5	55.42	X	0.63	X	0.7	-	78.08	(78)
South	0.9x	0.77	X	1.9	93	x	5	5.42	X	0.63	X	0.7	-	32.69	(78)
South	0.9x	0.77	X	1.2	29	x	4	40.4	X	0.63	X	0.7		15.93	(78)
South	0.9x	0.77	х	4.0	61	x	4	40.4	x	0.63	X	0.7	=	56.92	(78)
South	0.9x	0.77	X	1.9	93	X	4	40.4	X	0.63	X	0.7	=	23.83	(78)
7		watts, ca		1		$\overline{}$			<del>1                                    </del>	ı = Sum(74)m				_	
(83)m=	178.86	314.26	449.2	578.52	660.6		59.39	634.38	573	.91 494.79	353.	216.13	151.76	5	(83)
		nternal a		·	· ´ ´	Ť			T		1		T	7	(0.4)
(84)m=	586.57	719.96	841.9	950.27	1011.0	9 9	89.34	950.95	896	.29 827.9	707.3	594.74	548.59		(84)
7. Me	an inter	nal temp	erature	(heating	seaso	n)									
•		•	٠.			_			ble 9	Th1 (°C)				21	(85)
Utilisa		tor for ga		living ar	ea, h1,ı	<u>ո (s</u>	ee Ta	· ·			1		1	_	
	Jan	Feb	Mar	Apr	May	$\overline{}$	Jun	Jul	+	ug Sep	_		Dec		
(86)m=	0.99	0.98	0.95	0.87	0.72		0.53	0.38	0.4	0.66	0.91	0.99	1		(86)
1		l tempera		<del></del>	·	_			_					_	
(87)m=	19.94	20.16	20.45	20.75	20.93	2	20.99	21	2	1 20.96	20.7	1 20.26	19.9		(87)
Temp	erature	during h	eating p	eriods i	n rest c	f dw	elling	from Ta	able 9	9, Th2 (°C)				_	
(88)m=	19.97	19.98	19.98	19.99	19.99		20	20	20.	01 20	19.9	9 19.99	19.98		(88)

Utilisatio	on fact	or for a	aine for	rest of d	velling k	n2 m (se	o Tablo	Qa)						
	0.99	0.98	0.94	0.83	0.66	0.45	0.3	0.33	0.58	0.88	0.98	0.99		(89)
Mean in					<u> </u>		<u> </u>				0.30	0.55		(00)
	18.58	18.9	19.32	19.72	19.93	20	20	20	19.97	19.69	19.06	18.53		(90)
(50)111-	10.00	10.0	10.02	10.72	10.00	20	20	20			g area ÷ (4	ļ	0.36	(91)
											3 (	'' I	0.50	
Mean in							1				ı	<del></del>		(22)
` /	19.07	19.36	19.73	20.09	20.29	20.35	20.36	20.36	20.33	20.06	19.49	19.02		(92)
Apply a	<del></del>				· ·		i			·				(00)
` '	19.07	19.36	19.73	20.09	20.29	20.35	20.36	20.36	20.33	20.06	19.49	19.02		(93)
8. Spac														
Set Ti to				•		ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	on facto	or for g	ains, hm	:										
(94)m=	0.99	0.97	0.93	0.84	0.67	0.48	0.33	0.37	0.61	0.88	0.98	0.99		(94)
Useful g	gains, h	mGm ,	W = (94)	4)m x (84	4)m									
(95)m= 5	80.34	700.43	785.11	794.31	682.14	473.81	312.86	328.38	503.06	625.1	580.53	544.26		(95)
Monthly	avera	ge exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat los	ss rate	for mea	an intern	al tempe	erature, l	_m , W =	=[(39)m	x [(93)m	– (96)m	]				
` ′			1132.29		723.98	479.5	313.5	329.5	521.54	797.19	1050.09	1262.43		(97)
Space h	neating	require	ement fo	r each m	nonth, kV	Vh/mon	th = 0.02	4 x [(97	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m= 5	514.3	363.37	258.3	109.25	31.13	0	0	0	0	128.03	338.08	534.32		_
								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2276.77	(98)
Space h	neating	require	ement in	kWh/m²	/year								29.96	(99)
9a. Energ	gy requ	uiremen	ıts – Indi	ividual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space h		_												_
Fraction	of spa	ace hea	t from s	econdar	y/supple	mentary	system						0	(201)
Fraction	of spa	ace hea	t from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction	of tota	al heatir	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiend	cy of m	ain spa	ace heat	ing syste	em 1								93.5	(206)
Efficiend	cy of se	econda	ry/suppl	ementar	y heating	g system	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space h	neating	require	ement (c	alculated	d above)									
5	514.3	363.37	258.3	109.25	31.13	0	0	0	0	128.03	338.08	534.32		
(211)m =	: {[(98)]}	m x (20	4)] } x 1	00 ÷ (20	16)		_							(211)
` <i>′</i> —	í	388.63	276.25	116.84	33.29	0	0	0	0	136.93	361.58	571.46		
					· · · · · · · · ·			Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	2435.04	(211)
Space h	neating	fuel (se	econdar	v). kWh/	month							l		_
= {[(98)m	_	•		• •										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
<u></u>	<u> </u>				·!			Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<b>=</b>	0	(215)
												l		_

194.69 171.61 180.25 161.62 158.41 1	41.58 136	149.19	148.91	167.59	177.17	190.02		
Efficiency of water heater	41.00	140.10	140.01	107.00	177.17	100.02	79.8	(2
	79.8 79.8	79.8	79.8	84.11	86.51	87.42	70.0	J` (2
ruel for water heating, kWh/month				l				
219)m = (64)m x 100 ÷ (217)m								
219)m= 223.05   197.78   210.15   192.87   194.65   1	77.41 170.43	186.96	186.61	199.26	204.79	217.35		٦.
		rotai	= Sum(2	19a) <sub>112</sub> =			2361.31	(2
Annual totals Space heating fuel used, main system 1				K	Wh/year	· [	2435.04	1
Vater heating fuel used						ا [	2361.31	] ]
Electricity for pumps, fans and electric keep-hot						l	2001.01	j
central heating pump:						30		(2
boiler with a fan-assisted flue						45		(2
otal electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(2
Electricity for lighting							332.01	(2
12a. CO2 emissions - Individual heating system	s including m	icro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
	•			kg CO	2/kWh		kg CO2/yea	r
	kWh/year							(2
Space heating (main system 1)	kWh/year (211) x			0.2	16	= [	525.97	1
Space heating (main system 1) Space heating (secondary)	•			0.2		= [	525.97	] [2
	(211) x				19	l r		_
Space heating (secondary) Vater heating	(211) x (215) x		264) =	0.5	19	= [	0	] ](2
Space heating (secondary)  Vater heating  Space and water heating	(211) x (215) x (219) x		264) =	0.5	19	= [	0 510.04	] (2 ] (2 ] (2
Space heating (secondary)	(211) x (215) x (219) x (261) + (262)		264) =	0.5	19 16 19	= [	0 510.04 1036.01	] ](2 ](2

