

User Details: **Assessor Name:** Peter Mitchell Stroma Number: STRO007945 Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.3.15 Property Address: Unit 1 (GF&FF END) GREEN New Dwelling at:, Gordon House, 6 Lissenden Gardens, LONDON, NW5 1LX Address: 1. Overall dwelling dimensions Volume(m³) Area(m²) Av. Height(m) Ground floor (1a) x 2.4 (2a) (3a) 73.62 176.69 First floor (1b) x (3b) 3.32 (2b) 64.14 212.94 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)137.76 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n)(5) 389.63 2. Ventilation rate: main secondary other total m³ per hour heating heating Number of chimneys x 40 =(6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 Number of passive vents x 10 =(7b)0 0 x 40 =Number of flueless gas fires (7c)0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.05 (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) (9)0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 0 (15)(8) + (10) + (11) + (12) + (13) + (15) =Infiltration rate 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)4 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.25 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78 (20) $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.19 Infiltration rate modified for monthly wind speed

Sep

4

Oct

4.3

Nov

4.5

Aug

3.7

May

4.3

Jun

3.8

Jul

3.8

Mar

4.9

Apr

4.4

Jan

5.1

(22)m =

Feb

5

Monthly average wind speed from Table 7

Dec

4.7



Wind Factor (2	22a)m =	(22)m ÷	4										
(22a)m= 1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
		·					(0.4.)	(00.)		ı			
Adjusted infilt	nation rat	e (allowi	o.21	o.21	0.19	peed) = 0.19	(21a) x 0.18	(22a)m 0.19	0.21	0.22	0.23		
Calculate effe	1	l	1				0.16	0.19	0.21	0.22	0.23		
If mechanic	al ventila	ation:										0	(23a)
If exhaust air h) = (23a)			0	(23b)
If balanced wit	h heat reco	overy: effic	eiency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	1	·					- ^ `	ŕ	<u> </u>	- 	` ` ` `	÷ 100]	(- · ·
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	1						É È	í `	 				(0.41-)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)r	nouse ex m < 0.5 ×								.5 × (23b))			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	ventilation	on or wh	ole hous	e positi	ve input	ventilatio	on from I	oft	!	<u>. </u>			
	m = 1, the	- ` ´	· `		<u> </u>		 	2b)m² x	0.5]				
(24d)m= 0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53		(24d)
Effective air			<u> </u>	<u> </u>	í `	``	 	`					(05)
(25)m= 0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53		(25)
3. Heat losse	es and he	eat loss _l	paramete	er:									
3. Heat losse ELEMENT	es and he Gros area	SS	parameto Openin m	gs	Net Ar		U-valı W/m2		A X U (W/i	<)	k-value kJ/m²-ł		A X k kJ/K
	Gros area	SS	Openin	gs		n²		:K		<)			
ELEMENT	Gros area e 1	SS	Openin	gs	A ,n	m² x1.	W/m2	K 0.04] =	(W/I	<) 			kJ/K
ELEMENT Windows Type	Gros area e 1 e 2	SS	Openin	gs	A ,r	m ² x1.	W/m2 /[1/(1.4)+	K $0.04] = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	(W/F	<) 			kJ/K (27)
ELEMENT Windows Type Windows Type	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,n 5.31 8.12	x10 x10 x10	W/m2 /[1/(1.4)+ /[1/(1.4)+		7.04 10.77	<) 			kJ/K (27) (27)
ELEMENT Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4	SS	Openin	gs	A ,n 5.31 8.12 2.53	x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	[K] [0.04] = [0.04] = [0.04] = [0.04] = [0.04]	7.04 10.77 3.35	<) 			kJ/K (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$ \begin{aligned} (K) \\ 0.04] &= [\\ 0.04$	7.04 10.77 3.35 3.35	<)			kJ/K (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53 2.53	x1. x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K 0.04 =	7.04 10.77 3.35 3.35 3.35	<)			kJ/K (27) (27) (27) (27) (27)
Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53 2.53 2.53	x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K 0.04 =	7.04 10.77 3.35 3.35 3.35 3.35	<)			kJ/K (27) (27) (27) (27) (27) (27)
Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53 2.53 0.69	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K 0.04 =	7.04 10.77 3.35 3.35 3.35 3.35 0.91	<)			kJ/K (27) (27) (27) (27) (27) (27) (27)
Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53 2.53 0.69 1.27	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K 0.04 =	7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	ss (m²)	Openin	gs ₂	A ,n 5.31 8.12 2.53 2.53 2.53 0.69 1.27 3.42	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K 0.04 =	7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Rooflights	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	ss (m²)	Openin m	gs ₂	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42 12.74	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	(K) 0.04] = [0.	7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Rooflights Walls	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	.2 8	28.93 0	gs ₁ 2	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42 12.74 118.2	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K	(W/N 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53 17.836 18.92				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Rooflights Walls Roof Type1	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	.2 .8 .67	Openin m	gs ₁ 2	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42 118.2 9.48 58.93	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	(K) $0.04] = \begin{bmatrix} 0.04 \end{bmatrix} $	(W/N 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53 17.836				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Rooflights Walls Roof Type1 Roof Type2	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	.2 .8 .67	28.93 0	gs ₁ 2	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42 118.2 9.48 58.93 228.3	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	(K) $0.04] = \begin{bmatrix} 0.04 \end{bmatrix} $	(W/N 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53 17.836 18.92 1.33				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type Rooflights Walls Roof Type1 Roof Type2 Total area of 6	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	.2 .8 .67	28.93 0	gs ₁ 2	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42 118.2 9.48 58.93	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K	(W/N 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53 17.836 18.92				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)

(26)...(30) + (32) =

** include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$

83.74

(33)



	apaonty	Cm = S(/						((20)	.(30) + (32)	2) + (32a)	(326) –	0	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	: TFA) in	ı kJ/m²K			Indica	tive Value:	Medium		250	(35)
	•		ere the de tailed calcı		constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						16.5	(36)
if details	of therma	ıl bridging	are not kn	own (36) =	= 0.15 x (3	1)						'		
Total fa	abric he	at loss							(33) +	(36) =			100.24	(37)
Ventila	tion hea	t loss ca	alculated	monthly	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	68.25	68.1	67.95	67.24	67.11	66.49	66.49	66.38	66.73	67.11	67.38	67.66		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	168.49	168.34	168.19	167.48	167.35	166.73	166.73	166.62	166.97	167.35	167.62	167.9		
Heat Id	ss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	167.48	(39)
(40)m=	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.21	1.21	1.21	1.22	1.22		
									,	Average =	Sum(40) _{1.}	12 /12=	1.22	(40)
Numbe	er of day		nth (Tab	le 1a)	ı			<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. Wa	iter heat	ing ener	gy requi	irement:								kWh/ye	ear:	
Assum	ed occu	inancy I	NI.											
if TF		9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		91		(42)
if TF if TF Annua Reduce	A > 13.9 A £ 13.9 I averag the annua	9, N = 1 9, N = 1 e hot wa al average	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the d	ay Vd,av	erage = designed t	(25 x N)	+ 36		9)	91		(42)
if TF if TF Annua Reduce	A > 13.9 A £ 13.9 I averag the annual of that 125	O, N = 1 O, N = 1 e hot want average litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, f	ay Vd,avelwelling is	erage = designed (ld)	(25 x N) to achieve	+ 36 a water us	se target o	9)	3.38		. ,
if TF if TF Annua Reduce not more	A > 13.9 A £ 13.9 I average the annual that 125 Jan	P, N = 1 P, N = 1 P hot was Al average litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,avelling is not and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9)			. ,
if TF if TF Annua Reduce not more	A > 13.9 A £ 13.9 I average the annual of that 125 Jan er usage in	P, N = 1 P, N = 1 Pe hot was all average litres per p Peb	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac	y Vd,avelling is a not and co. Jun ctor from T	erage = designed to ld) Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	ce target o	9) 103 Nov	3.38 Dec		. ,
if TF if TF Annua Reduce not more	A > 13.9 A £ 13.9 I average the annual that 125 Jan	P, N = 1 P, N = 1 P hot was Al average litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,avelling is not and con	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us Sep 101.31	Oct	9) 103 Nov 109.58	Dec 113.71	1240.52	(43)
if TF if TF Annua Reduce not more Hot wate (44)m=	A > 13.9 A £ 13.9 I average the annual that 125 Jan er usage ii 113.71	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac	y Vd,avi welling is not and con Jun ctor from 1	erage = designed to ld) Jul Table 1c x 93.04	(25 x N) to achieve Aug (43) 97.17	+ 36 a water us Sep 101.31	Oct 105.44 Fotal = Sur	Nov 109.58 m(44) ₁₁₂ =	Dec 113.71	1240.52	. ,
if TF if TF Annua Reduce not more Hot wate (44)m=	A > 13.9 A £ 13.9 I average the annual that 125 Jan er usage ii 113.71	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac 97.17	y Vd,avi welling is not and con Jun ctor from 1	erage = designed to ld) Jul Table 1c x 93.04	(25 x N) to achieve Aug (43) 97.17	+ 36 a water us Sep 101.31	Oct 105.44 Fotal = Sur	Nov 109.58 m(44) ₁₁₂ =	Dec 113.71	1240.52	(43)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m=	A > 13.9 A £ 13.9 I average the annual of that 125 Jan er usage in 113.71 content of 168.63	P, N = 1 P, N = 1 P, N = 1 P hot was P average P litres per p P hot litres per P hot water	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - cale	ge in litre usage by a day (all w Apr ach month 101.31 culated mo	es per da 5% if the day vater use, I May Vd,m = factorize 97.17 varphi = 4	y Vd,avd dwelling is not and co. Jun ctor from 7 93.04	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81	(25 x N) to achieve Aug (43) 97.17 97.17 116.82	+ 36 a water us Sep 101.31 0 kWh/mon	Oct 105.44 Fotal = Sunth (see Tail 137.77	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1	3.38 Dec 113.71 c, 1d) 163.31	1240.52 1626.52	(43)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m=	A > 13.9 A £ 13.9 I average the annual of that 125 Jan er usage in 113.71 content of 168.63	P, N = 1 P, N = 1 P, N = 1 P hot was P average P litres per p P hot litres per P hot water	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - cale	ge in litre usage by a day (all w Apr ach month 101.31 culated mo	es per da 5% if the de tater use, l' May Vd,m = fact 97.17 onthly = 4.	y Vd,avd dwelling is not and co. Jun ctor from 7 93.04	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81	(25 x N) to achieve Aug (43) 97.17 97.17 116.82	+ 36 a water us Sep 101.31 0 kWh/mon	Oct 105.44 Fotal = Sunth (see Tail 137.77	Nov 109.58 m(44) ₁₁₂ = 150.39	3.38 Dec 113.71 c, 1d) 163.31		(43)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water	A > 13.9 A £ 13.9 A £ 13.9 A æ that 125 Jan er usage ii 113.71 content of 168.63 raneous w 25.3 storage	P, N = 1 P,	ter usage hot water person per Mar day for ear 105.44 used - calculated at point 22.83	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69 for use (no	es per da 5% if the d rater use, I May Vd,m = fac 97.17 onthly = 4. 127.32	y Vd,avelling is not and contained from 193.04 190 x Vd,rd 109.86 storage), 16.48	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81 enter 0 in 15.27	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52	+ 36 a water us Sep 101.31 0 kWh/mon 118.22 0 to (61) 17.73	Oct 105.44 Total = Sur 137.77 Total = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31		(43)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag	A > 13.9 A £ 13.9 I average the annual of that 125 Jan er usage in 113.71 content of 168.63 raneous w 25.3 storage e volum	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - calc 152.2 ag at point 22.83 includir	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69 r of use (no	es per da 5% if the divater use, I May Vd,m = fac 97.17	y Vd,avdwelling is not and co. Jun 93.04 190 x Vd,r. 109.86 storage), 16.48	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81 enter 0 in 15.27 storage	(25 x N) to achieve Aug (43) 97.17 97m / 3600 116.82 boxes (46) 17.52 within sa	+ 36 a water us Sep 101.31 0 kWh/mon 118.22 0 to (61) 17.73	Oct 105.44 Total = Sur 137.77 Total = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31		(43) (44) (45) (46)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commothere	A > 13.9 A £ 13.9 A £ 13.9 I average the annual enthat 125 Jan 113.71 content of 168.63 storage enthat 25.3 storage enthat 25.3 storage enthat 25.3	P, N = 1 P,	ter usage hot water person per Mar day for ear 105.44 used - calculate 152.2 ang at point 22.83 including and no talculate the same talculate the same talculate talcu	ge in litre usage by s day (all w Apr ach month 101.31 culated mo 132.69 19.9 ag any so ank in dw	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	ay Vd,avelwelling is not and constant of and constant of and constant of an area of a storage), and a storage)	erage = designed to ld) Jul Table 1c x 93.04 101.81 enter 0 in 15.27 storage litres in	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22 1 to (61) 17.73 ame vess	Oct 105.44 Fotal = Sur 137.77 Fotal = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 1 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31		(43) (44) (45) (46)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commothers Water	A > 13.9 A £ 13.9 I average the annual of that 125 Jan Per usage in 113.71 content of 168.63 staneous w 25.3 storage e volum munity he vise if no storage	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - calc 152.2 ag at point 22.83 includir nd no tal hot water	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69 19.9 ag any so ank in dw er (this in	es per da 5% if the d rater use, I May Vd,m = fac 97.17 onthly = 4. 127.32 o hot water 19.1 plar or W relling, e	y Vd,avdwelling is not and co. Jun g3.04 190 x Vd,r. 109.86 r storage), 16.48 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 93.04 101.81 enter 0 in 15.27 storage litres in neous co	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22 1 to (61) 17.73 ame vess	Oct 105.44 Fotal = Sur 137.77 Fotal = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 1 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31 24.5		(43) (44) (45) (46) (47)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commother Otherw Water a) If m	A > 13.9 A £ 13.9 A £ 13.9 A £ 13.9 A æ that 125 Jan er usage in 113.71 content of 168.63 storage e volum munity h vise if no storage anufact	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - call 152.2 mg at point 22.83 includin and no tal hot water	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69 for use (no 19.9 and any so ank in dw er (this in	es per da 5% if the divater use, P May $Vd,m = fac$ 97.17 P	y Vd,avdwelling is not and co. Jun g3.04 190 x Vd,r. 109.86 r storage), 16.48 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 93.04 101.81 enter 0 in 15.27 storage litres in neous co	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22 1 to (61) 17.73 ame vess	Oct 105.44 Fotal = Sur 137.77 Fotal = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31 24.5		(43) (44) (45) (46) (47)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If comr Otherw Water a) If m Tempe	A > 13.9 A £ 13.9 A £ 13.9 A £ 13.9 A æ that 125 Jan 113.71 content of 168.63 storage e volum munity h vise if no storage anufact erature fa	P, N = 1 P,	ter usage hot water person per Mar 105.44 used - call 152.2 ang at point 22.83 including and no tall hot water eclared lem Table	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69 for use (no 19.9 and any so ank in dw er (this in	es per da 5% if the d rater use, f May Vd,m = fac 97.17 onthly = 4. 127.32 o hot water 19.1 color or W relling, e ocludes in	y Vd,avdwelling is not and co. Jun g3.04 190 x Vd,r. 109.86 r storage), 16.48 /WHRS nter 110 nstantar	erage = designed to ld) Jul Table 1c x 93.04 101.81 enter 0 in 15.27 storage litres in neous con/day):	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22 0 to (61) 17.73 ame vess ers) ente	Oct 105.44 Fotal = Sur 137.77 Fotal = Sur 20.67	9) Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31 24.5		(43) (44) (45) (46) (47)



