

			User L	Details:									
User Details:         Assessor Name:       Stroma Number:         Software Name:       Stroma FSAP 2012       Software Version:       Version: 1.0         Property Address:       Flat 1 - Baseline													
Software Name:	Versic	on: 1.0.1.32											
		Baselin	е										
Address :	•	lest End Lane,	London,	NW6 4Q	J								
1. Overall dwelling dime	ISIONS:		<b>A</b> # <b>a</b>	e (me 2)		Av. He	: o: la 4 ( ma )			4			
Ground floor				<b>a(m²)</b> 39.19	(1a) x	-	<b>ight(m)</b> .35	(2a) =	<b>Volume(m</b> <sup>3</sup> 209.6	(3a)			
Total floor area TFA = (1a	)+(1b)+(1c)+	(1d)+(1e)+(	1n) 8	39.19	(4)								
Dwelling volume	209.6	(5)											
2. Ventilation rate:	main	second		other		total							
	m <sup>3</sup> per hou	r											
Number of chimneys	0	(6a)											
Number of open flues	0	+ 0	+	0	-   =	0	x	20 =	0	(6b)			
Number of intermittent far	IS IS					3	x ′	10 =	30	(7a)			
Number of passive vents						0	x /	10 =	0	(7b)			
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)			
Number of flueless gas fires     0     x 40 =     0       Air changes per													
Infiltration due to chimney	0.14	(8)											
Number of storeys in th			, ou to (117),				,		0	(9)			
Additional infiltration							[(9)	-1]x0.1 =	0	(10)			
Structural infiltration: 0.	25 for steel o	r timber frame	or 0.35 fo	r masoni	ry constr	uction			0	(11)			
if both types of wall are pro deducting areas of openin			to the grea	ter wall are	a (after								
If suspended wooden fl			0.1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, ent	er 0.05, else (	enter 0	,	,					0	(13)			
Percentage of windows	and doors dr	aught stripped							0	(14)			
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)			
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)			
Air permeability value, o	φ50, expresse	ed in cubic met	res per ho	our per s	quare m	etre of e	nvelope	area	5.849999904632	57 <mark>(17)</mark>			
If based on air permeabili									0.44	(18)			
Air permeability value applies		on test has been d	one or a de	gree air pe	rmeability	is being u	sed						
Number of sides sheltered Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19) (20)			
Infiltration rate incorporati	ng shelter fac	tor		(21) = (18					0.37	(21)			
Infiltration rate modified for	-								0.07				
	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]				
Monthly average wind spe	ed from Tabl	e 7	-		. <u> </u>				1				
	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7					
Wind Factor (22a)m = (22	)m ÷ 4	L I					8						
	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]				



Adjuste	ed infiltra	ation rat	e (allow	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
	0.47	0.46	0.45	0.41	0.4	0.35	0.35	0.34	0.37	0.4	0.42	0.44		
		<i>ctive air</i> al ventila	•	rate for t	he appli	cable ca	se			-		-	-	(00-)
				endix N, (2	(23a) – (23a	a) v Emv (a	auation (N	(5)) othe	rwise (23h	) – (23a)			0	
		• •	0 11	ciency in %	, (	, (		<i>,, ,</i>	``	) – (200)			0	
			-	-	-					2b)m i (f	00h) v [/	1 (220)	0	(23c)
(24a)m=				entilation				0	$\frac{1}{0} = \frac{1}{2}$	0	23D) X [	1 - (230)	] ]	(24a)
		-		I ° entilation	-	-	-				-	0		(=,
(24b)m=								0	$\int \int \int \int \partial \nabla $	0	230)	0	1	(24b)
	-	-		ntilation of	•	•	-		ů	Ŭ			J	(= ···)
,				then (24	•	•				5 × (23b	)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If	natural	ventilatio	on or wh	nole hous	e positiv	/e input	ventilatio	on from I	oft				1	
i	f (22b)n	n = 1, th	en (24d)	)m = (22l	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		•	•	
(24d)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(24d)
Effec	ctive air	change	rate - ei	nter (24a	) or (24t	o) or (24	c) or (24	d) in bo	k (25)				•	
(25)m=	0.61	0.61	0.6	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.59		(25)
3. He	at l <mark>osse</mark>	s and he	at loss	paramet	er:									
ELEN		Gros		Openin		Net Ar		U-val		AXU		k-value		AXk
_		area	(m²)	rr	12	A ,r		W/m2	2K	(VV/I	<)	kJ/m²•	K	kJ/K
Doors	_					1.92		1	= [	1.92				(26)
	ws Type					3.27		/[1/( 1.4 )+	La	4.34				(27)
Windov	ws Type	e 2				1.92	X1/	/[1/( 1.4 )+	0.04] =	2.55				(27)
Window	ws Type	93				3.65	x1,	/[1/( 1.4 )+	0.04] =	4.84				(27)
Window	ws Type	94				0.726	β <mark>χ1</mark> ,	/[1/( 1.4 )+	0.04] =	0.96				(27)
Window	ws Type	9 5				4.55	x1,	/[1/( 1.4 )+	0.04] =	6.03				(27)
Rooflig	hts					4.29	x1,	/[1/(1.4) +	0.04] =	6.006				(27b)
Floor						89.19	) X	0.13	=	11.5947	7			(28)
Walls 7	Гуре1	82.4	8	20.6	6	61.82	<u>2</u> x	0.18	=	11.13			<b>-</b>	(29)
Walls 1	Гуре2	42.3	3	1.92	2	40.38	3 X	0.17	= [	6.75	ז ר		ΞĒ	(29)
Roof		23.0	3	4.29	)	18.74	1 X	0.13	= [	2.44	i T		Ξ F	(30)
Total a	rea of e	lements	, m²			237								(31)
Party c	eiling					66.16	3				Γ			(32b)
•	-	roof wind	ows, use e	effective wi	ndow U-va			formula 1	/[(1/U-valu	ie)+0.04] a	L Is given in	paragraph	L h 3.2	` `
				nternal wal	ls and par	titions	-							
		s, W/K :	•	U)				(26)(30)	) + (32) =				66	.9 (33)
Heat c		Cm = S(	. ,						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
			10 × /TN/			n kJ/m²K			Indico	tive Value:	Modium		25	0 (35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K

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	s of therma abric he		are not kn	own (36) =	= 0.15 x (3	1)			(33) +	(36) =			89.36	(37)
			alculated	l monthly	v						25)m x (5)		09.00	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(38)m=	42.29	41.99	41.7	40.32	40.06	38.86	38.86	38.64	39.33	40.06	40.58	41.13		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m		•	
(39)m=	131.65	131.35	131.06	129.68	129.42	128.22	128.22	128	128.69	129.42	129.95	130.49		
Heat l	nss nara	meter (H	HLP), W/	m²k	-					Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	129.68	(39)
(40)m=	1.48	1.47	1.47	1.45	1.45	1.44	1.44	1.44	1.44	1.45	1.46	1.46	]	
			I		I		I		/	L Average =	Sum(40)1.	12 /12=	1.45	(40)
Numb	er of day	vs in mo	nth (Tab	le 1a)				-					1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requi	irement:								kWh/y	ear:	
Assum	ned occu	ipancy.	N								2	61	1	(42)
if TF	A > 13.	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		01	J	( )
	A £ 13.9		tor uso	no in litre	ne nor de	w Vd av	orago –	(25 x N)	1.26				1	(40)
								to achieve		se target o		.29		(43)
not mor	e that 125	litres p <mark>er j</mark>	person per	<sup>•</sup> day (all w	vater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	1 <mark>0</mark> 5.92	102.07	98.22	94.37	90.52	86.66	86.66	90.52	94.37	98.22	102.07	105.92		_
Energy	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x D	)Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1155.52	(44)
(45)m=	157.08	137.38	141.77	123.6	118.59	102.34	94.83	108.82	110.12	128.33	140.09	152.12		
If inctor	tonoouou	ator booti	na ot noint	of upp /m	hat wata	c otorogo)	ontor 0 in	haven (16		Total = Su	m(45) <sub>112</sub> =	-	1515.07	(45)
	r	i						boxes (46)					1	(40)
(46)m= Water	23.56 storage	20.61	21.27	18.54	17.79	15.35	14.22	16.32	16.52	19.25	21.01	22.82		(46)
	-		includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0	]	(47)
If com	munity h	eating a	ind no ta	nk in dw	velling, e	nter 110	litres in	(47)					1	
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	storage					. /1 \ \ /1	(1-1						1	
			eclared I		or is kno	wn (kvvr	n/day):					0	]	(48)
-			m Table					(40) (40)				0		(49)
Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not know								(48) x (49)	) =			0		(50)
Hot water storage loss factor from Table 2 (kWh/litre/day)												0	]	(51)
If community heating see section 4.3 Volume factor from Table 2a														
				<b>2</b> h								0		(52)
			m Table					(47) (	(50)	50)		0	]	(53)
-	y lost fro (50) or (		storage	, KVVh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54) (55)
LING	(00) 01	(J-1) III (C	50)									0	J	(55)

Water storage loss calculated for each month $((56)m = (55) \times (41))$	n		
(56)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)	m where (H11) is fro	m Appendix H	
(57)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)m$			
(modified by factor from Table H5 if there is solar water heating and a cylind	r thermostat)		
(59)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$			
(61)m= 50.96 46.03 50.05 46.54 46.13 42.74 44.16 46.13 46.54	50.05 49.32	50.96	(61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times$	45)m + (46)m +	(57)m + (59)ı	m + (61)m
(62)m= 208.04 183.41 191.82 170.13 164.72 145.08 138.99 154.95 156.66	178.39 189.4	203.08	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no sol	r contribution to wate	er heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)			
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(63)
Output from water heater			
(64)m= 208.04 183.41 191.82 170.13 164.72 145.08 138.99 154.95 156.66	178.39 189.4	203.08	
Output from v	ater heater (annual)	12	2084.67 (64)
Heat gains from water heating, kWh/month 0.25 $^{2}$ [0.85 x (45)m + (61)m] + 0.8	x [(46)m + (57)m	+ (59)m ]	
(65)m= 64.97 57.19 59.65 52.73 50.96 44.71 42.57 47.71 48.25	55.18 58.91	63.32	(65)
	33.10 30.31	00.02	()
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot			
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot v 5. Internal gains (see Table 5 and 5a):			
5. Internal gains (see Table 5 and 5a):			
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	ater is from com	munity heatin	
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep	ater is from com	munity heatin	g
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m=	ater is from com	munity heatin	g
5. Internal gains (see Table 5 and 5a):           Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep           (66)m=         130.72	Oct         Nov           130.72         130.72           17.5         20.42	Dec 130.72	g (66)
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m=       130.72       <	Oct         Nov           130.72         130.72           17.5         20.42	Dec 130.72	g (66)
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m= 130.72 130.72 130.72 130.72 130.72 130.72 130.72 130.72 130.72         Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5         (67)m=       21.18         18.81       15.3         11.58       8.66       7.31       7.9         10.27       13.78         Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5         (68)m=       237.58       240.04       233.83       220.61       203.91       188.22       177.74       175.27       181.48	Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71	Dec 130.72 21.77	g (66) (67)
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m= 130.72 130.72 130.72 130.72 130.72 130.72 130.72 130.72         Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5         (67)m=       21.18         18.81       15.3         11.58       8.66         7.31       7.9         10.27       13.78         Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71	Dec 130.72 21.77	g (66) (67)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5</td> <td>Dec 130.72 21.77 227.1</td> <td>g (66) (67) (68)</td>	Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5	Dec 130.72 21.77 227.1	g (66) (67) (68)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5</td> <td>Dec 130.72 21.77 227.1</td> <td>g (66) (67) (68)</td>	Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5	Dec 130.72 21.77 227.1	g (66) (67) (68)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07</td> <td>Dec           130.72           21.77           227.1           36.07</td> <td>g (66) (67) (68) (69)</td>	Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07	Dec           130.72           21.77           227.1           36.07	g (66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07</td> <td>Dec           130.72           21.77           227.1           36.07</td> <td>g (66) (67) (68) (69)</td>	Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07	Dec           130.72           21.77           227.1           36.07	g (66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       130.73       16.67	ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       211.41         5       36.07       36.07         36.07       36.07       36.07	Dec           130.72           21.77           227.1           36.07           3	g (66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       130.73       1607	ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       211.41         5       36.07       36.07         36.07       36.07       36.07	Dec           130.72           21.77           227.1           36.07           3	g (66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82</td> <td>Dec           130.72           21.77           227.1           36.07           3           -104.58           85.11</td> <td>g (66) (67) (68) (69) (70) (71)</td>	Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82	Dec           130.72           21.77           227.1           36.07           3           -104.58           85.11	g (66) (67) (68) (69) (70) (71)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       13.78       Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 68)       (68)m=       237.58       240.04       233.83       220.61 <t< td=""><td>Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82</td><td>Dec           130.72           21.77           227.1           36.07           3           -104.58           85.11</td><td>g (66) (67) (68) (69) (70) (71)</td></t<>	Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82	Dec           130.72           21.77           227.1           36.07           3           -104.58           85.11	g (66) (67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a 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	0.73	×	11.28	x	0.76	x	0.7	=	3.02	(75)
Northeast 0.9x	0.77	x	0.73	x	22.97	x	0.76	x	0.7	=	6.15	(75)
Northeast 0.9x	0.77	x	0.73	x	41.38	x	0.76	x	0.7	=	11.08	(75)
Northeast 0.9x	0.77	x	0.73	x	67.96	x	0.76	x	0.7	=	18.19	(75)
Northeast 0.9x	0.77	x	0.73	x	91.35	x	0.76	x	0.7	=	24.45	(75)
Northeast 0.9x	0.77	x	0.73	x	97.38	x	0.76	x	0.7	=	26.07	(75)
Northeast 0.9x	0.77	x	0.73	x	91.1	x	0.76	x	0.7	=	24.38	(75)
Northeast 0.9x	0.77	x	0.73	x	72.63	x	0.76	x	0.7	=	19.44	(75)
Northeast 0.9x	0.77	x	0.73	x	50.42	x	0.76	x	0.7	=	13.5	(75)
Northeast 0.9x	0.77	x	0.73	x	28.07	x	0.76	x	0.7	=	7.51	(75)
Northeast 0.9x	0.77	x	0.73	x	14.2	x	0.76	x	0.7	=	3.8	(75)
Northeast 0.9x	0.77	x	0.73	x	9.21	x	0.76	x	0.7	=	2.47	(75)
Southeast 0.9x	0.77	x	4.55	x	36.79	x	0.76	x	0.7	=	61.72	(77)
Southeast 0.9x	0.77	x	4.55	x	62.67	x	0.76	x	0.7	=	105.13	(77)
Southeast 0.9x	0.77	x	4.55	x	85.75	x	0.76	x	0.7	=	143.85	(77)
Southeast 0.9x	0.77	x	4.55	×	106.25	х	0.76	х	0.7	=	178.23	(77)
Southeast 0.9x	0.77	x	4.55	x	119.01	x	0.76	x	0.7	=	199.64	(77)
Southeast 0.9x	0.77	x	4.55	х	118.15	×	0.76	x	0.7	=	198.19	(77)
Southeast 0.9x	0.77	x	4.55	x	113.91	x	0.76	x	0.7	=	191.08	(77)
Southeast 0.9x	0.77	x	4.55	x	104.39	x	0.76	x	0.7	=	175.11	(77)
Southeast 0.9x	0.77	x	4.55	x	92.85	x	0.76	x	0.7	=	155.76	(77)
Southeast 0.9x	0.77	x	4.55	x	69.27	x	0.76	x	0.7	=	1 <mark>16.19</mark>	(77)
Southeast 0.9x	0.77	x	4.55	x	44.07	x	0.76	x	0.7	=	73.93	(77)
Southeast 0.9x	0.77	x	4.55	x	31.49	x	0.76	x	0.7	=	52.82	(77)
Southwest0.9x	••••	x	3.65	x	36.79		0.76	x	0.7	=	49.51	(79)
Southwest0.9x	0.77	x	3.65	x	62.67		0.76	x	0.7	=	84.34	(79)
Southwest0.9x	0.77	x	3.65	x	85.75		0.76	x	0.7	=	115.39	(79)
Southwest0.9x	0.77	x	3.65	x	106.25		0.76	x	0.7	=	142.98	(79)
Southwest0.9x	0.77	x	3.65	x	119.01		0.76	x	0.7	=	160.15	(79)
Southwest0.9x	0.77	x	3.65	x	118.15		0.76	x	0.7	=	158.99	(79)
Southwest0.9x		x	3.65	x	113.91		0.76	x	0.7	=	153.28	(79)
Southwest0.9x		x	3.65	x	104.39		0.76	x	0.7	=	140.47	(79)
Southwest0.9x	_	x	3.65	x	92.85		0.76	x	0.7	=	124.95	(79)
Southwest0.9x	0.77	x	3.65	x	69.27		0.76	x	0.7	=	93.21	(79)
Southwest0.9x		x	3.65	x	44.07		0.76	x	0.7	=	59.3	(79)
Southwest0.9x		x	3.65	x	31.49		0.76	x	0.7	=	42.37	(79)
Northwest 0.9x		x	3.27	×	11.28	x	0.76	x	0.7	=	40.81	(81)
Northwest 0.9x		x	1.92	×	11.28	x	0.76	x	0.7	=	7.99	(81)
Northwest 0.9x	0.77	x	3.27	×	22.97	x	0.76	x	0.7	=	83.06	(81)



Northwest 0.9x	0.77	x	1.92	x	22.97	x	0.76	x	0.7	=	16.26	(81)
Northwest 0.9x	0.77	x	3.27	x	41.38	x	0.76	x	0.7	=	149.66	(81)
Northwest 0.9x	0.77	x	1.92	x	41.38	x	0.76	x	0.7	=	29.29	(81)
Northwest 0.9x	0.77	x	3.27	x	67.96	x	0.76	x	0.7	=	245.78	(81)
Northwest 0.9x	0.77	x	1.92	x	67.96	x	0.76	x	0.7	=	48.1	(81)
Northwest 0.9x	0.77	x	3.27	x	91.35	x	0.76	x	0.7	=	330.37	(81)
Northwest 0.9x	0.77	x	1.92	x	91.35	x	0.76	x	0.7	=	64.66	(81)
Northwest 0.9x	0.77	x	3.27	x	97.38	x	0.76	x	0.7	=	352.21	(81)
Northwest 0.9x	0.77	x	1.92	x	97.38	x	0.76	x	0.7	=	68.93	(81)
Northwest 0.9x	0.77	x	3.27	x	91.1	x	0.76	x	0.7	=	329.49	(81)
Northwest 0.9x	0.77	x	1.92	x	91.1	x	0.76	x	0.7	=	64.49	(81)
Northwest 0.9x	0.77	x	3.27	x	72.63	x	0.76	x	0.7	=	262.67	(81)
Northwest 0.9x	0.77	x	1.92	x	72.63	x	0.76	x	0.7	=	51.41	(81)
Northwest 0.9x	0.77	x	3.27	x	50.42	x	0.76	x	0.7	=	182.36	(81)
Northwest 0.9x	0.77	x	1.92	x	50.42	x	0.76	x	0.7	=	35.69	(81)
Northwest 0.9x	0.77	x	3.27	x	28.07	x	0.76	x	0.7	=	101.51	(81)
Northwest 0.9x	0.77	x	1.92	x	28.07	x	0.76	x	0.7	=	19.87	(81)
Northwest 0.9x	0.77	x	3.27	×	14.2	х	0.76	x	0.7	=	51.35	(81)
Northwest 0.9x	0.77	x	1.92	x	14.2	x	0.76	x	0.7	=	10.05	(81)
Northwest 0.9x	0.77	x	3.27	x	9.21	×	0.76	x	0.7	=	33.33	(81)
Northwest 0.9x	0.77	x	1.92	x	9.21	x	0.76	x	0.7	=	6.52	(81)
Rooflights 0.9x	1	x	4.29	x	26	х	0.76	x	0.7	=	53.41	(82)
Rooflights 0.9x	1	x	4.29	x	54	x	0.76	x	0.7	=	110.92	(82)
Rooflights 0.9x	1	x	4.29	x	96	x	0.76	x	0.7	=	197.19	(82)
Rooflights 0.9x	1	x	4.29	x	150	x	0.76	x	0.7	=	308.11	(82)
Rooflights 0.9x	1	x	4.29	x	192	x	0.76	x	0.7	=	394.38	(82)
Rooflights 0.9x	1	x	4.29	x	200	x	0.76	x	0.7	=	410.81	(82)
Rooflights 0.9x	1	x	4.29	x	189	x	0.76	x	0.7	=	388.22	(82)
Rooflights 0.9x	1	x	4.29	x	157	x	0.76	x	0.7	=	322.49	(82)
Rooflights 0.9x	1	x	4.29	x	115	x	0.76	x	0.7	=	236.22	(82)
Rooflights 0.9x	1	x	4.29	x	66	x	0.76	x	0.7	=	135.57	(82)
Rooflights 0.9x	1	x	4.29	x	33	x	0.76	x	0.7	=	67.78	(82)
Rooflights 0.9x	1	x	4.29	x	21	x	0.76	x	0.7	=	43.14	(82)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	216.45	405.86	646.45	941.39	1173.65	1215.21	1150.94	971.59	748.46	473.86	266.21	180.64		(83)
Total g	ains – ir	nternal a	ind solar	<sup>-</sup> (84)m =	= (73)m -	⊦ (83)m	, watts							
(84)m=	627.75	815.03	1040.98	1312.03	1519.93	1538.05	1459.01	1286.48	1075.96	825.46	645.07	579.83		(84)
7. Me	an inter	nal temp	erature	(heating	season	)								
Temp	erature	during h	leating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(86)m=	1	0.99	0.96	0.87	0.7	0.52	0.38	0.45	0.72	0.95	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	19.44	19.7	20.1	20.58	20.87	20.97	20.99	20.99	20.89	20.44	19.84	19.39		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	19.71	19.71	19.71	19.72	19.72	19.73	19.73	19.74	19.73	19.72	19.72	19.72		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)		-				
(89)m=	0.99	0.98	0.95	0.83	0.63	0.42	0.27	0.33	0.63	0.92	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ina T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.66	18.04	18.63	19.27	19.61	19.72	19.73	19.73	19.66	19.11	18.26	17.6		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	A x T1	+ (1 – fL	A) x T2					
(92)m=	18.27	18.61	19.13	19.71	20.04	20.15	20.16	20.16	20.08	19.56	18.79	18.21		(92)
Apply	adjustr	nent to t	he mear	internal	l temper	i ature fro	n Table	e 4e, whe	ere appro	opriate				
(93)m=	18.27	18.61	19.13	19.71	20.04	20.15	20.16	20.16	20.08	19.56	18.79	18.21		(93)
8. Sp	ace hea	ting requ	uirement					<u>-</u>						
						ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation			using Ta	i									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0.05	0.45	0.01	0.07	0.05	0.00	0.00	0.00		(94)
(94)m=	0.99	0.98	0.94	0.83	0.65	0.45	0.31	0.37	0.65	0.92	0.98	0.99		(94)
(95)m=	622.88	798. <mark>0</mark> 2	, VV = (94 978.92	4)m x (84 109 <mark>2.9</mark>	989.51	696.07	454.39	476.52	704.41	75 <mark>6.3</mark> 9	634.59	576.51		(95)
				perature			404.00	470.52	704.41	730.33	004.00	570.51		(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)
								x [(93)m						( )
		r	r	1402.35	r	r	456.73	481.27	769.02	1159.7	1519.52	1828.53		(97)
Space	e heatin	g require	ement fo	r each n	ı nonth, k'	I Wh/moni	L th = 0.02	24 x [(97)	ı )m – (95	)m] x (4				
(98)m=	904.53	673.58	503.11	222.81	66.72	0	0	0	0	300.06	, 637.15	931.5		
								Tota	l per year	(kWh/year	·) = Sum(9	8)15,912 =	4239.45	(98)
Space	e heatin	a reauire	ement in	kWh/m <sup>2</sup>	?/vear								47.53	(99)
		• •			•	vetome i	ncluding	j micro-C	עםי/					
	e heatir			iviuuai n	eating s	ysterns i	nciuuing	f micro-c	, , , ,					
		-	at from s	econdar	y/supple	mentary	system						0	(201)
	-			nain syst			-	(202) = 1 -	– (201) =			·	1	(202)
	•			main sys				(204) = (2	02) × [1 –	(203)] =			1	(204)
			0	ing syste					- / 1	(/]			89.8	(206)
	•			• •		a ovotom	. 0/							
EIIICIE		i	1		- I	g system	i	1					0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space		ř ·	r ·		1						007.45	004.5		
	904.53	673.58	503.11	222.81	66.72	0	0	0	0	300.06	637.15	931.5		
(211)m			1	00 ÷ (20	· ·					004.11	700 -0	4007.04		(211)
	1007.27	750.08	560.25	248.12	74.3	0	0			334.14	709.52	1037.31		
								rota		ar) ≓Oum(2	211) <sub>15,1012</sub>		4720.99	(211)



Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)							
(215)m= 0 0 0 0 0	0 0	0 0	0	0	0		
		Total (kWh	/year) =Sum(:	2 <b>15)</b> <sub>15,101</sub>	2=	0	(215)
Water heating							
Output from water heater (calculated above)           208.04         183.41         191.82         170.13         164.72         1	145.08 138.99	154.95 156.	66 178.39	189.4	203.08	l	
Efficiency of water heater	140.00 100.99	104.95 100.	170.39	109.4	203.00	80.5	(216)
	80.5 80.5	80.5 80.	5 86.09	87.48	87.98	00.0	(217)
Fuel for water heating, kWh/month							
(219)m = (64)m x 100 ÷ (217)m		· · · · ·				I	
(219)m= 236.67 209.29 220.42 198.94 198.51 1	180.22 172.66	192.48 194		216.5	230.83		_
		Total = Su	m(219a) <sub>112</sub> =			2458.33	(219)
Annual totals			k	Wh/yea	r	kWh/year	–
Space heating fuel used, main system 1						4720.99	
Water heating fuel used						2458.33	
Electricity for pumps, fans and electric keep-hot							
central heating pump:					30		(230c)
Total electricity for the above, kWh/year		sum of (23	0a)(2 <mark>3</mark> 0g) =			30	(231)
Elec <mark>tricity</mark> for lighting						3 <mark>74.05</mark>	(232)
12a. CO2 emissions – Individual heating system	s including mi	cro-CHP					
	Francis		Ei.e.e	lan faa	1	<b>F</b> uele el eur	
	Energy kWh/year		kg CO	ion fac 2/k\//b	tor	Em <mark>issio</mark> ns kg CO2/yea	
Space heating (main system 1)	(211) x				=		(261)
	(215) x		0.2			1019.73	
Space heating (secondary)			0.5	19	=	0	(263)
Water heating	(219) x		0.2	16	=	531	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =	:			1550.73	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.5	19	=	15.57	(267)
Electricity for lighting	(232) x		0.5	19	=	194.13	(268)
Total CO2, kg/year		su	m of (265)(	271) =		1760.44	(272)
Dwelling CO2 Emission Rate		(2	72) ÷ (4) =			19.74	(273)
El rating (section 14)						82	(274)



			User L	Details:									
Assessor Name:				Strom	a Num	ber:							
Software Name:	Stroma FS	SAP 2012		Softwa	are Ver	sion:		Versio	on: 1.0.1.32				
			Property			Baselin	е						
Address :	•	lest End Lane	, London,	NW6 4Q	J								
1. Overall dwelling dime	nsions:		۸ro	a(m²)			ight(m)		Volume(m <sup>3</sup>	<b>`</b>			
Ground floor				. ,	(1a) x	-	<b>ight(m)</b> .35	(2a) =	122.39	<b>)</b> (3a)			
Total floor area TFA = (1a	ı)+(1b)+(1c)+	(1d)+(1e)+(	(1n) 👔	52.08	(4)								
Dwelling volume					(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	122.39	(5)			
2. Ventilation rate:													
	main heating	second heating		other		total			m <sup>3</sup> per hou	r			
Number of chimneys	0	+ 0	+	0	] = [	0	X 4	40 =	0	(6a)			
Number of open flues	0	+ 0	+	0	=	0	x	20 =	0	(6b)			
Number of intermittent far	IS				- Ē	2	x	10 =	20	(7a)			
Number of passive vents						0	x .	10 =	0	(7b)			
Number of flueless gas fir	es					0	X	40 =	0	(7c)			
Number of flueless gas fires     0     x 40 =       Air chan													
Infiltration due to chimney	Air chnfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div$ (5) =												
If a pressurisation test has be			eed to (17),	otherwise o	continue fro	om (9) to (	(16)			_			
Number of storeys in th Additional infiltration	e dwelling (n	s)					[(0)	11-0.4	0	(9)			
Structural infiltration: 0.	25 for steel o	r timber frame	or 0.35 fo	r masoni	v constr	uction	[(9)	-1]x0.1 =	0	(10)			
if both types of wall are pro-					•	dottori			0				
deducting areas of openin	- · · ·		0.4 (	- IN - I						<b>-</b>			
If suspended wooden fl		· · · · ·	0.1 (seale	ed), eise	enter U				0	(12)			
If no draught lobby, ent Percentage of windows			I						0	(13) (14)			
Window infiltration		augin shipped	4	0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)			
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)			
Air permeability value,	q50, expresse	ed in cubic me	tres per ho	our per s	quare m	etre of e	envelope	area	5.849999904632				
If based on air permeabili	ty value, then	(18) = [(17) ÷ 20]	+(8), otherw	ise (18) = (	(16)				0.46	(18)			
Air permeability value applies		on test has been o	done or a de	gree air pe	rmeability	is being u	sed			_			
Number of sides sheltered	b			(20) = 1	[0.075 x (1	0)1 -			2	(19)			
Shelter factor Infiltration rate incorporati	na chaltar far	stor		$(20) = 1^{-2}$ (21) = (18)		5)] –			0.85	(20)			
Infiltration rate modified for	•			(21) = (10	)				0.39	(21)			
	Mar Apr	May Jur	n Jul	Aug	Sep	Oct	Nov	Dec	]				
Monthly average wind spe	·			Aug	Ocp	000			1				
	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]				
				1				I	1				
Wind Factor (22a)m = (22	<u> </u>	· · · ·			1			1	1				
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	J				



Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	= (21a) x	(22a)m			_	_		
	0.49	0.48	0.47	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46			
		c <i>tive air (</i> al ventila	-	rate for t	he appli	cable ca	se								
				ondix N (2	2h) - (22c	$) \times Emv(c)$	oquation (		nuico (22h	(220)			0		(23a)
								N5)), othe		) = (23a)			0		(23b)
			-	-	-			m Table 4h			· · · •		0		(23c)
· · ·			1	i		<b></b>	<u> </u>	HR) (24a	ŕ	1	, -	1	+ ÷ 100] 1		
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	]		(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	covery (	MV) (24t	o)m = (22	2b)m + (2	23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]		(24b)
,					•	•		on from ( lc) = (22l		.5 × (23b	)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	]		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input :	ı ventilati	on from	loft				1		
,								0.5 + [(2		0.5]					
(24d)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.58	0.59	0.6	0.6			(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	4d) in bo	x (25)	-		-	•		
(25)m=	0.62	0.62	0.61	0.59	0.59	0.57	0.57	0.56	0.58	0.59	0.6	0.6			(25)
2 40	ot loopo	and he	ot loop i	oromot											_
		Gros				Net Ar	00	U-val	up	AXU		k-value		ΑX	k
ELEN		area		Openin m		A,r		W/m2		(W/I	<)	kJ/m <sup>2</sup> ·l		kJ/K	
Doors						1.92	x	1	=	1.92					(26)
Windo	ws Type	1				1	×	I/[1/( 1.4 )+	0.04] =	1.33	F				(27)
Windo	ws Type	2				13.43		I/[1/( 1.4 )+	0,04] =	17.8	Ħ				(27)
Floor T						0.69	×	0.13	=	0.0897	۲ F				(28)
Floor T	ype 2					12.03	3 X	0.13	=	1.5639	i F		Ξ F		(28)
Walls 7	Гуре1	62		14.43	3	47.57	7 X	0.18	=	8.56	ן ר		ΞĒ		(29)
Walls 7	Гуре2	15.7	'5	1.92		13.83	3 X	0.17	=	2.31			$\exists$		(29)
Total a	rea of e	lements	, m²			90.47	7								(31)
Party w	vall					9.1	x	0	=	0					(32)
Party fl	loor					42.99	)				[				(32a)
Party c	eiling					52.08	3								(32b)
				effective wi nternal wal			ated usin	g formula 1	l/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	ז 3.2		
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30	) + (32) =				33.	58	(33)
Heat ca	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	)	(34)
Therma	al mass	parame	ter (TMF		- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		25	0	(35)
	-		ere the de tailed calci		construct	ion are not	t known p	recisely the	e indicative	e values of	TMP in Ta	able 1f			-
				culated u	using Ar	pendix ł	<						15.	14	(36)
	-			own (36) =											J ` `
Total fa	abric he	at loss							(33) +	(36) =			48.	71	(37)