TER =

(273)

23.91

#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.26 Printed on 02 September 2020 at 17:34:22

Project Information:

Assessed By: John Simpson (STRO006273) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE

Total Floor Area: 57m<sup>2</sup>

Site Reference: Maitland Park Estate

Plot Reference: GT 404

Address: GT 404, Aspen Court, Maitland Park Estate, London, NW3 2EH

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: Electricity (c)

Fuel factor: 1.55 (electricity (c))

Target Carbon Dioxide Emission Rate (TER) 29.13 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER)

8.62 kg/m<sup>2</sup>

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.7 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 43.0 kWh/m²

OK

2 Fabric U-values

**Element Highest Average** 0.12 (max. 0.70) External wall 0.12 (max. 0.30) OK Party wall 0.00 (max. 0.20) OK Floor (no floor) Roof 0.10 (max. 0.20) 0.10 (max. 0.35) OK **Openings** 1.40 (max. 2.00) OK 1.40 (max. 3.30)

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 2.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main Heating system: Community heating schemes - Heat pump

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:	0.5	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: South	1.5m²	
Windows facing: North	2.24m²	
Windows facing: North	1.5m²	
Windows facing: North	6.73m²	
Ventilation rate:	3.00	
Blinds/curtains:	None	
10 Key features		
Air permeablility	2.0 m³/m²h	
Roofs U-value	0.1 W/m <sup>2</sup> K	
External Walls U-value	0.12 W/m <sup>2</sup> K	
Party Walls U-value	0 W/m²K	
Community heating, heat from electric heat pump		
Photovoltaic array		

			User D	etails:									
Assessor Name: Software Name:	r Name: John Simpson Stroma Number: ST Name: Stroma FSAP 2012 Software Version: Vers												
	Property Address: GT 404  GT 404, Aspen Court, Maitland Park Estate, London, NW3 2EH  elling dimensions:  Area(m²) Av. Height(m) Volum  57 (1a) $\times$ 2.6 (2a) = 148.  TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 57 (4)  The secondary other total m³ per heating heating heating heating  The secondary other total m³ per heating heat												
Address :		Court, Maitla	and Park	c Estate,	London	, NW3 2	EH.						
1. Overall dwelling dime	ensions:												
			Area	<u> </u>		Av. He	ight(m)	_	Volume(m	<u> </u>			
Ground floor				57	(1a) x	2	2.6	(2a) =	148.2	(3a)			
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+	·(1e)+(1r	n)	57	(4)								
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	148.2	(5)			
2. Ventilation rate:													
			у	other		total			m³ per hou	ır			
Number of chimneys			<b>+</b> [	0	] = [	0	Х	40 =	0	(6a)			
Number of open flues	0	(6b)											
Number of intermittent fa	0	(7a)											
	umber of intermittent fans $0                                    $												
•	0	(7b)											
Number of flueless gas f	0	(7c)											
								Air ch	anges per h	our			
Infiltration due to chimne	evs. flues and fans =	= (6a)+(6b)+(7	'a)+(7b)+(	7c) =	Г	0		÷ (5) =	0	(8)			
If a pressurisation test has I	•				ontinue fr	-		. (0) –	0	(0)			
Number of storeys in t	he dwelling (ns)								0	(9)			
Additional infiltration							[(9)	-1]x0.1 =	0	(10)			
Structural infiltration: 0	0.25 for steel or timb	er frame or	0.35 fo	r masonr	y constr	ruction			0	(11)			
if both types of wall are p		erresponding to	the great	er wall are	a (after								
deducting areas of openi If suspended wooden		ealed) or 0	1 (spale	معام (امد	enter N				0	(12)			
If no draught lobby, er	•	•	. i (Scaic	, cisc	CITICI O				0	(12)			
Percentage of window									0	(14)			
Window infiltration	s and doors draugn	it stripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)			
Infiltration rate				(8) + (10)			+ (15) =		0	(16)			
Air permeability value,	a50 expressed in	cubic metre	s ner ho	. , . ,	, , ,	, , ,	, ,	area		(17)			
If based on air permeabi			•	•	•	ou o o c	листорс	arou	0.1	(17)			
Air permeability value applie	•					is being u	sed		0.1	(10)			
Number of sides sheltered	•		•	,	,	J			2	(19)			
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.85	(20)			
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.08	(21)			
Infiltration rate modified	for monthly wind sp	eed											
Jan Feb	Mar Apr M	ay 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 $(22a)m = (2a)m =$	22)m ÷ 4	0 005	0.05	,					Ī				

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.11	0.11	0.1	0.09	0.09	0.08	0.08	0.08	0.08	0.09	0.1	0.1		
Calculate effect		_	rate for t	he appli	cable ca	se					•	· 	
If mechanica			andiv N (2	3h) - (23s	a) v Emy (e	aguation (I	NSN othe	rwisa (23h	) <i>- (</i> 23a)			0.5	(23
If balanced with									) = (23a)			0.5	(23
		-	•	_					26\m . /	22b) [	1 (22.5)	76.5	(23
a) If balance (24a)m= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22	<del>-</del> 100]	(24
` '					<u> </u>	<u> </u>	ļ	l	<u>l</u>	<u>Į</u>	0.22		(2.
b) If balance		o lical ve	0	0	0	0	0 0	0	0	0	0	]	(24
													(_
c) If whole h if (22b)n				•					5 × (23h	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	L nositiv	/e input	L ventilatio	on from I	oft	<u> </u>			l	
if (22b)n				•	•				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= 0.23	0.22	0.22	0.21	0.21	0.2	0.2	0.2	0.2	0.21	0.21	0.22		(25
3. Heat losses	c and he	oat loce r	aramata	or:			•						
	S and he Gros	·			Net Ar	00	U-valı	10	AXU		k-value	Δ	Χk
ELEMENT	area		Openin m		A,r		W/m2		(W/		kJ/m <sup>2</sup> ·l		J/K
Nindows Type	1				1.5	x1	/[1/( 1.4 )+	0.04] =	1.99				(27
Nindows Type	2				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97	Ħ			(27
Nindows Type	3				1.5		/[1/( 1.4 )+	0.04] =	1.99	一			(27
Vindows Type					6.73		/[1/( 1.4 )+	0.04] =	8.92	=			` (27
Walls	50.8	8	11.9	7	38.83	=	0.12		4.66	=		$\neg$	(29
Roof	57		0		57		0.12	╡ <sub>-</sub> ¦	5.7	북 ¦		╡	(30
Total area of e						<b>=</b>   ^	0.1	[	5.7				(31
	icincino	, ''''			107.8	_							
Party wall * for windows and	roof wind	04/0 1/00 6	effootivo wi	ndow I I ve	28.34		0	/[/1/    vol	0		norograph		(32
** include the area		•				ลเษน นรแญ	j iorriula i	/[(	1 <del>0</del> )+0.04] a	as giveri iri	paragrapi	1 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				26.23	(33
Heat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
or design assess	ments wh	ere the de	tails of the	construct	ion are not	t known pi	ecisely the	indicative	values of	TMP in Ta	able 1f		
can be used instea													
Thermal bridge	,	,			•	<						7.64	(36
f details of therma Fotal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(22) 1	(36) =				
		aloulotos	l manthi							(25)m v (F)	\	33.87	(37
/antilation has	11 1055 C	ziculate0	i monuni		Jun	Jul	Aug	Sep	Oct	(25)m x (5) Nov	Dec	]	
entilation hea	Eah	Mar	\ \nr				. 411(1	>=()		. 131(1)/			
Jan	Feb	Mar	Apr	May			<del></del>	<u> </u>	-	<del>                                     </del>	<b>†</b>		(38
38)m= 11.05	10.94	10.84	Apr 10.32	10.22	9.7	9.7	9.59	9.9	10.22	10.42	10.63		(38
Jan	10.94	10.84					<del></del>	9.9	-	10.42	<b>†</b>	1	(38)

