			User D	Notoile:						
Assessor Name: Software Name:	Natalie Wheeler Stroma FSAP 201	_		Strom Softwa	re Ver	sion:		Versio	0027778 on: 1.0.4.6	
Address :	Flat 6, Hampshire s		roperty .	Address	Be Clea	an-Flat 6	6 - 1st flo	oor		
1. Overall dwelling dime	·	troot								
<u> </u>				a(m²)	<i>(4.</i> )		ight(m)	1,, ,	Volume(m <sup>3</sup>	<u>^</u>
Ground floor				85.3	(1a) x		2.4	(2a) =	204.72	(3a)
Total floor area TFA = (1	(a)+(1b)+(1c)+(1d)+(1e	e)+(1r	1) [	85.3	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	204.72	(5)
2. Ventilation rate:	·			41						
Number of chimneys		econdar neating 0	у П + Г	other 0	] = [	total 0	x	40 =	m³ per hou	(6a)
Number of open flues			 		」		x	20 =		=
•		0	J ' L	0	J ¯ <u> </u>	0			0	(6b)
Number of intermittent fa	ans				L	2		10 =	20	(7a)
Number of passive vents	5					0	X	10 =	0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	NIIP.
Infiltration due to chimne	ave flues and fans - (6	:a)+(6b)+(7	'a\+(7h\+(	70) -	Г					_
	been carried out or is intende				ontinue fr	20 om (9) to i		÷ (5) =	0.1	(8)
Number of storeys in t		ou, proces	<i>a to (11),</i> (	ourior wido (	onunae m	om (0) to (	(10)		0	(9)
Additional infiltration	<b>3</b> (						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber	frame or	0.35 fo	r masoni	y constr	uction			0	(11)
	present, use the value corres	sponding to	the great	ter wall are	a (after					
deducting areas of open	ings); if equal user 0.35 floor, enter 0.2 (unsea	led) or 0	1 (seale	ad) else	enter ()				0	(12)
If no draught lobby, er	•	ica, oi o.	i (Scarc	<i>Ju)</i> , 0130	CITICI O				0	(13)
•	s and doors draught s	tripped							0	(14)
Window infiltration	3			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,	, q50, expressed in cub	oic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then $(18) = [(18)]$	7) ÷ 20]+(8	3), otherwi	ise (18) = (	16)				0.35	(18)
	es if a pressurisation test ha	s been don	e or a de	gree air pe	meability	is being u	sed			_
Number of sides shelter Shelter factor	ed			(20) = 1 -	0 075 x (1	9)1 –			2	(19)
Infiltration rate incorpora	ting shalter factor			(21) = (18)		O/] —			0.85	= (20)
Infiltration rate modified	•	4		(21) = (10)	X (20) -				0.3	(21)
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
		Juli	Jui	Aug	ОСР	Oct	1407	Dec	]	
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
\/···		1 0.0		I	·	L	<u> </u>	I	J	
Wind Factor (22a)m = (2	22)m ÷ 4	,							-	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltration	n rate (allow	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.38 0	.37 0.36	0.33	0.32	0.28	0.28	0.27	0.3	0.32	0.33	0.35		
Calculate effective	•	rate for t	he appli	cable ca	se						Г	<del></del>
If mechanical v		andiv N. (2	ah) (aa	s) Fm. / (	auatian (N	IEV) otho	muiaa (22h	\ (225\			0	(23a)
If exhaust air heat p								) = (23a)			0	(23b)
If balanced with he	-	-	_					21.)	001) [	4 (00.)	0	(23c)
a) If balanced n	1	1			<del>- ` `                                 </del>	<del>- ` ` - </del>	<del>í `</del>	<u> </u>	<del>-                                    </del>	<del>```</del>	÷ 100] I	(24a)
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced n					<del>-                                    </del>	<del></del>	ŕ	<del> </del>	<del></del>	Ι ,	1	(24b)
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0		(240)
c) If whole hous	e extract ve $0.5 \times (23b)$ ,		•	•				5 v (23h	<i>.</i> )			
(24c)m = 0	0.5 x (255),	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural ver					<u> </u>	<u> </u>	ļ	_			l	` '