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Ventila	tion hea	at loss ca	alculated	d monthl	У				(38)m	= 0.33 × (	(25)m x (5)				
Het transfer coefficient, W/K       (39)m = (37) + (89)m         (39)m = (37) + (39)m         Network (HLP), W/mPK         (40)m = (30m = (30m (30m - (30m (30m - (30m (30m (30m - (30m (30m (30m - (30m (30m (30m (30m (30m (30m (30m (30m		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
$ (39)_{\text{me}} = \frac{73.84}{73.65} = \frac{73.46}{73.46} = \frac{72.68}{72.41} = \frac{71.65}{71.65} = \frac{71.55}{71.55} = \frac{71.44}{71.41} = \frac{72.75}{72.57} = \frac{73.1}{73.1} \\ Average = Sum(30),, 1/2 = \frac{72.58}{72.41} = \frac{72.58}{71.5} = \frac{73.1}{71.50} = \frac{72.58}{71.5} = \frac{73.1}{71.50} = \frac{72.58}{71.5} = \frac{73.1}{71.50} = \frac{72.58}{71.5} = \frac{72.58}{71.5} = \frac{73.1}{71.50} = \frac{72.58}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.5}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.5}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.5}{71.5} = \frac{73.5}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.5}{71.5} = \frac{73.1}{71.5} = \frac{73.1}{71.5} = \frac{73.5}{71.5} = \frac{73.1}{71.5} = \frac{73.5}{71.5} = 73$	(38)m=	25.12	24.93	24.74	23.86	23.7	22.93	22.93	22.79	23.23	23.7	24.03	24.38		(38)	
Average Sum(3)/12         72.58         (3)           Heat loss parameter (HLP), W/m <sup>3</sup> K         (40)m = (39)m + (4)         (41)m         (42)m = (39)m + (4)         (43)m         (44)m = (39)m + (4)         (41)m         (42)m         (42)m         (41)m         (42)m         (42)m         (42)m         (42)m         (42)m         (42)m	Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (	38)m				
Heat loss parameter (HLP), W/m²K       (40)m = (39)m + (4)         (40)m = $1.42$ 1.41       1.41       1.39       1.38       1.37       1.38       1.37       1.38       1.41       1.4         Number of days in month (Table 1a)       Average = Sum(40), , , /12=       1.39         (41)m = $123$ Air Peb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (41)m = $123$ 31       30       31       30	(39)m=	73.84	73.65	73.46	72.58	72.41	71.65	71.65	71.5	71.94	72.41	72.75	73.1			
$ \begin{array}{c} (40)_{\text{fm}} = \begin{array}{c} 1.42 & 1.41 & 1.41 & 1.39 & 1.38 & 1.38 & 1.38 & 1.37 & 1.38 & 1.4 & 1.4 \\ \hline \text{Average} = \text{Sum}(40), & , e/12e \\ \hline \text{(41)} \\ \hline \text{Mumber of days in month (Table 1a)} \\ \hline \text{Mumber of days in month (Table 1a)} \\ \hline \text{(41)} \\ \hline \text{Mumber of days in month (Table 1a)} \\ \hline \text{(41)} \\ \hline \text{Mumber of days in month (Table 1a)} \\ \hline \text{(41)} \\ \hline \text{Mumber of days in month (Table 1a)} \\ \hline \text{(41)} \\ \hline \text{Assumed occupancy, N} \\ \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,8, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{if TFA > 13,8, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9)} \\ \hline \text{If anual a everage how large purporp per day (all water use, field and odd)} \\ \hline If anual a verage how low water usege b JS S if the diveling is designed to achieve a water use larget of row low low low low low low low low low l$	Heatle		motor (F		/m2k	1	1	1					12 /12=	72.58	(39)	
Average = Sum(40): -:/12=1.39Number of days in month (Table 1a)Image: April May Jun Jul Aug Sep Oct Nov Dec1.39(41)m= $an$ Feb Mar Apr May Jun Jul Aug Sep Oct Nov DecImage: April Table 1a)(41) <b>4. Water heating energy requirement:</b> KWh/yeer:Average for water usage in litres per day Vd, average = (25 x N) + 36(42)TFA > 13.9, N = 11.76(43)Annual average hot water usage in litres per day Vd, average = (25 x N) + 36Total Feb Mar Apr May Jun Jul Aug Sep Oct Nov DecFor water usage in litres per day Vd, average = (25 x N) + 36Total Feb Mar Apr May Jun Jul Aug Sep Oct Nov DecFor water usage in litres per day Vd, average = (25 x N) + 36Total Feb Mar Apr May Jun Jul Aug Sep Oct Nov DecFor water usage in litres per day (lor each month Vd, m statter from Table 1z x (49)Colspan= 500 Ct Nov DecFor water usage in litres per day (lor each month Vd, m statter from Table 1z x (49)Colspan= 500 Ct Nov DecFor water usage in litres in the per day (lor water use target of not water usage to inter use target of not water usage to usage to usage to the user use target of not water usage to usage user use target of not make target of not make user use target of not make user use target of not make user user user target of not not user user target of not not user user target of not not user user user target of not not us		· · ·	· · · · ·	<u>í</u>	1	1.39	1.38	1.38	1.37			<u> </u>	1.4			
Number of days in month (Table 1a) $\begin{array}{c c c c c c c c c c c c c c c c c c c $	(10)11-	2			1.00	1.00	1.00	1.00	1.07					1.39	(40)	
(41)me3128313031313031303130313130313130313130313130313130313130313131	Numbe	er of day	s in mo	nth (Tab	le 1a)					-						
4. Water heating energy requirement:KWh/year:Assumed occupancy, N1.75(42)if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)1.75(42)if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)(43)Annual average hot water usage in litres per day Vd, average = (25 x N) + 3675.8(43)Reduce the analyzenge hot water usage by 55 // the dwelling is dissigned to achieve a water use target of75.8(43)not nore that 125 litres per person per day (all water use, for and cold)Total = Sum(44)=909.56Hot water usage in litres per day for each month Vd, m = factor from Table 12 x (43)Total = Sum(44)=909.56(44) m=33.3880.3477.3174.2871.2568.2268.2268.2271.2574.2877.3180.3483.38Total = Sum(44)=Under the water used - calculated monthity = 4.180 x Vd.m xnm xDTm 73600 kWhmonth (see Tables tb. 1c. 1d)(45)(46)Total = Sum(45)=1192.57(45)It instantaneous water heating at point of use (no hot water storage), anter 0 in boxes (4b) to (51)(46)(47)Other water storage loss:0(46)(47)(48) x (49) =0(48)(49) x (48) x (49) = <td c<="" td=""><td></td><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td><td></td><td></td></td>	<td></td> <td>Jan</td> <td>Feb</td> <td>Mar</td> <td>Apr</td> <td>May</td> <td>Jun</td> <td>Jul</td> <td>Aug</td> <td>Sep</td> <td>Oct</td> <td>Nov</td> <td>Dec</td> <td></td> <td></td>		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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Assumed occupancy, N (17FA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2] + 0.0013 x (TFA - 13.9) (if TFA $\ge 13.9$ , N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5%. If the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Hot water usage in litres per day for each month Vd,m = factor from Table 12 x (49) (44)m= $8.3.38 + 0.34 + 77.31 + 74.28 + 71.29 + 68.22 + 63.22 + 71.25 + 74.28 + 77.31 + 80.34 + 110.59 + 72.9 + 93.36 + 80.65 + 74.64 + 85.66 + 66.66 + 101.02 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 119.74 + 10.27 + 1$																
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Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm/ 3600 kWh/month (see Tables 1b, 1c, 1d) (45)m = $123.64$ 108.14 111.59 97 29 93.35 80.55 74.64 85.66 86.68 101.02 110.27 119.74 Total = Sum(45)_1z = 1192.57 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)m = $18.55$ 16.22 16.74 14.59 14 12.08 11.2 12.85 13 15.15 16.54 17.96 (46) Water storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) Temperature factor from Table 2b (48) x (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a (52) Temperature factor from Table 2b (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)	(44)m=	83.38	80.34	//.31	74.28	/1.25	68.22	68.22	/1.25		L			000.56	(44)	
Total = Sum(45)Total = Sum(45)Total = Sum(45)(45)If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)(46)(46)(46)(46)Water storage loss:0(47)Storage volume (litres) including any solar or WWHRS storage within same vessel0(47)If community heating and no tank in dwelling, enter 110 litres in (47)Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)Water storage loss:a) If manufacturer's declared loss factor is known (kWh/day):0(48)0(48)Notal = Sum(45)0(48)1192.57(46)Water storage loss:0(47)Volume factor for to tale 2b0(48)100(48)100(48)(49)0(48)(49)0(48)(49)																



If cylinder con	tains dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	)m where (	H11) is fro	m Append	lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary cire	cuit loss (ar	nnual) fro	om Table	e 3	-	-					0		(58)
Primary cire					59)m = (	(58) ÷ 36	65 × (41)	m					
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss	calculated	for each	n month (	(61)m =	(60) ÷ 36	65 × (41	)m						
(61)m= 42.4	49 36.98	39.4	36.63	36.31	33.64	34.76	36.31	36.63	39.4	39.62	42.49		(61)
Total heat r	equired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)n	า
(62)m= 166	13 145.12	150.99	133.92	129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		(62)
Solar DHW in	out calculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	ar contribut	ion to wate	er heating)		
(add additio	onal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	n water hea	iter	_				_			_			
(64)m= 166.	13 145.12	150.99	133.92	129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		
		-					Outp	out from w	ater heate	r (annual)₁	12	1647.23	(64)
Hea <mark>t gains</mark>	from water	heating	, kWh/m	onth 0.2	5´[0.85	× (45)m	1 + (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 51.	73 45.2	46.95	41.51	40.12	<mark>3</mark> 5.19	33.51	37.56	37.98	43.44	46.57	50.44		(65)
in <mark>clude</mark> (	57)m in cal	culation	of (65)m	only i <mark>f</mark> c	ylinder i	s in th <mark>e</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Interna	l gains (see	e Ta <mark>ble 8</mark>	5 and 5a	):									
Metabolic g	ains (Table	e 5), Wat	tts										
Ja		Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 87.5	57 87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57		(66)
Lighting ga	ins (calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 13.0	61 12.09	9.83	7.44	5.56	4.7	5.07	6.6	8.85	11.24	13.12	13.99		(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	•			
(68)m= 152.	63 154.22	150.23	141.73	131	120.92	114.19	112.6	116.6	125.09	135.82	145.9		(68)
Cooking ga	ins (calcula	ted in A	ppendix	L, equat	tion L15	or L15a	), also se	e Table	95				
(69)m= 31.7	76 31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76		(69)
Pumps and	fans gains	(Table :	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)				1				
(71)m= -70.	06 -70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06		(71)
Water heat	ing gains (1	rable 5)							I				
(72)m= 69.5	<del></del>	63.11	57.65	53.92	48.88	45.04	50.48	52.75	58.38	64.68	67.79		(72)
Total inter	nal gains =		I	Į	(66)	ı m + (67)m	• n + (68)m +	ı ⊦ (69)m +	I (70)m + (7	1)m + (72)	m	I	
(73)m= 288.		275.44	259.09	242.76	226.77	216.57	221.95	230.47	246.99	265.89	279.95		(73)
6. Solar ga	ains:				1	1							
	are calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	ne applicat	ole orientat	ion.		
Orientation			Area		Flu			g_		FF		Gains	
	Table 6d		m²		Tal	ble 6a	Т	able 6b	Т	able 6c		(W)	

Northea	ast <mark>0.9x</mark>	0.77	x	1		<b>x</b> [	1	1.28	×		0.76	×	0.7		=	4.16	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	22	2.97	x		0.76	×	0.7		=	8.47	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	4	1.38	x		0.76	×	0.7		=	15.26	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	6	7.96	×		0.76	x	0.7		=	25.05	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	9	1.35	x		0.76	×	0.7		=	33.68	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	9	7.38	x		0.76	×	0.7		=	35.9	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	9	1.1	×		0.76	×	0.7		=	33.59	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		× [	72	2.63	x		0.76	×	0.7		=	26.78	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	50	0.42	×		0.76	×	0.7		=	18.59	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	28	8.07	×		0.76	×	0.7		=	10.35	(75)
Northea	ast 0.9x	0.77	x	1		x [	1	4.2	x		0.76	×	0.7		=	5.23	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	1		x [	9	.21	×		0.76	x	0.7		=	3.4	(75)
Southea	ast <mark>0.9x</mark>	0.77	x	13.	43	× [	30	6.79	x		0.76	x	0.7		=	182.18	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	13.	43	x [	62	2.67	x		0.76	×	0.7		=	310.32	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	13.	43	x [	8	5.75	x		0.76	×	0.7		=	424.59	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	13.	43	x [	10	6.25	x		0.76	×	0.7		=	526.09	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	13.	43	× [	11	9.01	x		0.76	×	0.7		=	589.26	(77)
Southea	ast 0.9x	0.77	x	13.	43	× [	11	8.15	x		0.76	×	0.7		=	585	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	13.	43	x	11	3.91	x		0.76	x	0.7		=	564	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	13.	43	x	10	4.39	] ×		0.76	x	0.7		=	5 <mark>16.87</mark>	(77)
Sout <mark>hea</mark>	ast <mark>0.9x</mark>	0.77	x	13.	43	x [	92	2.85	x		0.76	x	0.7		=	<b>4</b> 59.74	(77)
Southea	ast 0.9x	0.77	x	13.	43	x [	69	9.27	x		0.76	x	0.7		=	3 <mark>42.97</mark>	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	13.	43	x	44	4.07	×		0.76	x	0.7		=	2 <mark>18.21</mark>	(77)
Southea	ast 0.9x	0.77	×	13.	43	x [	3	1.49	x		0.76	x	0.7		=	155.91	(77)
									-								_
Solar g	ains in v	watts, ca	alculated	d for eac	n month				(83)n	n = Su	ım(74)m	.(82)m		-			
(83)m=	186.34	318.78	439.84	551.14	622.94	6	20.9	597.59	543	3.65	478.33	353.3	1 223.44	159.	.3		(83)
Total g	ains – ir	nternal a	ind sola	r (84)m =	= (73)m ·	+ (8	33)m ,	watts									
(84)m=	474.38	604.62	715.28	810.23	865.69	84	47.67	814.16	76	5.6	708.8	600.3	489.33	439.2	25		(84)
7. Me	an inter	nal temp	erature	(heating	season	)											
Temp	erature	during h	eating p	periods ir	n the livi	ng a	area f	rom Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	ı (se	ee Tal	ole 9a)	_	_				_			
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	De	ec		
(86)m=	0.99	0.97	0.93	0.84	0.7	C	).52	0.38	0.4	42	0.65	0.89	0.98	0.99	Э		(86)
Mean	internal	l temper	ature in	living are	ea T1 (fo	ollo	w step	os 3 to 7	7 in 1	Fable	9c)						
(87)m=	19.69	19.97	20.31	20.66	20.88	<b></b>	0.97	20.99	1	.99	20.94	20.62	20.08	19.6	3		(87)
Temp	erature	durina h	eating r	beriods ir	n rest of	dw	ellina	from Ta	able	9. Th	2 (°C)		•				
(88)m=	19.75	19.75	19.76	19.77	19.77	<b></b>	9.78	19.78	<u> </u>	.78	19.78	19.77	19.77	19.7	6		(88)
l Itilies	ntion fac	tor for a	ains for	rest of d	velling	h2	 m (se	e Table	9a)							I	
(89)m=	0.99	0.96	0.91	0.8	0.63	<b></b>	).43	0.28	0.:	31	0.55	0.85	0.97	0.99	9		(89)
				the rest			I						_!	I			

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

# be

(90)m=	18.05	18.46	18.94	19.41	19.67	19.77	19.78	19.78	19.74	19.38	18.63	17.99		(90)
						1			f	LA = Livin	g area ÷ (	4) =	0.59	(91)
Moon	internal	l tompor	atura (fo	or the wh	ala dwa	llina) – fl	Δ 🗸 Τ1	⊥ (1 _ fl	Δ) <del>v</del> T2					
(92)m=	19.01	19.35	19.75	20.15	20.38	20.48	20.49	20.49	20.44	20.11	19.48	18.95		(92)
		nent to t	L he mear	interna	temper	L ature fro	n Table	4e. whe	ere appro	opriate				
(93)m=	19.01	19.35	19.75	20.15	20.38	20.48	20.49	20.49	20.44	20.11	19.48	18.95		(93)
8. Spa	ace hea	ting requ	uirement									1		
					re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm	i			·							
(94)m=	0.98	0.96	0.91	0.82	0.67	0.48	0.34	0.38	0.61	0.86	0.97	0.99		(94)
	_		i	4)m x (84	-		i			ī.	i			()
(95)m=	466.49	580.06	652.16	660.45	576.02	410.75	277.21	289.87	429.74	518.43	472.61	433.72		(95)
1	<u> </u>	<u> </u>	i	perature		r								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
1			i	· ·					– (96)m	-				(07)
(97)m=	1086.37		973.22	816.33	628.67	420.97	278.93	292.58	456.11	688.73	900.82	1078.44		(97)
			1				1		)m – (95			470.07		
(98)m=	461.19	325.24	238.87	112.24	39.17	0	0	0	0	126.71	308.31	479. <mark>67</mark>		
								Tota	l per year	(kWh/year	') = Sum(9	8)15,912 =	2091.4	(98)
Space	e heatin	g requ <mark>ire</mark>	ement in	kWh/m <sup>2</sup>	/year								40.16	(99)
9a. En	ergy rec	uiremer	nts – Ind	ividu <mark>al h</mark>	eating s	ystems i	ncluding	micro-C	CHP)					
Space	e heatir	ng:												_
Fracti	on of sp	ace hea	t from s	<mark>econ</mark> dar	y/sup <mark>ple</mark>	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								89.8	(206)
Efficie	encv of s	seconda	rv/suppl	ementar	v heatin	a svsten	າ. %						0	(208)
		Feb	Mar	· · · · · ·			i	A.u.a	San	Oct	Nov	Dee		
Space	Jan			Apr alculate	May	Jun	Jul	Aug	Sep	001	NOV	Dec	kWh/ye	al
Opace	461.19	325.24	238.87	112.24	39.17	0	0	0	0	126.71	308.31	479.67		
(011)							Ů	Ů	Ŭ					(014)
(211)m	513.58	)m x (20 362.18	266	00 ÷ (20 124.99	43.62	0	0	0	0	141.1	343.33	534.15		(211)
	515.56	302.10	200	124.99	43.02	0	0		l (kWh/yea				0000.05	(211)
•		• • • /						1014	ii (itterio yee	ar) =00m(2		2-	2328.95	(211)
•		•		y), kWh/	month									
= {[(90) (215)m=	0	0	00 ÷ (20 0	0	0	0	0	0	0	0	0	0		
(213)11-	0	0	0	0	0	0	0		l (kWh/yea	-			0	(215)
\N/~+	hest'-	_						1010			- • • / 15,101	2	0	(213)
	heating		tor (oolo	ulated a	howo									
Juiput	166.13	145.12	150.99	ulated a	129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		
Efficier		ater hea				L							80.5	(216)
													00.0	(2.0)



(217)m= 87.13 86	6.71 85.95	84.49	82.48	80.5	80.5	80.5	80.5	84.66	86.53	87.25		(217)
Fuel for water hea	ating, kWh/m	onth		I	I						1	
(219)m = (64)m x	<u>x 100 ÷ (217)</u>	<u>m</u>		i	i			1		i		
(219)m= 190.66 16	7.36 175.66	158.5	157.2	141.86	135.91	151.51	153.18	165.86	173.22	185.93		
						Total	= Sum(2	19a) <sub>112</sub> =			1956.86	(219)
Annual totals								k\	Wh/year	•	kWh/yea	ar
Space heating fue	el used, main	system	1								2328.95	
Water heating fue	lused										1956.86	
Electricity for pum	ps, fans and	electric l	keep-ho	t								
central heating p	ump:									30		(230c)
Total electricity for	r the above,	kWh/yea	r			sum	of (230a).	(230g) =			30	(231)
Electricity for light	ing										240.31	(232)
12a. CO2 emissi	ons – Individ	ual heati	ng syste	ems inclu	uding mi	cro-CHP						
				_								
					ergy				ion fac	tor	Emission	-
				kΜ	/h/year			Emiss kg CO		tor	Emission kg CO2/y	-
Space heating (ma	ain system 1	)		kΜ					2/kWh	tor =		-
Space heating (ma Spa <mark>ce heating (se</mark>		)		kW (21	/h/year			kg CO	2/kWh		kg CO2/y	ear
		)		kW (21* (21)	/h/year 1) x			kg CO2	2/kWh 16		kg CO2/y	ear
Space heating (se	econdary)	)		kW (21 <sup>,1</sup> (21) (21)	/h/year 1) x 5) x 9) x	+ (263) + (2	264) =	kg CO2	2/kWh 16	=	kg CO2/ye	ear (261) (263)
Space heating (se Water heating	econdary) heating		keep-ho	kW (21* (21) (21) (26*	/h/year 1) x 5) x 9) x 1) + (262)	+ (263) + (2	264) =	kg CO2	2/kWh 16 19	=	kg CO2/ye 503.05 0 422.68	(261) (263) (264)
Space heating (se Water heating Space and water I	econdary) heating ips, fans and		keep-ho	kW (21* (21) (21) (26*	/h/year 1) x 5) x 9) x 1) + (262) 1) x	+ (263) + (2	264) =	kg CO2	2/kWh 16 19 16	-	kg CO2/ye 503.05 0 422.68 925.73	(261) (263) (264) (265)
Space heating (see Water heating Space and water I Electricity for pum	econdary) heating ups, fans and ing		keep-ho	kW (21) (21) (21) (26) t (23)	/h/year 1) x 5) x 9) x 1) + (262) 1) x	+ (263) + (2		kg CO2	2/kWh 16 19 16 19	=	kg CO2/y 503.05 0 422.68 925.73 15.57	ear (261) (263) (264) (265) (265) (267)
Space heating (see Water heating Space and water I Electricity for pum Electricity for lighti Total CO2, kg/yea	econdary) heating ups, fans and ing ar	electric I	keep-ho	kW (21) (21) (21) (26) t (23)	/h/year 1) x 5) x 9) x 1) + (262) 1) x	+ (263) + (2	sum o	kg CO2 0.2 0.5 0.2	2/kWh 16 19 16 19	=	kg CO2/y 503.05 0 422.68 925.73 15.57 124.72 1066.02	ear (261) (263) (264) (265) (267) (268) (268) (272)
Space heating (see Water heating Space and water l Electricity for pum Electricity for lighti Total CO2, kg/yea Dwelling CO2 Em	econdary) heating ups, fans and ing ar hission Rate	electric I	keep-ho	kW (21) (21) (21) (26) t (23)	/h/year 1) x 5) x 9) x 1) + (262) 1) x	+ (263) + (2	sum o	kg CO2 0.2 0.5 0.2 0.5 (0.5)	2/kWh 16 19 16 19	=	kg CO2/y 503.05 0 422.68 925.73 15.57 124.72 1066.02 20.47	ear (261) (263) (264) (265) (267) (268) (272) (273)
Space heating (see Water heating Space and water I Electricity for pum Electricity for lighti Total CO2, kg/yea	econdary) heating ups, fans and ing ar hission Rate	electric I	keep-ho	kW (21) (21) (21) (26) t (23)	/h/year 1) x 5) x 9) x 1) + (262) 1) x	+ (263) + (2	sum o	kg CO2 0.2 0.5 0.2 0.5 (0.5)	2/kWh 16 19 16 19	=	kg CO2/y 503.05 0 422.68 925.73 15.57 124.72 1066.02	ear (261) (263) (264) (265) (267) (268) (268) (272)



				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012			Strom Softwa	are Ver	sion:		Versio	on: 1.0.1.32	
A dalace e		loot End L			Address:		Baselin	e			
Address : 1. Overall dwelling dime	Flat 5, 27 W	est End La	ane, L	ondon, i	NVV6 4Q	J					
	511510115.			Δrea	a(m²)		Av He	ight(m)		Volume(m <sup>3</sup> )	
Ground floor				-		(1a) x	<b></b>	.35	(2a) =	117.08	(3a)
First floor						(1b) x		.35	(2b) =	131.48	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+	·(1n	) 10	05.77	(4)			1		J
Dwelling volume						(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	248.56	(5)
2. Ventilation rate:											
	main heating		ondar ating	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	0	+	0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	+	0	] + [	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins						2	<b>x</b> 1	10 =	20	(7a)
Number of passive vents	6						0	x 1	10 =	0	(7b)
Number of flueless gas fi	ires					Γ	0	x 4	40 =	0	(7c)
									Air ch	hanges per hou	ır
Infiltration due to chimne	ys, flu <mark>es a</mark> nd f	ans = (6a)+	+(6b)+(7	<mark>a)</mark> +(7b)+(	7c) =		20	· [	÷ (5) =	0.08	(8)
If a pressurisation test has b			proceed	d to (17), o	otherwise o	continue fro	om <mark>(9) to (</mark>	(16)			-
Number of storeys in the	he dw <mark>elling</mark> (n	5)								0	(9)
Additional infiltration		. time have free		0.05 (				[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are p	resent, use the va	lue correspo					UCTION			0	(11)
deducting areas of openi If suspended wooden t	• ·		d) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en										0	(13)
Percentage of window	s and doors di	aught strip	ped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)					0	(16)
Air permeability value,				•	•	•	etre of e	nvelope	area	5.8499999046325	4
If based on air permeabil Air permeability value applie	-						is heina u	sed		0.37	(18)
Number of sides sheltere			contaon		gree an per	Theability	s being ut	500		2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporate	ting shelter fac	tor			(21) = (18)	) x (20) =				0.32	(21)
Infiltration rate modified f	for monthly wir	nd speed									
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Monthly average wind sp	beed from Tab	e 7			,			· · · · ·		1	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		



#### Wind Factor $(22a)m = (22)m \div 4$ 1.27 0.95 0.92 (22a)m= 1.25 1.23 1.1 1.08 0.95 1 1.08 1.12 1.18 Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m 0.4 0.39 0.35 0.4 0.34 0.3 0.3 0.29 0.32 0.34 0.36 0.37 Calculate effective air change rate for the applicable case If mechanical ventilation: (23a) 0 If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 0 (23b) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × $[1 - (23c) \div 100]$ (24a)m 0 0 0 0 0 0 0 0 0 0 0 0 (24a) b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m 0 0 0 0 n 0 0 0 0 0 0 0 (24b) c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$ , then (24c) = (23b); otherwise $(24c) = (22b)m + 0.5 \times (23b)$ (24c)(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m<sup>2</sup> x 0.5] (24d)m= 0.58 0.58 0.58 0.56 0.56 0.55 0.55 0.56 0.56 0.57 (24d) 0.54 0.55 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.58 0.58 0.58 0.56 0.56 0.55 0.55 0.54 0.56 0.56 (25)0.55 0.57 ELEMENT Gross Openings Net Area **U-value** AXU k-value AXk W/m2K (W/K) kJ/m².K kJ/K area (m<sup>2</sup>) m<sup>2</sup> A ,m² Doors (26)1.92 1 1.92 Windows Type 1 $_{X}1/[1/(1.4)+0.04] =$ 5.88 7.8 (27)Windows Type 2 $x^{1/[1/(1.4)+0.04]} =$ 7.3 (27)5.508 Windows Type 3 $x^{1/[1/(1.4)+0.04]} =$ 20.08 26.62 (27)Windows Type 4 $x^{1/[1/(1.4)+0.04]} =$ 8.56 11.35 (27)Rooflights $x^{1/[1/(1.4) + 0.04]}$ (27b) = 11.91 16.674 Floor Type 1 16.24 0.13 2.1112 (28) Floor Type 2 0.13 0.0286 (28) 0.22 x = Walls Type1 126.43 40.03 86.4 0.18 15.55 (29) х Walls Type2 20.49 1.92 18.57 0.17 3.1 (29) x Roof 23.82 80.2 7.33 (30) 56.38 0.13 x Total area of elements, m<sup>2</sup> (31)243.58 Party wall (32)5.78 х 0 0 Party floor 62.51 (32a) \* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions Fabric heat loss, $W/K = S (A \times U)$ (26)...(30) + (32) =(33) 114.69 Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)0

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

Indicative Value: Medium

250

(35)

can be ι	ised instea	ad of a dei	tailed calc	ulation.										
Thermal bridges : $S(L \times Y)$ calculated using Appendix K $[$ <i>if details of thermal bridging are not known</i> (36) = 0.15 x (31) $(33) + (36) =$ Total fabric heat loss $(33) + (36) =$														(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) =			137.52	(37)
Ventila	tion hea	t loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	47.71	47.45	47.2	46	45.78	44.73	44.73	44.54	45.13	45.78	46.23	46.7		(38)
Heat tr	ansfer c	oefficier	nt, W/K				-	-	(39)m	= (37) + (3	38)m	<u> </u>		
(39)m=	185.23	184.97	184.72	183.52	183.3	182.25	182.25	182.06	182.65	183.3	183.75	184.22		
							1	1		-	Sum(39)1.	12 /12=	183.52	(39)
Heat lo	oss para	meter (H	HLP), W/	/m²K					(40)m	= (39)m ÷	- (4)	·		
(40)m=	1.75	1.75	1.75	1.74	1.73	1.72	1.72	1.72	1.73	1.73	1.74	1.74		_
Numbe	er of dav	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	1.74	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
<b>、</b> ,							I	I			I	<u> </u>		
1 \\/c	tor hoat	ing onor	av roqui	irement:								kWh/ye	or:	
4. 776	lier neal		gy requ	nement.								KVVII/ye	ai.	
		pancy, I										79		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	49 x (Th	-A -13.9	)2)] + 0.0	0013 x (	IFA -13.	.9)			
			ater usad	ne in litre	es per da	v Vd.av	erage =	(25 x N)	+ 36		100	0.39		(43)
Redu <mark>ce</mark>	the annua	al avera <mark>ge</mark>	hot water	usage by a	5% if the a	welling is	designed	to achieve		se target o		0.00		(10)
not more	e that 125	litres p <mark>er p</mark>	person pei	r day (all w	ater use, l	not and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	110.43	106.41	102.4	98.38	94.37	90.35	90.35	94.37	98.38	102.4	106.41	110.43		
							•	•			m(44) <sub>112</sub> =		1204.67	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	0Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	163.76	143.23	147.8	128.85	123.64	106.69	98.86	113.45	114.8	133.79	146.04	158.59		
lf instan	tanoous w	ator boati	na at point	of use (no	hot wato	storago)	ontor 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	-	1579.51	(45)
			• ·					· ·	· , ,					( 1 0 )
(46)m= Water	24.56 storage	21.48	22.17	19.33	18.55	16	14.83	17.02	17.22	20.07	21.91	23.79		(46)
	-		includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel	<b></b>	0		(47)
0		,		ink in dw			0					0		()
		-			-			ombi boil	ers) ente	er '0' in (	47)			
	storage									(	,			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =			0		(50)
			-	ylinder l		or is not	known:					-		
		-		om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
		-	ee secti	on 4.3										
		from Tal		2h								0		(52)
rempe	aluie la	autor 110	m Table	20								0		(53)

		om watei (54) in (5	-	e, kWh/ye	ear			(47) x (51	) x (52) x (	53) =		0	(54)
	. ,			for each	month			((56)m = (	(55) × (41)	n		U	(35)
(56)m=			0		0	0	0	0	0	0	0	0	(56)
	-						H11)] ÷ (5	-					
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0	(58)
	•					,	(58) ÷ 36 ter heatii	• • •		r thermo	stat)		
(59)m=		0	0		0	0	0			0	0	0	(59)
Combi		I Iculated	for each	n month (	(61)m –	I (60) ∸ 30	65 × (41)	)m					l
(61)m=	50.96	46.03	50.96	48.52	48.09	44.56	46.04	48.09	48.52	50.96	49.32	50.96	(61)
				eating ca		for eac			0.85 x (				J (59)m + (61)m
(62)m=	214.72	189.25	198.76	177.37	171.73	151.25	144.91	161.54	163.32	184.75	195.36	209.55	(62)
	-IW input	L calculated	using App	endix G o	r Appendix	L H (negati	I ve quantity	I /) (enter '0	l if no sola	r contributi	ion to wate	I er heating)	l
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)				
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)
Output	t from w	ater hea	iter								-	-	
(64)m=	214.72	189.25	198.76	177.37	171.73	151.25	144.91	161.54	163.32	184.75	195.36	209.55	
								Out	out from wa	ater heatei	r (annual)₁	12	2162.5 (64)
Hea <mark>t g</mark>	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)n	י 0.8 <mark>+</mark> 1	( <mark>46)m</mark>	+ (57)m	+ ( <mark>59)m</mark>	]
(65)m=	67.19	59.13	61.88	54.97	53.13	46.61	44.38	49.74	50.3	57.23	60.89	65.47	(65)
inclu	ide (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	leating
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):								
Metab	olic gair	ns (Table	<u>e 5), Wat</u>	tts									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	(66)
-	<u> </u>	· · · · · · · · · · · · · · · · · · ·	· · · · ·		· · ·		r L9a), a	i	1		·	i	1
(67)m=	23.65	21.01	17.09	12.94	9.67	8.16	8.82	11.47	15.39	19.54	22.81	24.31	(67)
		<u>`</u>	ı —	· · ·	· · · ·	1	13 or L1	, 	r				1
(68)m=	265.33	268.09	261.15	246.38	227.73	210.21	198.5	195.75	202.69	217.46	236.1	253.63	(68)
	<u> </u>	<u>`</u>	i		· · ·		or L15a)						1
(69)m=	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	(69)
	r	<u> </u>	(Table !	<u> </u>									1 (77)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
		· · · · · · · · · · · · · · · · · · ·	<del>, , , , , , , , , , , , , , , , , , , </del>	tive valu	, ``	,	1		1		i		1
(71)m=		-111.48		-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	(71)
		gains (1	· · · ·										1 (77)
(72)m=	90.31	87.99	83.18	76.35	71.41	64.74	59.65	66.86	69.86	76.92	84.57	88	(72)
		gains =	1				)m + (67)m	r	r · ·		1	r	1
(73)m=	447.1	444.89	429.21	403.47	376.62	350.92	334.78	341.88	355.74	381.72	411.28	433.74	(73)
6. So	lar gains	S:											

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	5.88	×	11.28	×	0.76	x	0.7	=	24.46	(75)
Northeast 0.9x	0.77	x	5.88	x	22.97	x	0.76	x	0.7	=	49.79	(75)
Northeast 0.9x	0.77	x	5.88	x	41.38	×	0.76	x	0.7	=	89.7	(75)
Northeast 0.9x	0.77	x	5.88	x	67.96	x	0.76	x	0.7	=	147.32	(75)
Northeast 0.9x	0.77	x	5.88	x	91.35	x	0.76	x	0.7	=	198.02	(75)
Northeast 0.9x	0.77	x	5.88	x	97.38	x	0.76	x	0.7	=	211.11	(75)
Northeast 0.9x	0.77	x	5.88	x	91.1	x	0.76	x	0.7	=	197.49	(75)
Northeast 0.9x	0.77	x	5.88	x	72.63	x	0.76	x	0.7	=	157.44	(75)
Northeast 0.9x	0.77	x	5.88	x	50.42	x	0.76	x	0.7	=	109.3	(75)
Northeast 0.9x	0.77	x	5.88	x	28.07	x	0.76	x	0.7	=	60.84	(75)
Northeast 0.9x	0.77	x	5.88	x	14.2	x	0.76	x	0.7	=	30.78	(75)
Northeast 0.9x	0.77	x	5.88	x	9.21	×	0.76	x	0.7	=	19.97	(75)
Southeast 0.9x	0.77	x	5.51	x	36.79	x	0.76	x	0.7	=	74.72	(77)
Southeast 0.9x	0.77	x	5.51	x	62.67	×	0.76	x	0.7	=	127.27	(77)
Southeast 0.9x	0.77	x	5.51	x	85.75	×	0.76	x	0.7	=	174.14	(77)
Southeast 0.9x	0.77	x	5.51	×	106.25	X	0.76	x	0.7	=	215.76	(77)
Southeast 0.9x	0.77	x	5.51	x	119.01	x	0.76	x	0.7	=	241.67	(77)
Southeast 0.9x	0.77	x	5.51	x	118.15	×	0.76	×	0.7	=	2 <mark>39.92</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	113.91	x	0.76	×	0.7	=	2 <mark>31.31</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	104.39	x	0.76	x	0.7	=	2 <mark>11.98</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	92.85	×	0.76	x	0.7	=	188.55	(77)
Southeast 0.9x	0.77	x	5.51	x	69.27	x	0.76	x	0.7	=	140.66	(77)
Southeast 0.9x	0.77	x	5.51	x	44.07	×	0.76	x	0.7	=	89.49	(77)
Southeast 0.9x	0.77	x	5.51	x	31.49	×	0.76	x	0.7	=	63.94	(77)
Southwest0.9x	0.77	x	8.56	x	36.79		0.76	x	0.7	=	116.12	(79)
Southwest0.9x	0.77	x	8.56	x	62.67		0.76	x	0.7	=	197.79	(79)
Southwest0.9x	0.77	x	8.56	x	85.75	]	0.76	x	0.7	=	270.62	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	106.25		0.76	x	0.7	=	335.32	(79)
Southwest0.9x	0.77	x	8.56	x	119.01		0.76	x	0.7	=	375.58	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	118.15		0.76	x	0.7	=	372.87	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.56	x	113.91		0.76	x	0.7	=	359.48	(79)
Southwest0.9x		x	8.56	x	104.39		0.76	x	0.7	=	329.44	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	92.85		0.76	x	0.7	=	293.03	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	69.27		0.76	x	0.7	=	218.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.56	x	44.07		0.76	x	0.7	=	139.08	(79)
Southwest <sub>0.9x</sub>	0	x	8.56	x	31.49		0.76	x	0.7	=	99.37	(79)
Northwest 0.9x		x	20.08	×	11.28	×	0.76	x	0.7	=	83.53	(81)
Northwest 0.9x		x	20.08	×	22.97	×	0.76	x	0.7	=	170.02	(81)
Northwest 0.9x	0.77	x	20.08	×	41.38	×	0.76	x	0.7	=	306.33	(81)