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.79	0.79	0.78	0.78	0.77	0.76	0.76	0.76	0.77	0.77	0.78	0.78		
						l	l		Average =	: Sum(40) <sub>1</sub>	12 /12=	0.77	(40)
Number of day	1	nth (Tab	le 1a)		ı			1					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		.9		(42)
Annual average Reduce the annual not more that 125	, al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t	,		se target o		).22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 87.14	83.98	80.81	77.64	74.47	71.3	71.3	74.47	77.64	80.81	83.98	87.14		
									Total = Su	ım(44) <sub>112</sub> =	-	950.67	(44)
Energy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x C	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 129.23	113.03	116.63	101.68	97.57	84.19	78.02	89.53	90.6	105.58	115.25	125.15		_
If instantaneous v	vater heati	na at noint	of use (no	hot water	r storaga)	enter∩in	hoves (16		Total = Su	ım(45) <sub>112</sub> =	= [	1246.47	(45)
			,	1	, , , , , , , , , , , , , , , , , , ,	ı	· · ·	, , , <del>,</del>	1.504	1,7,00	10.77		(46)
(46)m= 19.38 Water storage	16.95 loss:	17.5	15.25	14.64	12.63	11.7	13.43	13.59	15.84	17.29	18.77		(46)
Storage volum		) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost from		•			or io not		(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water store</li></ul>			-							0	02		(51)
If community h	-			_ (	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77				0.	.02		()
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in ( <del></del>	55)								1.	.03		(55)
Water storage	loss cal	culated f	or each	month	_		((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	(H11) is fro	m Appendi	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	loss (ar	nnual) fro	m Table	 3							0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 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 × (41)m														
(61)m= 0	0	0	0	0	0	0	) 	)	0	0	0	0	1	(61)
	L equired for	water he	eating ca	Lulated	L I for eac	ch month	(62)	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 184.5	<del></del>	171.91	155.18	152.85	137.69	1	144	_	144.09	160.86	168.74	180.43	]	(62)
Solar DHW inp	ut calculated	using App	endix G oı	· Appendix	H (nega	tive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	J	
(add additio												•		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter				•					•	!	•	
(64)m= 184.5	51 162.96	171.91	155.18	152.85	137.69	133.3	144	1.8	144.09	160.86	168.74	180.43	]	
	•			•		•		Outp	out from wa	ater heate	er (annual) <sub>1</sub>	12	1897.31	(64)
Heat gains	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	]	
(65)m= 87.1	9 77.52	83	76.61	76.66	70.79	70.16	73.	99	72.92	79.33	81.12	85.84	]	(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):										
Metabolic gains (Table 5), Watts														
Jai		Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(66)m= 94.7	8 94.78	94.78	94.78	94.78	94.78	94.78	94.	78	94.78	94.78	94.78	94.78		(66)
Lighting gai	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				-	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5  (67)m=														(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation I	_13 or L1	3a),	also	see Tal	ble 5		-	-	
(68)m= 165.3	32 167.04	162.72	153.51	141.89	130.98	123.68	121	.97	126.29	135.49	147.11	158.03	]	(68)
Cooking gai	ns (calcula	ited in A	opendix	L, equat	ion L15	or L15a	), als	o se	e Table	5	-	-	-	
(69)m= 32.4	8 32.48	32.48	32.48	32.48	32.48	32.48	32.	48	32.48	32.48	32.48	32.48	]	(69)
Pumps and	fans gains	(Table 5	āa)											
(70)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(70)
Losses e.g.	evaporation	n (negat	ive valu	es) (Tab	le 5)							-		
(71)m= -75.8	33 -75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75	.83	-75.83	-75.83	-75.83	-75.83		(71)
Water heati	ng gains (1	able 5)											_	
(72)m= 117.	19 115.36	111.56	106.4	103.04	98.32	94.3	99.	45	101.28	106.62	112.66	115.37		(72)
Total interr	al gains =	<b>.</b>			(60	6)m + (67)m	n + (68	3)m +	+ (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 348.0	346.93	336.36	319.4	302.4	285.82	274.92	279	.99	288.59	305.72	325.42	339.98		(73)
6. Solar ga	ins:													
Solar gains a		•					ations	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
N.I4I-					_		1							1
North 0.9		X	2.2		X	10.63	X		0.4	_  ×	8.0	=	5.28	(74)
North 0.9		X	1.		X	10.63	X		0.4		0.8	_  =	3.54	[(74)
North 0.9		X	6.7		X	10.63	X		0.4		0.8	=	15.87	[(74)
North 0.9		X	2.2	==	X	20.32	X		0.4	x	0.8	=	10.09	(74)
North 0.9	X 0.77	X	1.	5	X	20.32	X		0.4	X	0.8	=	6.76	(74)