Hot wa	tar etar	age loss	factor fr	om Tahl	الا\\\ ام 2 (لا\\\	h/litre/da	w)					0		(51)
		eating s			IC Z (KVV	11/11116/06	iy <i>)</i>					0		(51)
	-	from Tal										0		(52)
Tempe	rature f	actor fro	m Table	2b							1	0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
		(54) in (5	_									0		(55)
Water	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m			l.	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicated	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	m Table	- 3	•	•	•		•		0		(58)
	•	loss cal	,			59)m = ((58) ÷ 36	65 × (41)	m				l	
		factor fr								r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m					•	
(61)m=	50.96	46.03	50.96	49.32	49.52	45.88	47.41	49.52	49.32	50.96	49.32	50.96		(61)
			water h	<u> </u>	Lalculated	l for eac	L h month	(62)m =	0 85 × 0	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	219.59	193.52	203.15	182	176.84	155.75	149.22	166.34	167.53	188.73	199.71	214.27		(62)
` '		calculated		<u> </u>	L	<u> </u>	<u> </u>	(enter '0						
		I lines if								. continuati	on to wat	n noamig)		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	55.84	40.78	31.2	16.65	10.33	8.06	7.72	8.7	8.75	23.4	40.95	56.3		(63) (G2)
WWHRS	-55.17	-48.54	-49.54	-40.75	-37.83	-31.2	-26.4	-31.97	-32.9	-40.69	-47.14	-53.33		(63) (G10)
		ater hea												, , , ,
(64)m=	106.75	102.54	120.58	122.82	126.89	114.83	113.39	123.89	124.11	122.81	109.84	102.81		
(01)	100.10	102.01	120.00	122.02	120.00	111.00	110.00			ater heater		l .	1391.27	(64)
Heat a	aine fra	m water	hoating	k\//h/m/	onth 0.2	5 ′ [N <u>8</u> 5	v (45)m					+ (59)m],,
(65)m=	68.81	60.55	63.34	56.45	54.71	48	45.7	51.22	51.64	58.55	62.33	67.04] 	(65)
				l	l		l						ootina	(00)
						yiinder is	s in the t	weiling	or not w	ater is ir	om com	munity h	leating	
		ains (see):									
Metabo		s (Table				Ι.								
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(66)
(66)m=	174.76	174.76	174.76	174.76	174.76	174.76	174.76	174.76	174.76	174.76	174.76	174.76		(66)
Ū		(calculat		·	· · · ·							ı	I	(a=)
(67)m=	68.39	60.74	49.4	37.4	27.96	23.6	25.5	33.15	44.49	56.49	65.94	70.29		(67)
Appliar		ins (calc			·				see Ta	ble 5			•	
(68)m=	457.99	462.74	450.76	425.27	393.08	362.84	342.63	337.88	349.85	375.35	407.53	437.78		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a)	, also se	e Table	5				
(69)m=	55.39	55.39	55.39	55.39	55.39	55.39	55.39	55.39	55.39	55.39	55.39	55.39		(69)
Pumps	and fai	ns gains	(Table 5	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51		(71)



Water	heating	gains (T	able 5)										
(72)m=	92.49	90.1	85.14	78.4	73.54	66.67	61.43	68.85	71.72	78.7	86.57	90.11	(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	- (69)m + (70)m + (7	1)m + (72)	m	
(73)m=	735.51	730.22	701.95	657.71	611.22	569.75	546.2	556.52	582.7	627.18	676.68	714.82	(73)
6 00	or going												

Solar gains are calculated using solar	ar flux from Table 6	a and	associated equa	tions	to convert to the	applic	able orientation.			
Orientation: Access Factor	Area		Flux		_ g		FF		Gains	
Table 6d	m²		Table 6a		Table 6b		Table 6c		(W)	
Northeast 0.9x 0.77 x	2.53	X	11.28	x	0.76	x	0.7	=	10.52	(75)
Northeast 0.9x 0.77 x	2.53	X	11.28	x	0.76	x	0.7	=	10.52	(75)
Northeast _{0.9x} 0.77 x	2.53	X	11.28	X	0.76	X	0.7	=	10.52	(75)
Northeast 0.9x 0.77 x	2.53	X	11.28	x	0.76	x	0.7	=	10.52	(75)
Northeast 0.9x 0.77 x	2.53	x	22.97	X	0.76	x	0.7	=	21.42	(75)
Northeast 0.9x 0.77 x	2.53	X	22.97	X	0.76	x	0.7	=	21.42	(75)
Northeast 0.9x 0.77 x	2.53	X	22.97	x	0.76	x	0.7	=	21.42	(75)
Northeast 0.9x 0.77 x	2.53	x	22.97	x	0.76	x	0.7	=	21.42	(75)
Northeast _{0.9x} 0.77 x	2.53	X	41.38	X	0.76	X	0.7	=	38.6	(75)
Northeast _{0.9x} 0.77 x	2.53	X	41.38	X	0.76	X	0.7	=	38.6	(75)
Northeast _{0.9x} 0.77 x	2.53	X	41.38	X	0.76	X	0.7	=	38.6	(75)
Northeast _{0.9x} 0.77 x	2.53	x	41.38	X	0.76	X	0.7	=	38.6	(75)
Northeast _{0.9x} 0.77 x	2.53	X	67.96	X	0.76	X	0.7	=	63.39	(75)
Northeast _{0.9x} 0.77 x	2.53	X	67.96	X	0.76	X	0.7	=	63.39	(75)
Northeast _{0.9x} 0.77 x	2.53	X	67.96	X	0.76	X	0.7	=	63.39	(75)
Northeast _{0.9x} 0.77 x	2.53	x	67.96	X	0.76	X	0.7	=	63.39	(75)
Northeast _{0.9x} 0.77 x	2.53	X	91.35	X	0.76	X	0.7	=	85.2	(75)
Northeast _{0.9x} 0.77 x	2.53	x	91.35	X	0.76	x	0.7	=	85.2	(75)
Northeast _{0.9x} 0.77 x	2.53	x	91.35	X	0.76	X	0.7	=	85.2	(75)
Northeast _{0.9x} 0.77 x	2.53	x	91.35	X	0.76	X	0.7	=	85.2	(75)
Northeast _{0.9x} 0.77 x	2.53	X	97.38	X	0.76	X	0.7	=	90.84	(75)
Northeast _{0.9x} 0.77 x	2.53	X	97.38	X	0.76	X	0.7	=	90.84	(75)
Northeast 0.9x 0.77 x	2.53	x	97.38	X	0.76	X	0.7	=	90.84	(75)
Northeast _{0.9x} 0.77 x	2.53	X	97.38	X	0.76	X	0.7	=	90.84	(75)
Northeast _{0.9x} 0.77 x	2.53	X	91.1	X	0.76	X	0.7	=	84.97	(75)
Northeast 0.9x 0.77 x	2.53	x	91.1	X	0.76	X	0.7	=	84.97	(75)
Northeast _{0.9x} 0.77 x	2.53	x	91.1	X	0.76	x	0.7	=	84.97	(75)
Northeast _{0.9x} 0.77 x	2.53	x	91.1	X	0.76	x	0.7	=	84.97	(75)
Northeast _{0.9x} 0.77 x	2.53	x	72.63	x	0.76	x	0.7	=	67.74	(75)
Northeast 0.9x 0.77 x	2.53	x	72.63	x	0.76	x	0.7	=	67.74	(75)
Northeast 0.9x 0.77 x	2.53	x	72.63	x	0.76	x	0.7	=	67.74	(75)
Northeast 0.9x 0.77 x	2.53	X	72.63	x	0.76	X	0.7	=	67.74	(75)



Northeast _{0.9x}	0.77	1 x	2.52] _x	50.42] _x	0.76	l x	0.7	1 =	47.00	(75)
Northeast 0.9x	0.77] ^] x	2.53	^ x	50.42] ^] _x	0.76]]	0.7] -] =	47.03	(75)
Northeast 0.9x	0.77]	2.53	^ x	50.42] ^] _x	0.76	X	0.7] -] =	47.03 47.03	(75)
Northeast _{0.9x}	0.77] ^] x	2.53] ^] x	50.42] ^] x	0.76) ^ x	0.7] -] =	47.03	(75)
Northeast _{0.9x}	0.77] ^] x	2.53] ^] x	28.07] ^] _x	0.76	l ^ l x	0.7]	26.18	(75)
Northeast _{0.9x}	0.77] ^] x	2.53] ^ x	28.07] ^] x	0.76	x	0.7]	26.18	(75)
Northeast 0.9x	0.77] ^] x	2.53] ^] x	28.07] ^] x	0.76	l ^	0.7]	26.18	(75)
Northeast 0.9x	0.77	」^]x	2.53	l ^ l x	28.07] ^] _x	0.76	X	0.7]] =	26.18	(75)
Northeast _{0.9x}	0.77)	2.53) ^ x	14.2] ^] _X	0.76	x	0.7]] =	13.24	(75)
Northeast _{0.9x}	0.77]]	2.53	l x	14.2]] _x	0.76	l X	0.7]] ₌	13.24	(75)
Northeast _{0.9x}	0.77]]	2.53	l X	14.2]]	0.76	X	0.7] =	13.24	(75)
Northeast _{0.9x}	0.77	X	2.53	X	14.2) x	0.76	X	0.7	=	13.24	(75)
Northeast _{0.9x}	0.77) x	2.53) x	9.21) x	0.76	X	0.7] =	8.59	(75)
Northeast _{0.9x}	0.77	X	2.53	X	9.21	X	0.76	X	0.7] =	8.59	(75)
Northeast _{0.9x}	0.77	X	2.53	x	9.21	x	0.76	x	0.7	=	8.59	(75)
Northeast _{0.9x}	0.77	x	2.53	x	9.21	x	0.76	x	0.7	=	8.59	(75)
Southwest _{0.9x}	0.77	x	5.31	x	36.79	j	0.76	x	0.7	j =	72.03	(79)
Southwest _{0.9x}	0.77	x	8.12	x	36.79	j	0.76	x	0.7	=	110.15	(79)
Southwest _{0.9x}	0.77	x	3.42	x	36.79	ĺ	0.76	x	0.7	=	46.39	(79)
Southwest _{0.9x}	0.77	x	5.31	x	62.67]	0.76	x	0.7] =	122.69	(79)
Southwest _{0.9x}	0.77	X	8.12	x	62.67]	0.76	x	0.7	=	187.62	(79)
Southwest _{0.9x}	0.77	X	3.42	x	62.67]	0.76	x	0.7	=	79.02	(79)
Southwest _{0.9x}	0.77	X	5.31	x	85.75]	0.76	x	0.7	=	167.88	(79)
Southwest _{0.9x}	0.77	X	8.12	x	85.75]	0.76	X	0.7	=	256.71	(79)
Southwest _{0.9x}	0.77	X	3.42	x	85.75]	0.76	X	0.7	=	108.12	(79)
Southwest _{0.9x}	0.77	X	5.31	x	106.25]	0.76	x	0.7	=	208.01	(79)
Southwest _{0.9x}	0.77	X	8.12	X	106.25]	0.76	X	0.7] =	318.08	(79)
Southwest _{0.9x}	0.77	X	3.42	x	106.25]	0.76	X	0.7	=	133.97	(79)
Southwest _{0.9x}	0.77	X	5.31	X	119.01]	0.76	X	0.7	=	232.98	(79)
Southwest _{0.9x}	0.77	X	8.12	X	119.01]	0.76	X	0.7	=	356.28	(79)
Southwest _{0.9x}	0.77	X	3.42	X	119.01	[0.76	X	0.7	=	150.06	(79)
Southwest _{0.9x}	0.77	X	5.31	X	118.15		0.76	X	0.7	=	231.3	(79)
Southwest _{0.9x}	0.77	X	8.12	X	118.15	ļ	0.76	X	0.7	=	353.7	(79)
Southwest _{0.9x}	0.77	X	3.42	X	118.15	<u> </u>	0.76	X	0.7	=	148.97	(79)
Southwest _{0.9x}	0.77	X	5.31	X	113.91	<u> </u>	0.76	X	0.7	=	223	(79)
Southwest _{0.9x}	0.77	X	8.12	X	113.91]	0.76	x	0.7	=	341	(79)
Southwest _{0.9x}	0.77	X	3.42	X	113.91		0.76	X	0.7	=	143.62	(79)
Southwest _{0.9x}	0.77	X	5.31	X	104.39]	0.76	X	0.7	=	204.36	(79)
Southwesto.9x	0.77	X	8.12	X	104.39] 1	0.76	X	0.7] =	312.51	(79)
Southwesto.9x	0.77	X	3.42	X	104.39] 1	0.76	X	0.7	=	131.62	(79)
Southwest _{0.9x}	0.77	X	5.31	X	92.85]	0.76	X	0.7	_	181.77	(79)



Southwest _{0.9x}	0.77	X	8.12	X	92.85		0.76	X	0.7	=	277.97	(79)
Southwest _{0.9x}	0.77	X	3.42	X	92.85		0.76	x	0.7	=	117.07	(79)
Southwest _{0.9x}	0.77	X	5.31	X	69.27		0.76	x	0.7] =	135.6	(79)
Southwest _{0.9x}	0.77	X	8.12	X	69.27		0.76	x	0.7	=	207.36	(79)
Southwest _{0.9x}	0.77	X	3.42	X	69.27		0.76	x	0.7	=	87.34	(79)
Southwest _{0.9x}	0.77	X	5.31	X	44.07		0.76	x	0.7	=	86.28	(79)
Southwest _{0.9x}	0.77	X	8.12	X	44.07		0.76	x	0.7] =	131.93	(79)
Southwest _{0.9x}	0.77	x	3.42	X	44.07		0.76	x	0.7] =	55.57	(79)
Southwest _{0.9x}	0.77	X	5.31	X	31.49		0.76	x	0.7] =	61.64	(79)
Southwest _{0.9x}	0.77	X	8.12	X	31.49		0.76	X	0.7	=	94.26	(79)
Southwest _{0.9x}	0.77	X	3.42	X	31.49		0.76	x	0.7] =	39.7	(79)
Northwest _{0.9x}	0.77	X	0.69	X	11.28	X	0.76	X	0.7	=	2.87	(81)
Northwest 0.9x	0.77	X	1.27	x	11.28	X	0.76	x	0.7	=	5.28	(81)
Northwest _{0.9x}	0.77	X	0.69	X	22.97	X	0.76	X	0.7	=	5.84	(81)
Northwest 0.9x	0.77	X	1.27	X	22.97	X	0.76	X	0.7	=	10.75	(81)
Northwest 0.9x	0.77	X	0.69	X	41.38	X	0.76	x	0.7	=	10.53	(81)
Northwest _{0.9x}	0.77	X	1.27	X	41.38	X	0.76	X	0.7	=	19.37	(81)
Northwest _{0.9x}	0.77	X	0.69	X	67.96	X	0.76	X	0.7	=	17.29	(81)
Northwest _{0.9x}	0.77	X	1.27	X	67.96	X	0.76	X	0.7	=	31.82	(81)
Northwest _{0.9x}	0.77	X	0.69	X	91.35	X	0.76	X	0.7	=	23.24	(81)
Northwest _{0.9x}	0.77	X	1.27	X	91.35	X	0.76	X	0.7	=	42.77	(81)
Northwest 0.9x	0.77	X	0.69	X	97.38	X	0.76	x	0.7	=	24.77	(81)
Northwest 0.9x	0.77	X	1.27	X	97.38	X	0.76	X	0.7	=	45.6	(81)
Northwest _{0.9x}	0.77	X	0.69	X	91.1	X	0.76	X	0.7	=	23.17	(81)
Northwest _{0.9x}	0.77	X	1.27	X	91.1	X	0.76	X	0.7	=	42.66	(81)
Northwest 0.9x	0.77	X	0.69	X	72.63	X	0.76	X	0.7	=	18.48	(81)
Northwest _{0.9x}	0.77	X	1.27	X	72.63	X	0.76	X	0.7	=	34.01	(81)
Northwest _{0.9x}	0.77	X	0.69	X	50.42	X	0.76	X	0.7	=	12.83	(81)
Northwest _{0.9x}	0.77	X	1.27	X	50.42	X	0.76	X	0.7	=	23.61	(81)
Northwest 0.9x	0.77	X	0.69	X	28.07	X	0.76	x	0.7	=	7.14	(81)
Northwest _{0.9x}	0.77	X	1.27	X	28.07	X	0.76	X	0.7	=	13.14	(81)
Northwest _{0.9x}	0.77	X	0.69	X	14.2	X	0.76	X	0.7	=	3.61	(81)
Northwest 0.9x	0.77	X	1.27	X	14.2	X	0.76	x	0.7	=	6.65	(81)
Northwest _{0.9x}	0.77	X	0.69	X	9.21	X	0.76	X	0.7	=	2.34	(81)
Northwest _{0.9x}	0.77	X	1.27	X	9.21	X	0.76	X	0.7	=	4.31	(81)
Rooflights _{0.9x}	1	X	12.74	x	20.24	X	0.76	x	0.7	=	123.44	(82)
Rooflights _{0.9x}	1	X	12.74	x	40.55	X	0.76	x	0.7	=	247.33	(82)
Rooflights _{0.9x}	1	X	12.74	x	74.78	X	0.76	x	0.7	=	456.16	(82)
Rooflights _{0.9x}	1	X	12.74	x	130.19	x	0.76	x	0.7	=	794.13	(82)
Rooflights _{0.9x}	1	X	12.74	x	183.82	X	0.76	x	0.7	=	1121.29	(82)
Rooflights 0.9x	1	x	12.74	x	200.21	x	0.76	x	0.7	=	1221.24	(82)