_		_		_				_				
Northwest 0.9x	0.77	x	20.08	×	67.96	×	0.76	×	0.7	=	503.08	(81)
Northwest 0.9x	0.77	×	20.08	x	91.35	×	0.76	×	0.7	=	676.24	(81)
Northwest 0.9x	0.77	x	20.08	x	97.38	x	0.76	x	0.7	=	720.94	(81)
Northwest 0.9x	0.77	x	20.08	x	91.1	x	0.76	x	0.7	=	674.42	(81)
Northwest 0.9x	0.77	x	20.08	×	72.63	x	0.76	x	0.7	=	537.66	(81)
Northwest 0.9x	0.77	x	20.08	x	50.42	x	0.76	x	0.7	=	373.26	(81)
Northwest 0.9x	0.77	×	20.08	x	28.07	x	0.76	×	0.7	=	207.78	(81)
Northwest 0.9x	0.77	×	20.08	x	14.2	Īx	0.76	×	0.7	=	105.1	(81)
Northwest 0.9x	0.77	×	20.08	x	9.21	x	0.76	×	0.7	=	68.21	(81)
Rooflights 0.9x	1	×	11.91	x	26	] x [	0.76	×	0.7	=	296.53	(82)
Rooflights 0.9x	1	×	11.91	x	54	] x [	0.76	×	0.7	=	615.87	(82)
Rooflights 0.9x	1	×	11.91	x	96	x	0.76	×	0.7	=	1094.88	(82)
Rooflights 0.9x	1	] ×	11.91	x	150	] x	0.76	-   x	0.7	=	1710.75	(82)
Rooflights 0.9x	1	] ×	11.91	×	192	×	0.76	×	0.7	=	2189.76	(82)
Rooflights 0.9x	1	×	11.91	x	200	x	0.76	×	0.7	=	2281	(82)
Rooflights 0.9x	1	] ×	11.91	- X	189	×	0.76	×	0.7	=	2155.55	(82)
Rooflights 0.9x	1	] ×	11.91	×	157	×	0.76	×	0.7	=	1790.59	(82)
Rooflights 0.9x	1	×	11.91	X	115	x	0.76	x	0.7	=	1311.58	(82)
Rooflights 0.9x	1	] ×	11.91	T x	66	1 x	0.76	x	0.7	=	752.73	(82)
Rooflights 0.9x	1	] ×	11.91	x	33	i 🖌	0.76	x	0.7	=	376.37	(82)
Rooflights 0.9x	1	] ×	11.91	] x	21	x	0.76	x	0.7	=	239.51	(82)
Sola <mark>r gains in v</mark>	vatts, calcul	ated	for each mor	nth		(83)m	= Sum(74)m	. <mark>(8</mark> 2)m				
(83)m= 595.35	1160.74 193	5.67	2912.22 3681.	27 3	825.84 3618.26	3027	2.11 2275.72	1380.6	2 740.81	491.01		(83)
Total gains – ir	iternal and s	solar	(84)m = (73)	m + (	83)m , watts						_	
(84)m= 1042.45	1605.63 236	4.88	3315.69 4057.	89 4	176.76 3953.03	3368	8.99 2631.46	1762.3	3 1152.09	924.75		(84)
7. Mean interr	nal temperat	ture (	(heating seas	on)								
Temperature	during heati	ng p	eriods in the	iving	area from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	for li	iving area, h1	,m (s	ee Table 9a)							
Jan	Feb N	1ar	Apr Ma	аy	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	0.95 0.8	83	0.61 0.41		0.28 0.2	0.2	5 0.46	0.82	0.97	0.99	]	(86)
Mean internal	temperatur	e in l	iving area T1	(follo	ow steps 3 to 7	7 in T	able 9c)					
(87)m= 19.35	19.84 20	.43	20.84 20.9	7 2	20.99 21	2'	1 20.96	20.62	19.85	19.25	]	(87)
Temperature	durina heati	na p	eriods in rest	of dv	vellina from Ta	able 9			-		-	
(88)m= 19.5	<u> </u>	.51	19.52 19.5		19.52 19.52	19.	<u> </u>	19.52	19.51	19.51	]	(88)
										<u>I</u>	L	
Utilisation fact		79	0.55 0.35	<u> </u>	0.21 0.13	9a) 0.1	7 0.37	0.76	0.96	0.99	1	(89)
									0.00	0.09	1	(00)
Mean internal						r –	- I I	,	10.15	47.67	1	(90)
(90)m= 17.4	101 10		AU 07 1 40 4	<b>u</b> I -	10 EO I 10 EO	. 101		40.40	1 1 2 1 2	17.27	1	run
	18.1 18	.88	19.37 19.4	.9	19.52 19.52	19.		19.16	18.13 /ing area ÷ (4		0.43	(91)

Mean internal temperature (for the whole dwelling) =  $fLA \times T1 + (1 - fLA) \times T2$ 

(92)m= 18.24	18.84	19.55	20	20.13	20.15	20.16	20.16	20.13	19.79	18.87	18.12		(92)
Apply adjustn	nent to th	ne mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
(93)m= 18.24	18.84	19.55	20	20.13	20.15	20.16	20.16	20.13	19.79	18.87	18.12		(93)
8. Space hea	ting requ	uirement											
Set Ti to the r	nean int	ernal ter	nperatur	e obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(7	76)m an	d re-calc	ulate	
the utilisation	factor fo	or gains	using Ta	ble 9a									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:										
(94)m= 0.98	0.92	0.79	0.57	0.37	0.24	0.16	0.2	0.41	0.77	0.95	0.98		(94)
Useful gains,	hmGm ,	W = (94	4)m x (84	1)m									
(95)m= 1019.28	1484.63	1873.79	1890.48	1516.47	1007.95	647.52	682.38	1074.82	1353.06	1095.52	910.46		(95)
Monthly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea	an intern	al tempe	erature, l	_m , W =	=[(39)m x	к [(93)m-	– (96)m	]				
(97)m= 2581.83	2578.83	2409.97	2037.14	1544.34	1012.08	648.21	683.9	1101.2	1684.2	2162.21	2564.94		(97)
Space heatin	g require	ement fo	r each m	ionth, kV	Vh/mont	h = 0.02	4 x [(97)	)m – (95	)m] x (41	I)m			
(98)m= 1162.53	735.31	398.92	105.59	20.73	0	0	0	0	246.37	768.02	1230.93		
							Tota	l per year (	(kWh/year	) = Sum(9	8)15,912 =	4668.39	(98)
Space heatin	a require	ement in	kW/h/m²	Vear								44.14	(99)
	-												
9a. Energy rec		its – Indi	ividual h	eating sy	/stems II	ncluding	micro-C	(HP)					
Space heatin	-	1 from 0		deunale		a) vata va					1	-	
Fraction of sp					mentary							0	(201)
Fraction of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fra <mark>ction</mark> of to	tal heatir	ng from	main sys	stem 1			(204) = (204)	02) × [1 – (	[203)] =			1	(204)
Efficiency of r	main spa	ice heati	ing syste	em 1								89.8	(206)
Efficiency of s	seconda	rv/supple	ementar	v heating	a system	n. %						0	(208)
-		· · ·					A	San	Oct	Nov		k\A/b/vc	
Jan Space boatin	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	al
Space heatin	ř i	398.92	105.59	20.73	0	0	0	0	246.37	768.02	1230.93		
					0	0	0	•	240.57	100.02	1230.93		
(211)m = {[(98	)m x (20	4)] } x 1	$00 \cdot (20)$										
		<u> </u>		· · · · · ·									(211)
1294.58	818.83	444.23	117.58	23.09	0	0	0	0	274.35	855.25	1370.74		(211)
1294.58	818.83	<u> </u>		· · · · ·	0	0		0 I (kWh/yea				5198.65	(211)
Space heatin		444.23	117.58	23.09	0	0		-				5198.65	_
	g fuel (se	444.23 econdar	117.58 y), kWh/	23.09	0	0		-				5198.65	_
Space heatin	g fuel (se	444.23 econdar	117.58 y), kWh/	23.09	0	0		-				5198.65	_
Space heatin = {[(98)m x (20	g fuel (so )1)] } x 1	444.23 econdary 00 ÷ (20	117.58 y), kWh/ 8)	23.09 month			Tota 0	I (kWh/yea	ur) =Sum(2	(11) <sub>15,1012</sub>	- 0	5198.65	_
Space heatin = {[(98)m x (20 (215)m=0	g fuel (so 01)] } x 1 0	444.23 econdary 00 ÷ (20	117.58 y), kWh/ 8)	23.09 month			Tota 0	l (kWh/yea	ur) =Sum(2	(11) <sub>15,1012</sub>	- 0		(211)
Space heatin = {[(98)m x (20 (215)m= 0 Water heating	g fuel (so )1)] } x 1 0	444.23 econdary 00 ÷ (20 0	117.58 y), kWh/ 8) 0	23.09 month			Tota 0	l (kWh/yea	ur) =Sum(2	(11) <sub>15,1012</sub>	- 0		(211)
Space heatin = {[(98)m x (20 (215)m=0	g fuel (so )1)] } x 1 0	444.23 econdary 00 ÷ (20 0	117.58 y), kWh/ 8) 0	23.09 month			Tota 0	l (kWh/yea	ur) =Sum(2	(11) <sub>15,1012</sub>	- 0		(211)
Space heatin = {[(98)m x (20 (215)m= 0 Water heating Output from w	g fuel (si 01)] } x 1 0 g ater hea 189.25	444.23 econdar 00 ÷ (20 0 ter (calc 198.76	117.58 y), kWh/ 8) 0	23.09 month 0	0	0	Tota 0 Tota	0 I (kWh/yea	0 ir) =Sum(2 ir) =Sum(2	0 115) <sub>15,1012</sub>			(211)
Space heatin = $\{[(98)m \times (20)(215)m=0]$ Water heating Output from ware 214.72 Efficiency of ware	g fuel (si 01)] } x 1 0 g ater hea 189.25	444.23 econdar 00 ÷ (20 0 ter (calc 198.76	117.58 y), kWh/ 8) 0	23.09 month 0	0	0	Tota 0 Tota	0 I (kWh/yea	0 ir) =Sum(2 ir) =Sum(2	0 115) <sub>15,1012</sub>		0	(211)
Space heatin = $\{[(98)m \times (20)(215)m = 0$ Water heating Output from ware 214.72 Efficiency of ware (217)m = 88.21	g fuel (so )1)] } x 1 0 ater heat 189.25 ater hea 87.73	444.23 econdary 00 ÷ (20 0 ter (calco 198.76 ter 86.48	117.58 y), kWh/ 8) 0 ulated al 177.37 83.74	23.09 month 0 200ve) 171.73	0 151.25	0 144.91	Tota 0 Tota 161.54	0 I (kWh/yea I (kWh/yea 163.32	ur) =Sum(2 0 ur) =Sum(2 184.75	0 (15) <sub>15,1012</sub> 195.36	= 0 = 209.55	0	_(211) _(215) _(216)
Space heatin = $\{[(98)m \times (20)(215)m] = 0$ Water heating Output from ware 214.72 Efficiency of ware (217)m= 88.21 Fuel for water	g fuel (se 01)] } x 1 0 ater hea 189.25 ater hea 87.73 heating,	444.23 econdary 00 ÷ (20 0 ter (calco 198.76 ter 86.48 kWh/mc	117.58 y), kWh/ 8) 0 ulated al 177.37 83.74 onth	23.09 month 0 200ve) 171.73	0 151.25	0 144.91	Tota 0 Tota 161.54	0 I (kWh/yea I (kWh/yea 163.32	ur) =Sum(2 0 ur) =Sum(2 184.75	0 (15) <sub>15,1012</sub> 195.36	= 0 = 209.55	0	_(211) _(215) _(216)
Space heatin = $\{[(98)m \times (20)(215)m = 0$ Water heating Output from ware 214.72 Efficiency of ware (217)m = 88.21	g fuel (se 01)] } x 1 0 ater hea 189.25 ater hea 87.73 heating,	444.23 econdary 00 ÷ (20 0 ter (calco 198.76 ter 86.48 kWh/mc	117.58 y), kWh/ 8) 0 ulated al 177.37 83.74 onth	23.09 month 0 200ve) 171.73	0 151.25	0 144.91	Tota 0 Tota 161.54	0 I (kWh/yea I (kWh/yea 163.32	ur) =Sum(2 0 ur) =Sum(2 184.75	0 (15) <sub>15,1012</sub> 195.36	= 0 = 209.55	0	_(211) _(215) _(216)
Space heatin = $\{[(98)m \times (20)(215)m=0]$ Water heating Output from w. 214.72 Efficiency of w (217)m= 88.21 Fuel for water (219)m = (64)	g fuel (so 01)] } x 10 0 ater hea 189.25 ater hea 87.73 heating, m x 100	444.23 econdary 00 ÷ (20 0 ter (calco 198.76 ter 86.48 kWh/mc 0 ÷ (217)	117.58 y), kWh/ 8) 0 ulated al 177.37 83.74 onth m	23.09 month 0 50000 171.73 81.41	0 151.25 80.5	0 144.91 80.5	Tota 0 Tota 161.54 80.5 200.67	0 I (kWh/yea I (kWh/yea 163.32 80.5	0 ir) =Sum(2 184.75 85.56 215.92	0 (15) <sub>15,1012</sub> 195.36 87.74	= 0 = 209.55 88.32	0	_(211) _(215) _(216)



Annual totals		kWh/yea	r	kWh/year	_
Space heating fuel used, main system 1				5198.65	
Water heating fuel used				2559.03	]
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30	]	(230c)
Total electricity for the above, kWh/year	sun	n of (230a)(230g) =		30	(231)
Electricity for lighting				417.75	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CH	Р			
	<b>Energy</b> kWh/year	<b>Emission fac</b> kg CO2/kWh	ctor	<b>Emissions</b> kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.216	=	1122.91	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	552.75	(264)
Space and water heating	(261) + (262) + (263) +	(264) =		1675.66	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	216.81	(268)
Total CO2, kg/year		sum of (265)(271) =		1908.04	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		18.04	(273)
El rating (section 14)				83	(274)



User Details:													
Assessor Name: Stroma Number:													
Software Name: Stroma FSAP 2012 Software Version: Version	n: 1.0.1.32												
Property Address: Flat 1 - Lean													
Address :   Flat 1, 27 West End Lane, London, NW6 4QJ													
1. Overall dwelling dimensions:	) ( a la una a (ma 2)												
Area(m²)Av. Height(m)VolumGround floor $89.19$ $(1a) \times$ $2.35$ $(2a) =$ $209$ Total floor area TEA = $(1a)+(1b)+(1c)+(1d)+(1e)+$ $(1b)$ $20042$ $(1a)$													
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 89.19 (4)													
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	209.6 (5)												
2. Ventilation rate:													
main heatingsecondary heatingothertotalNumber of chimneys $0$ + $0$ = $0$ $x 40 =$	m <sup>3</sup> per hour												
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	0 (6b)												
	30 (7a)												
Number of passive vents   0   x 10 =	0 (7b)												
Number of flueless gas fires	0 (7c)												
Air cha	anges per hour												
Infiltration due to chimneys, flues and fans = $(6a)+(7b)+(7c) = 30 \div (5) = $	0.14 (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)	0 (9)												
Additional infiltration [(9)-1]x0.1 =	0 (9) 0 (10)												
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0 (11)												
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	0 (12)												
If no draught lobby, enter 0.05, else enter 0	0 (13)												
Percentage of windows and doors draught stripped	0 (14)												
Window infiltration         0.25 - [0.2 x (14) ÷ 100] =	0 (15)												
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)												
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	4 (17)												
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.34 (18)												
Number of sides sheltered	2 (19)												
Shelter factor (20) = 1 - [0.075 x (19)] =	0.85 (20)												
Infiltration rate incorporating shelter factor (21) = (18) × (20) =	0.29 (21)												
Infiltration rate modified for monthly wind speed													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
Monthly average wind speed from Table 7													
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7													
Wind Factor (22a)m = (22)m $\div$ 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													



Adjuste	ed infiltr	ation rat	e (allow	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
	0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se							(00-)
				endix N, (2	(23b) - (23c	a) v Emv (e	auation (N	(5)) othe	nwisa (23h	(23a)			0	(23a)
			• • •	ciency in %	, ,	, ,				i) = (23a)			0	(23b)
			-	-	-					01-)		4 (00-)	0	(23c)
				entilation				HR) (24a	a m = (22)	$\frac{2}{0}$ m + (	23D) × [*	1 - (23C)	; ÷ 100] ]	(24a)
(24a)m=	-			-		-	-					0	J	(244)
		<b></b>	<b></b>	entilation	1		r	r í í	ŕ	r i	<u>,</u>		1	(24b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(240)
,				ntilation of the	•					5 v (23h	N)			
ا = (24c)m	· ,		0		$\frac{3}{0} = (231)$		0	$\frac{0}{0} = \frac{221}{2}$	0		0	0	1	(24c)
	-		_	l v nole hous	-						0	Ů	l	()
,				)m = (22		•				0.5]				
(24d)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24d)
Effe	ctive air	change	rate - ei	nter (24a	) or (24t	o) or (24	c) or (24	d) in box	x (25)				1	
(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25)
	. ( )								1				1	
				paramet										
ELEN		Gros area		Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·l		A X k kJ/K
Doo <mark>rs</mark>						1.92	x	1	=	1.92				(26)
Windov	ws Type	e 1				3.27	x1,	/[1/( 1.4 )+	0.04] =	4.34	F			(27)
Windo	ws Type	2				1.92	<b>x</b> 1	/[1/( 1.4 )+	0.04] =	2.55	F			(27)
	ws Type					3.65		/[1/( 1.4 )+	0.04] =	4.84	5			(27)
	ws Type					0.726	= .	- /[1/( 1.4 )+	l	0.96	$\exists$			(27)
	ws Type						Ξ.	/[1/( 1.4 )+	l		$\dashv$			(27)
Rooflig						4.55		/[1/(1.4) +	- I	6.03				
-	jino					4.29			¦	6.006				(27b)
Floor	<b>F</b>					89.19		0.13	=	11.594			$\dashv$	(28)
Walls 7		82.4	18	20.6	6	61.82	<u>2</u> X	0.17	= [	10.51			_	(29)
Walls 7	Гуре2	42.	3	1.92	2	40.38	3 X	0.16	=	6.4				(29)
Roof		23.0	)3	4.29	)	18.74	t x	0.13	=	2.44				(30)
Total a	rea of e	elements	, m²			237								(31)
Party c	eiling					66.16	6							(32b)
				effective wi			ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
				nternal wal	is and par	titions		(26)(30)	) + (32) -					
		ss, W/K :	•	0)				(20)(30)		(20) + (2)	0) · (00-)	(22-)	65.9	
Heat C	apacity	Cm = S(	АХК)						((28)	(30) + (32	z) + (32a).	(32e) =	0	(34)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K

250

(35)

Indicative Value: Medium

			are not kn	own (36) =	= 0.15 x (3	1)			(22)	(2.2)				<b>-</b>
	abric he									(36) =			78.42	(37)
Ventila			alculated	· · ·	, 	Ι.	<u>г.</u>				25)m x (5)	1	l	
(20)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38)
(38)m=	39.37	39.18	39	38.14	37.98	37.24	37.24	37.1	37.53	37.98	38.31	38.65		(30)
		coefficier	-				1			= (37) + (3	I		I	
(39)m=	117.79	117.6	117.42	116.56	116.4	115.66	115.66	115.52	115.95	116.4	116.73	117.07	440.50	
Heat le	oss para	meter (H	HLP), W/	/m²K						4verage = = (39)m ÷	Sum(39) <sub>1</sub> . (4)	12/12=	116.56	(39)
(40)m=	1.32	1.32	1.32	1.31	1.31	1.3	1.3	1.3	1.3	1.31	1.31	1.31		_
Numb	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	1.31	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	L													
4. Wa	ater hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
A			NI										I	(12)
		upancy, ∣ 9, N = 1		[1 - exp	(-0.0003	349 x (TF		)2)] + 0.0	)013 x ( <sup>-</sup>	TFA -13.		61		(42)
if TF	A £ 13.	9, N = 1				·					,			
								(25 x N) to achieve		e target o		.29		(43)
		-	person per			-	-		a water us	se largel o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat			r day for ea						oop	000		200		
(44)m=	105.92	102.07	98.22	94.37	90.52	86.66	86.66	90.52	94.37	98.22	102.07	105.92		
	L		<u> </u>						-	Tota <mark>l = Su</mark>	m(44) <sub>112</sub> =	=	1155.52	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	)Tm / 3600	) kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)		
(45)m=	157.08	137.38	141.77	123.6	118.59	102.34	94.83	108.82	110.12	128.33	140.09	152.12		_
lf inotor	tonoouou	ator hooti	na ot point	of upp (pr	hot wata	rotorogol	ontor 0 in	havaa (16		Total = Su	m(45) <sub>112</sub> =	-	1515.07	(45)
			- ·	·	i			boxes (46,					l	(40)
(46)m= Water	23.56 storage	20.61	21.27	18.54	17.79	15.35	14.22	16.32	16.52	19.25	21.01	22.82		(46)
	-		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity ł	neating a	and no ta	ink in dw	velling, e	nter 110	) litres in	(47)						
Other	vise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage												L	
,			eclared I		or is kno	wn (kWł	n/day):					0		(48)
-			m Table									0		(49)
-	•		r storage eclared o	•		or is not		(48) x (49)	) =			0		(50)
,			factor fr	•				o						(51)
		-	ee secti		,		• /					-		
		from Ta										0		(52)
-			m Table									0		(53)
			storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	-	0		(54)
Enter	(50) or	(54) in (5	5)									0		(55)

Water storage loss calculated for each month $((56)m = (55) \times (41)m$												
(56)m= 0 0 0 0 0 0 0 0 0	0 0	0	(56)									
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)	m where (H11) is fro	m Appendix H										
(57)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(57)									
Primary circuit loss (annual) from Table 3		0	(58)									
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)m$												
(modified by factor from Table H5 if there is solar water heating and a cylind	r thermostat)											
(59)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(59)									
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$												
(61)m= 50.96 46.03 50.05 46.54 46.13 42.74 44.16 46.13 46.54	50.05 49.32	50.96	(61)									
Total heat required for water heating calculated for each month (62)m = $0.85 \times$	45)m + (46)m +	(57)m + (59)ı	m + (61)m									
(62)m= 208.04 183.41 191.82 170.13 164.72 145.08 138.99 154.95 156.66	178.39 189.4	203.08	(62)									
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no sol	r contribution to wate	er heating)										
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)												
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(63)									
Output from water heater												
(64)m= 208.04 183.41 191.82 170.13 164.72 145.08 138.99 154.95 156.66	178.39 189.4	203.08										
Output from v	ater heater (annual)	12	2084.67 (64)									
Heat gains from water heating, kWh/month 0.25 $^{2}$ [0.85 x (45)m + (61)m] + 0.8	x [(46)m + (57)m	+ (59)m ]										
(65)m= 64.97 57.19 59.65 52.73 50.96 44.71 42.57 47.71 48.25	55.18 58.91	63.32	(65)									
	33.10 30.31	00.02	()									
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot												
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot v 5. Internal gains (see Table 5 and 5a):												
5. Internal gains (see Table 5 and 5a):												
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	ater is from com	munity heatin										
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep	ater is from com	munity heatin	g									
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m=	ater is from com	munity heatin	g									
5. Internal gains (see Table 5 and 5a):           Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep           (66)m=         130.72	Oct         Nov           130.72         130.72           17.5         20.42	Dec 130.72	g (66)									
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m=       130.72       <	Oct         Nov           130.72         130.72           17.5         20.42	Dec 130.72	g (66)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71</td> <td>Dec 130.72 21.77</td> <td>g (66) (67)</td>	Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71	Dec 130.72 21.77	g (66) (67)									
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m= 130.72 130.72 130.72 130.72 130.72 130.72 130.72 130.72         Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5         (67)m=       21.18         18.81       15.3         11.58       8.66         7.31       7.9         10.27       13.78         Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71	Dec 130.72 21.77	g (66) (67)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5</td> <td>Dec 130.72 21.77 227.1</td> <td>g (66) (67) (68)</td>	Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5	Dec 130.72 21.77 227.1	g (66) (67) (68)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5</td> <td>Dec 130.72 21.77 227.1</td> <td>g (66) (67) (68)</td>	Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5	Dec 130.72 21.77 227.1	g (66) (67) (68)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07</td> <td>Dec           130.72           21.77           227.1           36.07</td> <td>g (66) (67) (68) (69)</td>	Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07	Dec           130.72           21.77           227.1           36.07	g (66) (67) (68) (69)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07</td> <td>Dec           130.72           21.77           227.1           36.07</td> <td>g (66) (67) (68) (69)</td>	Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07	Dec           130.72           21.77           227.1           36.07	g (66) (67) (68) (69)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       130.73       16.67	ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       211.41         5       36.07       36.07         36.07       36.07       36.07	Dec         130.72         21.77         227.1         36.07         3	g (66) (67) (68) (69) (70)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       130.73       1607	ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       211.41         5       36.07       36.07         36.07       36.07       36.07	Dec         130.72         21.77         227.1         36.07         3	g (66) (67) (68) (69) (70)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82</td> <td>Dec         130.72         21.77         227.1         36.07         3         -104.58         85.11</td> <td>g (66) (67) (68) (69) (70) (71)</td>	Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82	Dec         130.72         21.77         227.1         36.07         3         -104.58         85.11	g (66) (67) (68) (69) (70) (71)									
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       13.78         Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5       (68)m=       237.58       240.04       233.83       220.61       203	Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82	Dec         130.72         21.77         227.1         36.07         3         -104.58         85.11	g (66) (67) (68) (69) (70) (71)									

Solar gains are calculated using solar flux from Table 6a 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	0.73	×	11.28	x	0.76	x	0.7	=	3.02	(75)
Northeast 0.9x	0.77	x	0.73	x	22.97	x	0.76	x	0.7	=	6.15	(75)
Northeast 0.9x	0.77	x	0.73	x	41.38	x	0.76	x	0.7	=	11.08	(75)
Northeast 0.9x	0.77	x	0.73	x	67.96	x	0.76	x	0.7	=	18.19	(75)
Northeast 0.9x	0.77	x	0.73	x	91.35	x	0.76	x	0.7	=	24.45	(75)
Northeast 0.9x	0.77	x	0.73	x	97.38	x	0.76	x	0.7	=	26.07	(75)
Northeast 0.9x	0.77	x	0.73	x	91.1	x	0.76	x	0.7	=	24.38	(75)
Northeast 0.9x	0.77	x	0.73	x	72.63	x	0.76	x	0.7	=	19.44	(75)
Northeast 0.9x	0.77	x	0.73	x	50.42	x	0.76	x	0.7	=	13.5	(75)
Northeast 0.9x	0.77	x	0.73	x	28.07	x	0.76	x	0.7	=	7.51	(75)
Northeast 0.9x	0.77	x	0.73	x	14.2	x	0.76	x	0.7	=	3.8	(75)
Northeast 0.9x	0.77	x	0.73	x	9.21	x	0.76	x	0.7	=	2.47	(75)
Southeast 0.9x	0.77	x	4.55	x	36.79	x	0.76	x	0.7	=	61.72	(77)
Southeast 0.9x	0.77	x	4.55	x	62.67	x	0.76	x	0.7	=	105.13	(77)
Southeast 0.9x	0.77	x	4.55	x	85.75	x	0.76	x	0.7	=	143.85	(77)
Southeast 0.9x	0.77	x	4.55	×	106.25	х	0.76	х	0.7	=	178.23	(77)
Southeast 0.9x	0.77	x	4.55	x	119.01	x	0.76	x	0.7	=	199.64	(77)
Southeast 0.9x	0.77	x	4.55	х	118.15	×	0.76	x	0.7	=	198.19	(77)
Southeast 0.9x	0.77	x	4.55	x	113.91	x	0.76	x	0.7	=	191.08	(77)
Southeast 0.9x	0.77	x	4.55	x	104.39	x	0.76	x	0.7	=	175.11	(77)
Southeast 0.9x	0.77	x	4.55	x	92.85	x	0.76	x	0.7	=	155.76	(77)
Southeast 0.9x	0.77	x	4.55	x	69.27	x	0.76	x	0.7	=	1 <mark>16.19</mark>	(77)
Southeast 0.9x	0.77	x	4.55	x	44.07	x	0.76	x	0.7	=	73.93	(77)
Southeast 0.9x	0.77	x	4.55	x	31.49	x	0.76	x	0.7	=	52.82	(77)
Southwest0.9x	••••	x	3.65	x	36.79		0.76	x	0.7	=	49.51	(79)
Southwest0.9x	0.77	x	3.65	x	62.67		0.76	x	0.7	=	84.34	(79)
Southwest0.9x	0.77	x	3.65	x	85.75		0.76	x	0.7	=	115.39	(79)
Southwest0.9x	0.77	x	3.65	x	106.25		0.76	x	0.7	=	142.98	(79)
Southwest0.9x	0.77	x	3.65	x	119.01		0.76	x	0.7	=	160.15	(79)
Southwest0.9x	0.77	x	3.65	x	118.15		0.76	x	0.7	=	158.99	(79)
Southwest0.9x		x	3.65	x	113.91		0.76	x	0.7	=	153.28	(79)
Southwest0.9x		x	3.65	×	104.39		0.76	x	0.7	=	140.47	(79)
Southwest0.9x	_	x	3.65	x	92.85		0.76	x	0.7	=	124.95	(79)
Southwest0.9x	0.77	x	3.65	x	69.27		0.76	x	0.7	=	93.21	(79)
Southwest0.9x		x	3.65	x	44.07		0.76	x	0.7	=	59.3	(79)
Southwest0.9x		x	3.65	x	31.49		0.76	x	0.7	=	42.37	(79)
Northwest 0.9x		x	3.27	×	11.28	x	0.76	x	0.7	=	40.81	(81)
Northwest 0.9x		x	1.92	×	11.28	x	0.76	x	0.7	=	7.99	(81)
Northwest 0.9x	0.77	x	3.27	×	22.97	x	0.76	x	0.7	=	83.06	(81)



Northwest 0.9x	0.77	x	1.92	x	22.97	x	0.76	x	0.7	=	16.26	(81)
Northwest 0.9x	0.77	x	3.27	x	41.38	x	0.76	x	0.7	=	149.66	(81)
Northwest 0.9x	0.77	x	1.92	x	41.38	x	0.76	x	0.7	=	29.29	(81)
Northwest 0.9x	0.77	x	3.27	x	67.96	x	0.76	x	0.7	=	245.78	(81)
Northwest 0.9x	0.77	x	1.92	x	67.96	x	0.76	x	0.7	=	48.1	(81)
Northwest 0.9x	0.77	x	3.27	x	91.35	x	0.76	x	0.7	=	330.37	(81)
Northwest 0.9x	0.77	x	1.92	x	91.35	x	0.76	x	0.7	=	64.66	(81)
Northwest 0.9x	0.77	x	3.27	x	97.38	x	0.76	x	0.7	=	352.21	(81)
Northwest 0.9x	0.77	x	1.92	x	97.38	x	0.76	x	0.7	=	68.93	(81)
Northwest 0.9x	0.77	x	3.27	x	91.1	x	0.76	x	0.7	=	329.49	(81)
Northwest 0.9x	0.77	x	1.92	x	91.1	x	0.76	x	0.7	=	64.49	(81)
Northwest 0.9x	0.77	x	3.27	x	72.63	x	0.76	x	0.7	=	262.67	(81)
Northwest 0.9x	0.77	x	1.92	x	72.63	x	0.76	x	0.7	=	51.41	(81)
Northwest 0.9x	0.77	x	3.27	x	50.42	x	0.76	x	0.7	=	182.36	(81)
Northwest 0.9x	0.77	x	1.92	x	50.42	x	0.76	x	0.7	=	35.69	(81)
Northwest 0.9x	0.77	x	3.27	x	28.07	x	0.76	x	0.7	=	101.51	(81)
Northwest 0.9x	0.77	x	1.92	x	28.07	x	0.76	x	0.7	=	19.87	(81)
Northwest 0.9x	0.77	x	3.27	×	14.2	х	0.76	x	0.7	=	51.35	(81)
Northwest 0.9x	0.77	x	1.92	x	14.2	x	0.76	x	0.7	=	10.05	(81)
Northwest 0.9x	0.77	x	3.27	x	9.21	×	0.76	x	0.7	=	33.33	(81)
Northwest 0.9x	0.77	x	1.92	x	9.21	x	0.76	x	0.7	=	6.52	(81)
Rooflights 0.9x	1	x	4.29	x	26	х	0.76	x	0.7	=	53.41	(82)
Rooflights 0.9x	1	x	4.29	x	54	x	0.76	x	0.7	=	110.92	(82)
Rooflights 0.9x	1	x	4.29	x	96	x	0.76	x	0.7	=	197.19	(82)
Rooflights 0.9x	1	x	4.29	x	150	x	0.76	x	0.7	=	308.11	(82)
Rooflights 0.9x	1	x	4.29	x	192	x	0.76	x	0.7	=	394.38	(82)
Rooflights 0.9x	1	x	4.29	x	200	x	0.76	x	0.7	=	410.81	(82)
Rooflights 0.9x	1	x	4.29	x	189	x	0.76	x	0.7	=	388.22	(82)
Rooflights 0.9x	1	x	4.29	x	157	x	0.76	x	0.7	=	322.49	(82)
Rooflights 0.9x	1	x	4.29	x	115	x	0.76	x	0.7	=	236.22	(82)
Rooflights 0.9x	1	x	4.29	x	66	x	0.76	x	0.7	=	135.57	(82)
Rooflights 0.9x	1	x	4.29	x	33	x	0.76	x	0.7	=	67.78	(82)
Rooflights 0.9x	1	x	4.29	x	21	x	0.76	x	0.7	=	43.14	(82)