N I = ::4I=	_		7		1		1		ı		1		٦
North	0.9x	0.77	X	6.73	X	20.32	X	0.4	X	0.8	=	30.33	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.4	X	0.8	=	17.15	(74)
North	0.9x	0.77	X	1.5	X	34.53	X	0.4	X	0.8	=	11.49	(74)
North	0.9x	0.77	X	6.73	X	34.53	X	0.4	X	0.8	=	51.53	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.4	X	0.8	=	27.55	(74)
North	0.9x	0.77	X	1.5	X	55.46	X	0.4	X	0.8	=	18.45	(74)
North	0.9x	0.77	X	6.73	x	55.46	X	0.4	X	0.8	=	82.78	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.4	X	0.8	=	37.11	(74)
North	0.9x	0.77	X	1.5	X	74.72	X	0.4	X	0.8	=	24.85	(74)
North	0.9x	0.77	X	6.73	X	74.72	X	0.4	X	0.8	=	111.51	(74)
North	0.9x	0.77	X	2.24	x	79.99	X	0.4	X	0.8	=	39.73	(74)
North	0.9x	0.77	X	1.5	X	79.99	X	0.4	x	0.8	=	26.61	(74)
North	0.9x	0.77	X	6.73	x	79.99	X	0.4	X	0.8	=	119.37	(74)
North	0.9x	0.77	X	2.24	X	74.68	X	0.4	X	0.8	=	37.1	(74)
North	0.9x	0.77	X	1.5	X	74.68	X	0.4	X	0.8	=	24.84	(74)
North	0.9x	0.77	X	6.73	x	74.68	X	0.4	x	0.8	=	111.45	(74)
North	0.9x	0.77	X	2.24	x	59.25	X	0.4	x	0.8	=	29.43	(74)
North	0.9x	0.77	X	1.5	x	59.25	X	0.4	x	0.8	=	19.71	(74)
North	0.9x	0.77	X	6.73	x	59.25	x	0.4	x	0.8	=	88.42	(74)
North	0.9x	0.77	X	2.24	x	41.52	x	0.4	X	0.8	=	20.62	(74)
North	0.9x	0.77	X	1.5	x	41.52	x	0.4	x	0.8	=	13.81	(74)
North	0.9x	0.77	X	6.73	x	41.52	х	0.4	x	0.8	=	61.96	(74)
North	0.9x	0.77	X	2.24	x	24.19	X	0.4	x	0.8	=	12.02	(74)
North	0.9x	0.77	X	1.5	x	24.19	x	0.4	x	0.8	=	8.05	(74)
North	0.9x	0.77	X	6.73	x	24.19	x	0.4	x	0.8	=	36.1	(74)
North	0.9x	0.77	X	2.24	x	13.12	x	0.4	X	0.8	=	6.52	(74)
North	0.9x	0.77	X	1.5	x	13.12	x	0.4	x	0.8	=	4.36	(74)
North	0.9x	0.77	X	6.73	x	13.12	x	0.4	x	0.8	=	19.58	(74)
North	0.9x	0.77	X	2.24	x	8.86	x	0.4	x	0.8	=	4.4	(74)
North	0.9x	0.77	X	1.5	x	8.86	x	0.4	x	0.8	=	2.95	(74)
North	0.9x	0.77	X	6.73	x	8.86	X	0.4	x	0.8	=	13.23	(74)
South	0.9x	0.77	X	1.5	x	46.75	X	0.4	x	0.8	=	15.55	(78)
South	0.9x	0.77	X	1.5	x	76.57	X	0.4	x	0.8	=	25.47	(78)
South	0.9x	0.77	x	1.5	x	97.53	x	0.4	x	0.8	<b>=</b>	32.44	(78)
South	0.9x	0.77	x	1.5	x	110.23	x	0.4	x	0.8	] =	36.67	(78)
South	0.9x	0.77	x	1.5	x	114.87	x	0.4	x	0.8	j =	38.21	(78)
South	0.9x	0.77	x	1.5	x	110.55	x	0.4	x	0.8	] =	36.77	(78)
South	0.9x	0.77	×	1.5	×	108.01	x	0.4	x	0.8	j =	35.93	(78)
South	0.9x	0.77	X	1.5	×	104.89	x	0.4	x	0.8	j =	34.89	(78)
South	0.9x	0.77	X	1.5	x	101.89	x	0.4	x	0.8	=	33.89	(78)
South	0.9x	0.77	X	1.5	x	82.59	x	0.4	x	0.8	=	27.47	(78)
			-		•		•		•	•	•		_

South 0.9	0.77	x	1.5	5	х	55.42	x [		0.4	x [	0.8	=	18.43	(78)
South 0.9	0.77	x	1.5	5	х	40.4	x		0.4	x	0.8	=	13.44	(78)
				<u>-</u>	_									<del></del>
Solar gains	in watts, c	alculated	for each	n month			(83)m	= St	um(74)m .	(82)m				
(83)m= 40.2	4 72.65	112.62	165.45	211.69	222.	48 209.32	172.	45	130.29	83.63	48.89	34.02		(83)
Total gains	– internal a	and solar	(84)m =	: (73)m +	+ (83	)m , watts	•	•			•	•	•	
(84)m= 388.9	93 419.58	448.98	484.85	514.08	508	.3 484.23	452.	.44	418.87	389.36	374.31	374		(84)
7. Mean in	ternal tem	perature	(heating	season)	)									
Temperatu	re during l	neating p	eriods ir	the livir	ng ar	ea from Tal	ole 9,	Th	1 (°C)				21	(85)
Utilisation t	factor for g	ains for I	iving are	ea, h1,m	(see	Table 9a)								
Jai	n Feb	Mar	Apr	May	Ju	ın Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(86)m= 0.99	0.99	0.97	0.91	0.76	0.5	4 0.4	0.4	4	0.7	0.93	0.99	1		(86)
Moon intor	nal tompo	ratura in	living or	22 T1 (fo	امالا	steps 3 to 7	Tin T	able	. 00)		1	<u>I</u>		
(87)m= 20.3	<del></del>	20.63	20.84	20.96	21	i	21		20.98	20.83	20.57	20.34		(87)
. ,						<u> </u>	<u> </u>			20.00	20.07	20.04		(0.)
· -		<del>,                                    </del>		i		ling from Ta					1	1	1	(0.0)
(88)m= 20.2	6 20.27	20.27	20.27	20.28	20.2	28 20.28	20.2	29	20.28	20.28	20.27	20.27		(88)
Utilisation	factor for g	ains for ı	est of d	welling, ł	n2,m	(see Table	9a)							
(89)m= 0.99	0.99	0.97	0.89	0.71	0.4	9 0.33	0.3	7	0.64	0.91	0.98	0.99		(89)
Mean inter	nal tempe	rature in t	the rest	of dwelli	na T	2 (follow ste	ens 3	to 7	' in Tabl	e 9c)	-	-	•	
(90)m= 19.4	<del></del>	19.8	20.09	20.24	20.2	<u> </u>	20.2		20.27	20.09	19.72	19.38		(90)
` /								!	f	LA = Livi	ng area ÷ (4	1 4) =	0.56	(91)
						() A T4			A) TO					`
		<del>1 `</del>		-		= fLA × T1	<del>-                                    </del>			00.5	1 00 10	10.01	1	(00)
(92)m= 19.9		20.26	20.51	20.64	20.6		20.6		20.67	20.5	20.19	19.91		(92)
· · · · <del></del>		1				from Table				·	1 00 10	10.04	1	(02)
(93)m= 19.9		20.26	20.51	20.64	20.6	68 20.68	20.6	98	20.67	20.5	20.19	19.91		(93)
8. Space h						( - ( <b>4 4</b> - f	<b>.</b>	- 01		. T'	(70)	dan and	la ( a	
the utilisati			•		ed a	t step 11 of	rabi	e yr	o, so tha	t 11,m=	(76)m an	a re-caid	culate	
Jai		Mar	Apr	May	Ju	ın Jul	Αι	ıa	Sep	Oct	Nov	Dec		
Utilisation 1				·viay	-	••		<u> </u>	ООР		1.01			
(94)m= 0.99		0.97	0.9	0.74	0.5	2 0.37	0.4	1	0.67	0.92	0.98	0.99		(94)
Useful gair	ns, hmGm	. W = (94	I)m x (84	4)m		!	!	!				<u> </u>	I	
(95)m= 385.9	1	433.93	435.25	377.93	263.	58 177.75	185.	.93	280.73	357.76	367.78	371.71		(95)
Monthly av	erage exte	ernal tem	perature	from Ta	able 8	 8					1	<u>I</u>	l	
(96)m= 4.3	<del></del>	6.5	8.9	11.7	14.		16.	4	14.1	10.6	7.1	4.2		(96)
Heat loss r	ate for me	an intern	al tempe	erature, l	Lm ,	W =[(39)m	x [(93	 3)m-	– (96)m	]	•	<u>!</u>	1	
(97)m= 702.3		615.17	512.85	394.3	264.	<del></del>	186.	<del>_</del>	287.45	436.57	579.71	699.27		(97)
Space hea	ting requir	ement fo	r each m	nonth, kV	/Vh/m	nonth = 0.02	24 x [	<del></del> (97)	m – (95	)m] x (4	l1)m	1	1	
(98)m= 235.4	<del>-ř</del>	134.84	55.87	12.18	0		0	Ì	0	58.63	152.59	243.7		
				·!				Total	per year	(kWh/yea	ar) = Sum(9	8) <sub>15,912</sub> =	1071.8	(98)
Space hea	tina requir	ement in	k\/\/h/m²	/vear									18.8	(99)
орасс пеа	ang roquii	omont III		, y cai									10.0	(00)