Rooflights 0.9x 1	X 1:	2.74	x 1	85.57	X	0.76	x	0.7	=	1131.99	(82)
Rooflights _{0.9x} 1	x 1:	2.74	x 1	42.19	x	0.76	x	0.7	=	867.36	(82)
Rooflights _{0.9x} 1	x 1:	2.74	x 9	3.09	x	0.76	x	0.7	=	567.83	(82)
Rooflights _{0.9x} 1	x 1:	2.74	x 4	9.71	x	0.76	x [0.7	=	303.23	(82)
Rooflights _{0.9x} 1	x 1:	2.74	x 2	25.27	x	0.76	x	0.7	=	154.14	(82)
Rooflights _{0.9x} 1	x 1:	2.74	x 1	6.69	x	0.76	x	0.7	=	101.83	(82)
Solar gains in watts, calcu	lated for ea	ch month			(83)m =	Sum(74)m .	(82)m			_	
` '	73.16 1756.8		2388.92		1839.3	1369.2	858.54	491.14	338.48		(83)
Total gains – internal and	solar (84)m	= (73)m +	- (83)m	, watts	ī		ī		ī	1	
(84)m= 1137.77 1469.18 18	75.1 2414.5	2878.65	2958.67	2791.54	2395.8	2 1951.9	1485.72	1167.82	1053.3		(84)
7. Mean internal tempera	ture (heatin	g season)									
Temperature during heat	ing periods	in the livin	ig area	from Tab	ole 9, T	h1 (°C)				21	(85)
Utilisation factor for gains	s for living a	rea, h1,m	(see Ta	ıble 9a)							_
Jan Feb I	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.99 0.97 0	.92 0.75	0.53	0.36	0.26	0.32	0.57	0.89	0.98	0.99		(86)
Mean internal temperatur	re in living a	rea T1 (fo	llow ste	ps 3 to 7	in Tal	ole 9c)				•	
 	0.51 20.85	20.97	21	21	21	20.97	20.71	20.2	19.81]	(87)
Temperature during heat	ing periods	in rest of (dwelling	from Ta	ماما م	Th2 (°C)				J	
· · · · · · · · · · · · · · · · · · ·	9.9 19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91]	(88)
· /		1		l	l	1		1			` '
Utilisation factor for gains (89)m= 0.99 0.97 0	.89 0.7	0.47	0.3	0.2	9a) 0.24	0.49	0.85	0.97	0.99	1	(89)
· · · <u> </u>	l			ı	l .		<u> </u>	0.97	0.99		(09)
Mean internal temperatu		1 1	<u> </u>			1				1	
(90)m= 18.42 18.81 19	9.33 19.76	19.89	19.91	19.91	19.91	19.89	19.61	18.91	18.34		(90)
						1	rLA = Livir	ng area ÷ (4	4) =	0.47	(91)
Mean internal temperatu	re (for the w	hole dwel	ling) = f	LA × T1	+ (1 –	fLA) × T2	_		_	-	
(92)m= 19.09 19.43 19	9.88 20.27	20.39	20.42	20.42	20.42	20.4	20.13	19.51	19.02		(92)
Apply adjustment to the r										1	
` '	9.73 20.12	20.24	20.27	20.27	20.27	20.25	19.98	19.36	18.87		(93)
8. Space heating require											
Set Ti to the mean intern the utilisation factor for g			ed at st	ep 11 of	Table	9b, so tha	ıt Ti,m=(76)m an	d re-cald	culate	
	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilisation factor for gains	<u>-</u>	1 way	- Gari	<u> </u>	<u> </u>	T COP		1101		J	
	.89 0.71	0.49	0.32	0.22	0.27	0.51	0.85	0.97	0.99		(94)
Useful gains, hmGm , W	= (94)m x (34)m		ļ.			ļ.		ļ.	J	
(95)m= 1122.5 1413.24 166	68.73 1716.1	1404.5	942.07	611.27	643.62	1003.77	1262.39	1133.19	1042.99		(95)
Monthly average externa	l temperatu	re from Ta	ıble 8			•				•	
(96)m= 4.3 4.9 6	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean i			_m , W =	=[(39)m	x [(93)r	n– (96)m]			1	
` '	25.72 1878.7		944.68	611.58	644.45		1569.01	2055.48	2463.1		(97)
Space heating requirement		1						 		1	
(98)m= 1000.6 677.2 41	4.41 117.11	18.79	0	0	0	0	228.12	664.05	1056.56		



					Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	4176.84	(98)
Space heating requirement in	n kWh/m²	²/year								30.32	(99)
9a. Energy requirements – Inc	dividual h	eating s	ystems i	ncluding	micro-C	HP)					
Space heating:		/							Г		7(004)
Fraction of space heat from s			mentary	-	(202) = 1 -	(201) -			Ļ	0	(201)
Fraction of space heat from r	•	` '			(202) = 13 (204) = (204)	,	(202)] _		Ļ	1	(202)
Fraction of total heating from	•				(204) = (20	02) * [1 -	(203)] =			1	(204)
Efficiency of main space hea			a oveton	. 0/					L	90.4	(206)
Efficiency of secondary/supp	1		· ·					l	<u> </u>	0	(208)
Jan Feb Mar Space heating requirement (Apr calculate	May d above	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
1000.6 677.2 414.41	117.11	18.79	0	0	0	0	228.12	664.05	1056.56		
(211)m = {[(98)m x (204)] } x	100 ÷ (20)6)	l	l .		<u> </u>	<u>l</u>	<u>l</u>	<u> </u>		(211)
1106.86 749.11 458.41	129.55	20.79	0	0	0	0	252.34	734.57	1168.76		
	•				Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	2=	4620.4	(211)
Space heating fuel (seconda	• .	month									
$= \{ [(98)m \times (201)] \} \times 100 \div (201) $ $(215)m = 0 $	1				0	0	0				
(215)m= 0 0 0	0	0	0	0	0 Tota		ar) =Sum(2	215)	0	0	(215)
Water heating						()	(715,1012	L		(210)
Output from water heater (calc	culated a	bove)									
106.75 102.54 120.58	122.82	126.89	114.83	113.39	123.89	124.11	122.81	109.84	102.81		
Efficiency of water heater										80.3	(216)
(217)m= 89.32 88.93 87.91	84.93	81.47	80.3	80.3	80.3	80.3	86.59	88.81	89.4		(217)
Fuel for water heating, kWh/m (219)m = (64)m x 100 ÷ (217											
(219)m= 119.51 115.3 137.17	T	155.75	143.01	141.2	154.29	154.55	141.84	123.68	115		
		-	-	_	Tota	I = Sum(2	19a) ₁₁₂ =	-		1645.9	(219)
Annual totals							k'	Wh/yeaı	r F	kWh/yea	r
Space heating fuel used, mair	n system	1								4620.4	\exists
Water heating fuel used										1645.9	
Electricity for pumps, fans and	delectric	keep-ho	t								
central heating pump:									30		(2300
boiler with a fan-assisted flue)								45		(230
Total electricity for the above,	kWh/yea	ır			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting									ŗ	483.11	(232)
Electricity generated by PVs									L T	-259.09	(233)
10a. Fuel costs - individual h	eating sy	stems:							L		
THE TOTAL STREET	Jaming Gy		Fu	el /b/voor			Fuel P			Fuel Cost	

kWh/year

(Table 12)

£/year



Space heating - main system 1	(211) x	3.48 × 0.01 =	160.79 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.48 x 0.01 =	57.28 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	9.89 (249)
(if off-peak tariff, list each of (230a) to (230g) se Energy for lighting	parately as applicable and a (232)	pply fuel price according to	
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	-34.17 (252)
Appendix Q items: repeat lines (253) and (254)	as needed	10.10	<u> </u>
	247) + (250)(254) =		377.51 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255) x	(256)] ÷ [(4) + 45.0] =		0.87 (257)
SAP rating (Section 12)			87.9 (258)
12a. CO2 emissions – Individual heating syste	ms including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	998.01 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	355.52 (264)
Space and water heating	(261) + (262) + (263) + (264) =	=	1353.52 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	250.74 (268)
			250.74 (268)
Energy saving/generation technologies Item 1		0.519 =	
Item 1	SI		-134.47 (269)
		0.519 =	-134.47 (269) 1508.72 (272)
Item 1 Total CO2, kg/year		0.519 = um of (265)(271) =	-134.47 (269)
Item 1 Total CO2, kg/year CO2 emissions per m²		0.519 = um of (265)(271) =	-134.47 (269) 1508.72 (272) 10.95 (273)
Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14)	(2	0.519 = um of (265)(271) = 272) ÷ (4) =	-134.47 (269) 1508.72 (272) 10.95 (273) 89 (274)
Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14)		0.519 = um of (265)(271) =	-134.47 (269) 1508.72 (272) 10.95 (273)
Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14)	Energy	0.519 = um of (265)(271) = 272) ÷ (4) = Primary	-134.47 (269) 1508.72 (272) 10.95 (273) 89 (274) P. Energy
Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy	Energy kWh/year	0.519 = um of (265)(271) = 272) ÷ (4) = Primary factor	-134.47 (269) 1508.72 (272) 10.95 (273) 89 (274) P. Energy kWh/year
Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy Space heating (main system 1)	Energy kWh/year (211) x	0.519 = um of (265)(271) = 272) ÷ (4) = Primary factor 1.22 =	-134.47 (269) 1508.72 (272) 10.95 (273) 89 (274) P. Energy kWh/year 5636.88 (261)
Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x	0.519 = um of (265)(271) = 272) ÷ (4) = Primary factor = 3.07 = 1.22	-134.47 (269) 1508.72 (272) 10.95 (273) 89 (274) P. Energy kWh/year 5636.88 (261) 0 (263)



Primary energy kWh/m²/year		(272) ÷ (4) =	62.16 (273)
'Total Primary Energy		sum of (265)(271) =	8562.91 (272)
Energy saving/generation technologies Item 1		3.07	-795.39 (269)
Electricity for lighting	(232) x	0 =	1483.16 (268)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	230.25 (267)



User Details: STRO007945 **Assessor Name:** Peter Mitchell Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.3.15 Property Address: Unit 1 (GF&FF END) GREEN New Dwelling at:, Gordon House, 6 Lissenden Gardens, LONDON, NW5 1LX Address: 1. Overall dwelling dimensions Volume(m³) Area(m²) Av. Height(m) Ground floor (1a) x 2.4 (2a) 176.69 (3a) 73.62 First floor (2b) (1b) x (3b) 3.32 64.14 212.94 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)137.76 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =(5) 389.63 2. Ventilation rate: main secondary other total m³ per hour heating heating Number of chimneys x 40 =(6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 Number of passive vents x 10 =(7b)0 0 x 40 =Number of flueless gas fires (7c)O 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.05 (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) (9)0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 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)4 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.25 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78 (20) $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.19

Infiltrat	ion rate	modifie	d for mo	nthly wir	nd speed					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Month	v avera	ae wind	enaad fr	om Tahl	٥.7					

Monthl	y avera	ge wind	speed fr	om Tabl	le 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

Nov

Dec

Oct



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		
A P (1: 61)		· · · · ·					(0.4)	(22.)				•	
Adjusted infilt	ration rat	e (allowi	o.21	o.21	0.19	0.19	0.18	(22a)m 0.19	0.21	0.22	0.23	1	
Calculate effe	1	l	1				0.10	0.19	0.21	0.22	0.23	J	
If mechanic	al ventila	ation:										0	(23a)
If exhaust air h	neat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced wit	h heat reco	overy: effic	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	1	·	1		1	- ` ` 	- ^ `	ŕ	 	- 	i i	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	1						 	í `	r Ó - Ò	<u> </u>	ı	1	(0.41.)
(24b)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole I	nouse ex m < 0.5 ×			-	-				5 × (23b	o)			
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural	ventilation	on or wh	ole hous	e positi	ve input	ventilatio	on from I	oft			ı	,	
if (22b)	m = 1, th	en (24d)	m = (22k)	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			,	
(24d)m = 0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53		(24d)
Effective air	r change		- `) or (24b	o) or (24d	c) or (24		x (25)			1	1	
(25)m= 0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.53		(25)
							•		•	•	•	-	
3. Heat losse	es and he	eat loss i	paramete	er:									
3. Heat losse	Gros	SS	Openin	gs	Net Ar		U-valı W/m2		A X U	K)	k-value		A X k
	Gros area	SS		gs	Net Ard A ,r	m²	U-valı W/m2 /[1/(1.4)+	k.	A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
ELEMENT	Gros area e 1	SS	Openin	gs	A ,n	m² x1	W/m2	0.04] =	(W/I	K)			kJ/K
ELEMENT Windows Typ	Gros area e 1 e 2	SS	Openin	gs	A ,r	m ² x ¹	W/m2 /[1/(1.4)+	0.04 = 0.04 = 0.04 = 0.04	7.04	K)			kJ/K (27)
ELEMENT Windows Typ Windows Typ	Gros area e 1 e 2 e 3	SS	Openin	gs	A ,n 5.31 8.12	x10	W/m2 /[1/(1.4)+ /[1/(1.4)+	[0.04] = [0.04] = [0.04] = [0.04]	7.04 10.77	K)			kJ/K (27) (27)
ELEMENT Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2 e 3 e 4	SS	Openin	gs	A ,n 5.31 8.12 2.53	x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$ \begin{array}{l} (1.5) & (1.5) $	7.04 10.77 3.35	K)			kJ/K (27) (27) (27)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2 e 3 e 4 e 5	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53	m ² x1. x1. x1. x1. x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+		7.04 10.77 3.35 3.35	K)			kJ/K (27) (27) (27) (27)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53 2.53	m ²	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K 0.04 = 0.	7.04 10.77 3.35 3.35 3.35	K)			kJ/K (27) (27) (27) (27) (27)
ELEMENT Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ Windows Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53 2.53 2.53	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$ \begin{aligned} & (K) \\ & (0.04) = [\\ $	7.04 10.77 3.35 3.35 3.35 3.35	K)			kJ/K (27) (27) (27) (27) (27) (27)
ELEMENT Windows Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+		7.04 10.77 3.35 3.35 3.35 3.35 0.91	K)			kJ/K (27) (27) (27) (27) (27) (27) (27)
ELEMENT Windows Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	SS	Openin	gs	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K = 0.04 = C	7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Windows Typ	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8	ss (m²)	Openin	gs ²	A ,n 5.31 8.12 2.53 2.53 2.53 0.69 1.27 3.42	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K = 0.04 = C	(W/l 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Windows Typ Rooflights	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	ss (m²)	Openin m	gs ²	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K	(W/l 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Typ Rooflights Walls	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	.2 8	Openin m	gs ²	A ,n 5.31 8.12 2.53 2.53 2.53 0.69 1.27 3.42 118.2	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K	(W/l 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53 17.836 18.92				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Windows Typ Wooflights Walls Roof Type1	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	.2 .8 .67	28.93 0	gs ²	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42 12.74 118.2	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K	(W/l 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53 17.836 18.92 1.33				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Typ Rooflights Walls Roof Type1 Roof Type2	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	.2 .8 .67	28.93 0	gs ²	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42 118.2 9.48 58.93	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K	(W/l 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53 17.836 18.92 1.33				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Typ Rooflights Walls Roof Type1 Roof Type2 Total area of contractions	Gros area e 1 e 2 e 3 e 4 e 5 e 6 e 7 e 8 e 9	.2 .8 .67	28.93 0	gs ²	A ,n 5.31 8.12 2.53 2.53 2.53 2.53 0.69 1.27 3.42 118.2 9.48 58.93 228.3	x1.	W/m2 /[1/(1.4)+ /[1/(1.4)+	K	(W/l 7.04 10.77 3.35 3.35 3.35 3.35 0.91 1.68 4.53 17.836 18.92 1.33 8.25				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)

(26)...(30) + (32) =

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** include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$

83.74

(33)