Solar gains in watts, calculated for each month(83)m = Sum(74)m(82)m														
(83)m=	216.45	405.86	646.45	941.39	1173.65	1215.21	1150.94	971.59	748.46	473.86	266.21	180.64		(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts														
(84)m=	627.75	815.03	1040.98	1312.03	1519.93	1538.05	1459.01	1286.48	1075.96	825.46	645.07	579.83		(84)
7. Me	an inter	nal temp	erature	(heating	season	)								
Temp	erature	during h	leating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(86)m=	1	0.99	0.95	0.85	0.66	0.47	0.35	0.41	0.68	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ns 3 to 7	7 in Table	e 9c)					
(87)m=	19.63	19.89	20.28	20.69	20.92	20.99	21	20.99	20.93	20.55	19.99	19.58		(87)
	r	<u> </u>	1 <u> </u>	í –	i	<u> </u>	r	able 9, Tl	<u>, , ,</u>	10.94	10.02	10.02		(99)
(88)m=	19.82	19.83	19.83	19.84	19.84	19.84	19.84	19.84	19.84	19.84	19.83	19.83	I	(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)		-				
(89)m=	0.99	0.98	0.94	0.81	0.59	0.39	0.26	0.31	0.59	0.91	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.02	18.4	18.95	19.51	19.77	19.84	19.84	19.84	19.8	, 19.35	18.56	17.96		(90)
		1			1		1		f	L iLA = Livin	g area ÷ (4	4) =	0.34	(91)
		<u> </u>	r È	1	i	r <u>, ,</u>	· · · · · ·	+ (1 – fL	r	i			1	
(92)m=	18.57	18.91	19.4	19.92	20.16	20.23	20.24	20.23	20.18	19.76	19.05	18.51	I	(92)
		r	he mear	n interna	l temper	ature fro	m Table	e 4e, whe	ere appro	opriate			(	
(93)m=	18.42	18.76	19.25	19.77	20.01	20.08	20.09	20.08	20.03	19.61	18.9	18.36		(93)
8. Sp	ace hea	ting requ	uirement	1										
						ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	lisation			using Ta	i				i	r				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm									_		
(94)m=	0.99	0.98	0.93	0.8	0.6	0.41	0.28	0.33	0.61	0.9	0.98	0.99	I	(94)
Usefu	<mark>il g</mark> ains,	hmGm	, W = (9	4)m x (84		·						_		
(95)m=	6 <mark>2</mark> 2.88	796.73	970	1055.93	918.36	626.96	402.32	423.85	652.67	744.95	633.92	576.58		(95)
Mo <mark>nt</mark> l	nly aver	age exte	rnal terr	iperature	e from Ta	able 8		-		_				
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	1 <mark>0.6</mark>	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m=	1663.18	1629.41	1497.33	1266.49	967.44	633.47	403.14	425.66	687.82	1048.69	1377.18	1657.46		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/moni	th = 0.02	24 x [(97)	)m – (95	)m] x (4	 1)m			
(98)m=	773.98	559.56	392.34	151.61	36.52	0	0	0	0	225.99	535.15	804.18		
						I		Tota	l per year	(kWh/year	·) = Sum(9	8)15,912 =	3479.3	(98)
Space	o hootin	a roquir	omont in	k\//b/m2	woor								20.01	(99)
		• •		kWh/m <sup>2</sup>	•								39.01	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	j micro-C	CHP)					
-	e heatir	-										1		_
Fracti	ion of sp	bace hea	at from s	econdar	y/supple	ementary	system						0	(201)
Fracti	ion of sp	bace hea	at from m	nain syst	em(s)			(202) = 1 -	– (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		·	1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								90.8	(206)
	-			• •		aoveter	<b>o</b> 0/							
EIIICIE		seconda	ry/suppi	ementar	y neatin	g system	1, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heatin	g require	ement (c	alculate	d above	)							L	
	773.98	559.56	392.34	151.61	36.52	0	0	0	0	225.99	535.15	804.18		
(211)m	ו = {[(98	)m x (20	04)] } x 1	00 ÷ (20	)6)									(211)
. ,	852.4	616.25	432.09	166.97	40.22	0	0	0	0	248.88	589.37	885.66		
	L	1	I			1	1	Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	3831.83	(211)



Space heating fuel (secondary), kWh/month

= {[(98)m x (201)] } x 100 ÷ (208)								
(215)m= 0 0 0 0 0	0 0	0	0	0	0	0		
		Total	(kWh/yea	ar) =Sum(2	2 <b>15)</b> <sub>15,101</sub>	2=	0	(215)
Water heating								
Output from water heater (calculated above)           208.04         183.41         191.82         170.13         164.72         1	45.08 138.99	154.95	156.66	178.39	189.4	203.08		
Efficiency of water heater	43.00 130.99	104.95	150.00	170.55	103.4	203.00	81.5	(216)
	81.5 81.5	81.5	81.5	86.45	88.17	88.76	01.0	(217)
Fuel for water heating, kWh/month								· · ·
$(219)m = (64)m \times 100 \div (217)m$								
(219)m= 234.66 207.68 219.17 198.68 198.35 1	78.01 170.54	190.12	192.22	206.35	214.81	228.81		_
		Total	= Sum(21				2439.4	(219)
Annual totals Space heating fuel used, main system 1				k	Wh/yeai	ſ	kWh/yea	7
							3831.83	ļ
Water heating fuel used							2439.4	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
Total electricity for the above, kWh/year		sum o	of (230a).	<b>(2</b> 30g) =			30	(231)
Elec <mark>tricity</mark> for lighting							3 <mark>74.05</mark>	(232)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP						
	<b>En aver</b>			<b>E</b> urice	lan faa	1.0.4	Emissions	
	Energy kWh/year			kg CO	<b>ion fac</b> 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x			0.2		=	827.68	(261)
Space heating (secondary)	(215) x			0.5		=	0	(263)
Water heating	(219) x			0.2		=	526.91	(264)
	(261) + (262)	· (262) · (2	264) -	0.2	10			
Space and water heating		+ (203) + (2	.04) =				1354.59	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	15.57	(267)
Electricity for lighting	(232) x			0.5	19	=	194.13	(268)
Total CO2, kg/year			sum of	f (265)(2	271) =		1564.29	(272)
Dwelling CO2 Emission Rate			(272) -	÷ (4) =			17.54	(273)
El rating (section 14)							84	(274)



User Details:													
Assessor Name:Stroma Number:Software Name:Stroma FSAP 2012Software Version:Version: 1	1.0.1.32												
Property Address: Flat 4 - Lean         Address :       Flat 4, 27 West End Lane, London, NW6 4QJ													
Address :       Flat 4, 27 West End Lane, London, NW6 4QJ         1. Overall dwelling dimensions:													
Ground floor $\begin{array}{c} Area(m^2) \\ \hline 52.08 \\ \hline \end{array} (1a) \times \begin{array}{c} Av. \ Height(m) \\ \hline 2.35 \\ \hline \end{array} (2a) = \begin{array}{c} Volume(m^3) \\ \hline 122.39 \\ \hline \end{array} (3a) \end{array}$													
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.08 (4)													
Dwelling volume $(3a)+(3c)+(3d)+(3e)+(3n) =$	122.39 (5)												
2. Ventilation rate:													
main heatingsecondary heatingothertotalmNumber of chimneys $0$ $+$ $0$ $+$ $0$ $=$ $0$ $x 40 =$ Number of open flues $0$ $+$ $0$ $+$ $0$ $=$ $0$ $x 20 =$	0 (6a) 0 (6b)												
Number of intermittent fans   2   x 10 =	20 (7a)												
Number of passive vents 0 x 10 =	0 (7b)												
Number of flueless gas fires													
Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div$ (5) =0.16(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(9)													
Additional infiltration [(9)-1]x0.1 =	0 (10)												
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>if both types of wall are present, use the value corresponding to the greater wall area (after</i> <i>deducting areas of openings); if equal user 0.35</i> If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (11)												
If no draught lobby, enter 0.05, else enter 0	0 (12)												
Percentage of windows and doors draught stripped	0 (14)												
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$	0 (15)												
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)												
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$	4 (17) 0.36 (18)												
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.50												
Number of sides sheltered	2 (19)												
Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$	0.85 (20)												
Infiltration rate incorporating shelter factor (21) = (18) × (20) =	0.31 (21)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
Monthly average wind speed from Table 7													
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7													
Wind Factor (22a)m = (22)m ÷ 4													
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18													



Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	elter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.39	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36			
			-	rate for t	he appli	cable ca	se			-	-				
		al ventila		ondix N (2	2h) - (22	a) × Fmv (e	oquation (		nuico (22h	(220)			(		(23a)
										i) = (23a)			(		(23b)
			-	-	-	or in-use f							(	)	(23c)
· · ·		1	r			<b></b>	<u> </u>	1 / 1	ŕ	2b)m + ()	r <u>, -</u>	r <u>`</u>	÷ 100] I		(24a)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24a)
í I		1	· · · · · ·				, <u>, ,</u>	T T	ŕ	2b)m + (2 1	, <u> </u>	1	1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
,					•	ve input v o); otherv				.5 × (23b	))				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,						ve input erwise (2				0.5]					
(24d)m=	0.58	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24t	5) or (24	c) or (24	d) in bo	k (25)						
(25)m=	0.58	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(25)
							1		1	-					
		s ano ne Gros				Net Ar		U-val		AXU		k volu		ΑX	
ELEN	IENI	area		Openin m		A,r		W/m2		A X U (W/I	<)	k-value kJ/m²·l		kJ/	
Doors						1.92	x	1	=	1.92					(26)
Windo	ws Type	e 1				1		L/[1/( 1.4 )+	0.04] =	1.33	F				(27)
Windo	ws Type	2				13.43	x1	/[1/( 1.4 )+	0.04] =	17.8	Ħ				(27)
Floor T						0.69		0.13	=	0.0897	E r				(28)
Floor T						12.03		0.13		1.5639	=		╡┟		(28)
Walls 1		62		14.43		47.57					╡╏				(29)
Walls 1								0.17		8.09					=
		15.7		1.92		13.83		0.16	=	2.19					(29)
		lements	, m²			90.47	7								(31)
Party w						9.1	X	0	=	0					(32)
Party fl	loor					42.99	9								(32a)
Party c	eiling					52.08	3								(32b)
				ffective wi nternal wal			lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	1 3.2		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30	) + (32) =				32.	98	(33)
Heat ca	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	(	)	(34)
Therma	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		25	50	(35)
	-		ere the de tailed calc		construct	ion are noi	t known pl	recisely the	e indicative	e values of	TMP in Ta	able 1f			_
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix I	K						12.	33	(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) =			45.	32	(37)

Ventila	tion hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	23.33	23.2	23.09	22.53	22.42	21.93	21.93	21.84	22.12	22.42	22.63	22.85		(38)
Heat ti	ansfer c	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	68.64	68.52	68.4	67.84	67.74	67.25	67.25	67.16	67.44	67.74	67.95	68.17		
						!				Average =	Sum(39)1.	12 /12=	67.84	(39)
	· ·	· · ·	HLP), W	/m²K		i	i		(40)m	= (39)m ÷	· (4)			
(40)m=	1.32	1.32	1.31	1.3	1.3	1.29	1.29	1.29	1.29	1.3	1.3	1.31		
Numbe	er of day	s in mo	nth (Tab	le 1a)					/	Average =	Sum(40)1.	12 /12=	1.3	(40)
- turno	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,														. ,
4 10/-	ten heed													
4. 772	ater neat	ling ene	rgy requ	irement:								kWh/ye	ear:	
		ipancy, I										75		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	: [1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.	.9)			
			ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		7!	5.8		(43)
Reduce	the annua	al average	hot water	usage by	5% if the c	dwelling is	designed	to achieve		se target o				( - /
not more	e that 125	litres per	person pe	r day (all w	ater use, l	hot and co	id)				1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage II	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	l able 1c x	(43)						
(44)m=	<mark>8</mark> 3.38	80.34	77.31	74.28	71.25	68.22	68.22	71.25	74.28	77.31	80.34	<mark>8</mark> 3.38		
Energy	content of	hot water	used - ca	lculated m	onthly $= 4$ .	190 x Vd,r	m x nm x L	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	9 <mark>09.56</mark>	(44)
(45)m=	123.64	108.14	111.59	97.29	93.35	80.55	74.64	85.66	86.68	101.02	110.27	119.74		
									-	Total = Su	m(45) <sub>112</sub> =	=	1192.57	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46)	) to (61)					
(46)m=	18.55	16.22	16.74	14.59	14	12.08	11.2	12.85	13	15.15	16.54	17.96		(46)
	storage		ingludir		olor or M		otorogo	within or						(47)
-		. ,				enter 110	-	within sa	ame ves	501		0		(47)
		•			•			ombi boil	ers) ente	er '0' in (	47)			
	storage			. (					,		,			
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
			-	e, kWh/ye				(48) x (49)	) =			0		(50)
				•		or is not								
		-	ee secti		ie z (kvv	h/litre/da	ay)					0		(51)
		from Ta		011 4.0								0		(52)
Tempe														
	erature fa	actor no	m Table	2b								0		(53)
Energy				∘ 2b e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(53)
	/ lost fro		· storage		ear			(47) x (51)	) x (52) x (	53) =				
Enter	/ lost fro (50) or (	m water (54) in (5	· storage 55)					(47) x (51) ((56)m = (				0		(54)



If cylinder con	tains dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	)m where (	H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary cire	cuit loss (ar	nnual) fro	om Table	e 3	-	-	-				0		(58)
Primary cire					59)m = (	(58) ÷ 36	65 × (41)	m					
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss	calculated	for each	n month (	(61)m =	(60) ÷ 36	65 × (41	)m						
(61)m= 42.4	49 36.98	39.4	36.63	36.31	33.64	34.76	36.31	36.63	39.4	39.62	42.49		(61)
Total heat r	equired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)n	า
(62)m= 166	13 145.12	150.99	133.92	129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		(62)
Solar DHW in	out calculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	ar contribut	ion to wate	er heating)		
(add additio	onal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	n water hea	iter	_				_			_			
(64)m= 166.	13 145.12	150.99	133.92	129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		
		-					Outp	out from w	ater heate	r (annual)₁	12	1647.23	(64)
Hea <mark>t gains</mark>	from water	heating	, kWh/m	onth 0.2	5´[0.85	× (45)m	n + (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 51.	73 45.2	46.95	41.51	40.12	<mark>3</mark> 5.19	33.51	37.56	37.98	43.44	46.57	50.44		(65)
in <mark>clude</mark> (	57)m in cal	culation	of (65)m	only i <mark>f</mark> c	ylinder i	s in th <mark>e</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Interna	l gains (see	e Ta <mark>ble 8</mark>	5 and 5a	):									
Metabolic g	ains (Table	e 5), Wat	tts										
Ja		Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 87.5	57 87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57		(66)
Lighting ga	ins (calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 13.0	61 12.09	9.83	7.44	5.56	4.7	5.07	6.6	8.85	11.24	13.12	13.99		(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	•			
(68)m= 152.	63 154.22	150.23	141.73	131	120.92	114.19	112.6	116.6	125.09	135.82	145.9		(68)
Cooking ga	ins (calcula	ted in A	ppendix	L, equat	tion L15	or L15a	), also se	e Table	9 5				
(69)m= 31.7	76 31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76		(69)
Pumps and	fans gains	(Table :	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)				1				
(71)m= -70.	06 -70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06		(71)
Water heat	ing gains (1	rable 5)							I				
(72)m= 69.5	<del></del>	63.11	57.65	53.92	48.88	45.04	50.48	52.75	58.38	64.68	67.79		(72)
Total inter	nal gains =		I	Į	(66)	ı m + (67)m	I n + (68)m +	ı ⊦ (69)m +	(70)m + (7	1)m + (72)	m	I	
(73)m= 288.		275.44	259.09	242.76	226.77	216.57	221.95	230.47	246.99	265.89	279.95		(73)
6. Solar ga	ains:				1	1							
	are calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	ne applicat	ole orientat	ion.		
Orientation			Area		Flu			g_		FF		Gains	
	Table 6d		m²		Tal	ble 6a	Т	able 6b	Т	able 6c		(W)	

Northeast 0.9¢ 0.77 × 1 × 11.28 × 0.76 × 0.7 = 4.16 (76) Northeast 0.9¢ 0.77 × 1 × 1 × 22.97 × 0.76 × 0.7 = 6.47 (76) Northeast 0.9¢ 0.77 × 1 × 1 × 41.38 × 0.76 × 0.7 = 25.05 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.35 × 0.76 × 0.7 = 33.68 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.35 × 0.76 × 0.7 = 33.68 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.35 × 0.76 × 0.7 = 33.68 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.1 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.1 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 00.1 × 0.76 × 0.7 = 16.69 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 00.1 × 0.76 × 0.7 = 16.69 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.04 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.04 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.04 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.24 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.24 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.24 × 0.76 × 0.7 = 122.16(5) Southeast 0.9¢ 0.77 × 1 × 1 × 0.24 × 0.76 × 0.7 = 34.0(75) Southeast 0.9¢ 0.77 × 1 × 1 × 0.24 × 0.76 × 0.7 = 34.0(75) Southeast 0.9¢ 0.77 × 1 × 1 × 14.2 × 0.76 × 0.7 = 424.59 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 0.679 × 0.76 × 0.7 = 340.32 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 106.25 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 106.25 × 0.76 × 0.7 = 584.777 Southeast 0.9¢ 0.77 × 1 × 13.43 × 106.25 × 0.76 × 0.7 = 584.777 Southeast 0.9¢ 0.77 × 1 × 13.43 × 104.37 × 0.76 × 0.7 = 342.37 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 104.37 × 0.76 × 0.7 = 342.37 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 1 × 13.43 × 0.676 × 0.7 = 342.
Northeast 0.5% 0.77 × 1 × 1 × 41.38 × 0.76 × 0.7 = 15.26 (75) Northeast 0.5% 0.77 × 1 × 1 × 47.38 × 0.76 × 0.7 = 25.05 (75) Northeast 0.5% 0.77 × 1 × 1 × 97.38 × 0.76 × 0.7 = 33.68 (79) Northeast 0.5% 0.77 × 1 × 1 × 97.38 × 0.76 × 0.7 = 33.68 (79) Northeast 0.5% 0.77 × 1 × 1 × 97.38 × 0.76 × 0.7 = 35.9 (75) Northeast 0.5% 0.77 × 1 × 1 × 12.63 × 0.76 × 0.7 = 26.78 (75) Northeast 0.5% 0.77 × 1 × 1 × 12.63 × 0.76 × 0.7 = 26.78 (75) Northeast 0.5% 0.77 × 1 × 1 × 20.63 × 0.76 × 0.7 = 26.78 (75) Northeast 0.5% 0.77 × 1 × 1 × 20.62 × 0.76 × 0.7 = 10.55 (75) Northeast 0.5% 0.77 × 1 × 1 × 26.87 × 0.76 × 0.7 = 10.55 (75) Northeast 0.5% 0.77 × 1 × 1 × 26.87 × 0.76 × 0.7 = 5.23 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 28.07 × 0.76 × 0.7 = 5.23 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 0.21 × 0.76 × 0.7 = 5.23 (75) Southeast 0.5% 0.77 × 1 × 13.43 × 0.679 × 0.76 × 0.7 = 10.25 (77) Southeast 0.5% 0.77 × 13.43 × 0.679 × 0.76 × 0.7 = 10.26 (77) Southeast 0.5% 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 26.09 (77) Southeast 0.5% 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 588.267 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.267 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 0.44 (77) × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 0.44 (77) × 0.76 × 0.7 = 156.97 (77) South
Northeast 0.4 0.77 × 1 × 1 × 67.96 × 0.76 × 0.7 = 25.05 (75) Northeast 0.9 0.77 × 1 × 1 × 91.35 × 0.76 × 0.7 = 235.9 (75) Northeast 0.9 0.77 × 1 × 1 × 91.35 × 0.76 × 0.7 = 35.9 (75) Northeast 0.9 0.77 × 1 × 1 × 91.1 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 13.59 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 13.59 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 3.4 (75) Southeast 0.9 0.77 × 1 × 1 × 0.21 × 0.76 × 0.7 = 3.4 (75) Southeast 0.9 0.77 × 13.43 × 62.67 × 0.76 × 0.7 = 310.32 (77) Southeast 0.9 0.77 × 13.43 × 62.67 × 0.76 × 0.7 = 310.32 (77) Southeast 0.9 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 310.32 (77) Southeast 0.9 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 518.27 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 518.27 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 518.27 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 518.27 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 155.87 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 155.87 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 156.48 (77) Southeast 0.9 0.77 × 13.43 × 0.9 5.85 (43.85 (478.33 35.31 23.44 (59.3 (43) (77) Southeast 0.9 0.77 × 13.43 × 0.9 5.85 (43.85 (78.8 60.3 489.3 49.25 (64) Theorerature during heating periods in the living area from Tabl
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Northeast 0.9x       0.77       x       1       x       72.63       x       0.76       x       0.7       =       626.78       (75)         Northeast 0.9x       0.77       x       1       x       50.42       x       0.76       x       0.7       =       18.59       (75)         Northeast 0.9x       0.77       x       1       x       28.07       x       0.76       x       0.7       =       10.35       (75)         Northeast 0.9x       0.77       x       1       x       14.2       x       0.76       x       0.7       =       5.23       (75)         Northeast 0.9x       0.77       x       1       x       9.21       x       0.76       x       0.7       =       3.4       (75)         Southeast 0.9x       0.77       x       13.43       x       62.67       x       0.7       =       310.32       (77)         Southeast 0.9x       0.77       x       13.43       x       106.25       x       0.76       x       0.7       =       585.67       (77)       Southeast 0.9x       0.77       x       13.43       x       119.25       x       0.76
Northeast 0.9x       0.77       x       1       x       50.42       x       0.76       x       0.7       =       18.59       (75)         Northeast 0.9x       0.77       x       1       x       28.07       x       0.76       x       0.7       =       10.35       (75)         Northeast 0.9x       0.77       x       1       x       9.21       x       0.76       x       0.7       =       3.4       (75)         Southeast 0.9x       0.77       x       1.3.43       x       36.79       x       0.76       x       0.7       =       310.32       (77)         Southeast 0.9x       0.77       x       13.43       x       62.67       x       0.76       x       0.7       =       310.32       (77)         Southeast 0.9x       0.77       x       13.43       x       106.25       x       0.76       x       0.7       =       526.09       (77)         Southeast 0.9x       0.77       x       13.43       x       119.01       x       0.76       x       0.7       =       585       (77)       Southeast 0.9x       0.77       x       13.43       x       119.43<
Northeast $0.9x$ $0.77$ $x$ $1$ $x$ $28.07$ $x$ $0.76$ $x$ $0.7$ $=$ $10.35$ $75$ Northeast $0.9x$ $0.77$ $x$ $1$ $x$ $9.21$ $x$ $0.76$ $x$ $0.7$ $=$ $5.23$ $76$ Southeast $0.9x$ $0.77$ $x$ $1.3.43$ $x$ $36.79$ $x$ $0.7$ $=$ $182.18$ $77$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $62.67$ $x$ $0.7$ $=$ $310.32$ $77$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $106.25$ $x$ $0.76$ $x$ $0.7$ $=$ $424.59$ $77$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $106.25$ $x$ $0.76$ $x$ $0.7$ $=$ $586.0$ $77$ $586.2$ $77$ $586.2$ $77$ $586.2$ $77$ $586.2$ $77$ $586.2$ $77$ $586.2$ $77$ $586.2$ $77$ $586.2$
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Southeast 0, 9x       0.77       x       13.43       x       85.75       x       0.76       x       0.7       =       424.59       77)         Southeast 0, 9x       0.77       x       13.43       x       106.25       x       0.76       x       0.7       =       526.09       (77)         Southeast 0, 9x       0.77       x       13.43       x       119.01       x       0.76       x       0.7       =       528.09       (77)         Southeast 0, 9x       0.77       x       13.43       x       118.15       x       0.76       x       0.7       =       589.26       (77)         Southeast 0, 9x       0.77       x       13.43       x       113.91       x       0.76       x       0.7       =       586.4       (77)         Southeast 0, 9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       586.4       (77)         Southeast 0, 9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       459.74       (77)         Southeast 0, 9x       0.77       x       <
Southeast 0.9x       0.77       ×       13.43       ×       106.25       ×       0.76       ×       0.7       =       526.09       (77)         Southeast 0.9x       0.77       ×       13.43       ×       119.01       ×       0.76       ×       0.7       =       589.26       (77)         Southeast 0.9x       0.77       ×       13.43       ×       119.01       ×       0.76       ×       0.7       =       589.26       (77)         Southeast 0.9x       0.77       ×       13.43       ×       118.15       ×       0.76       ×       0.7       =       585       (77)         Southeast 0.9x       0.77       ×       13.43       ×       104.39       ×       0.76       ×       0.7       =       564.7       (77)         Southeast 0.9x       0.77       ×       13.43       ×       92.85       ×       0.76       ×       0.7       =       459.74       (77)         Southeast 0.9x       0.77       ×       13.43       ×       92.85       ×       0.76       ×       0.7       =       218.21       (77)         Southeast 0.9x       0.77       ×       13.43 </td
Southeast 0.9x       0.77       x       13.43       x       119.01       x       0.76       x       0.7       =       589.26       (77)         Southeast 0.9x       0.77       x       13.43       x       119.01       x       0.76       x       0.7       =       589.26       (77)         Southeast 0.9x       0.77       x       13.43       x       113.91       x       0.76       x       0.7       =       564       (77)         Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       564.4       (77)         Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       564.4       (77)         Southeast 0.9x       0.77       x       13.43       x       69.27       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43       x       44.07       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43
Southeast 0.9x       0.77       x       13.43       x       118.15       x       0.76       x       0.7       =       585       (77)         Southeast 0.9x       0.77       x       13.43       x       113.91       x       0.76       x       0.7       =       585       (77)         Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       586       (77)         Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       516.87       (77)         Southeast 0.9x       0.77       x       13.43       y       92.85       x       0.76       x       0.7       =       459.74       (77)         Southeast 0.9x       0.77       x       13.43       x       69.27       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43       x       44.07       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43
Southeast $0.9x$ $0.77$ x       13.43       x       113.91       x $0.76$ x $0.7$ =       564       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       104.39       x $0.76$ x $0.7$ =       516.87       (77)         Southeast $0.9x$ $0.77$ x       13.43       y       92.85       x $0.76$ x $0.7$ =       459.74       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       69.27       x $0.76$ x $0.7$ =       342.97       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       44.07       x $0.76$ x $0.7$ =       342.97       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       44.07       x $0.76$ x $0.7$ =       218.21       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       31.49       x $0.76$ x $0.7$ =       218.21       (77)         Southeast $0.9x$
Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       516.87       (77)         Southeast 0.9x       0.77       x       13.43       x       92.85       x       0.76       x       0.7       =       459.74       (77)         Southeast 0.9x       0.77       x       13.43       x       69.27       x       0.76       x       0.7       =       459.74       (77)         Southeast 0.9x       0.77       x       13.43       x       69.27       x       0.76       x       0.7       =       342.97       (77)         Southeast 0.9x       0.77       x       13.43       x       44.07       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43       x       31.49       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43       x       31.49       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43 </td
Southeast $0.9x$ $0.77$ x $13.43$ $92.85$ x $0.76$ $x$ $0.7$ = $459.74$ (77) Southeast $0.9x$ $0.77$ x $13.43$ $44.07$ $x$ $0.76$ $x$ $0.7$ = $342.97$ (77) Southeast $0.9x$ $0.77$ x $13.43$ $44.07$ $x$ $0.76$ $x$ $0.7$ = $218.21$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $44.07$ $x$ $0.76$ $x$ $0.7$ = $218.21$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $44.07$ $x$ $0.76$ $x$ $0.7$ = $218.21$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $31.49$ $x$ $0.76$ $x$ $0.7$ = $155.91$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $31.49$ $x$ $0.76$ $x$ $0.7$ = $155.91$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $31.49$ $x$ $0.76$ $x$ $0.7$ = $155.91$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $31.49$ $x$ $0.76$ $x$ $0.7$ = $155.91$ (77) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = $186.34$ $318.78$ $439.84$ $551.14$ $622.94$ $620.9$ $597.59$ $543.65$ $478.33$ $353.31$ $223.44$ $159.3$ (83) Total gains – internal and solar (84)m = (73)m + (83)m, watts (84)m = $474.38$ $604.62$ $715.28$ $810.23$ $865.69$ $847.67$ $814.16$ $765.6$ $708.8$ $600.3$ $489.33$ $439.25$ (84) <b>7. Mean internal temperature (heating season)</b> Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m = <u>13an Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> (86)m = <u>0.99 0.97 0.92 0.83 0.67 0.5 0.36 0.4 0.62 0.88 0.98 0.99 (86)</u>
Southeast $0.9x$ 0.77 × 13.43 × 69.27 × 0.76 × 0.7 = 342.97 (77) Southeast $0.9x$ 0.77 × 13.43 × 44.07 × 0.76 × 0.7 = 218.21 (77) Southeast $0.9x$ 0.77 × 13.43 × 44.07 × 0.76 × 0.7 = 218.21 (77) Southeast $0.9x$ 0.77 = 155.91 (77) Southeast $0.9x$ 0.77 = 155.91 (77) Southeast $0.9x$ 0.77 = 155.91 (77) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 186.34 318.78 439.84 551.14 622.94 620.9 597.59 543.65 478.33 353.31 223.44 159.3 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 474.38 604.62 715.28 810.23 865.69 847.67 814.16 765.6 708.8 600.3 489.33 439.25 (84) <b>7. Mean internal temperature (heating season)</b> Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m = <u>199 0.97 0.92 0.83 0.67 0.5 0.36 0.4 0.62 0.88 0.98 0.99</u> (86)
Southeast $0.9x$ $0.77$ x $13.43$ x $44.07$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $44.07$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $44.07$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $31.49$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $31.49$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $31.49$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.620.9$ $597.59$ $543.65$ $478.33$ $353.31$ $223.44$ $159.3$ $(83)$ Total gains - i
Southeast $0.9x$ $0.77$ x $13.43$ x $31.49$ x $0.76$ x $0.7$ = $155.91$ $(77)$ Solar gains in watts, calculated for each month       (83)m = Sum(74)m(82)m       (84)m = (73)m + (83)m , watts       (84)m = (73)m + (83)m , watts       (84)m = (73)m + (83)m , watts       (84)m = (74.38 604.62 715.28 810.23 865.69 847.67 814.16 765.6 708.8 600.3 489.33 439.25       (84)         Temperature during heating periods in the living area from Table 9, Th1 (°C)       21 (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)       (86)m = 0.99 0.97 0.92 0.83 0.67 0.5 0.36 0.4 0.62 0.88 0.98 0.99       (86)
Solar gains in watts, calculated for each month       (83)m = Sum(74)m(82)m         (83)m =       186.34       318.78       439.84       551.14       622.94       620.9       597.59       543.65       478.33       353.31       223.44       159.3       (83)         Total gains – internal and solar (84)m = (73)m + (83)m , watts       (84)m = $474.38$ 604.62       715.28       810.23       865.69       847.67       814.16       765.6       708.8       600.3       489.33       439.25       (84) <b>Chean internal temperature (heating season)</b> Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)       [36]m =       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Total gains - internal and solar (84)m = (73)m + (83)m , watts       (84)m= $474.38$ $604.62$ $715.28$ $810.23$ $865.69$ $847.67$ $814.16$ $765.6$ $708.8$ $600.3$ $489.33$ $439.25$ (84)         7. Mean internal temperature (heating season)         Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)         Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (86)         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
(84)m=       474.38       604.62       715.28       810.23       865.69       847.67       814.16       765.6       708.8       600.3       489.33       439.25       (84)         7. Mean internal temperature (heating season)         Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)         (86)m= <u>Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (86)         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)   </u>
7. Mean internal temperature (heating season)         Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
Utilisation factor for gains for living area, h1,m (see Table 9a)           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (86)m=         0.99         0.97         0.92         0.83         0.67         0.5         0.36         0.4         0.62         0.88         0.99         (86)
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (86)m=         0.99         0.97         0.92         0.83         0.67         0.5         0.36         0.4         0.62         0.88         0.98         0.99         (86)
(86)m= 0.99 0.97 0.92 0.83 0.67 0.5 0.36 0.4 0.62 0.88 0.98 0.99 (86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)
(87)m=         19.82         20.09         20.42         20.73         20.91         20.98         21         20.99         20.95         20.69         20.18         19.76         (87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(88)m=         19.83         19.83         19.84         19.85         19.85         19.84         19.84         19.83         (88)
(88)m=       19.83       19.83       19.84       19.84       19.85       19.85       19.84       19.84       19.84       19.83       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.99       0.96       0.9       0.78       0.6       0.41       0.27       0.3       0.53       0.84       0.97       0.99       (89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

# be

(90)m=	18.29	18.69	19.15	19.56	19.77	19.84	19.85	19.85	19.82	19.52	18.83	18.21		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.59	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) – fl	Δ 🗙 Τ1	+ (1 – fl	Δ) <del>v</del> T2					
(92)m=	19.19	19.52	19.89	20.25	20.44	20.51	20.52	20.52	20.48	20.21	19.62	19.12		(92)
		nent to t	L he mear	internal	temper	L ature fro	n Table	4e. whe	ere appro					
(93)m=	19.04	19.37	19.74	20.1	20.29	20.36	20.37	20.37	20.33	20.06	19.47	18.97		(93)
8. Sp	ace hea	ting requ	uirement											
					e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
				using Ta							,			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.98	0.96	0.9	0.79	0.63	0.45	0.31	0.35	0.57	0.85	0.96	0.99		(94)
Usefu		hmGm	, W = (94	4)m x (84	4)m	r	r				r			
(95)m=	465.99	577.6	644.4	642.19	546.91	381.48	252.81	265.3	403.83	507.69	470.97	433.45		(95)
	<u> </u>		r	perature		1	r				r			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			1	al tempe		i		<u> </u>	<u> </u>	_				
(97)m=	1011.55		905.96	759.72	581.95	387.36	253.65	266.68	420.41	640.63	840.65	1006.82		(97)
				r each n			1				1			
(98)m=	405.9	277.95	194.6	84.62	26.07	0	0	0	0	98.91	266.17	426. <mark>5</mark> 9	_	7
								Tota	l per year	(kWh/year	') = Sum(9	8)15,912 =	1780.81	(98)
Space	e h <mark>eatin</mark>	g requ <mark>ir</mark> e	ement in	kWh/m <sup>2</sup>	/year								34.19	(99)
9a. En	ergy rec	uiremer	nts – Ind	ividu <b>al h</b>	eating s	ystems i	ncluding	micro-C	CHP)					_
Spac	e heatir	ng:												
Fracti	on of sp	ace hea	at from s	<mark>econ</mark> dar	y/sup <mark>ple</mark>	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from n	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		·	1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1							·	90.8	(206)
				ementar		a system	ו %						0	(208)
2								A	0.010	0	Nau	Dee	-	
Snoo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	405.9	277.95	194.6	alculate 84.62	26.07	0	0	0	0	98.91	266.17	426.59		
(0.1.1)						0	0	0	0	50.51	200.17	420.00		
(211)m		í .	<u>, , , ,</u>	00 ÷ (20	, 					100.00	000.44	400.04		(211)
	447.02	306.11	214.32	93.2	28.71	0	0	0	0	108.93	293.14	469.81		
								Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u>_</u>	1961.24	(211)
•				y), kWh/	month									
	<u> </u>	/	00 ÷ (20	r í	-									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<u>_</u>	0	(215)
	heating	•												
Output	166.13	ater hea 145.12	ter (calc 150.99	ulated a	20 <b>ve)</b> 129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		
Efficier		ater hea		133.92	129.00	114.2	109.41	121.90	120.01	140.41	143.03	102.20	04 5	(216)
Enciel	icy of w	ater nea											81.5	(210)