9b. Energy requirements – Community heating scheme

This part is used for space heating, space cooling or water heating provided by a community scheme.

Fraction of space heat from secondary/supplementary heating (Table 1	11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	Try o a none	1	(302)
The community scheme may obtain heat from several sources. The procedure allows fo includes boilers, heat pumps, geothermal and waste heat from power stations. See App	•		
Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community he	eating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating Annual space heating requirement		<b>kWh/year</b> 1071.8	7
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1178.98	(307a)
Efficiency of secondary/supplementary heating system in % (from Table	le 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		1897.31	_ 7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2087.04	(310a)
Electricity used for heat distribution 0.0	32.66	(313)	
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	е	113	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	113	(331)
Energy for lighting (calculated in Appendix L)		260.29	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-482.76	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)
12b. CO2 Emissions – Community heating scheme			
	nergy Emission factor Vh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fue	els repeat (363) to (366) for the second fue	319	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x	(100 ÷ (367b) x 0.52 =	531.37	(367)
Electrical energy for heat distribution [(313) x	0.52	16.95	(372)
	366) + (368)(372)	548.32	(373)
	366) + (368)(372) = 0	340.32	(373) (374)

Total CO2 associated with space and water heating (373) + (374) + (375) =(376) 548.32 CO2 associated with electricity for pumps and fans within dwelling (331)) x (378) 0.52 58.65 CO2 associated with electricity for lighting (332))) x (379) 0.52 135.09 Energy saving/generation technologies (333) to (334) as applicable x 0.01 =Item 1 (380)0.52 -250.55 sum of (376)...(382) =Total CO2, kg/year 491.5 (383) $(383) \div (4) =$ **Dwelling CO2 Emission Rate** (384)8.62 El rating (section 14) (385)93.54

			User D	otaile:						
Assessor Name: Software Name:	John Simpson Stroma FSAP 20		0006273 on: 1.0.4.26							
Addan	CT 404 Aspen Co		i i	Address			\			
Address: 1. Overall dwelling dime	GT 404, Aspen Co	ourt, Maitia	and Park	K Estate,	London	, INVV3 Z	EH.			
1. Overall dwelling diffi	611510115.		Aros	a(m²)		۸۷ ۵۰	ight(m)		Volume(m³	1
Ground floor			Alec		(1a) x		2.6	(2a) =	148.2	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	1e)+(1r	n)	57	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	148.2	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating	у ] + [	other 0	] = [	total 0	X 4	40 =	m³ per hou	r (6a)
Number of open flues	0 +	0	i + F	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa					J <u>L</u>	2	x	10 =	20	(7a)
Number of passive vents					L	0	x ·	10 =		(7b)
•	0	= ' '								
Number of flueless gas f	rires					0	X 2	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	evs flues and fans =	(6a)+(6b)+(7	'a)+(7b)+(	7c) =	Г	20		÷ (5) =	0.13	(8)
If a pressurisation test has	•				ontinue fr	20 om (9) to		<del>.</del> (3) –	0.13	(0)
Number of storeys in t		.,	( //			( )	,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel or timbe	r frame or	0.35 for	r masonr	y constr	uction			0	(11)
if both types of wall are p deducting areas of open	present, use the value corre	esponding to	the great	er wall are	a (after					
If suspended wooden	• / .	aled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er		,	(	,,					0	(13)
Percentage of window									0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value	•		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeab	•								0.38	(18)
Air permeability value appli		as been dor	e or a deg	gree air pe	meability	is being u	sed		F	7(40)
Number of sides shelter Shelter factor	ea			(20) = 1 -	0.075 x (1	[9)] <b>=</b>			0.85	(19)
Infiltration rate incorpora	iting shelter factor			(21) = (18)		,-			0.33	(21)
Infiltration rate modified	-	ed		. , , ,	, ,				0.00	(=.)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind s		<u> </u>			•	<u>l</u>	1	<u>l</u>	_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
	)(2)m : 4	I		I		ı	1	I	1	
Wind Factor (22a)m = $(2^{22a})$ m =	<del>'</del>	0.05	0.95	0.02	1	1.08	1 10	1 10	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	ı	1.08	1.12	1.18	_	