	араску	J J	,						((20)	.(30) 1 (32	L) + (32a)	(020) =	0	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	: TFA) in	ı kJ/m²K			Indica	tive Value:	Medium		250	(35)
	•				constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated i	using Ap	pendix l	<						16.5	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)						'		_
Total fa	abric he	at loss							(33) +	(36) =			100.24	(37)
Ventila	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=	68.25	68.1	67.95	67.24	67.11	66.49	66.49	66.38	66.73	67.11	67.38	67.66		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	168.49	168.34	168.19	167.48	167.35	166.73	166.73	166.62	166.97	167.35	167.62	167.9		
Heat lo	ss para	meter (H	HLP), W/	′m²K						_		12 /12=	167.48	(39)
(40)m=	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.21	1.21	1.21	1.22	1.22		
							•	•	/	Average =	Sum(40) ₁	12 /12=	1.22	(40)
Numbe	er of day	's in mor	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. Wa	iter heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
A 001100	مم ممر	_												
if TF	A > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (1	ΓFA -13.		91		(42)
if TF if TF Annua Reduce	A > 13.9 A £ 13.9 I averag the annua	9, N = 1 9, N = 1 e hot wa al average	+ 1.76 x ater usag hot water	ge in litre	es per da 5% if the d	ay Vd,av Iwelling is	erage = designed t	(25 x N)	+ 36		9)			(42)
if TF if TF Annua Reduce	A > 13.9 A £ 13.9 I averag the annua e that 125	9, N = 1 9, N = 1 e hot wa al average litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, f	ay Vd,av welling is not and co	erage = designed (ld)	(25 x N) to achieve	+ 36 a water us	se target o	9)	3.38		, ,
if TF if TF Annua Reduce not more	A > 13.9 A £ 13.9 I averag the annual that 125 Jan	9, N = 1 9, N = 1 e hot wa al average litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9)			, ,
if TF if TF Annua Reduce not more	A > 13.9 A £ 13.9 I average the annual ethat 125 Jan er usage in	P, N = 1 P, N = 1 Po hot was all average litres per p Feb In litres per	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac	y Vd,av welling is not and co Jun ctor from	erage = designed to ld) Jul Table 1c x	(25 x N) to achieve Aug	+ 36 a water us Sep	ce target o	9) 103 Nov	3.38 Dec		, ,
if TF if TF Annua Reduce not more	A > 13.9 A £ 13.9 I averag the annual that 125 Jan	9, N = 1 9, N = 1 e hot wa al average litres per p	+ 1.76 x ater usag hot water person per	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ay Vd,av welling is not and co	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us Sep 101.31	Oct	9) 103 Nov 109.58	Dec 113.71		(43)
if TF if TF Annua Reduce not more Hot wate (44)m=	A > 13.9 A £ 13.9 I average the annual of that 125 Jan er usage in	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac 97.17	ay Vd,av welling is not and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 93.04	(25 x N) to achieve Aug (43) 97.17	+ 36 a water us Sep	Oct 105.44 Fotal = Sur	Nov 109.58 m(44) ₁₁₂ =	Dec 113.71	1240.52	, ,
if TF if TF Annua Reduce not more Hot wate (44)m=	A > 13.9 A £ 13.9 I average the annual of that 125 Jan er usage in	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea	ge in litre usage by a day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac 97.17	ay Vd,av welling is not and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 93.04	(25 x N) to achieve Aug (43) 97.17	+ 36 a water us Sep	Oct 105.44 Fotal = Sur	Nov 109.58 m(44) ₁₁₂ =	Dec 113.71	1240.52	(43)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m=	A > 13.9 A £ 13.9 I average the annual that 125 Jan er usage in 113.71 content of	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - cale	ge in litre usage by a day (all w Apr ach month 101.31 culated mo	es per da 5% if the de tater use, l' May Vd,m = fact 97.17 onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 7 93.04 190 x Vd,r	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82	+ 36 a water us Sep 101.31 0 kWh/mon	Oct 105.44 Fotal = Surth (see Ta	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 16 150.39	3.38 Dec 113.71 c, 1d) 163.31	1240.52 1626.52	(43)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m=	A > 13.9 A £ 13.9 I average the annual that 125 Jan er usage in 113.71 content of	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - cale	ge in litre usage by a day (all w Apr ach month 101.31 culated mo	es per da 5% if the de tater use, l' May Vd,m = fact 97.17 onthly = 4.	y Vd,av lwelling is not and co Jun ctor from 7 93.04 190 x Vd,r	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82	+ 36 a water us Sep 101.31 0 kWh/mon	Oct 105.44 Fotal = Surth (see Ta	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 16 150.39	3.38 Dec 113.71 c, 1d) 163.31		(43)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m=	A > 13.9 A £ 13.9 I average the annual that 125 Jan er usage in 113.71 content of 168.63 taneous w	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - call 152.2	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69	es per da 5% if the d rater use, I May Vd,m = fac 97.17 onthly = 4. 127.32	y Vd,av lwelling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81 enter 0 in	(25 x N) to achieve Aug (43) 97.17 97m / 3600 116.82 boxes (46)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22	Oct 105.44 Fotal = Sunth (see Tail 137.77) Fotal = Sunth (see Tail 137.77)	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 16 150.39 m(45) ₁₁₂ =	3.38 Dec 113.71 c, 1d) 163.31		(43)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water	For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 aran be used instead of a detailed calculation. 16.5 (36) 7 details of thermal bridging are not known (36) = 0.15 x (31) Total fabric heat loss Ventilation heat loss calculated monthly Ventilation heat loss loss of themse loss of the loss o													
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If comm	A > 13.9 A £ 13.9 I average the annual that 125 Jan arrusage ii 113.71 content of 168.63 taneous w 25.3 storage e volumemunity h	P, N = 1 P,	ter usage hot water person per Mar 105.44 used - calculated at point 22.83 including and no talculated at the calculated	ge in litre usage by s day (all w Apr ach month 101.31 culated mo 132.69 19.9 ag any so ank in dw	es per da 5% if the divater use, I May Vd,m = fac 97.17	ay Vd,av Iwelling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86 r storage), 16.48 /WHRS	erage = designed to ld) Jul Table 1c x 93.04 101.81 enter 0 in 15.27 storage litres in	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73 ame vess	Oct 105.44 Fotal = Sur 137.77 Fotal = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 1c 150.39 m(45) ₁₁₂ =	3.38 Dec 113.71 c, 1d) 163.31		(43) (44) (45) (46)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commother Water	A > 13.9 A £ 13.9 I average the annual that 125 Jan er usage in 113.71 content of 168.63 taneous w 25.3 storage e volum munity he wise if no storage	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - calc 152.2 ng at point 22.83 includir and no tal hot water	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69 19.9 ag any so ank in dw er (this in	es per da 5% if the d rater use, I May Vd,m = fac 97.17 onthly = 4. 127.32 o hot water 19.1 color or W relling, e	y Vd,av lwelling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86 r storage), 16.48 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 93.04 101.81 enter 0 in 15.27 storage litres in neous co	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73 ame vess	Oct 105.44 Fotal = Sur 137.77 Fotal = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 1c 150.39 m(45) ₁₁₂ =	3.38 Dec 113.71 c, 1d) 163.31		(43) (44) (45) (46)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commother Water	A > 13.9 A £ 13.9 I average the annual that 125 Jan er usage in 113.71 content of 168.63 taneous w 25.3 storage e volum munity he wise if no storage	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - calc 152.2 ng at point 22.83 includir and no tal hot water	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69 19.9 ag any so ank in dw er (this in	es per da 5% if the divater use, P May $Vd,m = fac$ 97.17 P	y Vd,av lwelling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86 r storage), 16.48 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 93.04 101.81 enter 0 in 15.27 storage litres in neous co	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73 ame vess	Oct 105.44 Fotal = Sur 137.77 Fotal = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 1c 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31		(43) (44) (45) (46)
if TF if TF Annua Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commotherw Water a) If m	A > 13.9 A £ 13.9 I average the annual enthal 125 Jan arrusage in 113.71 content of 168.63 storage enumity havise if no storage nanufact	P, N = 1 P,	+ 1.76 x ater usag hot water person per Mar day for ea 105.44 used - calc 152.2 ng at point 22.83 includir and no tal hot water	ge in litre usage by a day (all w Apr ach month 101.31 culated mo 132.69 for use (no 19.9 and any so ank in dw er (this in	es per da 5% if the d rater use, I May Vd,m = fac 97.17 onthly = 4. 127.32 o hot water 19.1 color or W relling, e	y Vd,av lwelling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86 r storage), 16.48 /WHRS nter 110	erage = designed to ld) Jul Table 1c x 93.04 101.81 enter 0 in 15.27 storage litres in neous co	(25 x N) to achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73 ame vess	Oct 105.44 Fotal = Sur 137.77 Fotal = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31 24.5		(43) (44) (45) (46) (47)



				.	0 (1)4(,						ı	
Hot water		-			e 2 (kW	h/litre/da	ıy)					0		(51)
Volume fa	-	_		011 4.3								0		(52)
Tempera				2b							-	0		(53)
Energy lo					ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50			_	,				, , , ,	, , ,	,		0		(55)
Water sto	orage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m			l	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder c	ontains	dedicated	d solar sto	<u>I</u> rage, (57)ı	<u>l</u> m = (56)m	x [(50) – (<u>I</u> H11)] ÷ (5	0), else (5	7)m = (56)	m where (L H11) is fro	n Append	l ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary o	circuit	loss (an	nual) fro	m Table	3	!				•		0		(58)
Primary of		•	,			59)m = ((58) ÷ 36	65 × (41)	m				l	, ,
-					,	•		, ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi los	ss cal	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m					•	
	50.96	46.03	50.96	49.32	49.52	45.88	47.41	49.52	49.32	50.96	49.32	50.96		(61)
L. Total hea	at reau	ired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
	19.59	193.52	203.15	182	176.84	155.75	149.22	166.34	167.53	188.73	199.71	214.27		(62)
Solar DHW			usina App	endix G o	l	I : H (negati	<u> </u>		if no sola	r contributi	l ion to wate	r heating)		
(add addi												, , , , , , , , , , , , , , , , , , , ,		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS 5	<u>-</u> 58.71	45.3	34.79	18.74	10.68	8.06	7.72	8.7	8.75	26.14	45.71	59.07	l	(63) (G2)
WWHRS -5	55.17	-48.54	-49.54	-40.75	-37.83	-31.2	-26.4	-31.97	-32.9	-40.69	-47.14	-53.33		(63) (G10)
Output fro	om wa	ater hea	ter											
· · —	03.88	98.01	116.98	120.74	126.54	114.83	113.39	123.89	124.11	120.07	105.08	100.04		
` ′	!							Outp	out from w	ı ater heate	I r (annual)₁	12	1367.56	(64)
Heat gain	ns fror	n water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n1 + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	_
	88.81	60.55	63.34	56.45	54.71	48	45.7	51.22	51.64	58.55	62.33	67.04	ĺ	(65)
include	 e (57)r	n in calc	culation	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	munity h	l eating	
5. Interr	. ,					,aa		- · · · · · · · · · · · · · · ·					.cum.g	
) •									
Metabolio	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
_	45.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63		(66)
Lighting g	l nains			<u> </u>	!		ļ.			<u>!</u>		<u> </u>		
· `	27.36	24.3	19.76	14.96	11.18	9.44	10.2	13.26	17.8	22.6	26.37	28.12		(67)
Appliance				<u> </u>	ļ	<u> </u>				ļ				, ,
·· —	06.85	310.03	302.01	284.93	263.37	243.1	229.56	226.38	234.4	251.48	273.05	293.31		(68)
Cooking										ļ	270.00	200.01		()
	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	1	(69)
` '	I			<u> </u>	1 07.00	1 07.00	1 07.00	1 07.00	27.00	1 07.00	1 07.00	1 07.00		(/
Pumps ar	nd iar	is gains	(Table :	3 3	3	3	3	3	3	3	3	3		(70)
	ļ			<u> </u>	!	<u> </u>								(. 0)
Losses e.	- -				<u> </u>		146.54	146.54	146.54	146.54	146.54	146.54		(71)
(71)m= -1	16.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51	-116.51		(7-1)



Water	heating	gains (T	able 5)										_
(72)m=	92.49	90.1	85.14	78.4	73.54	66.67	61.43	68.85	71.72	78.7	86.57	90.11	(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m	
(73)m=	496.38	494.12	476.6	447.98	417.78	388.9	370.88	378.18	393.61	422.47	455.68	481.23	(73)

o. Colai gairio.
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Oblai gains are calculated using solar liax from Table of and associated equations to convert to the applicable orientation.

Orientation: Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x} 0.77	x	2.53	x	11.28	x	0.76	x	0.7] =	10.52	(75)
Northeast _{0.9x} 0.77	x	2.53	x	11.28	x	0.76	x	0.7] =	10.52	(75)
Northeast 0.9x 0.77	x	2.53	x	11.28	x	0.76	x	0.7] =	10.52	(75)
Northeast _{0.9x} 0.77	x	2.53	x	11.28	x	0.76	x	0.7] =	10.52	(75)
Northeast _{0.9x} 0.77	x	2.53	x	22.97	x	0.76	x	0.7] =	21.42	(75)
Northeast _{0.9x} 0.77	x	2.53	x	22.97	x	0.76	x	0.7] =	21.42	(75)
Northeast _{0.9x} 0.77	x	2.53	x	22.97	х	0.76	x	0.7	<u> </u>	21.42	(75)
Northeast _{0.9x} 0.77	x	2.53	x	22.97	x	0.76	x	0.7	=	21.42	(75)
Northeast _{0.9x} 0.77	x	2.53	x	41.38	х	0.76	x	0.7] =	38.6	(75)
Northeast _{0.9x} 0.77	x	2.53	x	41.38	x	0.76	x	0.7	=	38.6	(75)
Northeast _{0.9x} 0.77	x	2.53	x	41.38	x	0.76	x	0.7	=	38.6	(75)
Northeast _{0.9x} 0.77	x	2.53	x	41.38	x	0.76	x	0.7	=	38.6	(75)
Northeast _{0.9x} 0.77	x	2.53	x	67.96	x	0.76	x	0.7	=	63.39	(75)
Northeast _{0.9x} 0.77	x	2.53	x	67.96	x	0.76	x	0.7	=	63.39	(75)
Northeast _{0.9x} 0.77	x	2.53	x	67.96	x	0.76	x	0.7	=	63.39	(75)
Northeast _{0.9x} 0.77	x	2.53	x	67.96	X	0.76	x	0.7] =	63.39	(75)
Northeast _{0.9x} 0.77	x	2.53	x	91.35	x	0.76	x	0.7	=	85.2	(75)
Northeast _{0.9x} 0.77	x	2.53	x	91.35	x	0.76	x	0.7	=	85.2	(75)
Northeast _{0.9x} 0.77	x	2.53	x	91.35	X	0.76	x	0.7	=	85.2	(75)
Northeast 0.9x 0.77	x	2.53	x	91.35	x	0.76	x	0.7] =	85.2	(75)
Northeast 0.9x 0.77	x	2.53	x	97.38	x	0.76	x	0.7] =	90.84	(75)
Northeast 0.9x 0.77	x	2.53	X	97.38	x	0.76	x	0.7	=	90.84	(75)
Northeast 0.9x 0.77	x	2.53	X	97.38	x	0.76	x	0.7	=	90.84	(75)
Northeast 0.9x 0.77	x	2.53	X	97.38	x	0.76	x	0.7	=	90.84	(75)
Northeast 0.9x 0.77	x	2.53	X	91.1	X	0.76	X	0.7	=	84.97	(75)
Northeast 0.9x 0.77	x	2.53	X	91.1	X	0.76	X	0.7	=	84.97	(75)
Northeast 0.9x 0.77	x	2.53	X	91.1	x	0.76	x	0.7	=	84.97	(75)
Northeast 0.9x 0.77	x	2.53	X	91.1	X	0.76	x	0.7] =	84.97	(75)
Northeast 0.9x 0.77	x	2.53	x	72.63	x	0.76	x	0.7] =	67.74	(75)
Northeast 0.9x 0.77	x	2.53	x	72.63	x	0.76	x	0.7] =	67.74	(75)
Northeast 0.9x 0.77	x	2.53	x	72.63	x	0.76	x	0.7	=	67.74	(75)
Northeast 0.9x 0.77	X	2.53	x	72.63	x	0.76	x	0.7	=	67.74	(75)