· · · · · · · · · · · · · · · · · · ·					i	<b></b>				i	1	(- · - ·
(217)m= 87.89 87.38	86.49	84.87	82.92	81.5	81.5	81.5	81.5	85.1	87.21	88.03		(217)
Fuel for water heating,												
$(219)m = (64)m \times 100$ (219)m = 189.03  166.08	) ÷ (217)r 174.58	n 157.8	156.36	140.12	134.24	149.65	151.3	164.99	171.86	184.29	l	
(219)11= 109.03 100.08	174.50	157.0	150.50	140.12	134.24			19a) <sub>1 12</sub> =	171.00	104.29	1940.3	(219)
Annual totals							(-		Wh/year		kWh/yea	· · · · ·
Space heating fuel use	d. main s	svstem	1					n.	wii/yeai		1961.24	<u> </u>
		-,										=
Water heating fuel use											1940.3	
Electricity for pumps, fa	ans and e	electric l	keep-hot	İ								
central heating pump:										30		(230c)
Total electricity for the	above, k	Wh/yea	r			sum	of (230a)	(230g) =			30	(231)
Electricity for lighting											240.31	(232)
12a. CO2 emissions -	– Individu	ial heati	na evete	me inclu								
		an nouti	ng sysie		Jaing mi	CLO-CHE						
		arricati	ng syste			CIO-CHP						
		ia neat		En	ergy				ion fac	tor	Emission	-
		an neat		En		CIO-CHP		<b>Emiss</b> kg CO2		tor	Emission kg CO2/ye	-
Space heating (main s				<b>En</b> kW	ergy	CIO-CHP			2/kWh	tor =		-
	ystem 1)			<b>En</b> kW (211	<b>ergy</b> /h/year			kg CO	2/kWh		kg CO2/ye	ar
Space heating (main s	ystem 1)			<b>En</b> kW (21 <sup>,</sup> (21)	<b>ergy</b> /h/year 1) x			kg CO2	2/kWh 16		kg CO2/ye	ar (261)
Space heating (main sy Space heating (second	ystem 1) lary)			En kW (211 (211 (211)	<b>ergy</b> /h/year 1) x 5) x 9) x	+ (263) + (		kg CO2	2/kWh 16	=	kg CO2/ye	ear (261) (263)
Space heating (main sy Space heating (second Water heating	ystem 1) lary) ng			En kW (21* (21) (21) (26*	ergy /h/year 1) x 5) x 9) x 1) + (262)			kg CO2	2/kWh 16 19	=	kg CO2/ye 423.63 0 419.1	261) (261) (263) (264)
Space heating (main sy Space heating (second Water heating Space and water heating	ystem 1) lary) ng			En kW (21* (21) (21) (26*	ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x			kg CO2	2/kWh 16 19 16	-	kg CO2/ye 423.63 0 419.1 842.73	(261) (263) (264) (265)
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa	ystem 1) lary) ng			En kW (21* (21) (21) (26* (23*	ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x		264) =	kg CO2	2/kWh 16 19 16 19 19	=	kg CO2/ye 423.63 0 419.1 842.73 15.57	261) (261) (263) (264) (265) (267)
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa Electricity for lighting Total CO2, kg/year	ystem 1) dary) ng ans and e			En kW (21* (21) (21) (26* (23*	ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x		264) = sum c	kg CO2 0.2 0.5 0.2 0.5 f (265)(2	2/kWh 16 19 16 19 19	=	kg CO2/ye 423.63 0 419.1 842.73 15.57 124.72 983.02	261) (261) (263) (264) (265) (265) (267) (268) (268) (272)
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa Electricity for lighting Total CO2, kg/year Dwelling CO2 Emissio	ystem 1) dary) ng ans and e			En kW (21* (21) (21) (26* (23*	ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x		264) = sum c	kg CO2 0.2 0.5 0.2	2/kWh 16 19 16 19 19	=	kg CO2/ye 423.63 0 419.1 842.73 15.57 124.72	261) (261) (263) (264) (265) (265) (267) (268)
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa Electricity for lighting Total CO2, kg/year	ystem 1) dary) ng ans and e			En kW (21* (21) (21) (26* (23*	ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x		264) = sum c	kg CO2 0.2 0.5 0.2 0.5 f (265)(2	2/kWh 16 19 16 19 19	=	kg CO2/ye 423.63 0 419.1 842.73 15.57 124.72 983.02	261) (261) (263) (264) (265) (265) (267) (268) (268) (272)



				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201			Strom Softwa Address	are Vei	rsion:		Versio	on: 1.0.1.32	
	Flat 5, 27	West End					Lean				
Address : 1. Overall dwelling dim		West End	i Lane, L	ondon, i	100 4Q	J					
				Aro	a(m²)			ight(m)		Volume(m <sup>3</sup>	\ \
Ground floor					• •	(1a) x		• • •	(2a) =	• •	) (3a)
				4			2	.35	]	117.08	
First floor				5	5.95	(1b) x	2	.35	(2b) =	131.48	(3b)
Total floor area TFA = (	1a)+(1b)+(1c	)+(1d)+(1e	e)+(1r	n) 10	05.77	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	248.56	(5)
2. Ventilation rate:											
	main heatin		econdar neating	У	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0	<u> </u>	0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0	+ [	0		0	] = [	0	x	20 =	0	(6b)
Number of intermittent f	ans	L				- L	2	<b>x</b> ′	10 =	20	(7a)
Number of passive vent	s						0	x ′	10 =	0	(7b)
Number of flueless gas	fires						0	x	40 =	0	(7c)
									Air ch	anges per ho	ur
Infiltration due to chimne	eys, flu <mark>es an</mark> o	l fans = (6	a)+(6b)+(7	<mark>'a)</mark> +(7b)+(	7c) =	Г	20	<u> </u>	÷ (5) =	0.08	(8)
lf a pressurisation test has	been ca <mark>rried o</mark> u	t or is intende	ed, procee	d to (17), d	otherwise o	continue fr	om (9) to (	(16)			_
Number of storeys in	the dw <mark>elling</mark>	ns)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration:							uction			0	(11)
if both types of wall are deducting areas of open			ponaing to	o the great	er wall are	a (atter					
If suspended wooden	floor, enter (	.2 (unseal	led) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, els	e enter 0								0	(13)
Percentage of windov	vs and doors	draught st	tripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)					0	(16)
Air permeability value				•	•	•	etre of e	envelope	area	4	(17)
If based on air permeab	<b>,</b>									0.28	(18)
Air permeability value appl Number of sides shelter		ation test ha	s been dor	ie or a deg	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	eu				(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19)
Infiltration rate incorpora	ating shelter f	actor			(21) = (18	) x (20) =				0.24	(21)
Infiltration rate modified	•		ł							, <u>, , , ,</u>	_)` ´
Jan Feb	Mar Ap		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Ta	ble 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		



#### Wind Factor $(22a)m = (22)m \div 4$ 1.27 0.95 0.92 (22a)m= 1.25 1.23 1.1 1.08 0.95 1 1.08 1.12 1.18 Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m 0.3 0.29 0.26 0.26 0.23 0.3 0.23 0.22 0.24 0.26 0.27 0.28 Calculate effective air change rate for the applicable case If mechanical ventilation: (23a) 0 If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 0 (23b) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m 0 0 0 0 0 0 0 0 0 0 0 0 (24a) b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m 0 0 0 0 n 0 0 0 0 0 0 0 (24b) c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$ , then (24c) = (23b); otherwise $(24c) = (22b)m + 0.5 \times (23b)$ (24c)(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m<sup>2</sup> x 0.5] (24d)m= 0.55 0.54 0.54 0.53 0.53 0.53 0.53 0.53 0.54 0.54 (24d) 0.52 0.53 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.55 0.54 0.54 0.53 0.53 0.53 0.53 0.52 0.53 (25)0.53 0.54 0.54 ELEMENT Gross Openings Net Area **U-value** AXU k-value AXk W/m2K (W/K) kJ/m².K kJ/K area (m²) m<sup>2</sup> A ,m² Doors (26)1.92 1 1.92 Windows Type 1 $x^{1/[1/(1.4)+0.04]} =$ 5.88 7.8 (27)Windows Type 2 $x^{1/[1/(1.4)+0.04]} =$ 7.3 (27)5.508 Windows Type 3 $x^{1/[1/(1.4)+0.04]} =$ 20.08 26.62 (27)Windows Type 4 $x^{1/[1/(1.4)+0.04]} =$ 8.56 11.35 (27)Rooflights $x^{1/[1/(1.4) + 0.04]}$ (27b) = 11.91 16.674 Floor Type 1 16.24 0.13 2.1112 (28) Floor Type 2 0.13 0.0286 (28) 0.22 x = Walls Type1 126.43 40.03 86.4 0.17 14.69 (29) х Walls Type2 20.49 1.92 18.57 0.16 2.94 (29) x Roof 23.82 80.2 (30) 56.38 0.13 7.33 x Total area of elements, m<sup>2</sup> (31)243.58 Party wall (32)5.78 х 0 0 Party floor 62.51 (32a) \* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions Fabric heat loss, $W/K = S (A \times U)$ (26)...(30) + (32) =(33) 113.67 Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)0

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Medium

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

250

(35)

can be ı	ised inste	ad of a dei	tailed calc	ulation.										
Therm	al bridge	əs : S (L	x Y) cal	culated u	using Ap	pendix I	K					]	22.83	(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) =		[	136.5	(37)
Ventila	tion hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	44.8	44.65	44.51	43.83	43.71	43.12	43.12	43.01	43.34	43.71	43.96	44.23		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	181.3	181.15	181.01	180.33	180.2	179.61	179.61	179.5	179.84	180.2	180.46	180.73		
		motor (l		/			•	•		-	Sum(39)1	12 /12=	180.33	(39)
		meter (H	,	i	47	47	47	47		= (39)m ÷		4 74		
(40)m=	1.71	1.71	1.71	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.71	1.71	47	
Numbe	er of day	/s in moi	nth (Tab	le 1a)						Average =	Sum(40)1	12/12=	1.7	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
								•		•	•			
4. Wa	iter heat	ting ener	gy requ	irement:								kWh/ye	ar:	
A			NI I											(40)
		ıpancy, l 9, N = 1		[1 - exp	(-0.0003	49 x (TF		$(2)^{1} + 0.0$	0013 x ( <sup>-</sup>	TFA -13.		79		(42)
	A £ 13.9				( 0.000			/_/] - 01						
		e hot wa										0.39		(43)
		al avera <mark>ge</mark> litres per j				-	7	to achieve	a water us	se target o	t			
Hot wate	Jan	Feb n litres per	Mar day for e	Apr Apr	May Vd m – fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
			-	-				· ·	00.00	400.4	400.44			
(44)m=	110.43	106.41	102.4	98.38	94.37	90.35	90.35	94.37	98.38	102.4	106.41	110.43		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			m(44) <sub>112</sub> = ables 1b, 1	L	1204.67	(44)
(45)m=	163.76	143.23	147.8	128.85	123.64	106.69	98.86	113.45	114.8	133.79	146.04	158.59		
( -)											m(45) <sub>112</sub> =	l	1579.51	(45)
lf instant	aneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46				L		
(46)m=	24.56	21.48	22.17	19.33	18.55	16	14.83	17.02	17.22	20.07	21.91	23.79		(46)
	storage		الم ماريما					ithin or		aal				
		e (litres)		0 1			0		ame ves	sei		0		(47)
	•	eating a stored			-			• •	ore) ont	or 'O' in (	47)			
	storage		not wate	51 (1115 11	iciuues i	nstantai	ieous co				47)			
	-	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
		actor fro					,,,,				<u> </u>	0		(49)
-		m water			ar			(48) x (49)	) –					(40)
•••		urer's de	-	•		or is not		(40) X (40)	, –			0		(30)
•		age loss		•								0		(51)
	-	leating s		on 4.3										
		from Tal										0		(52)
Tempe	rature f	actor fro	m Table	2b							1	0		(53)

		om watei (54) in (5	-	e, kWh/ye	ear			(47) x (51	) x (52) x (	53) =		0	(54)
	. ,			for each	month			((56)m = (	(55) × (41)	n		U	(35)
(56)m=			0		0	0	0	0	0	0	0	0	(56)
	-						H11)] ÷ (5	-					
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0	(58)
	•					,	(58) ÷ 36 ter heatii	• • •		r thermo	stat)		
(59)m=		0	0		0	0	0			0	0	0	(59)
Combi		I Iculated	for each	n month (	(61)m –	I (60) ∸ 30	65 × (41)	)m					l
(61)m=	50.96	46.03	50.96	48.52	48.09	44.56	46.04	48.09	48.52	50.96	49.32	50.96	(61)
				eating ca		for eac			0.85 x (				J (59)m + (61)m
(62)m=	214.72	189.25	198.76	177.37	171.73	151.25	144.91	161.54	163.32	184.75	195.36	209.55	(62)
	-IW input	L calculated	using App	endix G o	r Appendix	L H (negati	I ve quantity	I /) (enter '0	l if no sola	r contributi	ion to wate	I er heating)	l
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)				
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)
Output	t from w	ater hea	iter								-	-	
(64)m=	214.72	189.25	198.76	177.37	171.73	151.25	144.91	161.54	163.32	184.75	195.36	209.55	
								Out	out from wa	ater heatei	r (annual)₁	12	2162.5 (64)
Hea <mark>t g</mark>	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)n	י 0.8 <mark>+</mark> 1	( <mark>46)m</mark>	+ (57)m	+ ( <mark>59)m</mark>	]
(65)m=	67.19	59.13	61.88	54.97	53.13	46.61	44.38	49.74	50.3	57.23	60.89	65.47	(65)
inclu	ide (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	leating
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):								
Metab	olic gair	ns (Table	<u>e 5), Wat</u>	tts									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	(66)
-	<u> </u>	· · · · · · · · · · · · · · · · · · ·	· · · · ·		· · ·		r L9a), a	i	1		·	i	1
(67)m=	23.65	21.01	17.09	12.94	9.67	8.16	8.82	11.47	15.39	19.54	22.81	24.31	(67)
		<u>`</u>	ı —	· · ·	· · · ·	1	13 or L1	, 	r				1
(68)m=	265.33	268.09	261.15	246.38	227.73	210.21	198.5	195.75	202.69	217.46	236.1	253.63	(68)
	<u> </u>	<u>`</u>	i		· · ·		or L15a)						1
(69)m=	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	(69)
•	r	<u> </u>	(Table !	<u> </u>									1 (77)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
		· · · · · · · · · · · · · · · · · · ·	<del>, , , , , , , , , , , , , , , , , , , </del>	tive valu	, ``	,	1		1		i		1
(71)m=		-111.48		-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	(71)
		gains (1	· · · ·										1 (77)
(72)m=	90.31	87.99	83.18	76.35	71.41	64.74	59.65	66.86	69.86	76.92	84.57	88	(72)
		gains =	1				)m + (67)m	r	r · ·		1	r	1
(73)m=	447.1	444.89	429.21	403.47	376.62	350.92	334.78	341.88	355.74	381.72	411.28	433.74	(73)
6. So	lar gains	S:											

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	5.88	×	11.28	×	0.76	x	0.7	=	24.46	(75)
Northeast 0.9x	0.77	x	5.88	x	22.97	x	0.76	x	0.7	=	49.79	(75)
Northeast 0.9x	0.77	x	5.88	x	41.38	×	0.76	x	0.7	=	89.7	(75)
Northeast 0.9x	0.77	x	5.88	x	67.96	x	0.76	x	0.7	=	147.32	(75)
Northeast 0.9x	0.77	x	5.88	x	91.35	x	0.76	x	0.7	=	198.02	(75)
Northeast 0.9x	0.77	x	5.88	x	97.38	x	0.76	x	0.7	=	211.11	(75)
Northeast 0.9x	0.77	x	5.88	x	91.1	x	0.76	x	0.7	=	197.49	(75)
Northeast 0.9x	0.77	x	5.88	x	72.63	x	0.76	x	0.7	=	157.44	(75)
Northeast 0.9x	0.77	x	5.88	x	50.42	x	0.76	x	0.7	=	109.3	(75)
Northeast 0.9x	0.77	x	5.88	x	28.07	x	0.76	x	0.7	=	60.84	(75)
Northeast 0.9x	0.77	x	5.88	x	14.2	x	0.76	x	0.7	=	30.78	(75)
Northeast 0.9x	0.77	x	5.88	x	9.21	×	0.76	x	0.7	=	19.97	(75)
Southeast 0.9x	0.77	x	5.51	x	36.79	x	0.76	x	0.7	=	74.72	(77)
Southeast 0.9x	0.77	x	5.51	x	62.67	×	0.76	x	0.7	=	127.27	(77)
Southeast 0.9x	0.77	x	5.51	x	85.75	×	0.76	x	0.7	=	174.14	(77)
Southeast 0.9x	0.77	x	5.51	×	106.25	X	0.76	x	0.7	=	215.76	(77)
Southeast 0.9x	0.77	x	5.51	x	119.01	x	0.76	x	0.7	=	241.67	(77)
Southeast 0.9x	0.77	x	5.51	x	118.15	×	0.76	x	0.7	=	2 <mark>39.92</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	113.91	x	0.76	×	0.7	=	2 <mark>31.31</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	104.39	x	0.76	x	0.7	=	2 <mark>11.98</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	92.85	×	0.76	x	0.7	=	188.55	(77)
Southeast 0.9x	0.77	x	5.51	x	69.27	x	0.76	x	0.7	=	140.66	(77)
Southeast 0.9x	0.77	x	5.51	x	44.07	×	0.76	x	0.7	=	89.49	(77)
Southeast 0.9x	0.77	x	5.51	x	31.49	×	0.76	x	0.7	=	63.94	(77)
Southwest0.9x	0.77	x	8.56	x	36.79		0.76	x	0.7	=	116.12	(79)
Southwest0.9x	0.77	x	8.56	x	62.67		0.76	x	0.7	=	197.79	(79)
Southwest0.9x	0.77	x	8.56	x	85.75	]	0.76	x	0.7	=	270.62	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	106.25		0.76	x	0.7	=	335.32	(79)
Southwest0.9x	0.77	x	8.56	x	119.01		0.76	x	0.7	=	375.58	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	118.15		0.76	x	0.7	=	372.87	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.56	x	113.91		0.76	x	0.7	=	359.48	(79)
Southwest0.9x		x	8.56	x	104.39		0.76	x	0.7	=	329.44	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	92.85		0.76	x	0.7	=	293.03	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	69.27		0.76	x	0.7	=	218.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.56	x	44.07		0.76	x	0.7	=	139.08	(79)
Southwest <sub>0.9x</sub>	0	x	8.56	x	31.49		0.76	x	0.7	=	99.37	(79)
Northwest 0.9x		x	20.08	×	11.28	×	0.76	x	0.7	=	83.53	(81)
Northwest 0.9x		x	20.08	×	22.97	×	0.76	x	0.7	=	170.02	(81)
Northwest 0.9x	0.77	x	20.08	×	41.38	×	0.76	x	0.7	=	306.33	(81)





Northwest (	0.9x 0.77	x	20.08	x	67	.96	x	0.76	×	0.7	=	503.08	(81)
Northwest (	0.9x 0.77	x	20.08	x	91	.35	x	0.76	x	0.7	=	676.24	(81)
Northwest (	0.9x 0.77	x	20.08	x	97	.38	x	0.76	x	0.7	=	720.94	(81)
Northwest (	0.9x 0.77	x	20.08	x	9	1.1	x	0.76	×	0.7	=	674.42	(81)
Northwest (	0.9x 0.77	x	20.08	x	72	.63	x	0.76	×	0.7	=	537.66	(81)
Northwest (	0.9x 0.77	x	20.08	x	50	.42	x	0.76	x	0.7	=	373.26	(81)
Northwest (	0.9x 0.77	x	20.08	x	28	.07	x	0.76	×	0.7	=	207.78	(81)
Northwest (	0.9x 0.77	x	20.08	×	14	1.2	x	0.76	×	0.7	=	105.1	(81)
Northwest (	0.9x 0.77	x	20.08	×	9.	21	x	0.76	×	0.7	=	68.21	(81)
Rooflights (	).9x 1	x	11.91	×		26	x	0.76	×	0.7	=	296.53	(82)
Rooflights (	).9x 1	x	11.91	×	Ę	54	x	0.76	×	0.7	=	615.87	(82)
Rooflights (	).9x 1	x	11.91	×	9	96	x	0.76	×	0.7	=	1094.88	(82)
Rooflights (	).9x 1	x	11.91	×	1	50	x	0.76	×	0.7	=	1710.75	(82)
Rooflights (	).9x 1	x	11.91	×	1	92	x	0.76	x	0.7	=	2189.76	(82)
Rooflights (	).9x 1	x	11.91	×	2	00	x	0.76	×	0.7	=	2281	(82)
Rooflights (	).9x 1	x	11.91	×	1	89	x	0.76	×	0.7	=	2155.55	(82)
Rooflights (	).9x 1	x	11.91	×	1	57	x	0.76	×	0.7	=	1790.59	(82)
Rooflights (	).9x 1	x	11.91	X	1	15	x	0.76	x	0.7	=	1311.58	(82)
Roof <mark>lights (</mark>	).9x 1	×	11.91	×	6	66	x	0.76	×	0.7	- 1	752.73	(82)
Roof <mark>lights (</mark>	).9x 1	×	11.91	×	:	33	×	0.76	×	0.7	=	376.37	(82)
Roof <mark>lights (</mark>	).9x 1	x	11.91	×		21	×	0.76	×	0.7	=	239.51	(82)
		T											
Sola <mark>r gain</mark>	s in watts, calc	ulated	for each m	onth		3)	83)m = 5	Sum(74)m	. <mark>(8</mark> 2)m			_	
` '   L							3027.11	2275.72	13 <mark>80.6</mark>	2 740.81	491.01		(83)
	s – internal and		· , ,	·	· ,					_			
<mark>(84)m=</mark> 104	2.45 1605.63 2	364.88	3315.69 405	7.89 4	176.76	3953.03	3368.99	2631.46	1762.3	3 1152.09	924.75		(84)
7. Mean	internal tempe	rature	(heating sea	ason)									
Tempera	ture during hea	ating p	eriods in the	e living	area fr	om Tabl	le 9, Th	n1 (°C)				21	(85)
Utilisatio	n factor for gair	ns for l	iving area, ł	n1,m (s	see Tab	le 9a)						-	
J	an Feb	Mar	Apr N	/lay	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0	99 0.95	0.83	0.6 0	.4	0.27	0.2	0.24	0.46	0.81	0.97	0.99		(86)
Mean int	ernal temperat	ure in l	iving area T	1 (follo	ow step	s 3 to 7	in Tab	e 9c)					
(87)m= 19	.39 19.88	20.46	20.85 20	.97	20.99	21	21	20.97	20.64	19.88	19.29	]	(87)
Tempera	ture during hea	ating p	eriods in res	st of dy	velling	rom Tab	ole 9, T	h2 (°C)					
· · · · · · · · · · · · · · · · · · ·		19.53			19.54	19.54	19.54	19.54	19.54	19.54	19.53	]	(88)
Litilisatio	n factor for gair	ns for r	est of dwell	ina h?	) m (se	Table C	9a)					-	
		0.79		34	0.21	0.13	0.17	0.37	0.75	0.96	0.99	1	(89)
											-		
	ernal temperat	ure in t			<u> </u>	now step		r r	,			7	(00)
	10 17	18 O/ I	10/ 1/0	52 I	10 5/	10 EA	10 F 4	10.50	10 0	1010	170/		/um
(00)=	7.48 18.17	18.94	19.4 19	.52	19.54	19.54	19.54	19.52 fl	19.2	18.19 ring area ÷ (4	17.34	0.43	(90) (91)

Mean internal temperature (for the whole dwelling) =  $fLA \times T1 + (1 - fLA) \times T2$ 

<mark>(92)m=</mark> 18.3	18.9	19.59	20.02	20.14	20.16	20.17	20.17	20.14	19.82	18.91	18.18		(92)
Apply adjustn	nent to th	ne mean	internal	tempera	ature fro	m Table	4e, whe	re appro	opriate				
(93)m= 18.15	18.75	19.44	19.87	19.99	20.01	20.02	20.02	19.99	19.67	18.76	18.03		(93)
8. Space hea	ting requ	uirement											
Set Ti to the r	nean int	ernal ter	nperatur	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(7	76)m an	d re-calc	ulate	
the utilisation			•			•			, (	,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm											
(94)m= 0.98	0.92	0.78	0.56	0.36	0.23	0.16	0.19	0.39	0.76	0.95	0.98		(94)
Useful gains,	hmGm ,	W = (94	4)m x (84	 4)m									
(95)m= 1018.52	1479.52	1853.6	1850.45	1470.68	969.11	613.22	648.04	1037.9	1334.61	1093.01	910.03		(95)
Monthly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	for mea	an intern	al tempe	erature. I	_m . W =	[(39)m ;	r [(93)m	– (96)m	1				
(97)m= 2511.2			· · · ·	1493.88		613.72	649.17	1059.61	1634.12	2104.74	2499.24		(97)
Space heatin													
(98)m= 1110.56	- · ·	364.13	92.54	17.26	0	0.02	0	0	222.84	728.45	1182.37		
(50)11- 1110.50	032.04	304.13	52.04	17.20	0	Ŭ	-	-				4440.40	(98)
							Tota	i per year	(kWh/year	) = Sum(9	8)15,912 =	4410.19	(90)
Space heatin	g require	ement in	kWh/m <sup>2</sup>	/year								41.7	(99)
9a. Energy rec	uiremer	its – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space heatir						Ĭ		V Ó					
Fraction of sp	-	t from s	econdar	/supple	mentary	system						0	(201)
Fraction of sp							(202) = 1 -	- (201) =				1	(202)
									(000)]				
Fraction of to	tal neatir	ig from I	main sys	stem 1			(204) = (2	JZ) X [1 -	(203)] =			1	(204)
Efficiency of r	nain spa	ice heat	ing syste	em 1								90.8	=
												00.0	(206)
Efficiency of s	seconda			y heating	g system	ı, %						0	(206) (208)
-		ry/supple	ementar				Αυα	Sep	Oct	Nov	Dec	0	(208)
Jan	Feb	ry/supple Mar	ementar Apr	May	Jun	n, % Jul	Aug	Sep	Oct	Nov	Dec		(208)
Jan Space heatin	Feb g require	ry/supple Mar ement (c	ementary Apr alculated	May d above)	Jun	Jul						0	(208)
Jan Space heatin 1110.56	Feb g require 692.04	ry/supple Mar ement (c 364.13	ementar Apr alculated 92.54	May d above) 17.26	Jun		Aug 0	Sep 0	Oct 222.84	Nov 728.45	Dec 1182.37	0	(208)
Jan Space heatin 1110.56 (211)m = {[(98	Feb g require 692.04 )m x (20	ry/supple Mar ement (c 364.13 4)] } x 1	Apr alculated 92.54 00 ÷ (20	May d above) 17.26	Jun 0	Jul 0	0	0	222.84	728.45	1182.37	0	(208)
Jan Space heatin 1110.56 (211)m = {[(98	Feb g require 692.04	ry/supple Mar ement (c 364.13	ementar Apr alculated 92.54	May d above) 17.26	Jun	Jul	0	0	222.84 245.42	728.45 802.26	1182.37 1302.17	0	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98	Feb g require 692.04 )m x (20	ry/supple Mar ement (c 364.13 4)] } x 1	Apr alculated 92.54 00 ÷ (20	May d above) 17.26	Jun 0	Jul 0	0	0	222.84	728.45 802.26	1182.37 1302.17	0	(208)
Jan Space heatin 1110.56 (211)m = {[(98	Feb g require 692.04 )m x (20 762.16	ry/supple Mar ement (c 364.13 4)] } x 1 401.02	Apr alculated 92.54 00 ÷ (20 101.92	May d above) 17.26 6) 19.01	Jun 0	Jul 0	0	0	222.84 245.42	728.45 802.26	1182.37 1302.17	0 kWh/ye	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08	Feb g require 692.04 )m x (20 762.16 g fuel (se	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdary	Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/	May d above) 17.26 6) 19.01	Jun 0	Jul 0	0	0	222.84 245.42	728.45 802.26	1182.37 1302.17	0 kWh/ye	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin	Feb g require 692.04 )m x (20 762.16 g fuel (se	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdary	Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/	May d above) 17.26 6) 19.01	Jun 0	Jul 0	0	0	222.84 245.42	728.45 802.26	1182.37 1302.17	0 kWh/ye	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin = {[(98)m x (20	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8)	May d above) 17.26 (6) 19.01 month	Jun           0           0	Jul 0	0 0 Tota 0	0 I (kWh/yea	222.84 245.42 ar) =Sum(2	728.45 802.26 11) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin = {[(98)m x (20 (215)m= 0	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8)	May d above) 17.26 (6) 19.01 month	Jun           0           0	Jul 0	0 0 Tota 0	0 I (kWh/yea	222.84 245.42 ar) =Sum(2	728.45 802.26 11) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211) (211)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m =         0	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0	May d above) 17.26 6) 19.01 month	Jun           0           0	Jul 0	0 0 Tota 0	0 I (kWh/yea	222.84 245.42 ar) =Sum(2	728.45 802.26 11) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211) (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin = {[(98)m x (20 (215)m= 0	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0	May d above) 17.26 6) 19.01 month	Jun           0           0	Jul 0	0 0 Tota 0	0 I (kWh/yea	222.84 245.42 ar) =Sum(2	728.45 802.26 11) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211) (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin = {[(98)m x (20 (215)m= 0 Water heating Output from w	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 10)] } x 10 0	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 198.76	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0	May d above) 17.26 16) 19.01 month 0	0 0	Jul           0           0           0	0 Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211) (211)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from way         214.72         Efficiency of way	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 10)] } x 10 0 139.25 ater heat	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 0 ter (calc 198.76 ter	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0	May d above) 17.26 6) 19.01 month 0 200ve) 171.73	Jun 0 0 151.25	Jul           0           0           0	0 Tota 0 Tota 161.54	0 I (kWh/yea 0 I (kWh/yea	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub> 195.36	1182.37 1302.17 = 0 = 209.55	0 kWh/ye 4857.04	(208) ear (211) (211) (215)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from war         214.72         Efficiency of war         (217)m=         89.15	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 189.25 ater heat 189.25 ater heat 88.63	ry/supple Mar ament (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 0 ter (calc 198.76 ter 87.28	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0 ulated al 177.37 84.47	May d above) 17.26 16) 19.01 month 0	0 0	Jul 0 0	0 Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea 163.32	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2 184.75	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye 4857.04	(208) ear (211) (211) (211) (215)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from w.         214.72         Efficiency of w         (217)m=         89.15         Fuel for water	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 189.25 ater heat 189.25 ater hea 88.63 heating,	ry/supple Mar ament (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 0 ter (calco 198.76 ter 87.28 kWh/mc	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0 ulated al 177.37 84.47 onth	May d above) 17.26 6) 19.01 month 0 200ve) 171.73	Jun 0 0 151.25	Jul 0 0	0 Tota 0 Tota 161.54	0 I (kWh/yea 0 I (kWh/yea 163.32	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2 184.75	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub> 195.36	1182.37 1302.17 = 0 = 209.55	0 kWh/ye 4857.04	(208) ear (211) (211) (211) (215)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from war         214.72         Efficiency of war         (217)m=         89.15	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 189.25 ater heat 189.25 ater hea 88.63 heating,	ry/supple Mar ament (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 0 ter (calco 198.76 ter 87.28 kWh/mc	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0 ulated al 177.37 84.47 onth	May d above) 17.26 6) 19.01 month 0 200ve) 171.73	Jun 0 0 151.25	Jul 0 0	0 Tota 0 Tota 161.54	0 I (kWh/yea 0 I (kWh/yea 163.32	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2 184.75	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub> 195.36	1182.37 1302.17 = 0 = 209.55	0 kWh/ye 4857.04	(208) ear (211) (211) (211) (215)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from w         214.72         Efficiency of w         (217)m=         89.15         Fuel for water         (219)m = (64)	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 01)] ] x 10 0 g fuel (se 01)] x 10 0 (se 01) x 1	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 ter (calce 198.76 ter 87.28 kWh/mc 0 ÷ (217)	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0 ulated al 177.37 84.47 onth m	May d above) 17.26 6) 19.01 month 0 200ve) 171.73 82.27	Jun 0 0 151.25 81.5	Jul 0 0 144.91 81.5	0 Tota 0 Tota 161.54 81.5	0 I (kWh/yea 0 I (kWh/yea 163.32 81.5	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2 184.75 86.33 213.99	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub> 195.36 88.66	1182.37 1302.17 = 0 = 209.55 89.27	0 kWh/ye 4857.04	(208) ear (211) (211) (211) (215)





Annual totals		kWh/yea	r	kWh/year	_
Space heating fuel used, main system 1				4857.04	
Water heating fuel used				2531.88	]
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30	]	(230c)
Total electricity for the above, kWh/year	sur	n of (230a)(230g) =		30	(231)
Electricity for lighting				417.75	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CH	Р			
	<b>Energy</b> kWh/year	<b>Emission fac</b> kg CO2/kWh	ctor	<b>Emissions</b> kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	1049.12	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	546.89	(264)
Space and water heating	(261) + (262) + (263) +	(264) =		1596.01	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting	(232) x	0.519	=	216.81	(268)
Total CO2, kg/year		sum of (265)(271) =		1828.39	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		17.29	(273)
El rating (section 14)				84	(274)



Assessor Name: Stroma Number:	
Software Name:Stroma FSAP 2012Software Version:Version: 1.0.1.32	
Property Address: Flat 1 - Green	
Address :   Flat 1, 27 West End Lane, London, NW6 4QJ	
1. Overall dwelling dimensions:	a)
Area(m²)         Av. Height(m)         Volume(m           Ground floor         89.19         (1a) x         2.35         (2a) =         209.6	1 <b>3)</b> (3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 89.19 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 209.6$	(5)
2. Ventilation rate:	
main secondary other total m <sup>3</sup> per ho heating heating	ur
Number of chimneys $0$ + $0$ = $0$ $\times 40$ = $0$	(6a)
Number of open flues $0$ + $0$ = $0$ $\times 20$ $0$	(6b)
Number of intermittent fans3× 10 =30	(7a)
Number of passive vents 0 x 10 = 0	(7b)
Number of flueless gas fires 0 × 40 = 0	(7c)
Air changes per h	our
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 30 \div (5) = 0.14$	(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)     0       Additional infiltration     [(9)-1]x0.1 =     0	(9)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	(11)
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)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0	(12)
Percentage of windows and doors draught stripped 0	(14)
Window infiltration         0.25 - [0.2 x (14) ÷ 100] =         0	(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	(17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ 0.34	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered 2	(19)
Number of sides sheltered2Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85	(19)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.29$	(21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	
Wind Factor (22a)m = (22)m $\div$ 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	



Adjuste	ed infiltr	ation rat	e (allow	ing for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
	0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se							(00-)
				endix N, (2	(23b) - (23a	a) v Emv (e	auation (N	(5)) othe	nwisa (23h	(23a)			0	(23a)
			• • •	ciency in %	, ,	, ,				i) = (23a)			0	(23b)
			-	-	-					01-)		4 (00-)	0	(23c)
				entilation				HR) (24a	a m = (22)	$\frac{2}{0}$ m + (	23D) × [*	1 - (23C)	; ÷ 100] ]	(24a)
(24a)m=	-			-		-	-					0	J	(244)
		<b></b>	<b></b>	entilation	1		r	r í í	ŕ	r i	<u>,</u>		1	(24b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(240)
,				ntilation of the	•					5 v (23h	N)			
ا = (24c)m	· ,		0		$\frac{3}{0} = (231)$		0	$\frac{0}{0} = \frac{221}{2}$	0		0	0	1	(24c)
	-		_	l v nole hous	-						0	Ů	l	()
,				)m = (22		•				0.5]				
(24d)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24d)
Effe	ctive air	change	rate - ei	nter (24a	) or (24t	o) or (24	c) or (24	d) in box	x (25)				1	
(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25)
	. ( )								1				1	
				paramet										
ELEN		Gros area		Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²·l		A X k kJ/K
Doo <mark>rs</mark>						1.92	x	1	=	1.92				(26)
Windov	ws Type	e 1				3.27	x1,	/[1/( 1.4 )+	0.04] =	4.34	F			(27)
Windo	ws Type	2				1.92	<b>x</b> 1	/[1/( 1.4 )+	0.04] =	2.55	F			(27)
	ws Type					3.65		/[1/( 1.4 )+	0.04] =	4.84	5			(27)
	ws Type					0.726	= .	- /[1/( 1.4 )+	l	0.96	$\exists$			(27)
	ws Type						Ξ.	/[1/( 1.4 )+	l		$\dashv$			(27)
Rooflig						4.55		/[1/(1.4) +	- I	6.03				
-	jino					4.29			¦	6.006				(27b)
Floor	<b>F</b>					89.19		0.13	=	11.594			$\dashv$	(28)
Walls 7		82.4	18	20.6	6	61.82	<u>2</u> X	0.17	= [	10.51			_	(29)
Walls 7	Гуре2	42.	3	1.92	2	40.38	3 X	0.16	=	6.4				(29)
Roof		23.0	)3	4.29	)	18.74	t x	0.13	=	2.44				(30)
Total a	rea of e	elements	, m²			237								(31)
Party c	eiling					66.16	6							(32b)
				effective wi			ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
				nternal wal	is and par	titions		(26)(30)	) + (32) -					
		ss, W/K :	•	0)				(20)(30)		(20) + (2)	0) · (00-)	(22-)	65.9	
Heat C	apacity	Cm = S(	АХК)						((28)	(30) + (32	z) + (32a).	(32e) =	0	(34)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.