,	1, then (24d							0.5]				
(24d)m= 0.57 0	.57 0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(24d)
Effective air cha	inge rate - e	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	x (25)		•	•	•	
(25)m= 0.57 0	.57 0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(25)
3. Heat losses a	nd hoot loss	paramete	or:								•	
ELEMENT	Gross	Openin		Net Ar	<b>A</b> 2	U-val	IΙΑ	AXU		k-value	2	AXk
	area (m²)	m		A,r		W/m2		(W/I	۲)	kJ/m²-l		kJ/K
Doors				1.87	X	1	=	1.87				(26)
Windows Type 1				5.22	x1.	/[1/( 1.4 )+	0.04] =	6.92				(27)
Windows Type 2				4.35	x1.	/[1/( 1.4 )+	0.04] =	5.77				(27)
Windows Type 3				1.82	x1.	/[1/( 1.4 )+	0.04] =	2.41				(27)
Windows Type 4				2.3	x1.	/[1/( 1.4 )+	0.04] =	3.05				(27)
Floor				85.3	x	0.065		5.5445	=			(28)
Walls	76.27	15.50	3	60.71	=	0.18	= :	10.93	ન ¦		╡┝	(29)
Total area of elem		10.0		161.5	=	0.10		10.00				(31)
Party wall	,			32.71	=	0		0	<b>–</b> [			(32)
Party ceiling					=			0			╡┝	(32b)
* for windows and roo	windows use	effective wi	ndow I I-va	85.3		ı formula 1	/[(1/   -valı	ıe)+∩ ∩41 a	L os aiven in	naragranh		(320)
** include the areas of					atou using	TOTTILIA T	7[( 17 <b>0 - vaic</b>	ic)+0.0+j a	is given in	paragrapi	1 0.2	
Fabric heat loss,	N/K = S(Ax)	(U)				(26)(30)	) + (32) =				36.49	(33)
Heat capacity Cm	$= S(A \times k)$						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass pa	ameter (TM	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assessment can be used instead of			construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridges:	S (L x Y) ca	lculated (	using Ap	pendix ł	<						20.02	(36)
if details of thermal br	dging are not k	nown (36) =	= 0.15 x (3	11)								
Total fabric heat le							(33) +	(36) =			56.51	(37)
Ventilation heat lo	i	1			ı	1		= 0.33 × (		i	1	
Jan l	eb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m= 38.58	38.39	38.21	37.35	37.19	36.44	36.44	36.3	36.73	37.19	37.51	37.85		(38)
` '			37.33	37.19	30.44	30.44	30.3		l .	l .	37.00		(00)
Heat transfer of (39)m= 95.09	94.9	94.72	93.86	93.7	92.96	92.96	92.82	93.24	93.7	94.03	94.37		
(66)111=	0 1.0	0 11.72	00.00	00.7	02.00	02.00	02.02			Sum(39) <sub>1</sub>		93.86	(39)
Heat loss para	meter (H	ILP), W/	m²K				_		= (39)m ÷				
(40)m= 1.11	1.11	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11		_
Number of day	e in mor	oth (Tabl	le 1a)					1	Average =	Sum(40) <sub>1</sub>	12 /12=	1.1	(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)
` '							Į			<u> </u>			
4. Water heat	ing ener	av reani	rement:								kWh/ye	ear:	
4. Water fleat	ing choi	gy roqui	rement.								IXVVIII y	Jul.	
Assumed occur if TFA > 13.9			[1 - ovn	( <u>-</u> 0.0003	2/0 v /TE	-Λ <sub>-</sub> 13 Ω	)2)]	1013 v /	Γ <b>Ε</b> Λ <sub>-</sub> 13		56		(42)
if TFA £ 13.9		T 1.70 X	[I - exp	(-0.000	743 X (11	A - 10.9	<i>)</i> ∠)] + 0.0	) X 6100	II A - 13.	.9)			
Annual averag											4.9		(43)
Reduce the annua not more that 125							to acnieve	a water us	se target o	Ť			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								ОСР	001	1404	DCC		
(44)m= 104.39	100.59	96.8	93	89.21	85.41	85.41	89.21	93	96.8	100.59	104.39		
(**,***										m(44) <sub>112</sub> =	<u> </u>	1138.8	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 154.81	135.4	139.72	121.81	116.88	100.86	93.46	107.24	108.53	126.48	138.06	149.92		
									Total = Su	m(45) <sub>112</sub> =	=	1493.14	(45)
If instantaneous w								` '	i		ı		