Northeast 0.9x 0.77 x 2.53 x 50.42 x 0.76 x 0.7 = 47.03 Northeast 0.9x 0.77 x 2.53 x 50.42 x 0.76 x 0.7 = 47.03 Northeast 0.9x 0.77 x 2.53 x 50.42 x 0.76 x 0.7 = 47.03	(75)
Northeast 0.9x	
North and	(75)
Northeast 0.9x 0.77 x 2.53 x 50.42 x 0.76 x 0.7 = 47.03	(75)
Northeast 0.9x 0.77 x 2.53 x 28.07 x 0.76 x 0.7 = 26.18	(75)
Northeast 0.9x 0.77 x 2.53 x 28.07 x 0.76 x 0.7 = 26.18	(75)
Northeast 0.9x 0.77 x 2.53 x 28.07 x 0.76 x 0.7 = 26.18	(75)
Northeast 0.9x 0.77 x 2.53 x 28.07 x 0.76 x 0.7 = 26.18	(75)
Northeast 0.9x 0.77 x 2.53 x 14.2 x 0.76 x 0.7 = 13.24	(75)
Northeast 0.9x 0.77 x 2.53 x 14.2 x 0.76 x 0.7 = 13.24	(75)
Northeast 0.9x 0.77 x 2.53 x 14.2 x 0.76 x 0.7 = 13.24	. (75)
Northeast 0.9x 0.77 x 2.53 x 14.2 x 0.76 x 0.7 = 13.24	. (75)
Northeast 0.9x 0.77 x 2.53 x 9.21 x 0.76 x 0.7 = 8.59	(75)
Northeast 0.9x 0.77 x 2.53 x 9.21 x 0.76 x 0.7 = 8.59	(75)
Northeast 0.9x 0.77 x 2.53 x 9.21 x 0.76 x 0.7 = 8.59	(75)
Northeast 0.9x 0.77 x 2.53 x 9.21 x 0.76 x 0.7 = 8.59	(75)
Southwest _{0.9x} 0.77 x 5.31 x 36.79 0.76 x 0.7 = 72.00	(79)
Southwest _{0.9x} 0.77 x 8.12 x 36.79 0.76 x 0.7 = 110.1	(79)
Southwest _{0.9x} 0.77 x 3.42 x 36.79 0.76 x 0.7 = 46.39	(79)
Southwest _{0.9x} 0.77 x 5.31 x 62.67 0.76 x 0.7 = 122.6	9 (79)
Southwest _{0.9x} 0.77 x 8.12 x 62.67 0.76 x 0.7 = 187.6	(79)
Southwest _{0.9x} 0.77 x 3.42 x 62.67 0.76 x 0.7 = 79.02	(79)
Southwest _{0.9x} 0.77 x 5.31 x 85.75 0.76 x 0.7 = 167.8	(79)
Southwest _{0.9x} 0.77 x 8.12 x 85.75 0.76 x 0.7 = 256.7	(79)
Southwest _{0.9x} 0.77 x 3.42 x 85.75 0.76 x 0.7 = 108.1	(79)
Southwest _{0.9x} 0.77 x 5.31 x 106.25 0.76 x 0.7 = 208.0	(79)
Southwest _{0.9x} 0.77 x 8.12 x 106.25 0.76 x 0.7 = 318.0	(79)
Southwest _{0.9x} 0.77 x 3.42 x 106.25 0.76 x 0.7 = 133.9	7 (79)
Southwest _{0.9x} 0.77 x 5.31 x 119.01 0.76 x 0.7 = 232.9	(79)
Southwest _{0.9x} 0.77 x 8.12 x 119.01 0.76 x 0.7 = 356.2	(79)
Southwest _{0.9x} 0.77 x 3.42 x 119.01 0.76 x 0.7 = 150.0	(79)
Southwest _{0.9x} 0.77 x 5.31 x 118.15 0.76 x 0.7 = 231.3	(79)
Southwest _{0.9x} 0.77 x 8.12 x 118.15 0.76 x 0.7 = 353.	(79)
Southwest _{0.9x} 0.77 x 3.42 x 118.15 0.76 x 0.7 = 148.9	7 (79)
Southwest _{0.9x} 0.77 x 5.31 x 113.91 0.76 x 0.7 = 223	(79)
Southwest _{0.9x} 0.77 x 8.12 x 113.91 0.76 x 0.7 = 341	(79)
Southwest _{0.9x} 0.77 x 3.42 x 113.91 0.76 x 0.7 = 143.6	(79)
Southwest _{0.9x} 0.77 x 5.31 x 104.39 0.76 x 0.7 = 204.3	(79)
Southwest _{0.9x} 0.77 x 8.12 x 104.39 0.76 x 0.7 = 312.5	1 (79)
Southwest _{0.9x} 0.77 x 3.42 x 104.39 0.76 x 0.7 = 131.6	(79)
Southwest _{0.9x} 0.77 x 5.31 x 92.85 0.76 x 0.7 = 181.7	7 (79)



Southwest _{0.9x}	0.77	X	8.12	X	92.85		0.76	X	0.7	=	277.97	(79)
Southwest _{0.9x}	0.77	X	3.42	x	92.85		0.76	x	0.7	=	117.07	(79)
Southwest _{0.9x}	0.77	X	5.31	X	69.27		0.76	x	0.7] =	135.6	(79)
Southwest _{0.9x}	0.77	x	8.12	X	69.27		0.76	x	0.7	=	207.36	(79)
Southwest _{0.9x}	0.77	x	3.42	X	69.27		0.76	x	0.7	=	87.34	(79)
Southwest _{0.9x}	0.77	x	5.31	x	44.07		0.76	x	0.7	=	86.28	(79)
Southwest _{0.9x}	0.77	X	8.12	X	44.07		0.76	X	0.7] =	131.93	(79)
Southwest _{0.9x}	0.77	X	3.42	X	44.07		0.76	X	0.7	=	55.57	(79)
Southwest _{0.9x}	0.77	x	5.31	X	31.49		0.76	X	0.7	=	61.64	(79)
Southwest _{0.9x}	0.77	X	8.12	X	31.49		0.76	x	0.7	=	94.26	(79)
Southwest _{0.9x}	0.77	x	3.42	X	31.49		0.76	X	0.7	=	39.7	(79)
Northwest _{0.9x}	0.77	x	0.69	X	11.28	X	0.76	X	0.7	=	2.87	(81)
Northwest _{0.9x}	0.77	x	1.27	X	11.28	X	0.76	X	0.7	=	5.28	(81)
Northwest _{0.9x}	0.77	X	0.69	X	22.97	X	0.76	X	0.7	=	5.84	(81)
Northwest _{0.9x}	0.77	X	1.27	X	22.97	X	0.76	X	0.7	=	10.75	(81)
Northwest _{0.9x}	0.77	X	0.69	X	41.38	X	0.76	x	0.7	=	10.53	(81)
Northwest _{0.9x}	0.77	X	1.27	X	41.38	X	0.76	X	0.7	=	19.37	(81)
Northwest 0.9x	0.77	X	0.69	X	67.96	X	0.76	x	0.7	=	17.29	(81)
Northwest _{0.9x}	0.77	X	1.27	X	67.96	X	0.76	X	0.7	=	31.82	(81)
Northwest _{0.9x}	0.77	x	0.69	X	91.35	X	0.76	x	0.7] =	23.24	(81)
Northwest _{0.9x}	0.77	X	1.27	X	91.35	X	0.76	X	0.7	=	42.77	(81)
Northwest _{0.9x}	0.77	X	0.69	X	97.38	x	0.76	X	0.7	=	24.77	(81)
Northwest _{0.9x}	0.77	X	1.27	X	97.38	X	0.76	X	0.7] =	45.6	(81)
Northwest _{0.9x}	0.77	X	0.69	X	91.1	X	0.76	X	0.7	=	23.17	(81)
Northwest _{0.9x}	0.77	X	1.27	X	91.1	X	0.76	X	0.7	=	42.66	(81)
Northwest _{0.9x}	0.77	X	0.69	X	72.63	X	0.76	X	0.7	=	18.48	(81)
Northwest _{0.9x}	0.77	X	1.27	X	72.63	X	0.76	X	0.7	=	34.01	(81)
Northwest _{0.9x}	0.77	X	0.69	X	50.42	X	0.76	X	0.7	=	12.83	(81)
Northwest _{0.9x}	0.77	X	1.27	X	50.42	x	0.76	X	0.7	=	23.61	(81)
Northwest 0.9x	0.77	X	0.69	X	28.07	X	0.76	X	0.7	=	7.14	(81)
Northwest _{0.9x}	0.77	X	1.27	X	28.07	X	0.76	X	0.7	=	13.14	(81)
Northwest _{0.9x}	0.77	X	0.69	X	14.2	X	0.76	X	0.7	=	3.61	(81)
Northwest 0.9x	0.77	X	1.27	X	14.2	X	0.76	X	0.7	=	6.65	(81)
Northwest _{0.9x}	0.77	X	0.69	X	9.21	X	0.76	X	0.7	=	2.34	(81)
Northwest _{0.9x}	0.77	X	1.27	X	9.21	X	0.76	X	0.7	=	4.31	(81)
Rooflights _{0.9x}	1	X	12.74	X	20.24	X	0.76	X	0.7	=	123.44	(82)
Rooflights 0.9x	1	X	12.74	X	40.55	X	0.76	X	0.7	=	247.33	(82)
Rooflights _{0.9x}	1	X	12.74	X	74.78	X	0.76	X	0.7	=	456.16	(82)
Rooflights 0.9x	1	X	12.74	X	130.19	x	0.76	X	0.7	=	794.13	(82)
Rooflights _{0.9x}	1	X	12.74	X	183.82	x	0.76	X	0.7	=	1121.29	(82)
Rooflights 0.9x	1	X	12.74	X	200.21	X	0.76	X	0.7	=	1221.24	(82)



Rooflig	hts _{0.9x} [1	X	12.	74	x	18	35.57	x		0.76	x	0.7	=	1131.99	(82)
Rooflig	hts _{0.9x} [1	X	12.	74	x	14	12.19	X		0.76	x	0.7	=	867.36	(82)
Rooflig	hts _{0.9x}	1	X	12.	74	x	9:	3.09	X		0.76	x	0.7	=	567.83	(82)
Rooflig	hts _{0.9x}	1	X	12.	74	x	4	9.71	X		0.76	x	0.7	=	303.23	(82)
Rooflig	hts _{0.9x}	1	X	12.	74	x	2	5.27	X		0.76	x	0.7	=	154.14	(82)
Rooflig	hts _{0.9x}	1	X	12.	74	x	1	6.69	X		0.76	x	0.7	=	101.83	(82)
					_				-							
Solar	gains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m=	402.26	738.95	1173.16	1756.84	2267.43	23	88.92	2245.34	183	9.3	1369.2	858.54	491.14	338.48		(83)
Total g	jains – i	nternal a	and solar	r (84)m =	= (73)m ·	+ (8	33)m ,	watts					_	_		
(84)m=	898.65	1233.08	1649.76	2204.81	2685.2	27	77.82	2616.22	2217	7.48	1762.8	1281	946.82	819.7		(84)
7. Me	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)				21	(85)
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,m	(s	ee Tal	ble 9a)			` ,					
	Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.94	0.79	0.56	(0.38	0.28	0.3	34	0.62	0.93	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	a T1 (fo	مالد	w ster	ns 3 to 7	in T	ahle	2 Oc)				l	
(87)m=	19.71	20	20.41	20.81	20.97		21	21	2	$\overline{}$	20.96	20.63	20.06	19.65		(87)
		<u> </u>	<u> </u>	<u> </u>		<u>. </u>			L							` '
•		during h				_	~~			_		10.01	10.04	10.01		(99)
(88)m=	19.9	19.9	19.9	19.91	19.91	<u> </u>	9.91	19.91	19.	91	19.91	19.91	19.91	19.91		(88)
	ation fac	tor for g	i e	1		_	`		_					1	I	
(89)m=	1	0.98	0.93	0.75	0.5	(0.32	0.21	0.2	26	0.54	0.9	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng	T2 (fc	ollow ste	ps 3	to 7	in Tabl	e 9c)				
(90)m=	18.19	18.61	19.19	19.71	19.88	1	9.91	19.91	19.	91	19.89	19.51	18.71	18.11		(90)
											f	LA = Livir	ng area ÷ (4	4) =	0.47	(91)
Mean	interna	ıl temper	ature (fo	r the wh	ole dwe	llin	a) = fL	_A × T1	+ (1	– fL	A) × T2					
(92)m=	18.9	19.25	19.76	20.22	20.39	_	0.42	20.42	20.		20.39	20.03	19.34	18.83		(92)
Apply	adjustr	nent to t	he mear	interna	l temper	atu	re fro	m Table	4e,	whe	re appro	priate				
(93)m=	18.75	19.1	19.61	20.07	20.24	2	0.27	20.27	20.	27	20.24	19.88	19.19	18.68		(93)
8. Sp:	ace hea	ting requ	uirement													
						ed	at ste	p 11 of	Tabl	le 9b	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the ut		factor fo				_	. 1				_		Ι	Τ_	Ī	
Liera	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(94)m=	0.99	tor for g	ains, nm 0.92	0.75	0.52	_	0.34	0.23	0.2	<u>, </u>	0.56	0.9	0.99	1 1		(94)
		hmGm					J.34	0.23	0.2	29	0.56	0.9	0.99	1		(34)
(95)m=		1207.47	<u>`</u>	1661.87		94	41.12	611.14	643	21	991.85	1148.99	933.64	816.75		(95)
` '		age exte	l .	l	L			011111	0.0		001.00	1110.00	000.01	010.70		(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		<u> </u>	<u> </u>		!						<u>L</u>	<u>I</u>	1	
		2391.13		1871.33		_	44.55	611.56	644		1024.64		2026.75	2430.87		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Νh	/mont	h = 0.02	24 x [<u>_</u> [(97)	m – (95)m] x (4	1)m		1	
(98)m=	1146.36	795.42	507.38	150.81	24.51		0	0	0)	0	300.37	787.04	1200.9		
						-	•		-						•	



		Tot	al per year	(kWh/yeaı	r) = Sum(9	08) _{15,912} =	4912.78	(98)
Space heating requirement in kWh/m²/year							35.66	(99)
9a. Energy requirements – Individual heating s	ystems incl	uding micro-	CHP)					
Space heating:						Г		¬
Fraction of space heat from secondary/supple	mentary sy		(004)			ļ	0	(201)
Fraction of space heat from main system(s)		,	- (201) =	(000)1		Į T	1	(202)
Fraction of total heating from main system 1		(204) = (3)	202) × [1 –	(203)] =		ļ	1	(204)
Efficiency of main space heating system 1	0	,				 	90.4	(206)
Efficiency of secondary/supplementary heatin			1 -	I -	I	<u> </u>	0	(208)
Jan Feb Mar Apr May		Jul Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above 1146.36 795.42 507.38 150.81 24.51) 0	0 0	T 0	300.37	787.04	1200.9		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$			1 -					(211)
1268.1 879.89 561.26 166.82 27.11	0	0 0	0	332.26	870.62	1328.43		(=)
	<u> </u>	Tot	al (kWh/yea	ar) =Sum(2	211) _{15,101}	2=	5434.5	(211)
Space heating fuel (secondary), kWh/month						L		_
= {[(98)m x (201)] } x 100 ÷ (208)			1	1	I	1		
(215)m= 0 0 0 0 0	0	0 0 Tot	0 al (kWh/yea	0	0	0		7(045)
Water beating		100	ai (KVVII/yed	ai) =3uiii(2	213) _{15,1012}	2	0	(215)
Water heating Output from water heater (calculated above)								
103.88 98.01 116.98 120.74 126.54	114.83 11	13.39 123.89	124.11	120.07	105.08	100.04		
Efficiency of water heater		· 		-			80.3	(216)
(217)m= 89.47 89.17 88.32 85.61 81.78	80.3	80.3	80.3	87.27	89.08	89.53		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m								
(219)m =	143.01 1	41.2 154.29	154.55	137.59	117.96	111.74		
	!	Tot	al = Sum(2	19a) ₁₁₂ =			1614.58	(219)
Annual totals				k'	Wh/yeaı	r	kWh/yea	_
Space heating fuel used, main system 1						إ	5434.5	╛
Water heating fuel used							1614.58	
Electricity for pumps, fans 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		sur	n of (230a).	(230g) =			75	(231)
Electricity for lighting						Ī	483.11	(232)
Electricity generated by PVs							-259.09	(233)
12a. CO2 emissions – Individual heating syste	ems includir	ng micro-CH	P			L		
	Energ			Fmiss	ion fac	tor	Emissions	
	kWh/y			kg CO			kg CO2/ye	