Thermal bridges : S (L x Y) calculated using Appendix K

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K

250

(35)

Indicative Value: Medium

			are not kn	own (36) =	= 0.15 x (3	1)			(22)	(2.2)				<b>-</b>
	abric he									(36) =			78.42	(37)
Ventila			alculated	· · ·	, 	Ι.	<u>г.</u>				25)m x (5)	1	l	
(20)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38)
(38)m=	39.37	39.18	39	38.14	37.98	37.24	37.24	37.1	37.53	37.98	38.31	38.65		(30)
		coefficier	-				1			= (37) + (3	i		I	
(39)m=	117.79	117.6	117.42	116.56	116.4	115.66	115.66	115.52	115.95	116.4	116.73	117.07	440.50	
Heat le	oss para	meter (H	HLP), W/	/m²K						4verage = = (39)m ÷	Sum(39) <sub>1</sub> . (4)	12/12=	116.56	(39)
(40)m=	1.32	1.32	1.32	1.31	1.31	1.3	1.3	1.3	1.3	1.31	1.31	1.31		_
Numb	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	1.31	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
	L													
4. Wa	ater hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
A			NI										I	(12)
		upancy, ∣ 9, N = 1		[1 - exp	(-0.0003	849 x (TF		)2)] + 0.0	)013 x ( <sup>-</sup>	TFA -13.		61		(42)
if TF	A £ 13.	9, N = 1				·					,			
								(25 x N) to achieve		e target o		.29		(43)
		-	person per			-	-		a water us	se largel o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat			r day for ea						oop	000		200		
(44)m=	105.92	102.07	98.22	94.37	90.52	86.66	86.66	90.52	94.37	98.22	102.07	105.92		
	L		<u> </u>						-	Tota <mark>l = Su</mark>	m(44) <sub>112</sub> =	=	1155.52	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	)Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	157.08	137.38	141.77	123.6	118.59	102.34	94.83	108.82	110.12	128.33	140.09	152.12		_
lf inotor	tonoouou	ator hooti	na ot point	of upp (pr	hot wata	rotorogol	ontor 0 in	havaa (16		Total = Su	m(45) <sub>112</sub> =	-	1515.07	(45)
			- ·	·	i			boxes (46,					l	(40)
(46)m= Water	23.56 storage	20.61	21.27	18.54	17.79	15.35	14.22	16.32	16.52	19.25	21.01	22.82		(46)
	-		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity ł	neating a	and no ta	ink in dw	velling, e	nter 110	) litres in	(47)						
Other	vise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage												L	
,			eclared I		or is kno	wn (kWł	n/day):					0		(48)
-			m Table									0		(49)
-	•		storage	•		or is not		(48) x (49)	) =			0		(50)
,			factor fr	•								0		(51)
		-	ee secti		,		• /					-		
		from Ta										0		(52)
-			m Table									0		(53)
			storage	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	-	0		(54)
Enter	(50) or	(54) in (5	5)									0		(55)

Water storage loss calculated for each month $((56)m = (55) \times (41))$	n		
(56)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)	m where (H11) is fro	m Appendix H	
(57)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(57)
Primary circuit loss (annual) from Table 3		0	(58)
Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)m$			
(modified by factor from Table H5 if there is solar water heating and a cylind	r thermostat)		
(59)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$			
(61)m= 50.96 46.03 50.05 46.54 46.13 42.74 44.16 46.13 46.54	50.05 49.32	50.96	(61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times$	45)m + (46)m +	(57)m + (59)ı	m + (61)m
(62)m= 208.04 183.41 191.82 170.13 164.72 145.08 138.99 154.95 156.66	178.39 189.4	203.08	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no sol	r contribution to wate	er heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)			
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	0	(63)
Output from water heater			
(64)m= 208.04 183.41 191.82 170.13 164.72 145.08 138.99 154.95 156.66	178.39 189.4	203.08	
Output from v	ater heater (annual)	12	2084.67 (64)
Heat gains from water heating, kWh/month 0.25 $^{2}$ [0.85 x (45)m + (61)m] + 0.8	x [(46)m + (57)m	+ (59)m ]	
(65)m= 64.97 57.19 59.65 52.73 50.96 44.71 42.57 47.71 48.25	55.18 58.91	63.32	(65)
	33.10 30.31	00.02	()
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot			
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot v 5. Internal gains (see Table 5 and 5a):			
5. Internal gains (see Table 5 and 5a):			
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts	ater is from com	munity heatin	
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep	ater is from com	munity heatin	g
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m=	ater is from com	munity heatin	g
5. Internal gains (see Table 5 and 5a):           Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep           (66)m=         130.72	Oct         Nov           130.72         130.72           17.5         20.42	Dec 130.72	g (66)
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m=       130.72       <	Oct         Nov           130.72         130.72           17.5         20.42	Dec 130.72	g (66)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71</td> <td>Dec 130.72 21.77</td> <td>g (66) (67)</td>	Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71	Dec 130.72 21.77	g (66) (67)
Jan Feb Mar Apr May Jun Jul Aug Sep         (66)m= 130.72 130.72 130.72 130.72 130.72 130.72 130.72 130.72         Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5         (67)m=       21.18         18.81       15.3         11.58       8.66         7.31       7.9         10.27       13.78         Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71	Dec 130.72 21.77	g (66) (67)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5</td> <td>Dec           130.72           21.77           227.1</td> <td>g (66) (67) (68)</td>	Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5	Dec           130.72           21.77           227.1	g (66) (67) (68)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5</td> <td>Dec           130.72           21.77           227.1</td> <td>g (66) (67) (68)</td>	Ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         211.41       5	Dec           130.72           21.77           227.1	g (66) (67) (68)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07</td> <td>Dec           130.72           21.77           227.1           36.07</td> <td>g (66) (67) (68) (69)</td>	Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07	Dec           130.72           21.77           227.1           36.07	g (66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07</td> <td>Dec           130.72           21.77           227.1           36.07</td> <td>g (66) (67) (68) (69)</td>	Atter is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       194.71         194.71       211.41         5       36.07         36.07       36.07	Dec           130.72           21.77           227.1           36.07	g (66) (67) (68) (69)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       130.73       16.67	ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       211.41         5       36.07       36.07         3       3       3	Dec         130.72         21.77         227.1         36.07         3	g (66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       130.73       1607	ate       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       211.41         5       36.07       36.07         3       3       3	Dec         130.72         21.77         227.1         36.07         3	g (66) (67) (68) (69) (70)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72 <td>Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82</td> <td>Dec         130.72         21.77         227.1         36.07         3         -104.58         85.11</td> <td>g (66) (67) (68) (69) (70) (71)</td>	Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82	Dec         130.72         21.77         227.1         36.07         3         -104.58         85.11	g (66) (67) (68) (69) (70) (71)
5. Internal gains (see Table 5 and 5a):         Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep         (66)m=       130.72       13.78       Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 68)       (68)m=       237.58       240.04       233.83       220.61 <t< td=""><td>Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82</td><td>Dec         130.72         21.77         227.1         36.07         3         -104.58         85.11</td><td>g (66) (67) (68) (69) (70) (71)</td></t<>	Atter       r is from com         Oct       Nov         130.72       130.72         17.5       20.42         ole 5       20.42         194.71       211.41         5       36.07         36.07       36.07         3       3         -104.58       -104.58         74.17       81.82	Dec         130.72         21.77         227.1         36.07         3         -104.58         85.11	g (66) (67) (68) (69) (70) (71)

Solar gains are calculated using solar flux from Table 6a 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	0.73	×	11.28	x	0.76	x	0.7	=	3.02	(75)
Northeast 0.9x	0.77	x	0.73	x	22.97	x	0.76	x	0.7	=	6.15	(75)
Northeast 0.9x	0.77	x	0.73	x	41.38	x	0.76	x	0.7	=	11.08	(75)
Northeast 0.9x	0.77	x	0.73	x	67.96	x	0.76	x	0.7	=	18.19	(75)
Northeast 0.9x	0.77	x	0.73	x	91.35	x	0.76	x	0.7	=	24.45	(75)
Northeast 0.9x	0.77	x	0.73	x	97.38	x	0.76	x	0.7	=	26.07	(75)
Northeast 0.9x	0.77	x	0.73	x	91.1	x	0.76	x	0.7	=	24.38	(75)
Northeast 0.9x	0.77	x	0.73	x	72.63	x	0.76	x	0.7	=	19.44	(75)
Northeast 0.9x	0.77	x	0.73	x	50.42	x	0.76	x	0.7	=	13.5	(75)
Northeast 0.9x	0.77	x	0.73	x	28.07	x	0.76	x	0.7	=	7.51	(75)
Northeast 0.9x	0.77	x	0.73	x	14.2	x	0.76	x	0.7	=	3.8	(75)
Northeast 0.9x	0.77	x	0.73	x	9.21	x	0.76	x	0.7	=	2.47	(75)
Southeast 0.9x	0.77	x	4.55	x	36.79	x	0.76	x	0.7	=	61.72	(77)
Southeast 0.9x	0.77	x	4.55	x	62.67	x	0.76	x	0.7	=	105.13	(77)
Southeast 0.9x	0.77	x	4.55	x	85.75	x	0.76	x	0.7	=	143.85	(77)
Southeast 0.9x	0.77	x	4.55	×	106.25	х	0.76	х	0.7	=	178.23	(77)
Southeast 0.9x	0.77	x	4.55	x	119.01	x	0.76	x	0.7	=	199.64	(77)
Southeast 0.9x	0.77	x	4.55	х	118.15	×	0.76	x	0.7	=	198.19	(77)
Southeast 0.9x	0.77	x	4.55	x	113.91	x	0.76	x	0.7	=	191.08	(77)
Southeast 0.9x	0.77	x	4.55	x	104.39	x	0.76	x	0.7	=	175.11	(77)
Southeast 0.9x	0.77	x	4.55	x	92.85	x	0.76	x	0.7	=	155.76	(77)
Southeast 0.9x	0.77	x	4.55	x	69.27	x	0.76	x	0.7	=	1 <mark>16.19</mark>	(77)
Southeast 0.9x	0.77	x	4.55	x	44.07	x	0.76	x	0.7	=	73.93	(77)
Southeast 0.9x	0.77	x	4.55	x	31.49	x	0.76	x	0.7	=	52.82	(77)
Southwest0.9x	••••	x	3.65	x	36.79		0.76	x	0.7	=	49.51	(79)
Southwest0.9x	0.77	x	3.65	x	62.67		0.76	x	0.7	=	84.34	(79)
Southwest0.9x	0.77	x	3.65	x	85.75		0.76	x	0.7	=	115.39	(79)
Southwest0.9x	0.77	x	3.65	x	106.25		0.76	x	0.7	=	142.98	(79)
Southwest0.9x	0.77	x	3.65	x	119.01		0.76	x	0.7	=	160.15	(79)
Southwest0.9x	0.77	x	3.65	x	118.15		0.76	x	0.7	=	158.99	(79)
Southwest0.9x		x	3.65	x	113.91		0.76	x	0.7	=	153.28	(79)
Southwest0.9x		x	3.65	×	104.39		0.76	x	0.7	=	140.47	(79)
Southwest0.9x	_	x	3.65	x	92.85		0.76	x	0.7	=	124.95	(79)
Southwest0.9x	0.77	x	3.65	x	69.27		0.76	x	0.7	=	93.21	(79)
Southwest0.9x		x	3.65	x	44.07		0.76	x	0.7	=	59.3	(79)
Southwest0.9x		x	3.65	x	31.49		0.76	x	0.7	=	42.37	(79)
Northwest 0.9x		x	3.27	×	11.28	x	0.76	x	0.7	=	40.81	(81)
Northwest 0.9x		x	1.92	×	11.28	x	0.76	x	0.7	=	7.99	(81)
Northwest 0.9x	0.77	x	3.27	×	22.97	x	0.76	x	0.7	=	83.06	(81)



Northwest 0.9x	0.77	x	1.92	x	22.97	x	0.76	x	0.7	=	16.26	(81)
Northwest 0.9x	0.77	x	3.27	x	41.38	x	0.76	x	0.7	=	149.66	(81)
Northwest 0.9x	0.77	x	1.92	x	41.38	x	0.76	x	0.7	=	29.29	(81)
Northwest 0.9x	0.77	x	3.27	x	67.96	x	0.76	x	0.7	=	245.78	(81)
Northwest 0.9x	0.77	x	1.92	x	67.96	x	0.76	x	0.7	=	48.1	(81)
Northwest 0.9x	0.77	x	3.27	x	91.35	x	0.76	x	0.7	=	330.37	(81)
Northwest 0.9x	0.77	x	1.92	x	91.35	x	0.76	x	0.7	=	64.66	(81)
Northwest 0.9x	0.77	x	3.27	x	97.38	x	0.76	x	0.7	=	352.21	(81)
Northwest 0.9x	0.77	x	1.92	x	97.38	x	0.76	x	0.7	=	68.93	(81)
Northwest 0.9x	0.77	x	3.27	x	91.1	x	0.76	x	0.7	=	329.49	(81)
Northwest 0.9x	0.77	x	1.92	x	91.1	x	0.76	x	0.7	=	64.49	(81)
Northwest 0.9x	0.77	x	3.27	x	72.63	x	0.76	x	0.7	=	262.67	(81)
Northwest 0.9x	0.77	x	1.92	x	72.63	x	0.76	x	0.7	=	51.41	(81)
Northwest 0.9x	0.77	x	3.27	x	50.42	x	0.76	x	0.7	=	182.36	(81)
Northwest 0.9x	0.77	x	1.92	x	50.42	x	0.76	x	0.7	=	35.69	(81)
Northwest 0.9x	0.77	x	3.27	x	28.07	x	0.76	x	0.7	=	101.51	(81)
Northwest 0.9x	0.77	x	1.92	x	28.07	x	0.76	x	0.7	=	19.87	(81)
Northwest 0.9x	0.77	x	3.27	×	14.2	х	0.76	x	0.7	=	51.35	(81)
Northwest 0.9x	0.77	x	1.92	x	14.2	x	0.76	x	0.7	=	10.05	(81)
Northwest 0.9x	0.77	x	3.27	x	9.21	×	0.76	x	0.7	=	33.33	(81)
Northwest 0.9x	0.77	x	1.92	x	9.21	x	0.76	x	0.7	=	6.52	(81)
Rooflights 0.9x	1	x	4.29	x	26	х	0.76	x	0.7	=	53.41	(82)
Rooflights 0.9x	1	x	4.29	x	54	x	0.76	x	0.7	=	110.92	(82)
Rooflights 0.9x	1	x	4.29	x	96	x	0.76	x	0.7	=	197.19	(82)
Rooflights 0.9x	1	x	4.29	x	150	x	0.76	x	0.7	=	308.11	(82)
Rooflights 0.9x	1	x	4.29	x	192	x	0.76	x	0.7	=	394.38	(82)
Rooflights 0.9x	1	x	4.29	x	200	x	0.76	x	0.7	=	410.81	(82)
Rooflights 0.9x	1	x	4.29	x	189	x	0.76	x	0.7	=	388.22	(82)
Rooflights 0.9x	1	x	4.29	x	157	x	0.76	x	0.7	=	322.49	(82)
Rooflights 0.9x	1	x	4.29	x	115	x	0.76	x	0.7	=	236.22	(82)
Rooflights 0.9x	1	x	4.29	x	66	x	0.76	x	0.7	=	135.57	(82)
Rooflights 0.9x	1	x	4.29	x	33	x	0.76	x	0.7	=	67.78	(82)
Rooflights 0.9x	1	x	4.29	x	21	x	0.76	x	0.7	=	43.14	(82)

Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	216.45	405.86	646.45	941.39	1173.65	1215.21	1150.94	971.59	748.46	473.86	266.21	180.64		(83)
Total g	ains – ir	nternal a	ind solar	<sup>-</sup> (84)m =	= (73)m -	⊦ (83)m	, watts							
(84)m=	627.75	815.03	1040.98	1312.03	1519.93	1538.05	1459.01	1286.48	1075.96	825.46	645.07	579.83		(84)
7. Me	an inter	nal temp	erature	(heating	season	)								
Temp	erature	during h	leating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(86)m=	1	0.99	0.95	0.85	0.66	0.47	0.35	0.41	0.68	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ns 3 to 7	7 in Table	e 9c)					
(87)m=	19.63	19.89	20.28	20.69	20.92	20.99	21	20.99	20.93	20.55	19.99	19.58		(87)
	r	<u> </u>	1 <u> </u>	í –	i	<u> </u>	r	able 9, Tl	<u>, , ,</u>	10.94	10.02	10.02		(99)
(88)m=	19.82	19.83	19.83	19.84	19.84	19.84	19.84	19.84	19.84	19.84	19.83	19.83	I	(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)		-				
(89)m=	0.99	0.98	0.94	0.81	0.59	0.39	0.26	0.31	0.59	0.91	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.02	18.4	18.95	19.51	19.77	19.84	19.84	19.84	19.8	, 19.35	18.56	17.96		(90)
		1			1		1		f	L iLA = Livin	g area ÷ (4	4) =	0.34	(91)
		<u> </u>	r È	1	i	r <u>, ,</u>	r	+ (1 – fL	r	i			1	
(92)m=	18.57	18.91	19.4	19.92	20.16	20.23	20.24	20.23	20.18	19.76	19.05	18.51	I	(92)
		r	he mear	n interna	l temper	ature fro	m Table	e 4e, whe	ere appro	opriate			(	
(93)m=	18.42	18.76	19.25	19.77	20.01	20.08	20.09	20.08	20.03	19.61	18.9	18.36		(93)
8. Sp	ace hea	ting requ	uirement	1										
						ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut	lisation			using Ta	i				i	r				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm									_		
(94)m=	0.99	0.98	0.93	0.8	0.6	0.41	0.28	0.33	0.61	0.9	0.98	0.99	I	(94)
Usefu	<mark>il g</mark> ains,	hmGm	, W = (9	4)m x (84		·								
(95)m=	6 <mark>2</mark> 2.88	796.73	970	1055.93	918.36	626.96	402.32	423.85	652.67	744.95	633.92	576.58		(95)
Mo <mark>nt</mark> ł	nly aver	age exte	rnal terr	iperature	e from Ta	able 8		-						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	1 <mark>0.6</mark>	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m=	1663.18	1629.41	1497.33	1266.49	967.44	633.47	403.14	425.66	687.82	1048.69	1377.18	1657.46		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/moni	th = 0.02	24 x [(97)	)m – (95	)m] x (4	 1)m			
(98)m=	773.98	559.56	392.34	151.61	36.52	0	0	0	0	225.99	535.15	804.18		
						I		Tota	l per year	(kWh/year	·) = Sum(9	8)15,912 =	3479.3	(98)
Space	o hootin	a roquir	omont in	k\//b/m2	woor								20.01	(99)
		• •		kWh/m <sup>2</sup>	•								39.01	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	j micro-C	CHP)					
-	e heatir	-										1		_
Fracti	ion of sp	bace hea	at from s	econdar	y/supple	ementary	system						0	(201)
Fracti	ion of sp	bace hea	at from m	nain syst	em(s)			(202) = 1 -	– (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		·	1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								90.8	(206)
	-			• •		aoveter	<b>o</b> 0/							
EIIICIE		seconda	ry/suppi	ementar	y neatin	g system	1, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space	e heatin	g require	ement (c	alculate	d above	)							L	
	773.98	559.56	392.34	151.61	36.52	0	0	0	0	225.99	535.15	804.18		
(211)m	ו = {[(98	)m x (20	04)] } x 1	00 ÷ (20	)6)									(211)
. ,	852.4	616.25	432.09	166.97	40.22	0	0	0	0	248.88	589.37	885.66		
	L	1	I			1	1	Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	3831.83	(211)



Space heating fuel (secondary), kWh/month

$= \{[(98)m \times (201)]\} \times 100 \div (208)$								
(215)m= 0 0 0 0 0	0 0	0	0	0	0	0		
	·	Total (k	kWh/year	r) =Sum(2	2 <b>15)</b> <sub>15,1012</sub>	2	0	(215
Water heating								
Output from water heater (calculated above)           208.04         183.41         191.82         170.13         164.72         1	45.08 138.99	154.95 1	156.66	178.39	189.4	203.08		
Efficiency of water heater		1 1	[				81.5	(216
(217)m= 88.66 88.31 87.52 85.63 83.04	81.5 81.5	81.5	81.5	86.45	88.17	88.76		(217
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$	·		-					
	78.01 170.54	190.12 1	192.22	206.35	214.81	228.81		
	•	Total =	: Sum(21	9a) <sub>112</sub> =		•	2439.4	(219
Annual totals				k\	Nh/yeai	r	kWh/year	
Space heating fuel used, main system 1							3831.83	
Water heating fuel used							2439.4	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230
Total electricity for the above, kWh/year		sum of	(230a)	. <mark>(2</mark> 30g) =			30	(231
Electricity for lighting							374.05	(232
Electricity generated by PVs							-855.55	(233
12a. CO2 emissions – Individual heating system	s including m	icro-CHP						
	Energy			Emiss	ion fac	tor	Emissions	
	kWh/year			kg CO			kg <mark>CO2/</mark> yea	
Space heating (main system 1)	(211) x			0.2	16	=	827.68	(261
Space heating (secondary)	(215) x			0.5	19	=	0	(263
Water heating	(219) x			0.2	16	=	526.91	(264
Space and water heating	(261) + (262)	+ (263) + (26	64) =				1354.59	 ](265
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	15.57	 ](267
Electricity for lighting	(232) x			0.51	19	=	194.13	(268
Energy saving/generation technologies Item 1				0.5	19	=	-444.03	_ ](269
Total CO2, kg/year			sum of	(265)(2			1120.26	(272
Dwelling CO2 Emission Rate			(272) ÷	(4) =			12.56	 (273
El rating (section 14)							89	 (274
						I		<b>_</b> ] ,



User Details:		
Assessor Name:Stroma Number:Software Name:Stroma FSAP 2012Software Version:Version	n: 1.0.1.32	
Property Address: Flat 4 - Green		
Address : Flat 4, 27 West End Lane, London, NW6 4QJ		
1. Overall dwelling dimensions:		
Area(m²)         Av. Height(m)           Ground floor         52.08         (1a) x         2.35         (2a) =	Volume(m <sup>3</sup> )	(3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.08 (4)		
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	122.39	(5)
2. Ventilation rate:		
main secondary other total heating heating	m <sup>3</sup> per hour	
Number of chimneys $0$ + $0$ + $0$ = $0$ × 40 =	0	(6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	0	(6b)
Number of intermittent fans 2 x 10 =	20	(7a)
Number of passive vents 0 x 10 =	0	(7b)
Number of flueless gas fires	0	(7c)
Air cha	ange <mark>s per</mark> hour	•
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20 \div (5) = 20$	0.16	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)		(0)
Number of storeys in the dwelling (ns)         Additional infiltration         [(9)-1]x0.1 =		(9) (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		(11)
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	0	(12)
If no draught lobby, enter 0.05, else enter 0		(13)
Percentage of windows and doors draught stripped	0	(14)
Window infiltration         0.25 - [0.2 x (14) ÷ 100] =	0	(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	4	(17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.36	(18)
Number of sides sheltered	2	(19)
Shelter factor $(20) = 1 - [0.075 \times (19)] =$		(20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.31	(21)
Infiltration rate modified for monthly wind speed		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Monthly average wind speed from Table 7		
(22)m=         5.1         5         4.9         4.4         4.3         3.8         3.8         3.7         4         4.3         4.5         4.7		
Wind Factor (22a)m = (22)m $\div$ 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		



Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	elter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.39	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36			
			-	rate for t	he appli	cable ca	se			-	-				
		al ventila		ondix N (2	2h) - (22	a) × Fmv (e	oquation (		nuico (22h	(220)			(		(23a)
										i) = (23a)			(		(23b)
			-	-	-	or in-use f							(	)	(23c)
· · ·		1	r			<b></b>	<u> </u>	1 / 1	ŕ	2b)m + ()	r <u>, -</u>	r <u>`</u>	÷ 100] I		(24a)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24a)
í I		1	· · · · · ·				, <u>, ,</u>	T T	ŕ	2b)m + (2 1	, <u> </u>	1	1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
,					•	ve input v o); otherv				.5 × (23b	)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,						ve input erwise (2				0.5]					
(24d)m=	0.58	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24t	5) or (24	c) or (24	d) in bo	k (25)						
(25)m=	0.58	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57			(25)
							1		1	-					
		s ano ne Gros				Net Ar		U-val		AXU		k volu		ΑX	
ELEN	IENI	area		Openin m		A,r		W/m2		A X U (W/I	<)	k-value kJ/m²·l		kJ/	
Doors						1.92	x	1	=	1.92					(26)
Windo	ws Type	e 1				1		L/[1/( 1.4 )+	0.04] =	1.33	F				(27)
Windo	ws Type	2				13.43	x1	/[1/( 1.4 )+	0.04] =	17.8	Ħ				(27)
Floor T						0.69		0.13	=	0.0897	E r				(28)
Floor T						12.03		0.13		1.5639	=		╡┟		(28)
Walls 1		62		14.43		47.57					╡╏				(29)
Walls 1								0.17		8.09			╡╞		=
		15.7		1.92		13.83		0.16	=	2.19					(29)
		lements	, m²			90.47	7								(31)
Party w						9.1	X	0	=	0					(32)
Party fl	loor					42.99	9								(32a)
Party c	eiling					52.08	3								(32b)
				ffective wi nternal wal			lated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragraph	1 3.2		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30	) + (32) =				32.	98	(33)
Heat ca	apacity	Cm = S(	(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	(	)	(34)
Therma	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		25	50	(35)
	-		ere the de tailed calc		construct	ion are noi	t known pl	recisely the	e indicative	e values of	TMP in Ta	able 1f			_
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix I	K						12.	33	(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) =			45.	32	(37)

Ventila	tion hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	23.33	23.2	23.09	22.53	22.42	21.93	21.93	21.84	22.12	22.42	22.63	22.85		(38)
Heat ti	ansfer c	coefficie	nt, W/K	-	-				(39)m	= (37) + (3	38)m			
(39)m=	68.64	68.52	68.4	67.84	67.74	67.25	67.25	67.16	67.44	67.74	67.95	68.17		
										Average =	Sum(39)1.	12 /12=	67.84	(39)
	· ·		HLP), W/	/m²K	·	i			(40)m	= (39)m ÷	(4)			
(40)m=	1.32	1.32	1.31	1.3	1.3	1.29	1.29	1.29	1.29	1.3	1.3	1.31		
Numbe	er of day	s in mo	nth (Tab	le 1a)					/	Average =	Sum(40)₁.	12 /12=	1.3	(40)
- turno	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,														
4 10/-	ten heed													
4. 772	ater neat	ing ene	rgy requ	irement:								kWh/ye	an	
	ed occu											75		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.	9)			
		,	ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		7!	5.8		(43)
Reduce	the annua	al average	hot water	usage by	5% if the c	welling is	designed	to achieve		se target o				( - /
not more	e that 125	litres per	person pe	r day (all w	ater use, l	hot and co	ld)				-			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage II	n litres pei	day for ea	ach month	Vd,m = fa	ctor from T	l able 1c x	(43)		-				
(44)m=	<mark>8</mark> 3.38	80.34	77.31	74.28	71.25	68.22	68.22	71.25	74.28	77.31	80.34	<mark>8</mark> 3.38		<b></b>
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x L	OTm / 3600		Total = Su hth (see Ta		L	909.56	(44)
(45)m=	123.64	108.14	111.59	97.29	93.35	80.55	74.64	85.66	86.68	101.02	110.27	119.74		
									-	Total = Su	m(45) <sub>112</sub> =	=	1192.57	(45)
lf instan	taneous w	ater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46)	) to (61)					
(46)m=	18.55	16.22	16.74	14.59	14	12.08	11.2	12.85	13	15.15	16.54	17.96		(46)
	storage		ingludir		olor or M		otorogo	within or						(47)
-		. ,				enter 110	-	within sa	ame ves	501		0		(47)
		•			•			ombi boil	ers) ente	er '0' in (	47)			
	storage			. (					,		,			
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
			-	, kWh/ye				(48) x (49)	) =			0		(50)
				•		or is not								(- · · )
		-	ee secti		е 2 (ки	h/litre/da	iy)					0		(51)
	e factor	-		011 4.0								0		(52)
												0		
	erature fa	actor fro	m Table	2b								0		(53)
Energy				2b , kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(53) (54)
		m water	storage		ear			(47) x (51)	) x (52) x (	53) =				
Enter	/ lost fro (50) or (	m water (54) in (5	storage 55)					(47) x (51) ((56)m = (				0		(54)



If cylinder con	tains dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	)m where (	H11) is fro	m Append	lix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary cire	cuit loss (ar	nnual) fro	om Table	e 3	-	-					0		(58)
Primary cire					59)m = (	(58) ÷ 36	65 × (41)	m					
(modified	by factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss	calculated	for each	n month (	(61)m =	(60) ÷ 36	65 × (41	)m						
(61)m= 42.4	49 36.98	39.4	36.63	36.31	33.64	34.76	36.31	36.63	39.4	39.62	42.49		(61)
Total heat r	equired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)n	า
(62)m= 166	13 145.12	150.99	133.92	129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		(62)
Solar DHW in	out calculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	ar contribut	ion to wate	er heating)		
(add additio	onal lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	n water hea	iter	_				_			_			
(64)m= 166.	13 145.12	150.99	133.92	129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		
		-					Outp	out from w	ater heate	r (annual)₁	12	1647.23	(64)
Hea <mark>t gains</mark>	from water	heating	, kWh/m	onth 0.2	5´[0.85	× (45)m	1 + (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m= 51.	73 45.2	46.95	41.51	40.12	<mark>3</mark> 5.19	33.51	37.56	37.98	43.44	46.57	50.44		(65)
in <mark>clude</mark> (	57)m in cal	culation	of (65)m	only i <mark>f</mark> c	ylinder i	s in th <mark>e</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Interna	l gains (see	e Ta <mark>ble 8</mark>	5 and 5a	):									
Metabolic g	ains (Table	e 5), Wat	tts										
Ja		Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 87.5	57 87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57	87.57		(66)
Lighting ga	ins (calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m= 13.0	61 12.09	9.83	7.44	5.56	4.7	5.07	6.6	8.85	11.24	13.12	13.99		(67)
Appliances	gains (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	•			
(68)m= 152.	63 154.22	150.23	141.73	131	120.92	114.19	112.6	116.6	125.09	135.82	145.9		(68)
Cooking ga	ins (calcula	ted in A	ppendix	L, equat	tion L15	or L15a	), also se	e Table	9 5				
(69)m= 31.7	76 31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76		(69)
Pumps and	fans gains	(Table :	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)				1				
(71)m= -70.	06 -70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06	-70.06		(71)
Water heat	ing gains (1	rable 5)							I				
(72)m= 69.5	<del></del>	63.11	57.65	53.92	48.88	45.04	50.48	52.75	58.38	64.68	67.79		(72)
Total inter	nal gains =		I	Į	(66)	ı m + (67)m	• n + (68)m +	ı ⊦ (69)m +	I (70)m + (7	1)m + (72)	m	I	
(73)m= 288.		275.44	259.09	242.76	226.77	216.57	221.95	230.47	246.99	265.89	279.95		(73)
6. Solar ga	ains:				1	1							
	are calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	onvert to th	ne applicat	ole orientat	ion.		
Orientation			Area		Flu			g_		FF		Gains	
	Table 6d		m²		Tal	ble 6a	Т	able 6b	Т	able 6c		(W)	