Adjusted infiltr	ration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.42	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.38		
Calculate effe		•	rate for t	he appli	cable ca	se			!			·	<u> </u>
If mechanic			andiv N. (2	12h) - (22a	) × Emy (	aguation (I	VEVV otho	nuico (22h	) - (232)			0	(23:
If exhaust air h									) = (23a)			0	(23
If balanced wit		•	-	_					21.) (	001 \ [	4 (00.)	0	(23
a) If balance	1	1	i	i		<del>-                                    </del>	<del>-                                    </del>	<del>```</del>	<del> </del>	<del></del>	<del>- `                                   </del>	÷ 100] I	(24)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	1	1	i	i	1	<del></del>	<del> </del>	<del>í `</del>	<del>r ´       `</del>	<del>-                                    </del>		1	(24
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	nouse ex m < 0.5 >			•	•				5 v (23h	<i>a</i> )			
$\frac{11(220)1}{(24c)m=0}$	0.57	0	0	0	0	0	0	0	0	0	0		(24
d) If natural													•
,	m = 1, th								0.5]				
(24d)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(24
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)	!	•		•	
(25)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(25
0 115541555													
3. Heat losse					NIa4 Au		اميدالا		A V I I		المراجع الما		۸ V I.
ELEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²-l		AXk <j k<="" td=""></j>
Windows Type	e 1				1.5	<sub>x</sub> 1	/[1/( 1.4 )+	0.04] =	1.99				(27
Windows Type	e 2				2.24	x1	/[1/( 1.4 )+	0.04] =	2.97				(27)
Windows Type					1.5	=	/[1/( 1.4 )+	0.04] =	1.99	=			(27
Windows Type					6.73	ऱ .	/[1/( 1.4 )+	l l	8.92	=			(27)
Walls	50.		11.9	7	38.83	=	0.18		6.99	╡ ,		<b>-</b>	(29)
Roof			0				0.13	-       -	7.41	믁 ¦		╡	(30
Total area of e	57				57	╣ ^	0.13		7.41	[			
	elements	o, III <sup>-</sup>			107.8	=							(31
Party wall	-l				28.34		0	= [	0				(32
* for windows and ** include the are						atea using	j tormula 1	/[(1/U-vail	ie)+0.04] a	as given in	paragrapr	1 3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30)	+ (32) =				30.27	(33
Heat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	s parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
For design asses	sments wh	ere the de	tails of the	construct	ion are no	t known pi	ecisely the	indicative	values of	TMP in T	able 1f		
can be used inste													
Thermal bridg	•	•		• .	•	<						5.92	(36
if details of therm Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) 1	(36) =				
		alaulataa	l manthl							(25)m v (5)	١	36.18	(37
Ventilation he	Feb	Mar	T .	I	lun	Jul	۸۱۱۵	Sep	Oct	(25)m x (5) Nov	Dec	1	
(38)m= 28.71	28.54	28.38	Apr 27.62	May 27.48	Jun 26.82	26.82	Aug 26.69	27.07	27.48	27.77	28.07		(38
` ′	<u> </u>		21.02	21.40	20.02	20.02	20.09	<u> </u>	<u> </u>		20.07	I	(00)
Heat transfer		<del> </del>	00.01	00.00			I 00 00		= (37) + (	1	T 04 5=	1	
(39)m= 64.89	64.73	64.57	63.81	63.66	63	63	62.88	63.26	63.66	63.95	64.25		
								4	Average =	Sum(39)₁	12 /12=	63.81	(39

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1.14	1.14	1.13	1.12	1.12	1.11	1.11	1.1	1.11	1.12	1.12	1.13		
	ı			I.			ı		Average =	Sum(40) <sub>1</sub> .	12 /12=	1.12	(40)
Number of day	ys in mo	nth (Tab	le 1a)			1		1	1	1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		.9		(42)
Annual average Reduce the annu- not more that 125	al average	hot water	usage by	5% if the $c$	lwelling is	designed t	,		se target o		.22		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea			ctor from	Table 1c x		! '	!	ļ.			
(44)m= 87.14	83.98	80.81	77.64	74.47	71.3	71.3	74.47	77.64	80.81	83.98	87.14		
	·!			!			!			m(44) <sub>112</sub> =	L	950.67	(44)
Energy content of	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= 129.23	113.03	116.63	101.68	97.57	84.19	78.02	89.53	90.6	105.58	115.25	125.15		_
If instantaneous v	water heati	na at naint	of uso (no	hot water	r storago)	ontor O in	havas (16		Total = Su	m(45) <sub>112</sub> =	= [	1246.47	(45)
	1		,	ı	, , , , , , , , , , , , , , , , , , ,		· · ·	, , , <del>,</del>					(40)
(46)m= 19.38 Water storage	16.95 LOSS:	17.5	15.25	14.64	12.63	11.7	13.43	13.59	15.84	17.29	18.77		(46)
Storage volum		) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	) litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f										0.	54		(49)
Energy lost fro		•					(48) x (49)	) =		0.	75		(50)
b) If manufact Hot water stor			-								0		(51)
If community h	•				,	-97					<u> </u>		(0.)
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	factor fro	m Table	2b								0		(53)
Energy lost fro	om watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or	(54) in (	55)								0.	75		(55)
Water storage	loss cal	culated 1	or each	month			((56)m = (	(55) × (41)	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 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	хН	
(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	t loss (ar	nual) fro	m Table	 e 3							0		(58)
Primary circuit	,	•			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	y factor f	rom Tab	le H5 if t	here is	solar 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)

Combi loss o	salaulatad	for oach	month (	(61)m –	(60) · 3	65 v (11	/m						
Combi loss of $(61)$ m= 0	0 0	0	0	0	0	00 x (41	0	0	0	0	0	1	(61)
	<u> </u>		<u> </u>	<u> </u>	<u> </u>		<u>.                                    </u>	<u> </u>	<u> </u>		ļ	J · (59)m + (61)m	
(62)m= 175.8	<del>`</del>	163.23	146.78	144.16	129.29	124.61	136.1		152.18	160.34	171.75	]	(62)
Solar DHW inpu	ut calculated	using App	endix G o	r Appendix	H (negat	ive quantity	y) (entei	''0' if no sola	ır contribut	tion to wate	er heating)	ı	
(add addition	nal lines if	FGHRS	and/or \	NWHRS	applies	s, see Ap	pendi	( G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter											
(64)m= 175.8	3 155.11	163.23	146.78	144.16	129.29	124.61	136.1	2 135.69	152.18	160.34	171.75		_
							0	utput from w	ater heate	er (annual)	112	1795.09	(64)
Heat gains fi	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61	)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 80.25	71.25	76.06	69.88	69.72	64.07	63.22	67.04	66.2	72.38	74.39	78.89		(65)
include (57	7)m in cald	culation (	of (65)m	only if c	ylinder	is in the	dwellir	g or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):									
Metabolic ga	ins (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78	94.78		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m= 14.78	3 13.13	10.68	8.08	6.04	5.1	5.51	7.16	9.61	12.21	14.25	15.19		(67)
Appliances of	gains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), al	so see Ta	ble 5		_	-	
(68)m= 165.3	2 167.04	162.72	153.51	141.89	130.98	123.68	121.9	7 126.29	135.49	147.11	158.03	]	(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5	-	-	-	
(69)m= 32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48	32.48		(69)
Pumps and f	ans gains	(Table 5	5a)									-	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -75.83	3 -75.83	-75.83	-75.83	-75.83	-75.83	-75.83	-75.8	3 -75.83	-75.83	-75.83	-75.83		(71)
Water heatin	ng gains (T	able 5)										_	
(72)m= 107.8	6 106.03	102.23	97.06	93.71	88.98	84.97	90.11	91.94	97.29	103.33	106.03		(72)
Total intern	al gains =	1			(66	s)m + (67)m	า + (68)เ	n + (69)m +	(70)m + (7	71)m + (72)	)m		
(73)m= 342.3	9 340.63	330.05	313.09	296.08	279.49	268.6	273.6	8 282.28	299.42	319.12	333.69		(73)
6. Solar gai	ns:												
Solar gains are		_					ations to	convert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ıble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
NI d							, –		_ '			( ( V )	1
North 0.9		X	2.2	24	X	10.63	] x	0.63	x	0.7	=	7.28	(74)
North 0.9		X	1.			10.63	] x	0.63	x	0.7	=	4.87	[(74)
North 0.9		X	6.7			10.63	] x [	0.63	x	0.7	=	21.87	<u> </u> (74)
North 0.9		X	2.2	24	<b>—</b>	20.32	] x [	0.63	x	0.7	=	13.91	(74)
North 0.9	0.77	X	1.	5	X	20.32	X	0.63	X	0.7	=	9.32	(74)