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Space heating (main system 1)	(211) x	0.216	=	1173.85	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	348.75	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1522.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	250.74	(268)
Energy saving/generation technologies					_
Item 1		0.519	=	-134.47	(269)
Total CO2, kg/year	sum o	of (265)(271) =		1677.8	(272)
Dwelling CO2 Emission Rate	(272)	÷ (4) =		12.18	(273)
El rating (section 14)				88	(274)



User Details: STRO007945 **Assessor Name:** Peter Mitchell Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.3.15 Property Address: Unit 1 (GF&FF END) GREEN New Dwelling at:, Gordon House, 6 Lissenden Gardens, LONDON, NW5 1LX Address: 1. Overall dwelling dimensions Volume(m³) Area(m²) Av. Height(m) Ground floor (1a) x 2.4 (2a) =176.69 (3a) 73.62 First floor (1b) x (2b) (3b) 64.14 3.32 212.94 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)137.76 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =(5) 389.63 2. Ventilation rate: main secondary other total m³ per hour heating heating Number of chimneys x 40 =(6a) 0 0 0 0 0 x 20 =Number of open flues 0 0 0 0 0 (6b) Number of intermittent fans x 10 =(7a)40 4 Number of passive vents x 10 =(7b)0 0 x 40 =Number of flueless gas fires (7c)O 0 Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = \div (5) = 0.1 (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) (9)0 Additional infiltration [(9)-1]x0.1 =(10)0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 (12)0 If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped (14)0 $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration 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)5 If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise (18) = (16)0.35 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78 (20) $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.27

Infiltrat	ion rate	modified	d for mo	nthly wir	nd speed	l		
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Γ

	Jan	reb	iviai	Aþi	iviay	Juli	Jui	Aug	Sep	Oct	INOV	Dec
Monthl	y avera	ge wind	speed fr	om Tabl	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

con l

Oct

Nov



Wind Factor (22a)m = (22)m ÷ 4										
	1.1 1.	08 0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjusted infiltration rate (allowing			ا م م م ما /	(240) **	(000)	<u>.</u>				
Adjusted infiltration rate (allowing 0.35 0.34 0.33		29 0.26	0.26	0.25	(22a)m 0.27	0.29	0.31	0.32		
Calculate effective air change rat		ı	1	0.20	0.27	0.23	0.01	0.02		
If mechanical ventilation:									0	(23a)
If exhaust air heat pump using Append) = (23a)			0	(23b)
If balanced with heat recovery: efficien		_							0	(23c)
a) If balanced mechanical vent		 	- 	, 	ŕ	- ` `		``	÷ 100] I	(0.4-)
(24a)m= 0 0 0		0 0	0	0	0	0	0	0		(24a)
b) If balanced mechanical venti			 	, 	i `	- 			Ī	(24b)
(24b)m= 0 0 0		0 0	0	0	0	0	0	0		(24b)
c) If whole house extract ventilating if (22b)m < 0.5 × (23b), the	-	•				5 × (23b))			
(24c)m= 0 0 0	`	0 0	0	0	0	0	0	0		(24c)
d) If natural ventilation or whole						•			•	
if (22b)m = 1, then (24d)m	````					0.5]			1	
` '		54 0.53	0.53	0.53	0.54	0.54	0.55	0.55		(24d)
Effective air change rate - ente		<u> </u>	ì	i					I	(05)
(25)m= 0.56 0.56 0.56	0.55 0.	54 0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
3. Heat losses and heat loss par	rameter:									
ELEMENT Gross O	rameter: Openings m ²	Net A	irea ,m²	U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-ł		A X k kJ/K
·	penings		,m²		!K	A X U (W/I	<)			
ELEMENT Gross area (m²)	penings	Α	,m² 9 x1	W/m2	0.04] = [(W/I	<) 			kJ/K
ELEMENT Gross area (m²) Windows Type 1	penings	A 4.3	ym² 9 x1 1 x1	W/m2 /[1/(1.4)+	0.04] = 0.04] = 0.04]	(W/I 5.82	<) 			kJ/K (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2	penings	4.3 6.7	9 x1 1 x1 9 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+	[0.04] = [0.04] = [0.04] = [0.04]	5.82 8.9	<) 			kJ/K (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3	penings	4.3 6.7 2.0	m ² 9 x1 1 x1 9 x1 9 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$ \begin{array}{l} (1.5) \\ (1.5) $	5.82 8.9 2.77	<) 			kJ/K (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4	penings	4.3 6.7 2.0	9 x1 9 x1 9 x1 9 x1 9 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$ \begin{aligned} (K) \\ (0.04) &= \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{bmatrix} \\ (0.04) &= \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \\ (0.04) &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} \\ (0.04) &= \begin{bmatrix} \\ \\ \\ \end{bmatrix} $	(W/I 5.82 8.9 2.77 2.77	<)			kJ/K (27) (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5	penings	4.3 6.7 2.0 2.0	m ² 9 x1 1 x1 9 x1 9 x1 9 x1 9 x1 9 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+		(W/I 5.82 8.9 2.77 2.77	<)			kJ/K (27) (27) (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6	penings	4.3 6.7 2.0 2.0 2.0	m ² 9 x1 1 x1 9 x1 9 x1 9 x1 7 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$\begin{array}{l} \text{K} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ 0.04] = \\ \end{bmatrix} \\ 0.04] = \begin{bmatrix} \\ \end{bmatrix} $	(W/I 5.82 8.9 2.77 2.77 2.77	<)			kJ/K (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7	penings	4.3 6.7 2.0 2.0 2.0 0.5	9 x1 9 x1 9 x1 9 x1 9 x1 9 x1 7 x1 5 x1	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	$ \begin{aligned} & (K) \\ & (0.04) = [\\ $	(W/I 5.82 8.9 2.77 2.77 2.77 2.77 0.76	<)			kJ/K (27) (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8	penings	A	m ² 9 x ¹ 1 x ¹ 9 x ¹ 9 x ¹ 9 x ¹ 7 x ¹ 5 x ¹ 3 x ¹	W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	K = 0.04	(W/I 5.82 8.9 2.77 2.77 2.77 2.77 0.76 1.39				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9	penings	A	m ² 9 x ¹ 1 x ¹ 9 x ¹ 9 x ¹ 9 x ¹ 7 x ¹ 5 x ¹ 3 x ¹	W/m2 /[1/(1.4)+ /[1/(1.7)+	K = 0.04	(W/I 5.82 8.9 2.77 2.77 2.77 2.77 0.76 1.39 3.75				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Rooflights Walls	penings m²	A	m² 9 x1 1 x1 9 x1 9 x1 9 x1 9 x1 7 x1 5 x1 3 x1 29 x	W/m2 /[1/(1.4)+ /[1/(1.7) +	K = 0.04	(W/I 5.82 8.9 2.77 2.77 2.77 2.77 0.76 1.39 3.75 17.9002 22.19				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Rooflights Walls	Dpenings m² 23.91	A 4.3 6.7 2.0 2.0 2.0 2.0 1.0 2.8 10.52	m² 9 x1 1 x1 9 x1 9 x1 9 x1 9 x1 7 x1 5 x1 3 x1 953 x1 29 x	W/m2 /[1/(1.4)+ /[1/(1.7) +	$\begin{array}{l} K \\ $	(W/I 5.82 8.9 2.77 2.77 2.77 2.77 0.76 1.39 3.75 17.9002				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
ELEMENT Gross area (m²) Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Rooflights Walls 147.2 Roof Type1 9.48	Openings m² 23.91	A	m² 9 x1 9 x1 9 x1 9 x1 9 x1 7 x1 5 x1 3 x1 953 x1 29 x	W/m2 /[1/(1.4)+ /[1/(1.7) + 0.18 0.13	K	(W/I 5.82 8.9 2.77 2.77 2.77 2.77 0.76 1.39 3.75 17.9002 22.19 1.23				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Rooflights Walls 147.2 Roof Type1 9.48 Roof Type2 71.67	Dpenings m² 23.91	A	m² 9 x1 9 x1 9 x1 9 x1 9 x1 7 x1 5 x1 3 x1 29 x 8 x 4 x	W/m2 /[1/(1.4)+ /[1/(1.7) + 0.18 0.13	K	(W/I 5.82 8.9 2.77 2.77 2.77 2.77 0.76 1.39 3.75 17.9002 22.19 1.23				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)
Windows Type 1 Windows Type 2 Windows Type 3 Windows Type 4 Windows Type 5 Windows Type 6 Windows Type 7 Windows Type 8 Windows Type 9 Rooflights Walls 147.2 Roof Type1 9.48 Roof Type2 71.67 Total area of elements, m²	Dpenings m² 23.91	A	m² 9 x1 1 x1 9 x1 9 x1 9 x1 9 x1 7 x1 5 x1 3 x1 29 x 4 x	W/m2 /[1/(1.4)+ /[1/(1.7)+ 0.18 0.13	K	(W/I 5.82 8.9 2.77 2.77 2.77 2.77 0.76 1.39 3.75 17.9002 22.19 1.23 7.95				kJ/K (27) (27) (27) (27) (27) (27) (27) (27)

(26)...(30) + (32) =

** include the areas on both sides of internal walls and partitions

Fabric heat loss, $W/K = S (A \times U)$

79.83

(33)



	apacity	0111 – 0(// / / / /						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Therma	al mass	parame	ter (TMF	P = Cm -	- TFA) in	kJ/m²K	•		Indica	tive Value:	Medium		250	(35)
	-		ere the de tailed calci		constructi	on are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	K						6.8	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.15 x (3	1)						•		
Total fa	abric he	at loss							(33) +	(36) =			86.64	(37)
Ventila	tion hea	t loss ca	alculated	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=	72.1	71.79	71.5	70.1	69.84	68.62	68.62	68.4	69.09	69.84	70.37	70.92		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	158.73	158.43	158.13	156.74	156.47	155.26	155.26	155.03	155.73	156.47	157	157.56		
Heat Ic	ss para	meter (H	HLP), W/	′m²K						Average = = (39)m ÷		12 /12=	156.73	(39)
(40)m=	1.15	1.15	1.15	1.14	1.14	1.13	1.13	1.13	1.13	1.14	1.14	1.14		
									,	Average =	Sum(40) ₁ .	12 /12=	1.14	(40)
Numbe	er of day	s in mor	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. Wa	iter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
		pancy, I										0.4		(42)
	A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (1	ΓFA -13.		91		(:= /
if TF Annual Reduce	A £ 13.9 I averag the annua	9, N = 1 e hot wa al average	ater usaç hot water	ge in litre	(-0.0003 es per da 5% if the d rater use, F	ıy Vd,av welling is	erage = designed t	(25 x N)	+ 36		9)	3.38		(43)
if TF Annual Reduce	A £ 13.9 I averag the annua e that 125	e hot wa la average litres per p	ater usaç hot water person per	ge in litre usage by a day (all w	es per da 5% if the d rater use, f	y Vd,av welling is not and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	9)	3.38		. ,
if TF Annual Reduce not more	A £ 13.9 I averag the annua e that 125 Jan	O, N = 1 e hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w	es per da 5% if the d	ny Vd,av welling is not and co Jun	erage = designed t ld) Jul	(25 x N) to achieve	+ 36		9)			. ,
if TF Annual Reduce not more	A £ 13.9 I averag the annua that 125 Jan er usage in	e hot wa al average litres per p Feb	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the d rater use, f May Vd,m = fac	y Vd,av welling is not and co Jun ctor from	erage = designed to lid) Jul Table 1c x	(25 x N) to achieve Aug (43)	+ 36 a water us Sep	Se target of	9) 10: Nov	3.38 Dec		. ,
if TF Annual Reduce not more	A £ 13.9 I averag the annua e that 125 Jan	O, N = 1 e hot wa al average litres per p	ater usag hot water person per Mar	ge in litre usage by day (all w	es per da 5% if the d vater use, I	ny Vd,av welling is not and co Jun	erage = designed t ld) Jul	(25 x N) to achieve	+ 36 a water us Sep 101.31	Oct	9) 10: Nov 109.58	3.38 Dec 113.71	1240.52	(43)
if TF Annual Reduce not more Hot wate (44)m=	A £ 13.9 I average the annual enthat 125 Jan er usage in 113.71 content of	e hot wa e hot wa al average litres per p Feb n litres per 109.58	hot water person per Mar day for ea 105.44 used - cal	ge in litre usage by day (all w Apr ach month 101.31	es per da 5% if the day vater use, I May Vd,m = factorize 97.17 ponthly = 4	y Vd,av welling is not and co Jun ctor from 7 93.04	erage = designed in did) Jul Table 1c x 93.04	(25 x N) to achieve Aug (43) 97.17	+ 36 a water us Sep 101.31	Oct 105.44 Total = Suith (see Tai	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1	3.38 Dec 113.71 c, 1d)	1240.52	. ,
if TF Annual Reduce not more Hot wate (44)m=	A £ 13.9 I average the annual enthat 125 Jan er usage in	e hot wa el average litres per p Feb n litres per	hot water person per Mar day for ea	ge in litre usage by day (all w Apr ach month	es per da 5% if the d vater use, I May Vd,m = fac 97.17	y Vd,av welling is not and co Jun ctor from 1	erage = designed to ld) Jul Table 1c x 93.04	(25 x N) o achieve Aug (43) 97.17	+ 36 a water us Sep 101.31	Oct 105.44 Total = Sur 137.77	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39	3.38 Dec 113.71		(43)
if TF Annual Reduce not more Hot wate (44)m= Energy (45)m=	A £ 13.9 I average the annual of that 125 Jan er usage in 113.71 content of 168.63	P, N = 1 e hot wa al average litres per p Feb n litres per 109.58 hot water 147.49	Mar 105.44 used - calc	ge in litre usage by day (all w Apr ach month 101.31 culated me 132.69	es per da 5% if the day vater use, I May Vd,m = factorize 97.17 ponthly = 4	y Vd,av welling is not and co Jun ctor from 7 93.04 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 97.17 97m / 3600 116.82	+ 36 a water us Sep 101.31 0 kWh/mon 118.22	Oct 105.44 Total = Suith (see Tai	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39	3.38 Dec 113.71	1240.52 1626.52	(43)
if TF Annual Reduce not more Hot wate (44)m= Energy (45)m=	A £ 13.9 I average the annual of that 125 Jan er usage in 113.71 content of 168.63	P, N = 1 e hot wa al average litres per p Feb n litres per 109.58 hot water 147.49	Mar 105.44 used - calc	ge in litre usage by day (all w Apr ach month 101.31 culated me 132.69	es per da 5% if the de tater use, l' May Vd,m = fact 97.17 onthly = 4.	y Vd,av welling is not and co Jun ctor from 7 93.04 190 x Vd,r	erage = designed to designed t	(25 x N) o achieve Aug (43) 97.17 97m / 3600 116.82	+ 36 a water us Sep 101.31 0 kWh/mon 118.22	Oct 105.44 Total = Sur 137.77	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39	3.38 Dec 113.71		(43)
if TF Annual Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water	A £ 13.9 I average the annual enthal 125 Jan er usage in 113.71 content of 168.63 taneous w 25.3 storage	e hot wa el average litres per p Feb n litres per 109.58 hot water 147.49 ater heatin 22.12	hot water person per day for ear 105.44 used - call 152.2 ang at point 22.83	ge in litre usage by day (all w Apr ach month 101.31 culated mo 132.69 of use (no	es per da 5% if the d vater use, I May Vd,m = fact 97.17 onthly = 4.	y Vd,av welling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81 enter 0 in 15.27	(25 x N) o achieve Aug (43) 97.17 77m / 3600 116.82 boxes (46) 17.52	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73	Oct 105.44 Total = Sur 137.77 Total = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39 m(45) ₁₁₂ =	3.38 Dec 113.71		(43)
if TF Annual Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag	A £ 13.9 I average the annual of that 125 Jan er usage in 113.71 content of 168.63 taneous w 25.3 storage e volum	P, N = 1 e hot wa el average litres per l litres per l 109.58 hot water 147.49 eater heatif 22.12 loss: e (litres)	Mar day for ea 105.44 used - calc 152.2 ng at point 22.83	ge in litre usage by day (all w Apr ach month 101.31 culated me 132.69 of use (no	es per da 5% if the de 5% if the 5% if the de 5% if the de 5% if the de 5% if the de 5% if the d	y Vd,av welling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86 x storage), 16.48	erage = designed to designed t	(25 x N) o achieve Aug (43) 97.17 0Tm / 3600 116.82 boxes (46) 17.52 within sa	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73	Oct 105.44 Total = Sur 137.77 Total = Sur 20.67	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39 m(45) ₁₁₂ =	3.38 Dec 113.71 = c, 1d) 163.31 = 24.5		(43) (44) (45) (46)
if TF Annual Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If comr Otherw	A £ 13.9 I average the annual of that 125 Jan Per usage in 113.71 content of 168.63 staneous w 25.3 storage e volume munity herical in not seen to the content of the c	e hot was all average litres per per litres per per litres per per litres per	Mar day for ea 105.44 used - call 152.2 ng at point 22.83 includin nd no ta	ge in litre usage by day (all w Apr ach month 101.31 culated mo 132.69 of use (no 19.9 ag any so ank in dw	es per da 5% if the divater use, I May Vd,m = fac 97.17	y Vd,av welling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86 storage), 16.48 WHRS	erage = designed to ld) Jul Table 1c x 93.04 m x nm x E 101.81 enter 0 in 15.27 storage D litres in	(25 x N) o achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73 ame vess	Oct 105.44 Total = Sunth (see Tall 137.77) Total = Sunth (see Tall 137.77) Total = Sunth (see Tall 137.77)	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 1 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 = c, 1d) 163.31 = 24.5		(43) (44) (45) (46)
if TF Annual Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commotherw Water	A £ 13.9 I average the annual of that 125 Jan 113.71 content of 168.63 taneous w 25.3 storage e volum munity he vise if no storage	e hot was all average litres per per litres per per litres per per litres per	Mar Mar 105.44 152.2 mg at point 22.83 includin nd no ta hot water	ge in litre usage by day (all w Apr ach month 101.31 culated me 132.69 of use (no 19.9 ag any so ank in dw er (this in	es per da 5% if the divater use, P May $Vd,m = fac$ 97.17 P	y Vd,av welling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86 storage), 16.48 /WHRS nter 110	erage = designed to designed t	(25 x N) o achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73 ame vess	Oct 105.44 Total = Sunth (see Tall 137.77) Total = Sunth (see Tall 137.77) Total = Sunth (see Tall 137.77)	Nov 109.58 m(44) ₁₁₂ = sbles 1b, 1 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 = c, 1d) 163.31 = 24.5		(43) (44) (45) (46)
if TF Annual Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If commother Otherw Water a) If m	A £ 13.9 I average the annual of that 125 Jan Per usage in 113.71 content of 168.63 storage e volume munity he vise if no storage transfact	e hot was all average litres per per litres per per litres per per litres per	Mar Mar 105.44 152.2 mg at point 22.83 includin nd no ta hot water	ach month 101.31 culated mo 132.69 of use (no 19.9 and in dw er (this in	es per da 5% if the d rater use, I May Vd,m = fac 97.17 onthly = 4. 127.32 o hot water 19.1 color or W relling, e	y Vd,av welling is not and co Jun ctor from 7 93.04 190 x Vd,r 109.86 storage), 16.48 /WHRS nter 110	erage = designed to designed t	(25 x N) o achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 0 kWh/mon 118.22) to (61) 17.73 ame vess	Oct 105.44 Total = Sunth (see Tall 137.77) Total = Sunth (see Tall 137.77) Total = Sunth (see Tall 137.77)	Nov 109.58 m(44) ₁₁₂ = 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31 24.5		(43) (44) (45) (46) (47)
if TF Annual Reduce not more Hot wate (44)m= Energy (45)m= If instant (46)m= Water Storag If comr Otherw Water a) If m Tempe Energy	A £ 13.9 I average the annual of that 125 Jan Per usage in 113.71 content of 168.63 storage e volum munity he vise if no storage in anufact erature far volost fro	e hot was all average litres per	Mar day for ea 105.44 152.2 mg at point 22.83 includin nd no ta hot water	ge in litre usage by day (all w Apr ach month 101.31 culated mo 132.69 of use (no 19.9 ag any so ank in dw er (this in oss facto 2b , kWh/ye	es per da 5% if the d rater use, f May Vd,m = fac 97.17 onthly = 4. 127.32 o hot water 19.1 color or W relling, e ncludes in	y Vd,av welling is not and co Jun etor from 7 93.04 190 x Vd,r 109.86 storage), 16.48 /WHRS nter 110 nstantar	erage = designed to designed t	(25 x N) o achieve Aug (43) 97.17 07m / 3600 116.82 boxes (46) 17.52 within sa (47)	+ 36 a water us Sep 101.31 118.22 1) to (61) 17.73 ame vess ers) ente	Oct 105.44 Total = Sunth (see Tall 137.77) Total = Sunth (see Tall 137.77) Total = Sunth (see Tall 137.77)	Nov 109.58 m(44) ₁₁₂ = ables 1b, 1 150.39 m(45) ₁₁₂ = 22.56	3.38 Dec 113.71 c, 1d) 163.31 24.5 0		(43) (44) (45) (46) (47)