(46)m= 23.22 Water storage	20.31	20.96	18.27	17.53	15.13	14.02	16.09	16.28	18.97	20.71	22.49		(46)
Storage volum		includin	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	, ,					_							(,
Otherwise if no	_			_			. ,	ers) ente	er '0' in (	47)			
Water storage													
a) If manufact				or is kno	wn (kWh	n/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro b) If manufact		•			or is not		(48) x (49)	) =			0		(50)
Hot water stora			-								0		(51)
If community h	•			,		• /					-		, ,
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	-	0		(54)
Enter (50) or (	, ,	•	lon an ele	m c :n t l-			//EC\ '	EE) (44)			0		(55)
Water storage							((56)m = (			ı	I		(==)
(56)m= 0	0	0	0	0 = (56)m	0 (50) (	0 H11)1 · (5)	0) also (5)	0 7\m = (56)	0 m whore (	0	0 Appoint	iv Ll	(56)
If cylinder contains												IA П	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)

Primary circuit	t loss (ar	inual) fro	ım Table	4 3						,	0		(58)
Primary circuit	,	•			59)m = (	(58) ÷ 36	35 × (41)	m					,
(modified by				•			, ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss ca	lculated	for each	month (	61)m =	(60) ÷ 36	65 × (41	 )m						
(61)m= 50.96	46.03	49.33	45.86	45.46	42.12	43.52	45.46	45.86	49.33	49.32	50.96		(61)
Total heat req	uired for	water he	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 205.77	181.42	189.04	167.67	162.34	142.98	136.98	152.7	154.39	175.8	187.37	200.88		(62)
Solar DHW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	/) (enter '0'	if no sola	r contributi	on to wate	er heating)		
(add additiona	al lines if	FGHRS	and/or V	/WHRS	applies	, see Ap	pendix C	<del>-</del>					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHRS -49.28	-43.36	-44.25	-36.42	-33.82	-27.9	-23.62	-28.59	-29.43	-36.37	-42.12	-47.63		(63) (G10)
Output from w	ater hea	ter											
(64)m= 156.49	138.06	144.79	131.25	128.52	115.08	113.37	124.11	124.96	139.43	145.25	153.25		
_							Outp	out from wa	ater heater	(annual) <sub>1.</sub>	12	1614.56	(64)
Heat gains fro	m water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	ı] + 0.8 x	( <u>[(46)</u> m	+ (57)m	+ (59)m	]	
(65)m= 64.21	56.53	58.79	51.97	50.23	44.06	41.96	47.02	47.55	54.38	58.23	62.59		(65)
include (57)	m in calc	culation o	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Internal g	ains (see	Table 5	and 5a)	):									
Metabolic gair	n <u>s (Table</u>	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 153.35	153.35	153.35	153.35	153.35	153.35	153.35	153.35	153.35	153.35	153.35	153.35		(66)
Lighting gains	(calcula	ted in Ap	pendix l	L, equat	ion L9 o	 r L9a). a	lso see	 Table 5					
						//		1 4510 0					
(67)m= 52.24	46.4	37.73	28.57	21.35	18.03	19.48	25.32	33.99	43.15	50.37	53.69		(67)
(67)m= 52.24 Appliances ga		<u> </u>			18.03	19.48	25.32	33.99	<u> </u>	50.37	53.69	I	(67)
` '	ins (calc	<u> </u>			18.03	19.48	25.32	33.99	<u> </u>	50.37 305.68	53.69 328.37		(67) (68)
Appliances ga	ains (calc 347.09	ulated in 338.11	318.98	dix L, eq 294.84	18.03 uation L <sup>2</sup> 272.15	19.48 13 or L1 257	25.32 3a), also 253.43	33.99 see Tal 262.41	ble 5 281.54				
Appliances ga	ains (calc 347.09	ulated in 338.11	318.98	dix L, eq 294.84	18.03 uation L <sup>2</sup> 272.15	19.48 13 or L1 257	25.32 3a), also 253.43	33.99 see Tal 262.41	ble 5 281.54				