<b>N</b> 1 (1	_		1		1				l		,		_
North	0.9x	0.77	X	6.73	Х	20.32	X	0.63	X	0.7	=	41.8	(74)
North	0.9x	0.77	X	2.24	X	34.53	X	0.63	X	0.7	=	23.64	(74)
North	0.9x	0.77	X	1.5	x	34.53	X	0.63	X	0.7	=	15.83	(74)
North	0.9x	0.77	X	6.73	X	34.53	X	0.63	X	0.7	=	71.02	(74)
North	0.9x	0.77	X	2.24	X	55.46	X	0.63	X	0.7	=	37.97	(74)
North	0.9x	0.77	X	1.5	X	55.46	X	0.63	X	0.7	=	25.43	(74)
North	0.9x	0.77	X	6.73	X	55.46	X	0.63	X	0.7	=	114.08	(74)
North	0.9x	0.77	X	2.24	X	74.72	X	0.63	X	0.7	=	51.15	(74)
North	0.9x	0.77	X	1.5	X	74.72	X	0.63	X	0.7	=	34.25	(74)
North	0.9x	0.77	X	6.73	X	74.72	X	0.63	X	0.7	=	153.67	(74)
North	0.9x	0.77	X	2.24	X	79.99	X	0.63	x	0.7	=	54.76	(74)
North	0.9x	0.77	X	1.5	x	79.99	x	0.63	x	0.7	=	36.67	(74)
North	0.9x	0.77	X	6.73	x	79.99	X	0.63	x	0.7	=	164.51	(74)
North	0.9x	0.77	X	2.24	x	74.68	X	0.63	x	0.7	=	51.12	(74)
North	0.9x	0.77	X	1.5	x	74.68	x	0.63	x	0.7	=	34.23	(74)
North	0.9x	0.77	X	6.73	x	74.68	x	0.63	X	0.7	=	153.59	(74)
North	0.9x	0.77	X	2.24	x	59.25	x	0.63	x	0.7	=	40.56	(74)
North	0.9x	0.77	X	1.5	x	59.25	x	0.63	x	0.7	=	27.16	(74)
North	0.9x	0.77	X	6.73	x	59.25	X	0.63	x	0.7	=	121.86	(74)
North	0.9x	0.77	X	2.24	x	41.52	x	0.63	X	0.7	=	28.42	(74)
North	0.9x	0.77	X	1.5	x	41.52	x	0.63	x	0.7	=	19.03	(74)
North	0.9x	0.77	X	6.73	х	41.52	x	0.63	x	0.7	=	85.39	(74)
North	0.9x	0.77	X	2.24	x	24.19	X	0.63	X	0.7	=	16.56	(74)
North	0.9x	0.77	X	1.5	x	24.19	x	0.63	x	0.7	=	11.09	(74)
North	0.9x	0.77	X	6.73	x	24.19	X	0.63	x	0.7	=	49.75	(74)
North	0.9x	0.77	X	2.24	x	13.12	x	0.63	x	0.7	=	8.98	(74)
North	0.9x	0.77	X	1.5	x	13.12	x	0.63	x	0.7	=	6.01	(74)
North	0.9x	0.77	X	6.73	x	13.12	x	0.63	x	0.7	=	26.98	(74)
North	0.9x	0.77	X	2.24	x	8.86	x	0.63	x	0.7	=	6.07	(74)
North	0.9x	0.77	X	1.5	x	8.86	x	0.63	x	0.7	=	4.06	(74)
North	0.9x	0.77	X	6.73	x	8.86	x	0.63	x	0.7	=	18.23	(74)
South	0.9x	0.77	X	1.5	X	46.75	X	0.63	x	0.7	=	21.43	(78)
South	0.9x	0.77	X	1.5	x	76.57	X	0.63	x	0.7	=	35.1	(78)
South	0.9x	0.77	X	1.5	x	97.53	x	0.63	x	0.7	=	44.71	(78)
South	0.9x	0.77	X	1.5	x	110.23	x	0.63	x	0.7	=	50.53	(78)
South	0.9x	0.77	x	1.5	х	114.87	x	0.63	x	0.7	=	52.66	(78)
South	0.9x	0.77	X	1.5	x	110.55	x	0.63	x	0.7	=	50.68	(78)
South	0.9x	0.77	X	1.5	x	108.01	x	0.63	x	0.7	] =	49.51	(78)
South	0.9x	0.77	x	1.5	x	104.89	x	0.63	x	0.7	] =	48.09	(78)
South	0.9x	0.77	X	1.5	x	101.89	x	0.63	x	0.7	] =	46.71	(78)
South	0.9x	0.77	x	1.5	x	82.59	x	0.63	x	0.7	] =	37.86	(78)