Hot wa	otar star	ana lass	factor fr	om Tahl	الا\\\ ام 2 (لا\\\	h/litre/da	w)					0		(51)
		eating s			IC Z (KVV	11/11116/06	iy <i>)</i>					0		(51)
	•	from Tal										0		(52)
Tempe	erature f	actor fro	m Table	2b							1	0		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
٠.		(54) in (5	-									0		(55)
Water	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m			l.	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicated	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	m Table	- 3	•	•			•		0		(58)
	-					59)m = ((58) ÷ 36	65 × (41)	m				l	
	-									r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	50.96	46.03	50.96	49.32	49.52	45.88	47.41	49.52	49.32	50.96	49.32	50.96		(61)
			water h	<u> </u>	L alculated	l for eac	h month	(62)m =	0.85 x (<u> </u>	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	219.59	193.52	203.15	182	176.84	155.75	149.22	166.34	167.53	188.73	199.71	214.27		(62)
,				<u> </u>	L	<u> </u>	<u> </u>			r contributi				,
						applies				i contributi	on to wate	or ricuting)		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	0	0	0	0	0	0	0	0	0	0	0	0		(63) (G2)
WWHRS	-	0	0	0	0	0	0	0	0	0	0	0		(63) (G10)
		•		Ü	Ü	Ü	Ŭ	Ü	Ü	Ü	Ŭ	ŭ		(55) (515)
-		ater hea		102	176.04	155 75	149.22	166 24	167.52	100 72	199.71	214.27		
(64)m=	219.59	193.52	203.15	182	176.84	155.75	149.22	166.34	167.53	188.73		l	2216.65	(64)
11	_: f		h	L-\ A / In / /		- ′ [O OF	(45)			ater heater		ı](04)
				i e	i e		i			1		+ (59)m] 	(65)
(65)m=	68.81	60.55	63.34	56.45	54.71		45.7	51.22	51.64	58.55	62.33	67.04		(03)
						ylınder ı	s in the d	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metab	olic gain	s (Table			ı		Г						l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63	145.63		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	27.36	24.3	19.76	14.96	11.18	9.44	10.2	13.26	17.8	22.6	26.37	28.12		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	306.85	310.03	302.01	284.93	263.37	243.1	229.56	226.38	234.4	251.48	273.05	293.31		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a)	, also se	e Table	5				
(69)m=	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56	37.56		(69)
Pumps	and fai	ns gains	(Table 5	 5а)	=	-	-							
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-116.51	-	-116.51	-116.51	-116.51		-116.51	-116.51	-116.51	-116.51	-116.51	-116.51		(71)



Water	heating	gains (T	able 5)										
(72)m=	92.49	90.1	85.14	78.4	73.54	66.67	61.43	68.85	71.72	78.7	86.57	90.11	(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m	
(73)m=	496.38	494.12	476.6	447.98	417.78	388.9	370.88	378.18	393.61	422.47	455.68	481.23	(73)

6. Solar gains:

-	calculated using saccess Factor Table 6d		Area m²	a and	Flux Table 6a	itions	g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	X	2.09	x	11.28	×	0.63	x	0.7	l =	7.21	(75)
Northeast 0.9x	0.77	X	2.09	x	11.28	x	0.63	X	0.7	=	7.21	(75)
Northeast 0.9x	0.77	X	2.09	х	11.28	x	0.63	х	0.7	=	7.21	(75)
Northeast 0.9x	0.77	X	2.09	х	11.28	x	0.63	X	0.7	=	7.21	(75)
Northeast 0.9x	0.77	X	2.09	x	22.97	x	0.63	X	0.7	=	14.67	(75)
Northeast 0.9x	0.77	X	2.09	x	22.97	x	0.63	x	0.7	=	14.67	(75)
Northeast 0.9x	0.77	x	2.09	x	22.97	x	0.63	х	0.7	i =	14.67	(75)
Northeast 0.9x	0.77	X	2.09	х	22.97	x	0.63	x	0.7	=	14.67	(75)
Northeast 0.9x	0.77	X	2.09	х	41.38	х	0.63	x	0.7	j =	26.43	(75)
Northeast 0.9x	0.77	x	2.09	х	41.38	х	0.63	х	0.7	j =	26.43	(75)
Northeast 0.9x	0.77	x	2.09	х	41.38	x	0.63	x	0.7	=	26.43	(75)
Northeast 0.9x	0.77	X	2.09	х	41.38	x	0.63	x	0.7	j =	26.43	(75)
Northeast 0.9x	0.77	X	2.09	x	67.96	x	0.63	x	0.7	j =	43.41	(75)
Northeast 0.9x	0.77	X	2.09	x	67.96	x	0.63	x	0.7	=	43.41	(75)
Northeast 0.9x	0.77	X	2.09	x	67.96	x	0.63	x	0.7	j =	43.41	(75)
Northeast 0.9x	0.77	X	2.09	x	67.96	x	0.63	x	0.7	j =	43.41	(75)
Northeast 0.9x	0.77	x	2.09	x	91.35	x	0.63	х	0.7	=	58.35	(75)
Northeast 0.9x	0.77	x	2.09	x	91.35	x	0.63	x	0.7	=	58.35	(75)
Northeast 0.9x	0.77	X	2.09	x	91.35	х	0.63	x	0.7	=	58.35	(75)
Northeast 0.9x	0.77	x	2.09	х	91.35	х	0.63	x	0.7	=	58.35	(75)
Northeast 0.9x	0.77	X	2.09	x	97.38	x	0.63	x	0.7	=	62.2	(75)
Northeast 0.9x	0.77	X	2.09	x	97.38	x	0.63	X	0.7	=	62.2	(75)
Northeast 0.9x	0.77	X	2.09	x	97.38	x	0.63	x	0.7	=	62.2	(75)
Northeast 0.9x	0.77	X	2.09	x	97.38	x	0.63	x	0.7	=	62.2	(75)
Northeast 0.9x	0.77	x	2.09	x	91.1	x	0.63	X	0.7	=	58.19	(75)
Northeast 0.9x	0.77	x	2.09	x	91.1	x	0.63	x	0.7	=	58.19	(75)
Northeast 0.9x	0.77	X	2.09	x	91.1	x	0.63	x	0.7	=	58.19	(75)
Northeast 0.9x	0.77	X	2.09	x	91.1	x	0.63	X	0.7	=	58.19	(75)
Northeast _{0.9x}	0.77	X	2.09	x	72.63	x	0.63	x	0.7	=	46.39	(75)
Northeast _{0.9x}	0.77	X	2.09	x	72.63	x	0.63	x	0.7	=	46.39	(75)
Northeast 0.9x	0.77	X	2.09	x	72.63	x	0.63	x	0.7	=	46.39	(75)
Northeast 0.9x	0.77	X	2.09	x	72.63	x	0.63	x	0.7	j =	46.39	(75)



Northeast 0.9x 0.77	X	2.09	X	50.42	x	0.63	x	0.7	=	32.21	(75)
Northeast 0.9x 0.77	X	2.09	X	50.42	x	0.63	x	0.7	=	32.21	(75)
Northeast 0.9x 0.77	X	2.09	X	50.42	x	0.63	x	0.7	=	32.21	(75)
Northeast 0.9x 0.77	x	2.09	X	50.42	X	0.63	x	0.7	=	32.21	(75)
Northeast 0.9x 0.77	X	2.09	X	28.07	X	0.63	X	0.7	=	17.93	(75)
Northeast 0.9x 0.77	X	2.09	X	28.07	x	0.63	X	0.7	=	17.93	(75)
Northeast 0.9x 0.77	X	2.09	X	28.07	X	0.63	X	0.7] =	17.93	(75)
Northeast 0.9x 0.77	X	2.09	X	28.07	x	0.63	X	0.7	=	17.93	(75)
Northeast 0.9x 0.77	X	2.09	X	14.2	X	0.63	X	0.7] =	9.07	(75)
Northeast 0.9x 0.77	X	2.09	X	14.2	X	0.63	X	0.7	=	9.07	(75)
Northeast 0.9x 0.77	x	2.09	X	14.2	X	0.63	X	0.7	=	9.07	(75)
Northeast 0.9x 0.77	X	2.09	X	14.2	X	0.63	X	0.7] =	9.07	(75)
Northeast 0.9x 0.77	×	2.09	X	9.21	X	0.63	X	0.7	=	5.89	(75)
Northeast 0.9x 0.77	x	2.09	X	9.21	X	0.63	X	0.7	=	5.89	(75)
Northeast 0.9x 0.77	X	2.09	X	9.21	X	0.63	X	0.7] =	5.89	(75)
Northeast 0.9x 0.77	X	2.09	X	9.21	x	0.63	X	0.7	=	5.89	(75)
Southwest _{0.9x} 0.77	x	4.39	X	36.79		0.63	x	0.7] =	49.36	(79)
Southwest _{0.9x} 0.77	X	6.71	X	36.79		0.63	X	0.7	=	75.45	(79)
Southwest _{0.9x} 0.77	×	2.83	X	36.79]	0.63	X	0.7	=	31.82	(79)
Southwest _{0.9x} 0.77	x	4.39	X	62.67		0.63	X	0.7] =	84.09	(79)
Southwest _{0.9x} 0.77	X	6.71	X	62.67]	0.63	X	0.7	=	128.52	(79)
Southwest _{0.9x} 0.77	×	2.83	X	62.67]	0.63	X	0.7	=	54.21	(79)
Southwest _{0.9x} 0.77	x	4.39	X	85.75		0.63	X	0.7] =	115.05	(79)
Southwest _{0.9x} 0.77	X	6.71	X	85.75		0.63	X	0.7] =	175.85	(79)
Southwest _{0.9x} 0.77	X	2.83	X	85.75]	0.63	X	0.7	=	74.17	(79)
Southwest _{0.9x} 0.77	x	4.39	X	106.25		0.63	X	0.7] =	142.55	(79)
Southwest _{0.9x} 0.77	X	6.71	X	106.25		0.63	X	0.7] =	217.89	(79)
Southwest _{0.9x} 0.77	X	2.83	X	106.25]	0.63	X	0.7	=	91.9	(79)
Southwest _{0.9x} 0.77	X	4.39	X	119.01		0.63	X	0.7	=	159.67	(79)
Southwest _{0.9x} 0.77	X	6.71	X	119.01]	0.63	X	0.7	=	244.05	(79)
Southwest _{0.9x} 0.77	X	2.83	X	119.01]	0.63	X	0.7	=	102.93	(79)
Southwest _{0.9x} 0.77	X	4.39	X	118.15]	0.63	X	0.7] =	158.51	(79)
Southwest _{0.9x} 0.77	X	6.71	X	118.15]	0.63	X	0.7	=	242.29	(79)
Southwest _{0.9x} 0.77	X	2.83	X	118.15		0.63	X	0.7	=	102.19	(79)
Southwest _{0.9x} 0.77	X	4.39	X	113.91		0.63	X	0.7	=	152.83	(79)
Southwest _{0.9x} 0.77	×	6.71	x	113.91]	0.63	x	0.7	=	233.59	(79)
Southwest _{0.9x} 0.77	×	2.83	x	113.91]	0.63	x	0.7] =	98.52	(79)
Southwest _{0.9x} 0.77	×	4.39	X	104.39]	0.63	x	0.7	=	140.05	(79)
Southwest _{0.9x} 0.77	×	6.71	x	104.39]	0.63	x	0.7	=	214.07	(79)
Southwest _{0.9x} 0.77	×	2.83	x	104.39]	0.63	x	0.7	=	90.29	(79)
Southwest _{0.9x} 0.77	X	4.39	x	92.85]	0.63	X	0.7	=	124.57	(79)