Northeast 0.9¢ 0.77 × 1 × 11.28 × 0.76 × 0.7 = 4.16 (76) Northeast 0.9¢ 0.77 × 1 × 1 × 22.97 × 0.76 × 0.7 = 6.47 (76) Northeast 0.9¢ 0.77 × 1 × 1 × 41.38 × 0.76 × 0.7 = 25.05 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.35 × 0.76 × 0.7 = 33.68 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.35 × 0.76 × 0.7 = 33.68 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.35 × 0.76 × 0.7 = 33.68 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.1 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 01.1 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 00.1 × 0.76 × 0.7 = 16.69 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 00.1 × 0.76 × 0.7 = 16.69 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.04 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.04 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 14.2 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 0.21 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9¢ 0.77 × 1 × 1 × 14.2 × 0.76 × 0.7 = 122.4 (75) Southeast 0.9¢ 0.77 × 1 × 1 × 14.2 × 0.76 × 0.7 = 34.4 (75) Southeast 0.9¢ 0.77 × 1 × 1 × 14.2 × 0.76 × 0.7 = 34.4 (75) Southeast 0.9¢ 0.77 × 1 × 13.43 × 0.679 × 0.76 × 0.7 = 340.32 (77) Southeast 0.9¢ 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 424.59 (77) Southeast 0.9¢ 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9¢ 0.77 × 13.43 × 118.15 × 0.76 × 0.7 = 584.7 (77) Southeast 0.9¢ 0.77 × 13.43 × 118.15 × 0.76 × 0.7 = 584.7 (77) Southeast 0.9¢ 0.77 × 13.43 × 118.15 × 0.76 × 0.7 = 342.37 (77) Southeast 0.9¢ 0.77 × 13.43 × 118.15 × 0.76 × 0.7 = 342.37 (77) Southeast 0.9¢ 0.77 × 13.43 × 118.15 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.77 × 13.43 × 104.37 × 0.76 × 0.7 = 342.47 (77) Southeast 0.9¢ 0.
Northeast 0.5% 0.77 × 1 × 1 × 41.38 × 0.76 × 0.7 = 15.26 (75) Northeast 0.5% 0.77 × 1 × 1 × 47.38 × 0.76 × 0.7 = 25.05 (75) Northeast 0.5% 0.77 × 1 × 1 × 97.38 × 0.76 × 0.7 = 33.68 (79) Northeast 0.5% 0.77 × 1 × 1 × 97.38 × 0.76 × 0.7 = 33.68 (79) Northeast 0.5% 0.77 × 1 × 1 × 97.38 × 0.76 × 0.7 = 35.9 (75) Northeast 0.5% 0.77 × 1 × 1 × 12.63 × 0.76 × 0.7 = 26.78 (75) Northeast 0.5% 0.77 × 1 × 1 × 12.63 × 0.76 × 0.7 = 26.78 (75) Northeast 0.5% 0.77 × 1 × 1 × 20.63 × 0.76 × 0.7 = 26.78 (75) Northeast 0.5% 0.77 × 1 × 1 × 20.62 × 0.76 × 0.7 = 10.55 (75) Northeast 0.5% 0.77 × 1 × 1 × 26.87 × 0.76 × 0.7 = 10.55 (75) Northeast 0.5% 0.77 × 1 × 1 × 26.87 × 0.76 × 0.7 = 5.23 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 28.07 × 0.76 × 0.7 = 5.23 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 0.21 × 0.76 × 0.7 = 5.23 (75) Northeast 0.5% 0.77 × 1 × 1.4.3 × 36.79 × 0.76 × 0.7 = 10.25 (77) Southeast 0.5% 0.77 × 13.43 × 162.67 × 0.76 × 0.7 = 142.18 (77) Southeast 0.5% 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 26.60 (77) Southeast 0.5% 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 588.267 (77) Southeast 0.5% 0.77 × 13.43 × 118.15 × 0.76 × 0.7 = 588.267 (77) Southeast 0.5% 0.77 × 13.43 × 114.19 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 114.19 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 588.277 Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 158.97 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 104.39 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5
Northeast 0.4 0.77 × 1 × 1 × 67.96 × 0.76 × 0.7 = 25.05 (75) Northeast 0.9 0.77 × 1 × 1 × 91.35 × 0.76 × 0.7 = 235.9 (75) Northeast 0.9 0.77 × 1 × 1 × 91.35 × 0.76 × 0.7 = 35.9 (75) Northeast 0.9 0.77 × 1 × 1 × 91.1 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 26.78 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 10.35 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 13.59 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 13.59 (75) Northeast 0.9 0.77 × 1 × 1 × 28.07 × 0.76 × 0.7 = 3.4 (75) Southeast 0.9 0.77 × 1 × 1 × 0.21 × 0.76 × 0.7 = 3.4 (75) Southeast 0.9 0.77 × 13.43 × 62.67 × 0.76 × 0.7 = 310.32 (77) Southeast 0.9 0.77 × 13.43 × 62.67 × 0.76 × 0.7 = 310.32 (77) Southeast 0.9 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 310.32 (77) Southeast 0.9 0.77 × 13.43 × 106.25 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 589.26 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 518.27 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 518.27 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 518.27 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 518.27 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 155.87 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 155.87 (77) Southeast 0.9 0.77 × 13.43 × 104.27 × 0.76 × 0.7 = 156.48 (77) Southeast 0.9 0.77 × 13.43 × 0.9 5.85 (43.85 (478.33 35.31 23.44 (59.3 (43) (77) Southeast 0.9 0.77 × 13.43 × 0.9 5.85 (43.85 (78.8 60.3 489.3 49.25 (64) Theorerature during heating periods in the living area from Tabl
Northeast 0.5% 0.77 × 1 × 91.35 × 0.76 × 0.7 = 33.68 (7) Northeast 0.5% 0.77 × 1 × 97.38 × 0.76 × 0.7 = 33.59 (75) Northeast 0.5% 0.77 × 1 × 97.38 × 0.76 × 0.7 = 26.78 (75) Northeast 0.5% 0.77 × 1 × 1.2 × 0.76 × 0.7 = 26.78 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 0.42 × 0.76 × 0.7 = 18.59 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 0.42 × 0.76 × 0.7 = 18.59 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 0.42 × 0.76 × 0.7 = 18.59 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 0.42 × 0.76 × 0.7 = 10.35 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 0.42 × 0.76 × 0.7 = 10.35 (75) Northeast 0.5% 0.77 × 1 × 1.4 × 0.42 × 0.76 × 0.7 = 10.25 (75) Northeast 0.5% 0.77 × 1.4 × 0.26 × 0.76 × 0.7 = 3.4 (75) Southeast 0.5% 0.77 × 13.43 × 0.675 × 0.76 × 0.7 = 34.4 (75) Southeast 0.5% 0.77 × 13.43 × 0.675 × 0.76 × 0.7 = 340.2 (77) Southeast 0.5% 0.77 × 13.43 × 0.675 × 0.76 × 0.7 = 424.59 (77) Southeast 0.5% 0.77 × 13.43 × 0.575 × 0.76 × 0.7 = 424.59 (77) Southeast 0.5% 0.77 × 13.43 × 0.575 × 0.76 × 0.7 = 588.26 (77) Southeast 0.5% 0.77 × 13.43 × 0.575 × 0.76 × 0.7 = 588.26 (77) Southeast 0.5% 0.77 × 13.43 × 0.575 × 0.76 × 0.7 = 564.77 (77) Southeast 0.5% 0.77 × 13.43 × 0.255 × 0.76 × 0.7 = 564.77 (77) Southeast 0.5% 0.77 × 13.43 × 0.255 × 0.76 × 0.7 = 564.77 (77) Southeast 0.5% 0.77 × 13.43 × 0.255 × 0.76 × 0.7 = 564.77 (77) Southeast 0.5% 0.77 × 13.43 × 0.925 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 0.925 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 0.925 × 0.76 × 0.7 = 218.21 (77) Southeast 0.5% 0.77 × 13.43 × 0.955 543.65 70.8 60.3 489.3 439.5 (74) Magne 186.34 318.78 439.84 551.14 62.24 62.9 597.59 543.65 70.8 60.3 489.3 439.5 (74) Magne 186.34 318.78 439.84 551.14 62.24 62.9 597.59 543.65 70.8 60.3 489.3 439.5 (74) Magne 186.34 318.78 439.84 551.14 62.24 62.9 597.59 543.65 70.8 60.3 489.3 439.5 (74) Magne 186.34 318.78 439.84 551.14 62.24 62.9 597.59 543.65 70.8 60.3 489.3 439.5 (74) Magne 186.34 318.78 439.84 551.14 62.24 62.9 597.59 543.65 70.8 60.3 489.3 439.5 (74) Magne 186.34 318.78 439.84 551.14 6
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Northeast 0.9x       0.77       x       1       x       72.63       x       0.76       x       0.7       =       626.78       (75)         Northeast 0.9x       0.77       x       1       x       50.42       x       0.76       x       0.7       =       18.59       (75)         Northeast 0.9x       0.77       x       1       x       28.07       x       0.76       x       0.7       =       10.35       (75)         Northeast 0.9x       0.77       x       1       x       14.2       x       0.76       x       0.7       =       5.23       (75)         Northeast 0.9x       0.77       x       1       x       9.21       x       0.76       x       0.7       =       3.4       (75)         Southeast 0.9x       0.77       x       13.43       x       62.67       x       0.7       =       310.32       (77)         Southeast 0.9x       0.77       x       13.43       x       106.25       x       0.76       x       0.7       =       585.67       (77)       Southeast 0.9x       0.77       x       13.43       x       119.25       x       0.76
Northeast 0.9x       0.77       x       1       x       50.42       x       0.76       x       0.7       =       18.59       (75)         Northeast 0.9x       0.77       x       1       x       28.07       x       0.76       x       0.7       =       10.35       (75)         Northeast 0.9x       0.77       x       1       x       9.21       x       0.76       x       0.7       =       3.4       (75)         Southeast 0.9x       0.77       x       1.3.43       x       36.79       x       0.76       x       0.7       =       310.32       (77)         Southeast 0.9x       0.77       x       13.43       x       62.67       x       0.76       x       0.7       =       310.32       (77)         Southeast 0.9x       0.77       x       13.43       x       106.25       x       0.76       x       0.7       =       526.09       (77)         Southeast 0.9x       0.77       x       13.43       x       119.01       x       0.76       x       0.7       =       585       (77)       Southeast 0.9x       0.77       x       13.43       x       119.43<
Northeast $0.9x$ $0.77$ $x$ $1$ $x$ $28.07$ $x$ $0.76$ $x$ $0.7$ $=$ $10.35$ $75$ Northeast $0.9x$ $0.77$ $x$ $1$ $x$ $9.21$ $x$ $0.76$ $x$ $0.7$ $=$ $5.23$ $76$ Southeast $0.9x$ $0.77$ $x$ $1.3.43$ $x$ $36.79$ $x$ $0.7$ $=$ $182.18$ $77$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $62.67$ $x$ $0.7$ $=$ $310.32$ $77$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $106.25$ $x$ $0.76$ $x$ $0.7$ $=$ $424.59$ $77$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $106.25$ $x$ $0.76$ $x$ $0.7$ $=$ $586.0$ $77$ $586.0$ $77$ $586.7$ $77$ $586.7$ $77$ $586.7$ $77$ $586.7$ $77$ $586.7$ $77$ $586.7$ $77$ $586.7$
Northeast $0.9x$ $0.77$ $x$ $1$ $x$ $14.2$ $x$ $0.76$ $x$ $0.7$ $=$ $5.23$ $75$ )         Northeast $0.9x$ $0.77$ $x$ $11$ $x$ $9.21$ $x$ $0.76$ $x$ $0.7$ $=$ $3.4$ $(76)$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $62.67$ $x$ $0.76$ $x$ $0.7$ $=$ $310.32$ $(77)$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $62.67$ $x$ $0.76$ $x$ $0.7$ $=$ $424.59$ $(77)$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $106.25$ $x$ $0.7$ $=$ $526.09$ $(77)$ Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $118.15$ $0.76$ $x$ $0.7$ $=$ $589.26$ $(77)$ $589.26$ $(77)$ $589.26$ $(77)$ $589.26$ $(77)$ $589.26$ $(77)$ $589.26$ $(77)$ $589.26$ $(77)$ $589.26$
Northeast $0.5x$ $0.77$ x       1       x       9.21       x $0.76$ x $0.7$ = $3.4$ $75$ Southeast $0.9x$ $0.77$ x $13.43$ $36.79$ x $0.76$ x $0.7$ = $1182.18$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $62.67$ x $0.76$ x $0.7$ = $1182.18$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $106.25$ x $0.76$ x $0.7$ = $424.59$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $110.625$ x $0.76$ x $0.7$ = $589.26$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $113.91$ x $0.76$ x $0.7$ = $589.26$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ $113.91$ x $0.76$ x $0.7$ = $5864$ $(77)$ $586.27$
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Southeast 0, 9x       0.77       x       13.43       x       85.75       x       0.76       x       0.7       =       424.59       77)         Southeast 0, 9x       0.77       x       13.43       x       106.25       x       0.76       x       0.7       =       526.09       (77)         Southeast 0, 9x       0.77       x       13.43       x       119.01       x       0.76       x       0.7       =       528.09       (77)         Southeast 0, 9x       0.77       x       13.43       x       118.15       x       0.76       x       0.7       =       589.26       (77)         Southeast 0, 9x       0.77       x       13.43       x       113.91       x       0.76       x       0.7       =       586.4       (77)         Southeast 0, 9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       586.4       (77)         Southeast 0, 9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       459.74       (77)         Southeast 0, 9x       0.77       x       <
Southeast 0.9x       0.77       ×       13.43       ×       106.25       ×       0.76       ×       0.7       =       526.09       (77)         Southeast 0.9x       0.77       ×       13.43       ×       119.01       ×       0.76       ×       0.7       =       589.26       (77)         Southeast 0.9x       0.77       ×       13.43       ×       119.01       ×       0.76       ×       0.7       =       589.26       (77)         Southeast 0.9x       0.77       ×       13.43       ×       118.15       ×       0.76       ×       0.7       =       585       (77)         Southeast 0.9x       0.77       ×       13.43       ×       104.39       ×       0.76       ×       0.7       =       564.7       (77)         Southeast 0.9x       0.77       ×       13.43       ×       92.85       ×       0.76       ×       0.7       =       459.74       (77)         Southeast 0.9x       0.77       ×       13.43       ×       92.85       ×       0.76       ×       0.7       =       218.21       (77)         Southeast 0.9x       0.77       ×       13.43 </td
Southeast 0.9x       0.77       x       13.43       x       119.01       x       0.76       x       0.7       =       589.26       (77)         Southeast 0.9x       0.77       x       13.43       x       119.01       x       0.76       x       0.7       =       589.26       (77)         Southeast 0.9x       0.77       x       13.43       x       113.91       x       0.76       x       0.7       =       564       (77)         Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       564.4       (77)         Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       564.4       (77)         Southeast 0.9x       0.77       x       13.43       x       69.27       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43       x       44.07       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43
Southeast 0.9x       0.77       x       13.43       x       118.15       x       0.76       x       0.7       =       585       (77)         Southeast 0.9x       0.77       x       13.43       x       113.91       x       0.76       x       0.7       =       585       (77)         Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       586       (77)         Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       516.87       (77)         Southeast 0.9x       0.77       x       13.43       y       92.85       x       0.76       x       0.7       =       459.74       (77)         Southeast 0.9x       0.77       x       13.43       x       69.27       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43       x       44.07       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43
Southeast $0.9x$ $0.77$ x       13.43       x       113.91       x $0.76$ x $0.7$ =       564       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       104.39       x $0.76$ x $0.7$ =       516.87       (77)         Southeast $0.9x$ $0.77$ x       13.43       y       92.85       x $0.76$ x $0.7$ =       459.74       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       69.27       x $0.76$ x $0.7$ =       342.97       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       44.07       x $0.76$ x $0.7$ =       342.97       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       44.07       x $0.76$ x $0.7$ =       218.21       (77)         Southeast $0.9x$ $0.77$ x       13.43       x       31.49       x $0.76$ x $0.7$ =       218.21       (77)         Southeast $0.9x$
Southeast 0.9x       0.77       x       13.43       x       104.39       x       0.76       x       0.7       =       516.87       (77)         Southeast 0.9x       0.77       x       13.43       x       92.85       x       0.76       x       0.7       =       459.74       (77)         Southeast 0.9x       0.77       x       13.43       x       69.27       x       0.76       x       0.7       =       459.74       (77)         Southeast 0.9x       0.77       x       13.43       x       69.27       x       0.76       x       0.7       =       342.97       (77)         Southeast 0.9x       0.77       x       13.43       x       44.07       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43       x       31.49       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43       x       31.49       x       0.76       x       0.7       =       218.21       (77)         Southeast 0.9x       0.77       x       13.43 </td
Southeast $0.9x$ $0.77$ x $13.43$ $92.85$ x $0.76$ $x$ $0.7$ = $459.74$ (77) Southeast $0.9x$ $0.77$ x $13.43$ $44.07$ $x$ $0.76$ $x$ $0.7$ = $342.97$ (77) Southeast $0.9x$ $0.77$ x $13.43$ $44.07$ $x$ $0.76$ $x$ $0.7$ = $218.21$ (77) Southeast $0.9x$ $0.77$ x $13.43$ $x$ $44.07$ $x$ $0.76$ $x$ $0.7$ = $218.21$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $44.07$ $x$ $0.76$ $x$ $0.7$ = $218.21$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $31.49$ $x$ $0.76$ $x$ $0.7$ = $155.91$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $31.49$ $x$ $0.76$ $x$ $0.7$ = $155.91$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $31.49$ $x$ $0.76$ $x$ $0.7$ = $155.91$ (77) Southeast $0.9x$ $0.77$ $x$ $13.43$ $x$ $31.49$ $x$ $0.76$ $x$ $0.7$ = $155.91$ (77) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = $186.34$ $318.78$ $439.84$ $551.14$ $622.94$ $620.9$ $597.59$ $543.65$ $478.33$ $353.31$ $223.44$ $159.3$ (83) Total gains – internal and solar (84)m = (73)m + (83)m, watts (84)m = $474.38$ $604.62$ $715.28$ $810.23$ $865.69$ $847.67$ $814.16$ $765.6$ $708.8$ $600.3$ $489.33$ $439.25$ (84) <b>7. Mean internal temperature (heating season)</b> Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m = <u>0.99 0.97 0.92 0.83 0.67 0.5 0.36 0.4 0.62 0.88 0.98 0.99 (86)</u>
Southeast $0.9x$ 0.77 × 13.43 × 69.27 × 0.76 × 0.7 = 342.97 (77) Southeast $0.9x$ 0.77 × 13.43 × 44.07 × 0.76 × 0.7 = 218.21 (77) Southeast $0.9x$ 0.77 × 13.43 × 44.07 × 0.76 × 0.7 = 218.21 (77) Southeast $0.9x$ 0.77 = 155.91 (77) Southeast $0.9x$ 0.77 = 155.91 (77) Southeast $0.9x$ 0.77 = 155.91 (77) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 186.34 318.78 439.84 551.14 622.94 620.9 597.59 543.65 478.33 353.31 223.44 159.3 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 474.38 604.62 715.28 810.23 865.69 847.67 814.16 765.6 708.8 600.3 489.33 439.25 (84) <b>7. Mean internal temperature (heating season)</b> Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m = <u>199 0.97 0.92 0.83 0.67 0.5 0.36 0.4 0.62 0.88 0.98 0.99</u> (86)
Southeast $0.9x$ $0.77$ x $13.43$ x $44.07$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $44.07$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $44.07$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $31.49$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $31.49$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.77$ x $13.43$ x $31.49$ x $0.76$ x $0.7$ = $218.21$ $(77)$ Southeast $0.9x$ $0.620.9$ $597.59$ $543.65$ $478.33$ $353.31$ $223.44$ $159.3$ $(83)$ Total gains - i
Southeast $0.9x$ $0.77$ x $13.43$ x $31.49$ x $0.76$ x $0.7$ = $155.91$ $(77)$ Solar gains in watts, calculated for each month       (83)m = Sum(74)m(82)m       (84)m = (73)m + (83)m , watts       (84)m = (73)m + (83)m , watts       (84)m = (73)m + (83)m , watts       (84)m = (74.38 604.62 715.28 810.23 865.69 847.67 814.16 765.6 708.8 600.3 489.33 439.25       (84)         Temperature during heating periods in the living area from Table 9, Th1 (°C)       21 (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)       (86)m = 0.99 0.97 0.92 0.83 0.67 0.5 0.36 0.4 0.62 0.88 0.98 0.99       (86)
Solar gains in watts, calculated for each month       (83)m = Sum(74)m(82)m         (83)m =       186.34       318.78       439.84       551.14       622.94       620.9       597.59       543.65       478.33       353.31       223.44       159.3       (83)         Total gains – internal and solar (84)m = (73)m + (83)m , watts       (84)m = $474.38$ 604.62       715.28       810.23       865.69       847.67       814.16       765.6       708.8       600.3       489.33       439.25       (84) <b>Chean internal temperature (heating season)</b> Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)       [36]m =       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Total gains - internal and solar (84)m = (73)m + (83)m , watts       (84)m= $474.38$ $604.62$ $715.28$ $810.23$ $865.69$ $847.67$ $814.16$ $765.6$ $708.8$ $600.3$ $489.33$ $439.25$ (84)         7. Mean internal temperature (heating season)         Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)         Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (86)         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
(84)m=       474.38       604.62       715.28       810.23       865.69       847.67       814.16       765.6       708.8       600.3       489.33       439.25       (84)         7. Mean internal temperature (heating season)         Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)         (86)m= <u>Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec       (86)         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)   </u>
7. Mean internal temperature (heating season)         Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
Temperature during heating periods in the living area from Table 9, Th1 (°C)       21       (85)         Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
Utilisation factor for gains for living area, h1,m (see Table 9a)         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (86)m=       0.99       0.97       0.92       0.83       0.67       0.5       0.36       0.4       0.62       0.88       0.99       (86)
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (86)m=         0.99         0.97         0.92         0.83         0.67         0.5         0.36         0.4         0.62         0.88         0.98         0.99         (86)
(86)m= 0.99 0.97 0.92 0.83 0.67 0.5 0.36 0.4 0.62 0.88 0.98 0.99 (86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)
(87)m=         19.82         20.09         20.42         20.73         20.91         20.98         21         20.99         20.95         20.69         20.18         19.76         (87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)
(88)m=         19.83         19.83         19.84         19.85         19.85         19.84         19.84         19.83         (88)
(88)m=       19.83       19.83       19.84       19.84       19.85       19.85       19.84       19.84       19.84       19.83       (88)         Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)         (89)m=       0.99       0.96       0.9       0.78       0.6       0.41       0.27       0.3       0.53       0.84       0.97       0.99       (89)

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

# be

(90)m=	18.29	18.69	19.15	19.56	19.77	19.84	19.85	19.85	19.82	19.52	18.83	18.21		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.59	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) – fl	Δ 🗙 Τ1	+ (1 – fl	Δ) <del>v</del> T2					
(92)m=	19.19	19.52	19.89	20.25	20.44	20.51	20.52	20.52	20.48	20.21	19.62	19.12		(92)
		nent to t	L he mear	internal	temper	L ature fro	n Table	4e. whe	ere appro					
(93)m=	19.04	19.37	19.74	20.1	20.29	20.36	20.37	20.37	20.33	20.06	19.47	18.97		(93)
8. Sp	ace hea	ting requ	uirement											
					e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
				using Ta							,			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.98	0.96	0.9	0.79	0.63	0.45	0.31	0.35	0.57	0.85	0.96	0.99		(94)
Usefu		hmGm	, W = (94	4)m x (84	4)m	r	r				r			
(95)m=	465.99	577.6	644.4	642.19	546.91	381.48	252.81	265.3	403.83	507.69	470.97	433.45		(95)
	<u> </u>		r	perature		1	r				r			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			1	al tempe		i		1	<u> </u>	_				
(97)m=	1011.55		905.96	759.72	581.95	387.36	253.65	266.68	420.41	640.63	840.65	1006.82		(97)
				r each n			1				1			
(98)m=	405.9	277.95	194.6	84.62	26.07	0	0	0	0	98.91	266.17	426. <mark>5</mark> 9	_	7
								Tota	l per year	(kWh/year	') = Sum(9	8)15,912 =	1780.81	(98)
Space	e h <mark>eatin</mark>	g requ <mark>ir</mark> e	ement in	kWh/m <sup>2</sup>	/year								34.19	(99)
9a. En	ergy rec	uiremer	nts – Ind	ividu <b>al h</b>	eating s	ystems i	ncluding	micro-C	CHP)					_
Spac	e heatir	ng:												
Fracti	on of sp	ace hea	at from s	<mark>econ</mark> dar	y/sup <mark>ple</mark>	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from n	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		·	1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1							·	90.8	(206)
				ementar		a system	ו %						0	(208)
Lineit								A	0.010	0	Nau	Dee	-	
Snoo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	405.9	277.95	194.6	alculate 84.62	26.07	0	0	0	0	98.91	266.17	426.59		
(0.1.1)						0	0	0	0	50.51	200.17	420.00		
(211)m		í .	<u>, , , ,</u>	00 ÷ (20	, 					100.00	000.44	400.04		(211)
	447.02	306.11	214.32	93.2	28.71	0	0	0	0	108.93	293.14	469.81		
								Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u>_</u>	1961.24	(211)
•				y), kWh/	month									
	<u> </u>	/	00 ÷ (20	r í	-									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		<b>-</b>
								Tota	l (kWh/yea	ar) = Sum(2)	215) <sub>15,1012</sub>	<u>_</u>	0	(215)
	heating	•												
Output	166.13	ater hea 145.12	ter (calc 150.99	ulated a	20 <b>ve)</b> 129.66	114.2	109.41	121.96	123.31	140.41	149.89	162.23		
Efficier		ater hea		133.92	129.00	114.2	109.41	121.90	120.01	140.41	143.03	102.20	04 5	(216)
Enciel	icy of w	ater nea											81.5	(210)



(217)m= 87.89 87.38	86.49	84.87	82.92	81.5	81.5	81.5	81.5	85.1	87.21	88.03		(217)
Fuel for water heating			02.92	01.0	01.5	01.5	01.5	00.1	07.21	00.00		(=)
$(219)m = (64)m \times 100$			-	-	_	_	_	-	-			
(219)m= 189.03 166.08	174.58	157.8	156.36	140.12	134.24	149.65	151.3	164.99	171.86	184.29		
						Tota	al = Sum(2	19a) <sub>112</sub> =			1940.3	(219)
Annual totals								k	Wh/year		kWh/yea	<b>ir</b>
Space heating fuel use	·	system	1								1961.24	
Water heating fuel use	ed										1940.3	
Electricity for pumps, f	ans and	electric	keep-ho	t								
central heating pump	:									30		(230c)
Total electricity for the	above, k	(Wh/yea	ır			sum	of (230a)	(230g) =			30	(231)
Electricity for lighting											240.31	(232)
Electricity generated b	y PVs										-855.55	(233)
12a. CO2 emissions	– Individ	ual heati	ina svste	ems inclu	udina mi	cro-CHF	)					
120.002 0113310113			goyore		a an ig in							
				En	ergy				<b>ion fac</b> 2/kWh	tor	Emission kg CO2/ye	-
Space heating (main s				En kW	Ŭ			Emiss kg CO2	2/kWh	tor =	Emission kg CO2/ye	-
Space heating (main s	system 1)			<b>En</b> kW (211	<b>ergy</b> /h/year			kg CO2	2/kWh	tor =	kg CO2/ye	ear (261)
Space heating (main s Space heating (secon	system 1)			En kW (21 <sup>,</sup> (21)	ergy /h/year 1) x 5) x			kg CO2	2/kWh 16	=	kg CO2/ye	(261) (263)
Space heating (main s Space heating (secon Water heating	system 1) dary)			En kW (21* (21) (21)	<b>ergy</b> /h/year 1) x 5) x 9) x			kg CO2	2/kWh 16	=	kg CO2/ye	(261) (263) (264)
Space heating (main s Space heating (secon Water heating Space and water heat	system 1) dary) ing			En kW (211 (215 (215) (26)	<b>hergy</b> /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + (		kg CO2	2/kWh 16	=	kg CO2/ye	(261) (263)
Space heating (main s Space heating (secon Water heating	system 1) dary) ing			En kW (211 (215 (215) (26)	<b>ergy</b> /h/year 1) x 5) x 9) x			kg CO2	2/kWh 16 19 16	=	kg CO2/ye	(261) (263) (264)
Space heating (main s Space heating (secon Water heating Space and water heat	system 1) dary) ing			En kW (211 (215 (215) (26)	<b>hergy</b> /h/year 1) x 5) x 9) x 1) + (262) 1) x			kg CO2	2/kWh 16 19 16	=	kg CO2/ye 423.63 0 419.1 842.73	(261) (263) (264) (265)
Space heating (main s Space heating (secon Water heating Space and water heat Electricity for pumps, f	system 1) dary) ing fans and	electric	keep-ho	En kW (21 <sup>2</sup> (219 (26 <sup>2</sup> (26 <sup>2</sup> )	<b>hergy</b> /h/year 1) x 5) x 9) x 1) + (262) 1) x			kg CO2	2/kWh 16 19 16	=	kg CO2/ye 423.63 0 419.1 842.73 15.57	(261) (263) (264) (265) (267)
Space heating (main s Space heating (secon Water heating Space and water heat Electricity for pumps, f Electricity for lighting	system 1) dary) ing fans and	electric	keep-ho	En kW (21 <sup>2</sup> (219 (26 <sup>2</sup> (26 <sup>2</sup> )	<b>hergy</b> /h/year 1) x 5) x 9) x 1) + (262) 1) x			kg CO2	2/kWh 16 19 16 19 19	=	kg CO2/ye 423.63 0 419.1 842.73 15.57	(261) (263) (264) (265) (267)
Space heating (main s Space heating (secon Water heating Space and water heat Electricity for pumps, f Electricity for lighting Energy saving/genera	system 1) dary) ing fans and	electric	keep-ho	En kW (21 <sup>2</sup> (219 (26 <sup>2</sup> (26 <sup>2</sup> )	<b>hergy</b> /h/year 1) x 5) x 9) x 1) + (262) 1) x		(264) =	kg CO2	2/kWh 16 19 16 19 19 19	=	kg CO2/ye 423.63 0 419.1 842.73 15.57 124.72	(261) (263) (264) (265) (267) (268)
Space heating (main s Space heating (secon Water heating Space and water heat Electricity for pumps, f Electricity for lighting Energy saving/genera Item 1	system 1) dary) ing fans and tion tech	electric	keep-ho	En kW (21 <sup>2</sup> (219 (26 <sup>2</sup> (26 <sup>2</sup> )	<b>hergy</b> /h/year 1) x 5) x 9) x 1) + (262) 1) x		(264) = sum c	kg CO2	2/kWh 16 19 16 19 19 19	=	kg CO2/ye 423.63 0 419.1 842.73 15.57 124.72 -444.03	(261) (263) (264) (265) (267) (268) (269)
Space heating (main s Space heating (secon Water heating Space and water heat Electricity for pumps, f Electricity for lighting Energy saving/genera Item 1 Total CO2, kg/year	system 1) dary) ing fans and tion tech	electric	keep-ho	En kW (21 <sup>2</sup> (219 (26 <sup>2</sup> (26 <sup>2</sup> )	<b>hergy</b> /h/year 1) x 5) x 9) x 1) + (262) 1) x		(264) = sum c	kg CO2 0.2 0.5 0.5 0.5 0.5	2/kWh 16 19 16 19 19 19	=	kg CO2/ye 423.63 0 419.1 842.73 15.57 124.72 -444.03 538.99	(261) (263) (264) (265) (267) (268) (269) (269)



				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012			Strom Softwa Address	are Vei	sion:		Versio	n: 1.0.1.32	
Address	Flat 5, 27 W	lost End I					Green				
Address : 1. Overall dwelling dime		rest Enu i	Lane, L	ondon, i	1004Q	J					
				Aro	a(m²)			ight(m)		Volume(m <sup>3</sup> )	\ \
Ground floor					. ,	(1a) x	Av. He		(2a) =	· ·	) (3a)
				4			2	.35	]	117.08	
First floor				5	5.95	(1b) x	2	.35	(2b) =	131.48	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)	+(1n	) 10	05.77	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	248.56	(5)
2. Ventilation rate:											
	main heating		condar eating	У	other		total			m <sup>3</sup> per hou	r
Number of chimneys		] + [	0	+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0		0		0	] = [	0	x2	20 =	0	(6b)
Number of intermittent fa	ans					- L	2	x ^	10 =	20	(7a)
Number of passive vents	6					L L	0	x ^	10 =	0	(7b)
Number of flueless gas f	ires						0	×4	40 =	0	(7c)
									Air ch	ange <mark>s per</mark> ho	ur
Infiltration due to chimne	eys, flu <mark>es an</mark> d f	ans = (6 <mark>a</mark>	)+(6b)+(7	<mark>a)+</mark> (7b)+(	7c) =		20	<u> </u>	÷ (5) =	0.08	(8)
If a pressurisation test has b			d, proceed	d to (17), d	otherwise o	continue fr	om <mark>(</mark> 9) to (	(16)			
Number of storeys in t	he dw <mark>elling</mark> (n	5)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are p							uction			0	(11)
deducting areas of openi			onung to	ine great		a (anoi					
If suspended wooden	floor, enter 0.2	(unseale	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	nter 0.05, else	enter 0								0	(13)
Percentage of window	s and doors di	aught str	ipped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)					0	(16)
Air permeability value,	• • •			•	•	•	etre of e	nvelope	area	4	(17)
If based on air permeabi										0.28	(18)
Air permeability value applie Number of sides sheltere		on test has	been don	e or a deg	gree air pe	rmeability	is being us	sed			
Shelter factor	eu				(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate incorpora	ting shelter fac	tor			(21) = (18					0.03	(21)
Infiltration rate modified f	-									0.24	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	beed from Tab	e 7			•	•	•				
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		



#### Wind Factor $(22a)m = (22)m \div 4$ 1.27 0.95 0.92 (22a)m= 1.25 1.23 1.1 1.08 0.95 1 1.08 1.12 1.18 Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m 0.3 0.29 0.26 0.26 0.23 0.3 0.23 0.22 0.24 0.26 0.27 0.28 Calculate effective air change rate for the applicable case If mechanical ventilation: (23a) 0 If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 0 (23b) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (23c) a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m 0 0 0 0 0 0 0 0 0 0 0 0 (24a) b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m 0 0 0 0 n 0 0 0 0 0 0 0 (24b) c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$ , then (24c) = (23b); otherwise $(24c) = (22b)m + 0.5 \times (23b)$ (24c)(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m<sup>2</sup> x 0.5] (24d)m= 0.55 0.54 0.54 0.53 0.53 0.53 0.53 0.53 0.54 0.54 (24d) 0.52 0.53 Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.55 0.54 0.54 0.53 0.53 0.53 0.53 0.52 0.53 (25)0.53 0.54 0.54 ELEMENT Gross Openings Net Area **U-value** AXU k-value AXk W/m2K (W/K) kJ/m².K kJ/K area (m²) m<sup>2</sup> A ,m² Doors (26)1.92 1 1.92 Windows Type 1 $x^{1/[1/(1.4)+0.04]} =$ 5.88 7.8 (27)Windows Type 2 $x^{1/[1/(1.4)+0.04]} =$ 7.3 (27)5.508 Windows Type 3 $x^{1/[1/(1.4)+0.04]} =$ 20.08 26.62 (27)Windows Type 4 $x^{1/[1/(1.4)+0.04]} =$ 8.56 11.35 (27)Rooflights $x^{1/[1/(1.4) + 0.04]}$ (27b) = 11.91 16.674 Floor Type 1 16.24 0.13 2.1112 (28) Floor Type 2 0.13 0.0286 (28) 0.22 x = Walls Type1 126.43 40.03 86.4 0.17 14.69 (29) х Walls Type2 20.49 1.92 18.57 0.16 2.94 (29) x Roof 23.82 80.2 (30) 56.38 0.13 7.33 x Total area of elements, m<sup>2</sup> (31)243.58 Party wall (32)5.78 х 0 0 Party floor 62.51 (32a) \* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \*\* include the areas on both sides of internal walls and partitions Fabric heat loss, $W/K = S (A \times U)$ (26)...(30) + (32) =(33) 113.67 Heat capacity $Cm = S(A \times k)$ ((28)...(30) + (32) + (32a)...(32e) =(34)0