South 0.9	× 0.77	х	1.	5	х	55.42	X		0.63	x	0.7	=	25.4	(78)
South 0.9	× 0.77	x	1.	5	x	40.4	x		0.63	×	0.7	=	18.52	(78)
					_									
Solar gains	in watts, c	alculated	I for eac	h month	l		(83)r	n = Sı	um(74)m .	(82)m				
(83)m= 55.4	6 100.12	155.2	228.01	291.73	306	.61 288.	46 237	7.66	179.55	115.26	67.38	46.88		(83)
Total gains	- internal a	and solar	(84)m =	= (73)m	+ (83	)m , wat	s				•	•	•	
(84)m= 397.8	440.75	485.25	541.1	587.81	586	.11 557.	06 51	1.34	461.83	414.68	386.5	380.57		(84)
7. Mean in	ernal temp	perature	(heating	season	)		<u> </u>							
Temperatu						ea from	Table 9	, Th	1 (°C)				21	(85)
Utilisation f	actor for g	ains for I	iving are	ea, h1,m	ı (see	Table 9	a)							
Jar	<u> </u>	Mar	Apr	May	<u> </u>	ın Ju	<del> </del>	ug	Sep	Oct	Nov	Dec	]	
(86)m= 1	0.99	0.98	0.95	0.84	0.6	_	_	55	0.81	0.96	0.99	1		(86)
` '							7:		- 0-)	<u> </u>		<u> </u>	J	
Mean inter		20.24	20.57	ea 11 (10	20.9	i	1	.99	20.9	20.57	20.16	19.84	1	(87)
(87)m= 19.8	20	20.24	20.57	20.64	20.	97   20.8	19   20	.99	20.9	20.57	20.16	19.64		(07)
Temperatu	re during h	neating p	eriods ir	rest of	dwel	ling from	Table	9, Tł	n2 (°C)				,	
(88)m= 19.9	7 19.97	19.97	19.99	19.99	20	) 20	2	20	19.99	19.99	19.98	19.98		(88)
Utilisation f	actor for g	ains for i	rest of d	welling,	h2,m	(see Ta	ble 9a)							
(89)m= 0.99	0.99	0.98	0.93	0.79	0.5	7 0.3	3 0.	44	0.74	0.95	0.99	1		(89)
Mean inter	nal temner	ature in t	the rest	of dwell	ina T	2 (follow	stens ?	3 to 7	7 in Tahl	le 9c)			ı	
(90)m= 18.4		19.02	19.49	19.83	19.9	<u> </u>	-i-	.99	19.91	19.49	18.91	18.44	]	(90)
(00)	1					1	-				ing area ÷ (	ļ	0.56	(91)
											,	,	0.00	(0.)
Mean inter	_ <del>-</del>	<u> </u>			<del>, ,</del>					1		•	1	(22)
(92)m= 19.2		19.7	20.09	20.39	20.			.55	20.46	20.09	19.61	19.22		(92)
Apply adjus					1		-	-		r –	1	1	1	(22)
(93)m= 19.2		19.7	20.09	20.39	20.	53 20.5	5 20	.55	20.46	20.09	19.61	19.22		(93)
8. Space h														
Set Ti to th			•		ned a	t step 11	of Tab	le 9b	o, so tha	ıt Ti,m=	:(76)m an	d re-cal	culate	
the utilisati		Mar			<u> </u>	ın Ju	<u>,                                    </u>		Sep	Oct	Nov	Dec	1	
Utilisation f			. Apr	May	] ](	in Ju	1   <i>P</i>	ug	Sep	l Oct	INOV	Dec		
(94)m= 0.99	<del></del>	0.97	0.93	0.81	0.6	1 0.4	4 0	5	0.78	0.95	0.99	0.99	]	(94)
Useful gair		ļ		l .		1 0.1	·   ~		0.10	0.00	1 0.00	0.00	J	(- /
(95)m= 395.2	1	472.94	502.48	476.67	359.	.47 246.	74 256	6.85	358.07	393.85	381.64	378.57	]	(95)
Monthly av				<u> </u>			- 1 200	,	000.07	000.00	001.01	0.0.01	J	()
(96)m= 4.3	4.9	6.5	8.9	11.7	14.		5 16	6.4	14.1	10.6	7.1	4.2	]	(96)
Heat loss r											1		J	· ,
(97)m= 969.8	1	852.08	713.84	553.31	373.	<del></del>	<del></del>	0.77	402.43	604.05	799.87	965.05	]	(97)
Space hea										ļ		1 000.00	J	(- /
(98)m= 427.4		282.08	152.17	57.02	0		-	0	0	156.39	<del> </del>	436.34	]	
(00)111= 127.	000.01	202.00	102.17	07.02							ar) = Sum(9	ļ	2150.93	(98)
								TOla	i pei yeai	(KVVII/ye	ar) = Surri(s	O)15,912 =	2150.95	= '
Space hea	ting requir	ement in	kWh/m²	²/year									37.74	(99)
<u> </u>		4 1 1												
9a. Energy ı	equiremer	nts – Indi	ividual h	eating s	ysten	ns includ	ing mic	ro-C	HP)					
Space hear Fraction of	ting:							ro-C	HP)				0	(201)

									_
Fraction of space heat from main system(s)		1	(202)						
Fraction of total heating from main system 1			1	(204)					
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heating requirement (calculated above)  427.47   338.34   282.08   152.17   57.02	0	0	0	0	156.39	301.13	436.34		
	0	U	U	U	156.59	301.13	430.34		(211)
$ (211) m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ 457.18  361.86  301.69  162.75  60.98 $	0	0	0	0	167.26	322.06	466.67		(211)
			Tota	I (kWh/yea	ar) =Sum(2		<u> </u>	2300.46	(211)
Space heating fuel (secondary), kWh/month									_
= {[(98)m x (201)] } x 100 ÷ (208)								1	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		7(045)
Materia			Tota	i (kvvn/yea	ar) =Sum(2	(15) <sub>15,1012</sub>	=	0	(215)
Water heating Output from water heater (calculated above)									
·	129.29	124.61	136.12	135.69	152.18	160.34	171.75		
Efficiency of water heater								79.8	(216)
(217)m= 87.1 86.84 86.26 84.91 82.57	79.8	79.8	79.8	79.8	84.89	86.47	87.2		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
` '	162.01	156.16	170.58	170.04	179.27	185.43	196.97		
	•		Tota	I = Sum(2	19a) <sub>112</sub> =			2137.64	(219)
Annual totals					k\	Nh/year	•	kWh/year	
									٦
Space heating fuel used, main system 1								2300.46	
Water heating fuel used									]
								2300.46	
Water heating fuel used							30	2300.46	(230c)
Water heating fuel used Electricity for pumps, fans and electric keep-hot							30 45	2300.46	(230c) (230e)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:			sum	of (230a).	(230g) =			2300.46	
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue			sum	of (230a).	(230g) =			2300.46 2137.64	(230e)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year	ns inclu	iding mid			(230g) =			2300.46 2137.64 75	(230e) (231)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting		J					45	2300.46 2137.64 75 261	(230e) (231)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting	End	iding mid e <b>rgy</b> h/year				ion fac	45	2300.46 2137.64 75	(230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting	End	<b>ergy</b> h/year			Emiss	ion fac 2/kWh	45	2300.46 2137.64  75 261  Emissions	(230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system	<b>En</b> ekW	ergy h/year			Emiss kg CO	ion fac 2/kWh	45	2300.46 2137.64  75 261  Emissions kg CO2/yea	(230e) (231) (232)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)	<b>End</b> kW (211	ergy h/year ) ×			Emiss kg CO2	ion fac 2/kWh	45 tor =	2300.46 2137.64  75 261  Emissions kg CO2/yea 496.9	(230e) (231) (232)  ar (261) (263)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating	Enc kW (211 (215 (219	ergy h/year ) x ) x			Emiss kg CO2	ion fac 2/kWh	45 tor = =	2300.46 2137.64  75 261  Emissions kg CO2/yea 496.9  0 461.73	(230e) (231) (232)  ar (261) (263) (264)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating  Space and water heating	End kW (211 (215 (219 (261	ergy h/year ) x ) x ) x ) x	cro-CHP		Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19	45 tor = =	2300.46 2137.64  75 261  Emissions kg CO2/yea 496.9 0 461.73 958.63	(230e) (231) (232)  ar (261) (263) (264) (265)
Water heating fuel used  Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue  Total electricity for the above, kWh/year  Electricity for lighting  12a. CO2 emissions – Individual heating system  Space heating (main system 1)  Space heating (secondary)  Water heating	End kW (211 (215 (219 (261 (231	ergy h/year ) x ) x ) x ) x	cro-CHP		Emiss kg CO2	ion fac 2/kWh 16 19 16	45 tor = =	2300.46 2137.64  75 261  Emissions kg CO2/yea 496.9  0 461.73	(230e) (231) (232)  ar (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1133.02 (272)

TER = 29.13 (273)