_		_		_		_				_		
Southwest _{0.9x}	0.77	X	6.71	X	92.85		0.63	X	0.7	=	190.41	(79)
Southwest _{0.9x}	0.77	X	2.83	X	92.85		0.63	X	0.7	=	80.31	(79)
Southwest _{0.9x}	0.77	X	4.39	X	69.27		0.63	X	0.7	=	92.93	(79)
Southwest _{0.9x}	0.77	X	6.71	X	69.27		0.63	X	0.7	=	142.04	(79)
Southwest _{0.9x}	0.77	X	2.83	x	69.27		0.63	x	0.7	=	59.91	(79)
Southwest _{0.9x}	0.77	X	4.39	X	44.07		0.63	x	0.7	=	59.13	(79)
Southwest _{0.9x}	0.77	X	6.71	X	44.07		0.63	x	0.7	=	90.37	(79)
Southwest _{0.9x}	0.77	X	2.83	x	44.07]	0.63	x	0.7	=	38.12	(79)
Southwest _{0.9x}	0.77	X	4.39	X	31.49		0.63	x	0.7	=	42.25	(79)
Southwest _{0.9x}	0.77	X	6.71	X	31.49		0.63	x	0.7	=	64.57	(79)
Southwest _{0.9x}	0.77	X	2.83	x	31.49		0.63	x	0.7	=	27.23	(79)
Northwest _{0.9x}	0.77	X	0.57	X	11.28	x	0.63	x	0.7	=	1.97	(81)
Northwest _{0.9x}	0.77	X	1.05	X	11.28	x	0.63	x	0.7	=	3.62	(81)
Northwest 0.9x	0.77	x	0.57	X	22.97	X	0.63	x	0.7	=	4	(81)
Northwest 0.9x	0.77	x	1.05	x	22.97	x	0.63	x	0.7	=	7.37	(81)
Northwest _{0.9x}	0.77	X	0.57	x	41.38	x	0.63	x	0.7	=	7.21	(81)
Northwest 0.9x	0.77	x	1.05	X	41.38	X	0.63	x	0.7	=	13.28	(81)
Northwest 0.9x	0.77	X	0.57	X	67.96	X	0.63	X	0.7] =	11.84	(81)
Northwest 0.9x	0.77	X	1.05	x	67.96	X	0.63	x	0.7] =	21.81	(81)
Northwest 0.9x	0.77	X	0.57	X	91.35	X	0.63	X	0.7] =	15.91	(81)
Northwest 0.9x	0.77	X	1.05	X	91.35	X	0.63	X	0.7] =	29.31	(81)
Northwest 0.9x	0.77	x	0.57	x	97.38	x	0.63	x	0.7	=	16.96	(81)
Northwest 0.9x	0.77	X	1.05	X	97.38	X	0.63	X	0.7	=	31.25	(81)
Northwest _{0.9x}	0.77	X	0.57	X	91.1	X	0.63	X	0.7	=	15.87	(81)
Northwest 0.9x	0.77	X	1.05	x	91.1	X	0.63	x	0.7] =	29.23	(81)
Northwest 0.9x	0.77	X	0.57	X	72.63	X	0.63	x	0.7] =	12.65	(81)
Northwest 0.9x	0.77	X	1.05	X	72.63	X	0.63	x	0.7] =	23.31	(81)
Northwest _{0.9x}	0.77	X	0.57	X	50.42	x	0.63	x	0.7	=	8.78	(81)
Northwest 0.9x	0.77	X	1.05	X	50.42	X	0.63	x	0.7] =	16.18	(81)
Northwest 0.9x	0.77	X	0.57	X	28.07	X	0.63	x	0.7	=	4.89	(81)
Northwest 0.9x	0.77	X	1.05	x	28.07	X	0.63	x	0.7] =	9.01	(81)
Northwest 0.9x	0.77	X	0.57	x	14.2	X	0.63	x	0.7] =	2.47	(81)
Northwest 0.9x	0.77	X	1.05	X	14.2	X	0.63	X	0.7	=	4.56	(81)
Northwest 0.9x	0.77	X	0.57	X	9.21	X	0.63	X	0.7	=	1.61	(81)
Northwest _{0.9x}	0.77	X	1.05	X	9.21	X	0.63	X	0.7	=	2.96	(81)
Rooflights _{0.9x}	1	X	10.53	x	20.24	X	0.63	x	0.7	=	84.57	(82)
Rooflights _{0.9x}	1	X	10.53	x	40.55	X	0.63	x	0.7	=	169.45	(82)
Rooflights _{0.9x}	1	x	10.53	x	74.78	x	0.63	x	0.7	=	312.52	(82)
Rooflights _{0.9x}	1	X	10.53	x	130.19	x	0.63	x	0.7	=	544.08	(82)
Rooflights _{0.9x}	1	X	10.53	x	183.82	X	0.63	x	0.7	=	768.22	(82)
Rooflights 0.9x	1	x	10.53	x	200.21	x	0.63	x	0.7	=	836.7	(82)



Roofligh	its 0.9x	1	х	10.	53	x	18	85.57	x		0.63	x	0.7	7	=	775.55	(82)
Roofligh	its _{0.9x}	1	х	10.	53	x	14	42.19	x		0.63	x	0.7	7	_ =	594.24	(82)
Roofligh	its _{0.9x}	1	X	10.	53	x	9	3.09	x		0.63	×	0.7	7	=	389.03	(82)
Roofligh	its _{0.9x}	1	X	10.	53	x	4	9.71	x		0.63	×	0.7	7	=	207.75	(82)
Roofligh	its _{0.9x}	1	x	10.	53	x	2	5.27	x		0.63	x	0.7	7	_ =	105.6	(82)
Roofligh	its 0.9x	1	x	10.	53	x	1	6.69	x		0.63	x	0.7	7	=	69.77	(82)
Solar g	ains in v	watts, ca	alculated	d for eac	h month				(83)m	n = Sı	um(74)m .	(82)m					
(83)m=	275.63	506.31	803.79	1203.68	1553.48	16	36.71	1538.34	1260	0.17	938.1	588.2	4 336.5	52	231.92		(83)
Total ga	ains – ir	nternal a	nd sola	r (84)m =	(73)m -	+ (8	33)m	, watts		•			•	•		-	
(84)m=	772.01	1000.43	1280.4	1651.65	1971.25	20	25.61	1909.22	1638	8.34	1331.71	1010.	71 792.	2	713.15		(84)
7. Mea	an inter	nal temp	erature	(heating	season)							·				
				periods in		,	area f	from Tab	ole 9.	. Th	1 (°C)					21	(85)
•		•	٥.	living are		•				,	. (•)						(33)
Г	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oc	i No	νT	Dec]	
(86)m=	1	0.99	0.98	0.89	0.69	⊢	0.48	0.36	0.4	 	0.74	0.96	-	+	1		(86)
` ' L				<u> </u>		l									•		
г				living are						\neg			.			1	(07)
(87)m=	19.72	19.94	20.29	20.71	20.93	2	0.99	21	2	1	20.93	20.5	20.0	5	19.68		(87)
Tempe	erature	during h	eating p	periods in	rest of	dw	elling	from Ta	ble 9	9, Tł	n2 (°C)					,	
(88)m=	19.96	19.96	19.96	19.97	19.97	1	9.98	19.98	19.	98	19.98	19.9	19.9	7	19.97		(88)
Utilisa	tion fac	tor for ga	ains for	rest of d	welling, l	h2,	m (se	e Table	9a)								
(89)m=	1	0.99	0.97	0.86	0.63		0.41	0.27	0.3	34	0.65	0.95	0.99)	1		(89)
Mean	internal	temner	ature in	the rest	of dwelli	na	T2 (f	allow ste	ne 3	to 7	7 in Tahl	a 9c)				•	
(90)m=	18.25	18.57	19.07	19.65	19.91	-	9.97	19.98	19.	_	19.93	19.4	18.7	₄ T	18.19]	(90)
` ′ L				1		<u> </u>					f	LA = Li	ving area	÷ (4)) =	0.47	(91)
										4.						V	`
Г			· `	or the wh		_			<u> </u>			40.0	, 400	<u>. T</u>	40.00	1	(02)
(92)m=	18.93	19.21	19.64	20.14	20.39		0.45	20.45	20.	!	20.4	19.9		5	18.89		(92)
(93)m=	18.93	19.21	19.64	n internal	20.39	_	0.45	20.45	4e, 20.	$\overline{}$	20.4	19.9		<u>. T</u>	18.89	l	(93)
		ting requ			20.00		0.40	20.43	20.	70	20.4	13.3	10.0	<u> </u>	10.00		(66)
•				mperatui	re ohtain	مما	at sta	an 11 of	Tahl	Ah ما	so tha	t Ti m	-(76)m	and	l re-cald	rulate	
				using Ta		ica	at st	SP 11 01	Tabi	10 01), 50 tria		-(70)111	aria	i i c oaic	diato	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oc	i No	v	Dec		
Utilisa	tion fac	tor for g	ains, hm	n:						•			•	•		_	
(94)m=	1	0.99	0.96	0.86	0.65	(0.44	0.31	0.3	38	0.69	0.95	0.99)	1		(94)
Usefu	l gains,	hmGm ,	W = (9	4)m x (8	4)m											-	
(95)m=	769.96	991.2	1234.97	1421.98	1288.13	89	99.45	597.16	625	.37	916.32	957.6	7 786.9	95	711.85		(95)
Month	ly avera	age exte	rnal ten	perature	from Ta	abl	e 8									,	
(96)m=	4.3	4.9	6.5	8.9	11.7	Ľ	14.6	16.6	16	.4	14.1	10.6	7.1		4.2		(96)
				nal tempe		_			_ <u>-</u> `		<u> </u>					1	
L				1761.69			07.82	598.25	628		980.65	1466.		.8	2313.83		(97)
				r each n		//h			$\overline{}$	Ť			` 	_		1	
(98)m=	1155.16	857.12	626.97	244.59	53.2		0	0	0)	0	378.3	9 817.8	31	1191.87		



Space heating requirement in kWh/m³/year Suni(88), 5325.1 (98)													_
Salign S							Tota	l per year	(kWh/year	r) = Sum(9	98) _{15,912} =	5325.1	(98)
Fraction of space heat from main system secondary/supplementary system	Space heating require	ement in	kWh/m²	²/year								38.65	(99)
Fraction of space heat from secondary/supplementary system	9a. Energy requiremer	nts – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system (s) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =	•			/									7(004)
Color Colo	-				ementary	-	(202) – 1	(201) -					= ' '
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Space heating Space Space	·		-	, ,			, ,	, ,	(202)1				╡` ′
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year		_	-				(204) = (2	02) x [1 –	(203)] =				╡` ′
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above)			•			- 0/							╡` ′
Space heating requirement (calculated above) 1155.16 857.12 826.97 244.99 53.2 0 0 0 0 378.39 817.81 1191.87	-	· · ·	1	·	· ·	_				1			`
1155.16		<u> </u>				Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
(211)m = {{([98)m x (204)] } x 100 ÷ (206)} (211)	· -	 	1			l 0	0	0	378 39	817.81	1191 87	1	
1236.78 917.68 671.28 261.87 56.96 0 0 0 0 405.13 875.6 1276.1		l		L					1 070.00	017.01	1101.07		(211)
Total (kWh/year) = Sum(211), x, x, x, z,			1	i	0	0	0	0	405.13	875.6	1276.1		(211)
(198) m x (201)]				<u> </u>	<u> </u>	<u> </u>			ar) =Sum(2			5701.4	(211)
Carried Carr	Space heating fuel (s	econdar	y), kWh/	month									
Total (kWh/year) = Sum(215) Lass_0.cf 0 (215)			• , .					_					
Water heating Output from water heater (calculated above) 219.59 193.52 203.15 182 176.84 155.75 149.22 166.34 167.53 188.73 199.71 214.27 Efficiency of water heater 80.3 (216) (217)m= 88.62 88.35 87.7 85.8 82.43 80.3 80.3 80.3 80.3 86.77 88.22 88.7 (217) Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= (247.79 219.03 231.65 212.13 214.53 193.96 185.83 207.15 208.64 217.51 226.37 241.57 Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: 30 (230c) boiler with a fan-assisted flue 45 (230e) Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) Electricity for lighting 483.11 (232) 12a. CO2 emissions – Individual heating systems including micro-CHP	(215)m= 0 0	0	0	0	0	0							_
Output from water heater (calculated above) 219.59 193.52 203.15 182 176.84 155.75 149.22 166.34 167.53 188.73 199.71 214.27 Efficiency of water heater							Tota	ıl (kWh/ye	ar) =Sum(2	215) _{15,101}	2=	0	(215)
219.59 193.52 203.15 182 176.84 155.75 149.22 166.34 167.53 188.73 199.71 214.27													
Efficiency of water heater (217)m= 88.62 88.35 87.7 85.8 82.43 80.3 80.3 80.3 80.3 86.77 88.22 88.7 Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 247.79 219.03 231.65 212.13 214.53 193.96 185.83 207.15 208.64 217.51 226.37 241.57 Total = Sum(219a) Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: 5701.4 Water heating pump: 5701.4 Water heating pump: 5701.4 Water heating fuel used Electricity for the above, kWh/year Sum of (230a)(230g) = 75 (231) Electricity for lighting Energy KWh/year Emission factor kg CO2/kWh Emissions kg CO2/year		ĭ			155.75	149 22	166 34	167 53	188 73	199 71	214 27		
(217) m=			102	170.01	100.70	1 10.22	100.01	107.00	100.70	100.71	211.21	80.3	(216)
(219)m = (64)m x 100 ÷ (217)m (219)m = 247.79 219.03 231.65 212.13 214.53 193.96 185.83 207.15 208.64 217.51 226.37 241.57 Total = Sum(219a) = 2606.15 (219) 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 Sum of (230a)(230g) = 75 (231) Electricity for lighting 12a. CO2 emissions – Individual heating systems including micro-CHP Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/year	<u> </u>		85.8	82.43	80.3	80.3	80.3	80.3	86.77	88.22	88.7		
247.79 219.03 231.65 212.13 214.53 193.96 185.83 207.15 208.64 217.51 226.37 241.57	Fuel for water heating,	kWh/m	onth	ļ	!	ļ		<u> </u>	!	!	!		
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 Sum of (230a)(230g) = Electricity for lighting Total electricity for lighting Energy kWh/year Total = Sum(219a)2 = 2606.15 (219) kWh/year kWh/year Emission factor kg CO2/kWh kg CO2/year			1	l					T	l	Ī	Ī	
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 Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/year	(219)m= 247.79 219.03	231.65	212.13	214.53	193.96	185.83				226.37	241.57	0000.45	7(242)
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 Energy kWh/year Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/year	Annual totala						TOTA	ii = Suiii(2		Mbbaa	_		 `
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 Energy kWh/year Energy kg CO2/kWh Energy kg CO2/kWh		ed, main	system	1					K	wii/yeai			<u>'</u>
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 Energy kWh/year Energy kg CO2/kWh Energy kg CO2/kWh	Water heating fuel use	ed.	•									2606.15	╡
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kg CO2/kWh Energy kg CO2/kWh Energy kg CO2/year	_		electric	keen-ho	t								
boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kWh/year Energy kWh/year Energy kWh/year Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/year			Cicotiio	коор по	•							Ī	(2200)
Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) Electricity for lighting 483.11 (232) 12a. CO2 emissions – Individual heating systems including micro-CHP Energy kWh/year Emission factor kg CO2/kWh kg CO2/year											30		
Electricity for lighting 12a. CO2 emissions – Individual heating systems including micro-CHP Energy Emission factor kg CO2/kWh Emissions kg CO2/year	boiler with a fan-assis	sted flue									45		(230e)
12a. CO2 emissions – Individual heating systems including micro-CHP Energy Emission factor kg CO2/kWh kg CO2/year	Total electricity for the	above, I	kWh/yea	ır			sum	of (230a)	(230g) =			75	(231)
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year	Electricity for lighting											483.11	(232)
kWh/year kg CO2/kWh kg CO2/year	12a. CO2 emissions	– Individ	lual heat	ing syste	ems inclu	uding mi	cro-CHF)					
											tor		
	Space heating (main s	ystem 1)		(21	1) x			0.2	16	=	1231.5	(261)



Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	562.93	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1794.43	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	250.74	(268)
Total CO2, kg/year	sum	of (265)(271) =		2084.09	(272)

TER = 15.13 (273)