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m<sup>2</sup>K Indicative Value: Medium

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

250

(35)

can be ı	ised inste	ad of a dei	tailed calc	ulation.										
Therm	al bridge	əs : S (L	x Y) cal	culated u	using Ap	pendix I	K					]	22.83	(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) =		[	136.5	(37)
Ventila	tion hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	44.8	44.65	44.51	43.83	43.71	43.12	43.12	43.01	43.34	43.71	43.96	44.23		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	181.3	181.15	181.01	180.33	180.2	179.61	179.61	179.5	179.84	180.2	180.46	180.73		
		motor (l		/			•	•		-	Sum(39)1	12 /12=	180.33	(39)
		meter (H	,	i	47	47	47	47		= (39)m ÷		4 74		
(40)m=	1.71	1.71	1.71	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.71	1.71	47	
Numbe	er of day	/s in moi	nth (Tab	le 1a)						Average =	Sum(40)1	12/12=	1.7	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
								•		•	•			
4. Wa	iter heat	ting ener	gy requ	irement:								kWh/ye	ar:	
A			NI I											(40)
		ıpancy, l 9, N = 1		[1 - exp	(-0.0003	49 x (TF		$(2)^{1} + 0.0$	0013 x ( <sup>-</sup>	TFA -13.		79		(42)
	A £ 13.9				( 0.000			/_/] - 01						
		e hot wa										0.39		(43)
		al avera <mark>ge</mark> litres per j				-	7	to achieve	a water us	se target o	t			
Hot wate	Jan	Feb n litres per	Mar day for e	Apr Apr	May Vd m – fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
			-	-				· ·	00.00	400.4	400.44			
(44)m=	110.43	106.41	102.4	98.38	94.37	90.35	90.35	94.37	98.38	102.4	106.41	110.43		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )			m(44) <sub>112</sub> = ables 1b, 1	L	1204.67	(44)
(45)m=	163.76	143.23	147.8	128.85	123.64	106.69	98.86	113.45	114.8	133.79	146.04	158.59		
( -)											m(45) <sub>112</sub> =	l	1579.51	(45)
lf instant	aneous w	vater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46				L		
(46)m=	24.56	21.48	22.17	19.33	18.55	16	14.83	17.02	17.22	20.07	21.91	23.79		(46)
	storage		الم ماريما					ithin or		aal				
0		e (litres)		0 1			0		ame ves	sei		0		(47)
	•	eating a stored			-			• •	ore) ont	or 'O' in (	47)			
	storage		not wate	51 (1115 11	iciuues i	nstantai	ieous co				47)			
	-	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
		actor fro					,,,,				<u> </u>	0		(49)
-		m water			ar			(48) x (49)	) –					(40)
•••		urer's de	-	•		or is not		(40) X (40)	, –			0		(30)
•		age loss		•								0		(51)
	-	leating s		on 4.3										
		from Tal										0		(52)
Tempe	rature f	actor fro	m Table	2b								0		(53)

		om watei (54) in (5	-	e, kWh/ye	ear			(47) x (51	) x (52) x (	53) =		0	(54)
	. ,			for each	month			((56)m = (	(55) × (41)	n		U	(35)
(56)m=			0		0	0	0	0	0	0	0	0	(56)
	-						H11)] ÷ (5	-					
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0	(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0	(58)
	•					,	(58) ÷ 36 ter heatii	• • •		r thermo	stat)		
(59)m=		0	0		0		0			0	0	0	(59)
Combi		I Iculated	for each	n month (	(61)m –	I (60) ∸ 30	65 × (41)	)m					l
(61)m=	50.96	46.03	50.96	48.52	48.09	44.56	46.04	48.09	48.52	50.96	49.32	50.96	(61)
				eating ca		for eac			0.85 x (				J (59)m + (61)m
(62)m=	214.72	189.25	198.76	177.37	171.73	151.25	144.91	161.54	163.32	184.75	195.36	209.55	(62)
	-IW input	L calculated	using App	endix G o	r Appendix	L H (negati	I ve quantity	I /) (enter '0	l if no sola	r contributi	ion to wate	I er heating)	l
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (	G)				
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)
Output	t from w	ater hea	iter								-	-	
(64)m=	214.72	189.25	198.76	177.37	171.73	151.25	144.91	161.54	163.32	184.75	195.36	209.55	
								Out	out from wa	ater heatei	r (annual)₁	12	2162.5 (64)
Hea <mark>t g</mark>	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)n	י 0.8 <mark>+</mark> 1	( <mark>46)m</mark>	+ (57)m	+ ( <mark>59)m</mark>	]
(65)m=	67.19	59.13	61.88	54.97	53.13	46.61	44.38	49.74	50.3	57.23	60.89	65.47	(65)
inclu	ide (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	leating
5. Int	ternal ga	ains (see	e Table 5	5 and 5a	):								
Metab	olic gair	ns (Table	<u>e 5), Wat</u>	tts									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m=	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	139.35	(66)
-	<u> </u>	· · · · · · · · · · · · · · · · · · ·	· · · · ·		· · ·		r L9a), a	i	1		·	i	1
(67)m=	23.65	21.01	17.09	12.94	9.67	8.16	8.82	11.47	15.39	19.54	22.81	24.31	(67)
		<u>`</u>	ı —	· · ·	· · · ·	1	13 or L1	, 	r				1
(68)m=	265.33	268.09	261.15	246.38	227.73	210.21	198.5	195.75	202.69	217.46	236.1	253.63	(68)
	<u> </u>	<u>`</u>	i		· · ·		or L15a)						1
(69)m=	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	(69)
•	r	<u> </u>	(Table !	<u> </u>									1 (77)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)
		· · · · · · · · · · · · · · · · · · ·	<del>, , , , , , , , , , , , , , , , , , , </del>	tive valu	, ``	,	1		1		i		1
(71)m=		-111.48		-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	-111.48	(71)
		gains (1	· · · ·										1 (77)
(72)m=	90.31	87.99	83.18	76.35	71.41	64.74	59.65	66.86	69.86	76.92	84.57	88	(72)
		gains =	1				)m + (67)m	r	r · ·		1	r	1
(73)m=	447.1	444.89	429.21	403.47	376.62	350.92	334.78	341.88	355.74	381.72	411.28	433.74	(73)
6. So	lar gains	S:											

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	5.88	×	11.28	×	0.76	x	0.7	=	24.46	(75)
Northeast 0.9x	0.77	x	5.88	x	22.97	x	0.76	x	0.7	=	49.79	(75)
Northeast 0.9x	0.77	x	5.88	x	41.38	×	0.76	x	0.7	=	89.7	(75)
Northeast 0.9x	0.77	x	5.88	x	67.96	x	0.76	x	0.7	=	147.32	(75)
Northeast 0.9x	0.77	x	5.88	x	91.35	x	0.76	x	0.7	=	198.02	(75)
Northeast 0.9x	0.77	x	5.88	x	97.38	x	0.76	x	0.7	=	211.11	(75)
Northeast 0.9x	0.77	x	5.88	x	91.1	x	0.76	x	0.7	=	197.49	(75)
Northeast 0.9x	0.77	x	5.88	x	72.63	x	0.76	x	0.7	=	157.44	(75)
Northeast 0.9x	0.77	x	5.88	x	50.42	x	0.76	x	0.7	=	109.3	(75)
Northeast 0.9x	0.77	x	5.88	x	28.07	x	0.76	x	0.7	=	60.84	(75)
Northeast 0.9x	0.77	x	5.88	x	14.2	x	0.76	x	0.7	=	30.78	(75)
Northeast 0.9x	0.77	x	5.88	x	9.21	×	0.76	x	0.7	=	19.97	(75)
Southeast 0.9x	0.77	x	5.51	x	36.79	x	0.76	x	0.7	=	74.72	(77)
Southeast 0.9x	0.77	x	5.51	x	62.67	×	0.76	x	0.7	=	127.27	(77)
Southeast 0.9x	0.77	x	5.51	x	85.75	×	0.76	x	0.7	=	174.14	(77)
Southeast 0.9x	0.77	x	5.51	×	106.25	X	0.76	x	0.7	=	215.76	(77)
Southeast 0.9x	0.77	x	5.51	x	119.01	x	0.76	x	0.7	=	241.67	(77)
Southeast 0.9x	0.77	x	5.51	x	118.15	×	0.76	x	0.7	=	2 <mark>39.92</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	113.91	x	0.76	×	0.7	=	2 <mark>31.31</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	104.39	x	0.76	x	0.7	=	2 <mark>11.98</mark>	(77)
Southeast 0.9x	0.77	x	5.51	x	92.85	×	0.76	x	0.7	=	188.55	(77)
Southeast 0.9x	0.77	x	5.51	x	69.27	x	0.76	x	0.7	=	140.66	(77)
Southeast 0.9x	0.77	x	5.51	x	44.07	×	0.76	x	0.7	=	89.49	(77)
Southeast 0.9x	0.77	x	5.51	x	31.49	×	0.76	x	0.7	=	63.94	(77)
Southwest0.9x	0.77	x	8.56	x	36.79		0.76	x	0.7	=	116.12	(79)
Southwest0.9x	0.77	x	8.56	x	62.67		0.76	x	0.7	=	197.79	(79)
Southwest0.9x	0.77	x	8.56	x	85.75	]	0.76	x	0.7	=	270.62	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	106.25		0.76	x	0.7	=	335.32	(79)
Southwest0.9x	0.77	x	8.56	x	119.01		0.76	x	0.7	=	375.58	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	118.15		0.76	x	0.7	=	372.87	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.56	x	113.91		0.76	x	0.7	=	359.48	(79)
Southwest0.9x		x	8.56	x	104.39		0.76	x	0.7	=	329.44	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	92.85		0.76	x	0.7	=	293.03	(79)
Southwest <sub>0.9x</sub>		x	8.56	x	69.27		0.76	x	0.7	=	218.6	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.56	x	44.07		0.76	x	0.7	=	139.08	(79)
Southwest <sub>0.9x</sub>	0	x	8.56	x	31.49		0.76	x	0.7	=	99.37	(79)
Northwest 0.9x		x	20.08	×	11.28	×	0.76	x	0.7	=	83.53	(81)
Northwest 0.9x		x	20.08	×	22.97	×	0.76	x	0.7	=	170.02	(81)
Northwest 0.9x	0.77	x	20.08	×	41.38	×	0.76	x	0.7	=	306.33	(81)





Northwest (	0.9x 0.77	x	20.08	x	67	.96	x	0.76	×	0.7	=	503.08	(81)
Northwest (	0.9x 0.77	x	20.08	x	91	.35	x	0.76	x	0.7	=	676.24	(81)
Northwest (	0.9x 0.77	x	20.08	x	97	.38	x	0.76	x	0.7	=	720.94	(81)
Northwest (	0.9x 0.77	x	20.08	x	9	1.1	x	0.76	x	0.7	=	674.42	(81)
Northwest (	0.9x 0.77	x	20.08	x	72	.63	x	0.76	×	0.7	=	537.66	(81)
Northwest (	0.9x 0.77	x	20.08	x	50	.42	x	0.76	x	0.7	=	373.26	(81)
Northwest (	0.9x 0.77	x	20.08	x	28	.07	x	0.76	×	0.7	=	207.78	(81)
Northwest (	0.9x 0.77	x	20.08	×	14	1.2	x	0.76	×	0.7	=	105.1	(81)
Northwest (	0.9x 0.77	x	20.08	×	9.	21	x	0.76	×	0.7	=	68.21	(81)
Rooflights (	).9x 1	x	11.91	×		26	x	0.76	×	0.7	=	296.53	(82)
Rooflights (	).9x 1	x	11.91	×	Ę	54	x	0.76	×	0.7	=	615.87	(82)
Rooflights (	).9x 1	x	11.91	×	9	96	x	0.76	×	0.7	=	1094.88	(82)
Rooflights (	).9x 1	x	11.91	×	1	50	x	0.76	×	0.7	=	1710.75	(82)
Rooflights (	).9x 1	x	11.91	×	1	92	x	0.76	x	0.7	=	2189.76	(82)
Rooflights (	).9x 1	x	11.91	×	2	00	x	0.76	×	0.7	=	2281	(82)
Rooflights (	).9x 1	x	11.91	×	1	89	x	0.76	×	0.7	=	2155.55	(82)
Rooflights (	).9x 1	x	11.91	×	1	57	x	0.76	×	0.7	=	1790.59	(82)
Rooflights (	).9x 1	x	11.91	X	1	15	x	0.76	x	0.7	=	1311.58	(82)
Roof <mark>lights (</mark>	).9x 1	×	11.91	×	6	66	x	0.76	×	0.7	- 1	752.73	(82)
Roof <mark>lights (</mark>	).9x 1	×	11.91	×	:	33	×	0.76	×	0.7	=	376.37	(82)
Roof <mark>lights (</mark>	).9x 1	x	11.91	×		21	×	0.76	×	0.7	=	239.51	(82)
		T											
Sola <mark>r gain</mark>	s in watts, calc	ulated	for each m	onth		3)	83)m = 5	Sum(74)m	. <mark>(8</mark> 2)m			_	
` '   L							3027.11	2275.72	13 <mark>80.6</mark>	2 740.81	491.01		(83)
	s – internal and		· , ,	·	· ,					_			
<mark>(84)m=</mark> 104	2.45 1605.63 2	364.88	3315.69 405	7.89 4	176.76	3953.03	3368.99	2631.46	1762.3	3 1152.09	924.75		(84)
7. Mean	internal tempe	rature	(heating sea	ason)									
Tempera	ture during hea	ating p	eriods in the	e living	area fr	om Tabl	le 9, Th	n1 (°C)				21	(85)
Utilisatio	n factor for gair	ns for l	iving area, ł	n1,m (s	see Tab	le 9a)						-	
J	an Feb	Mar	Apr N	/lay	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0	99 0.95	0.83	0.6 0	.4	0.27	0.2	0.24	0.46	0.81	0.97	0.99		(86)
Mean int	ernal temperat	ure in l	iving area T	1 (follo	ow step	s 3 to 7	in Tab	e 9c)					
(87)m= 19	.39 19.88	20.46	20.85 20	.97	20.99	21	21	20.97	20.64	19.88	19.29	]	(87)
Tempera	ture during hea	ating p	eriods in res	st of dy	velling	rom Tab	ole 9, T	h2 (°C)					
· · · · · · · · · · · · · · · · · · ·		19.53			19.54	19.54	19.54	19.54	19.54	19.54	19.53	]	(88)
Litilisatio	n factor for gair	ns for r	est of dwell	ina h?	) m (se	Table C	9a)					-	
		0.79		34	0.21	0.13	0.17	0.37	0.75	0.96	0.99	1	(89)
											-		
	ernal temperat	ure in t			<u> </u>	now step		r r	,			7	(00)
	10 17	18 O/ I	10/ 1/0	52 I	10 5/	10 EA	10 F 4	10.50	10 0	1010	170/		/um
(00)=	7.48 18.17	18.94	19.4 19	.52	19.54	19.54	19.54	19.52 fl	19.2	18.19 ring area ÷ (4	17.34	0.43	(90) (91)

Mean internal temperature (for the whole dwelling) =  $fLA \times T1 + (1 - fLA) \times T2$ 

<mark>(92)m=</mark> 18.3	18.9	19.59	20.02	20.14	20.16	20.17	20.17	20.14	19.82	18.91	18.18		(92)
Apply adjustn	nent to th	ne mean	internal	tempera	ature fro	m Table	4e, whe	re appro	opriate				
(93)m= 18.15	18.75	19.44	19.87	19.99	20.01	20.02	20.02	19.99	19.67	18.76	18.03		(93)
8. Space hea	ting requ	uirement											
Set Ti to the r	nean int	ernal ter	nperatur	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(7	76)m an	d re-calc	ulate	
the utilisation			•			•			, (	,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm											
(94)m= 0.98	0.92	0.78	0.56	0.36	0.23	0.16	0.19	0.39	0.76	0.95	0.98		(94)
Useful gains,	hmGm ,	W = (94	4)m x (84	 4)m									
(95)m= 1018.52	1479.52	1853.6	1850.45	1470.68	969.11	613.22	648.04	1037.9	1334.61	1093.01	910.03		(95)
Monthly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	for mea	an intern	al tempe	erature. I	_m . W =	L =[(39)m :	r [(93)m	– (96)m	1				
(97)m= 2511.2			· · · ·	1493.88		613.72	649.17	1059.61	1634.12	2104.74	2499.24		(97)
Space heatin													
(98)m= 1110.56	- · ·	364.13	92.54	17.26	0	0.02	0	0	222.84	728.45	1182.37		
(50)11- 1110.50	032.04	304.13	52.04	17.20	0	Ŭ	-	-				4440.40	(98)
							Tota	i per year	(kWh/year	) = Sum(9	8)15,912 =	4410.19	(90)
Space heatin	g require	ement in	kWh/m <sup>2</sup>	/year								41.7	(99)
9a. Energy rec	uiremer	its – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space heatir						Ĭ		V Ó					
Fraction of sp	-	t from s	econdar	/supple	mentary	system						0	(201)
Fraction of sp							(202) = 1 -	- (201) =				1	(202)
									(000)]				
Fraction of to	tal neatir	ig from I	main sys	stem 1			(204) = (2	JZ) X [1 -	(203)] =			1	(204)
Efficiency of r	nain spa	ice heat	ing syste	em 1								90.8	=
												00.0	(206)
Efficiency of s	seconda			y heating	g system	ı, %						0	(206) (208)
-		ry/supple	ementar				Αυα	Sep	Oct	Nov	Dec	0	(208)
Jan	Feb	ry/supple Mar	ementar Apr	May	Jun	n, % Jul	Aug	Sep	Oct	Nov	Dec		(208)
Jan Space heatin	Feb g require	ry/supple Mar ement (c	ementary Apr alculated	May d above)	Jun	Jul						0	(208)
Jan Space heatin 1110.56	Feb g require 692.04	ry/supple Mar ement (c 364.13	ementar Apr alculated 92.54	May d above) 17.26	Jun		Aug 0	Sep 0	Oct 222.84	Nov 728.45	Dec 1182.37	0	(208)
Jan Space heatin 1110.56 (211)m = {[(98	Feb g require 692.04 )m x (20	ry/supple Mar ement (c 364.13 4)] } x 1	Apr alculated 92.54 00 ÷ (20	May d above) 17.26	Jun 0	Jul 0	0	0	222.84	728.45	1182.37	0	(208)
Jan Space heatin 1110.56 (211)m = {[(98	Feb g require 692.04	ry/supple Mar ement (c 364.13	ementar Apr alculated 92.54	May d above) 17.26	Jun	Jul	0	0	222.84 245.42	728.45 802.26	1182.37 1302.17	0	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98	Feb g require 692.04 )m x (20	ry/supple Mar ement (c 364.13 4)] } x 1	Apr alculated 92.54 00 ÷ (20	May d above) 17.26	Jun 0	Jul 0	0	0	222.84	728.45 802.26	1182.37 1302.17	0	(208)
Jan Space heatin 1110.56 (211)m = {[(98	Feb g require 692.04 )m x (20 762.16	ry/supple Mar ement (c 364.13 4)] } x 1 401.02	Apr alculated 92.54 00 ÷ (20 101.92	May d above) 17.26 6) 19.01	Jun 0	Jul 0	0	0	222.84 245.42	728.45 802.26	1182.37 1302.17	0 kWh/ye	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08	Feb g require 692.04 )m x (20 762.16 g fuel (se	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdary	Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/	May d above) 17.26 6) 19.01	Jun 0	Jul 0	0	0	222.84 245.42	728.45 802.26	1182.37 1302.17	0 kWh/ye	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin	Feb g require 692.04 )m x (20 762.16 g fuel (se	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdary	Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/	May d above) 17.26 6) 19.01	Jun 0	Jul 0	0	0	222.84 245.42	728.45 802.26	1182.37 1302.17	0 kWh/ye	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin = {[(98)m x (20	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8)	May d above) 17.26 (6) 19.01 month	Jun           0           0	Jul 0	0 0 Tota 0	0 I (kWh/yea	222.84 245.42 ar) =Sum(2	728.45 802.26 11) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin = {[(98)m x (20 (215)m= 0	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8)	May d above) 17.26 (6) 19.01 month	Jun           0           0	Jul 0	0 0 Tota 0	0 I (kWh/yea	222.84 245.42 ar) =Sum(2	728.45 802.26 11) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211) (211)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m =         0	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0	May d above) 17.26 6) 19.01 month	Jun           0           0	Jul 0	0 0 Tota 0	0 I (kWh/yea	222.84 245.42 ar) =Sum(2	728.45 802.26 11) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211) (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin = {[(98)m x (20 (215)m= 0	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0	May d above) 17.26 6) 19.01 month	Jun           0           0	Jul 0	0 0 Tota 0	0 I (kWh/yea	222.84 245.42 ar) =Sum(2	728.45 802.26 11) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211) (211)
Jan Space heatin 1110.56 (211)m = {[(98 1223.08 Space heatin = {[(98)m x (20 (215)m= 0 Water heating Output from w	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 10)] } x 10 0	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 198.76	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0	May d above) 17.26 16) 19.01 month 0	0 0	Jul           0           0           0	0 Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye	(208) ear (211) (211)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from way         214.72         Efficiency of way	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 10)] } x 10 0 139.25 ater heat	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 0 ter (calc 198.76 ter	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0	May d above) 17.26 6) 19.01 month 0 200ve) 171.73	Jun 0 0 151.25	Jul           0           0           0	0 Tota 0 Tota 161.54	0 I (kWh/yea 0 I (kWh/yea	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub> 195.36	1182.37 1302.17 = 0 = 209.55	0 kWh/ye 4857.04	(208) ear (211) (211) (215)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from war         214.72         Efficiency of war         (217)m=         89.15	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 189.25 ater heat 189.25 ater heat 88.63	ry/supple Mar ament (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 0 ter (calc 198.76 ter 87.28	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0 ulated al 177.37 84.47	May d above) 17.26 16) 19.01 month 0	0 0	Jul 0 0	0 Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea 163.32	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2 184.75	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub>	1182.37 1302.17 = 0	0 kWh/ye 4857.04	(208) ear (211) (211) (215)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from w.         214.72         Efficiency of w         (217)m=         89.15         Fuel for water	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 189.25 ater heat 189.25 ater hea 88.63 heating,	ry/supple Mar ament (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 0 ter (calco 198.76 ter 87.28 kWh/mc	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0 ulated al 177.37 84.47 onth	May d above) 17.26 6) 19.01 month 0 200ve) 171.73	Jun 0 0 151.25	Jul 0 0	0 Tota 0 Tota 161.54	0 I (kWh/yea 0 I (kWh/yea 163.32	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2 184.75	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub> 195.36	1182.37 1302.17 = 0 = 209.55	0 kWh/ye 4857.04	(208) ear (211) (211) (215)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from war         214.72         Efficiency of war         (217)m=         89.15	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 189.25 ater heat 189.25 ater hea 88.63 heating,	ry/supple Mar ament (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 0 ter (calco 198.76 ter 87.28 kWh/mc	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0 ulated al 177.37 84.47 onth	May d above) 17.26 6) 19.01 month 0 200ve) 171.73	Jun 0 0 151.25	Jul 0 0	0 Tota 0 Tota 161.54	0 I (kWh/yea 0 I (kWh/yea 163.32	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2 184.75	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub> 195.36	1182.37 1302.17 = 0 = 209.55	0 kWh/ye 4857.04	(208) ear (211) (211) (215)
Jan         Space heatin         1110.56         (211)m = {[(98)         1223.08         Space heatin         = {[(98)m x (20)         (215)m=         0         Water heating         Output from w         214.72         Efficiency of w         (217)m=         89.15         Fuel for water         (219)m = (64)	Feb g require 692.04 )m x (20 762.16 g fuel (se 01)] } x 10 0 g fuel (se 01)] ] x 10 0 g fuel (se 01)] x 10 0 x 10 0 x 10 0 x 10	ry/supple Mar ement (c 364.13 4)] } x 1 401.02 econdar 00 ÷ (20 0 ter (calce 198.76 ter 87.28 kWh/mc 0 ÷ (217)	ementary Apr alculated 92.54 00 ÷ (20 101.92 y), kWh/ 8) 0 ulated al 177.37 84.47 onth m	May d above) 17.26 6) 19.01 month 0 200ve) 171.73 82.27	Jun 0 0 151.25 81.5	Jul 0 0	0 Tota 0 Tota 161.54 81.5	0 I (kWh/yea 0 I (kWh/yea 163.32 81.5	222.84 245.42 ar) =Sum(2 0 ar) =Sum(2 184.75 86.33 213.99	728.45 802.26 (11) <sub>15,1012</sub> 0 (15) <sub>15,1012</sub> 195.36 88.66	1182.37 1302.17 = 0 = 209.55 89.27	0 kWh/ye 4857.04	(208) ear (211) (211) (215)





Annual totals		kWh/yea	ır	kWh/year	
Space heating fuel used, main system 1				4857.04	]
Water heating fuel used				2531.88	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
Total electricity for the above, kWh/year	sum of (230a)	(230g) =		30	(231)
Electricity for lighting				417.75	(232)
Electricity generated by PVs				-855.55	(233)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	ctor	<b>Emissions</b> kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	1049.12	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	546.89	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1596.01	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	15.57	(267)
Electricity for lighting Energy saving/generation technologies	(232) x	0.519	-	2 <mark>16.81</mark>	(268)
Item 1		0.519	=	-444.03	(269)
Total CO2, kg/year	sum	of (265)(271) =		1384.36	(272)
Dwelling CO2 Emission Rate	(272)	÷ (4) =		13.09	(273)
El rating (section 14)				88	(274)

Code for Sustainable Homes - Ene 1 DER Ene 7 LZC Technologies - Calculator Tool - Rev 00

breglobal

	May 2009 version - Revision 00
Job no:	West End Lane
Assessment date:	
Assessor name:	
Registration no:	
Development name:	



ENE 7 ASSESSMENT TOOL 6 BOX NUMBER APT2 Description MST1 SAP Reference No. 1 Individual heating Individual heating systems Individual heating systems Individual heating systems Define dwelling heating system from drop down list Click to select Click to select systems

All values to be taken from the box numbers described within the worksheets set out in the Government's Standard Assessment Procedure for the Energy Rating of Dwellings, 2005 edition, revision 2, June 2008.

Part 1: STANDARD System Specification CO <sub>2</sub> emissions (no LZC te	chnologies)					
CO <sub>2</sub> emissions from space & water heating (from Standard case SAP 2005 DER worksheet)	(SAP DOX 107) KOCU <sub>2</sub> /VI					
$CO_2$ emissions from fans and pumps (from Standard case SAP 2005 DER worksheet)	(SAP box 108) kgCO <sub>2</sub> /yr					
CO <sub>2</sub> emissions from lighting (from Standard case SAP 2005 DER worksheet)	(SAP box 109) KdCO <sub>2</sub> /Vr					
Energy demand from mechanical cooling	kWh/yr supplied					
$\mathrm{CO}_2$ emissions from mechanical cooling	kgCO <sub>2</sub> /yr					
Total Floor Area	(SAP box 5) m <sup>2</sup>	89.19	52.08	104.77		
$CO_2$ emissions from appliances & cooking	kgCO <sub>2</sub> /yr	1197.99	824.89	1276.41		
Total $\rm CO_2$ emissions from Standard case system specification	kgCO <sub>2</sub> /yr					

Part 2: ACTUAL System Specification CO <sub>2</sub> Emissions (including LZC	technologies)							
CO₂ emissions from fans and pumps (from SAP 2005 DER worksheet)				Enter value from SAP box 108	Enter value from SAP box 108		Enter value from SAP box 108	Enter value from SAP box 108
	(SAP box 108)	kgCO <sub>2</sub> /yr						
	(SAP box 114*)	kgCO <sub>2</sub> /yr						
Reduction in $\text{CO}_2$ emissions for pumps and fans in actual dwelling specification		kgCO <sub>2</sub> /yr		0.00	0.00		0.00	0.00
CO <sub>2</sub> emissions from space heating and hot water (from SAP 2005 DER worksheet)				Enter value from SAP box 107	Enter value from SAP box 107		Enter value from SAP box 107	Enter value from SAP box 107
	(SAP box 107)	kgCO <sub>2</sub> /yr						
	(SAP box 115*)	kgCO <sub>2</sub> /yr		-		_	_	
CO <sub>2</sub> reduction for space and water heating from LZC technologies covered by SAP2005		kgCO2/yr		0.00	0.00		0.00	0.00
CO <sub>2</sub> reduction from electricity generated by LZC technologies covered in SAP 2005 (from DER worksheet)				Enter below figures from SAP 110 and SAP 111	Enter below figures from SAP 110 and SAP 111		Enter below figures from SAP 110 and SAP 111	Enter below figures from SAP 110 and SAP 111
	(SAP box 110)	kgCO <sub>2</sub> /yr						
	(SAP box 111)	kgCO <sub>2</sub> /yr						
	(SAP box 117*)	kgCO <sub>2</sub> /yr						
	(SAP box 118*)	kgCO <sub>2</sub> /yr						
$\mathrm{CO}_2$ reduction from electricity generated by LZC technologies covered in SAP		kgCO <sub>2</sub> /yr		0.00	0.00		0.00	0.00
CO <sub>2</sub> reduction from additional allowable electricity generation considered in section 14 of SAP 2005	(SAP box ZC7) k	gCO <sub>2</sub> /m²/yr						
	(SAP box 5)	m²	89.19	52.08	104.77	0.00	0.00	0.00
		kgCO <sub>2</sub> /yr						
Is a community biomass CHP space and/or water heating system present?	Select from drop do	own menus						
Is system a DHW only community CHP scheme?								
Is SAP box [107] set to 0?								
Is SAP box [115*] set to 0?								
	(SAP box 108*)	kgCO <sub>2</sub> /yr						
	(SAP box 110*)	kgCO <sub>2</sub> /yr						
	(SAP box 111*)	kgCO <sub>2</sub> /yr						

bre

	(SAP box 112*)	kgCO <sub>2</sub> /yr				
	(SAP box 113*)	kgCO <sub>2</sub> /yr				
CO2 emissions offset for community biomass CHP		kgCO <sub>2</sub> /yr	0.00	0.00	0.00	0.00
(from SAP 2005 DER worksheet)			3.00	0.00	0.00	0.00

\* Please see section C4 of the Government's Standard Assessment procedure for Energy Rating of Dwellings (Revision 2, June 2008) for more details of DHW - only community schemes.

Part 3: CO <sub>2</sub> reduction from generation							
CO <sub>2</sub> reduction from LZC electricity generation	kgCO <sub>2</sub> /yr						
$\mathrm{CO}_2$ reduction from LZC thermal generation	kgCO₂/yr		0.00	0.00		0.00	0.00
Total CO <sub>2</sub> reduction from specified LZC technologies	kgCO₂/yr						

Part 4: Percentage of $CO_2$ saving as a result of using LZC systems				
CO <sub>2</sub> saving as a percentage of standard case CO2 emissions ('Actual' over 'Standard Case')				
Credits Achieved				

# Part G Compliance Report

#### **PROJECT DETAILS**

Project Reference:	
Client:	
Property:	West End

Lane

Local Authority: Agent:

Assessor:	
Address:	
Contact:	
Software:	G-Calc 2015 version 3.0.2
Prepared on:	19-Feb-16

**RESULT SUMMARY** 

By following the Government's national calculation methodology for assessing water efficiency in new dwellings this 2 bed dwelling, as designed, achieves a water consumption of 104.6 litres per person per day.

Compliance with Building Regulation 36(1) has been demonstrated.

Table 1: The Wa	ater Calculator	for New	Dwellings	5	1
Installation Type	Unit of measure	Value	Use factor	Fixed use	litres/person/day
WC(single flush)	Flush volume				
	(litres)		4.42	0.00	
WC(dual flush)	Full flush vol.	4	1.46	0.00	5.84
	Part flush vol.	2.5	2.96	0.00	7.4
WC(multiple fittings)	Average effective				
	Flush vol. (litres)	0	4.42	0.00	0
Taps(excl. Kitchen)	Flow rate				
	(litres/min)	5	1.58	1.58	9.48
Bath (shower	Capacity to				
also present)	overflow (litres)	170	0.11	0.00	18.7
Shower (bath	Flow rate				
also present)	(litres/min)	8	4.37	0.00	34.96
Bath only	Capacity to				
	overflow (litres)	0	0.50	0.00	0
Shower only	Flow rate				
	(litres/minute)	0	5.6	0.00	0
Kitchen sink taps	Flow rate	_			
	(litres/minute)	6	0.44	10.36	13
Washing Machine	litres/kg		2.4		
Distance in the	dry load	7.5	2.1	0.0	15.75
Dishwasher	litres/place	1 20	2.6	0.0	4.22
Masta diavasal	setting	1.20	3.6	0.0	4.32
Waste disposal	litres/use	0	3.08	0.0	0
Water softener	litres/person/day	0	1.0	0.0	
		0	1.0	0.0	0
			ulated use		100.45
	-	(litres/per		wator	109.45
			ion from grey	water	
	-	(litres/person/day) Contribution from rainwater (litres/person/day)			-
	-	(iities/pei	son/uay)		-
	_	Normalisation factor			0.91
		Total Wat			
		for Sustainable Homes (litres/person/day)			99.6
	Ļ				
			water use		5.0
			ter Consumpt	ion. (36(1))	1015
		(litres/per	rson/day)		104.6

Summary of fitting types "As Designed"						
Туре	Description	Flow rates, volumes etc.	Qty			
Taps	TBC	5 litres/min	1			
Baths	ТВС	170 litres to overflow	1			
Dishwashers	ТВС	1.20 litres/place	1			
Washing Machines	ТВС	7.5 litres/kg	1			
Showers	ТВС	8 litres/min	1			
WC's	ТВС	4 / 2.5 litres flush vols.	1			
Kitchen/Utility taps	ТВС	6 litres/min	1			

The lower section of this table is to be filled in by the builder prior to completion. The descriptions, values and quantities should represent the 'as built' specification. Please note the values above represent design values and should not be exceeded without prior consultation with the agent/designer (). The completed table should be returned to the assessor: the agent/designer.

Declaration of fitting types "As Built"							
Туре	Make and Model	Flow rates, volumes etc.	Qty				
Taps							
Baths							
Dishwashers							
Washing Machines							
Showers							
WC's							
Kitchen/Utility taps							

Project ref: - West End Lane

The above declaration of fittings, values and quantities is a true reflection of those installed on this project.

Signature: ..... Date: ..... Name: .....

-----End of Report-----