Appliances ga (68)m= 343.52 Cooking gains	347.09 s (calcula 52.89	ulated in 338.11 ated in Ap 52.89	318.98 ppendix 52.89	dix L, eq 294.84 L, equat	18.03 uation L <sup>2</sup> 272.15 tion L15	19.48 13 or L1 257 or L15a)	25.32 3a), also 253.43 ), also se	33.99 see Tal 262.41 ee Table	ble 5 281.54	305.68	328.37		(68)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89	347.09 s (calcula 52.89	ulated in 338.11 ated in Ap 52.89	318.98 ppendix 52.89	dix L, eq 294.84 L, equat	18.03 uation L <sup>2</sup> 272.15 tion L15	19.48 13 or L1 257 or L15a)	25.32 3a), also 253.43 ), also se	33.99 see Tal 262.41 ee Table	ble 5 281.54	305.68	328.37		(68)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89 Pumps and fa	ains (calcula 347.09 s (calcula 52.89 ns gains 3	ulated in 338.11 steed in Ap 52.89 (Table 5	318.98 ppendix 52.89 5a)	294.84 L, equat 52.89	18.03 uation L <sup>2</sup> 272.15 tion L15 52.89	19.48 13 or L1 257 or L15a) 52.89	25.32 3a), also 253.43 ), also se 52.89	33.99 see Tal 262.41 ee Table 52.89	ble 5 281.54 5 52.89	305.68	328.37 52.89		(68) (69)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89 Pumps and fa (70)m= 3	s (calcula 52.89 ns gains 3 vaporatio	ulated in 338.11  Inted in Ap  52.89  (Table 5  3  In (negat	318.98 ppendix 52.89 5a)	294.84 L, equat 52.89	18.03 uation L <sup>2</sup> 272.15 tion L15 52.89	19.48 13 or L1 257 or L15a) 52.89	25.32 3a), also 253.43 ), also se 52.89	33.99 see Tal 262.41 ee Table 52.89	ble 5 281.54 5 52.89	305.68	328.37 52.89		(68) (69)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89 Pumps and fa (70)m= 3 Losses e.g. ev	s (calcula 52.89 ns gains 3 vaporatio	ulated in 338.11 sted in Ap 52.89 (Table 5 3 on (negat -102.23	Appendix 52.89 5a) 3	dix L, equat L, equat 52.89	18.03  uation L <sup>2</sup> 272.15  tion L15 52.89  3  sle 5)	19.48 13 or L1 257 or L15a) 52.89	25.32 3a), also 253.43 ), also se 52.89	33.99 262.41 262.41 262.89	ble 5 281.54 5 52.89	305.68 52.89	328.37 52.89		(68) (69) (70)
Appliances ga (68)m= $343.52Cooking gains(69)$ m= $52.89Pumps and fa(70)$ m= $3Losses e.g. ev(71)$ m= $-102.23$	s (calcula 52.89 ns gains 3 vaporatio	ulated in 338.11 sted in Ap 52.89 (Table 5 3 on (negat -102.23	Appendix 52.89 5a) 3	dix L, equat L, equat 52.89	18.03  uation L <sup>2</sup> 272.15  tion L15 52.89  3  sle 5)	19.48 13 or L1 257 or L15a) 52.89	25.32 3a), also 253.43 ), also se 52.89	33.99 262.41 262.41 262.89	ble 5 281.54 5 52.89	305.68 52.89	328.37 52.89		(68) (69) (70)
Appliances ga (68)m= 343.52  Cooking gains (69)m= 52.89  Pumps and fa (70)m= 3  Losses e.g. ex (71)m= -102.23  Water heating	s (calcula 52.89 ns gains 3 vaporatio -102.23 gains (T	ulated in 338.11  sted in Ap 52.89  (Table 5 3 on (negat -102.23  Table 5) 79.02	318.98 ppendix 52.89 5a) 3 tive value	dix L, equat 294.84 L, equat 52.89 3 es) (Tab -102.23	18.03  uation L <sup>2</sup> 272.15  tion L15 52.89  3 sle 5) -102.23	19.48 13 or L1 257 or L15a) 52.89 3 -102.23	25.32 3a), also 253.43 ), also se 52.89 3 -102.23	33.99 262.41 262.41 262.49 3 -102.23	ble 5 281.54 5 52.89 3 -102.23	305.68 52.89 3 -102.23	328.37 52.89 3 -102.23		(68) (69) (70) (71)
Appliances ga (68)m= 343.52  Cooking gains (69)m= 52.89  Pumps and fa (70)m= 3  Losses e.g. ev (71)m= -102.23  Water heating (72)m= 86.31	ains (calcula 347.09 s (calcula 52.89 s gains 3 vaporatio -102.23 gains (T 84.12 s gains =	ulated in 338.11  sted in Ap 52.89  (Table 5 3 on (negat -102.23  Table 5) 79.02	318.98 ppendix 52.89 5a) 3 tive value	dix L, equat 294.84 L, equat 52.89 3 es) (Tab -102.23	18.03  uation L <sup>2</sup> 272.15  tion L15 52.89  3 sle 5) -102.23	19.48 13 or L1 257 or L15a) 52.89 3 -102.23	25.32 3a), also 253.43 ), also se 52.89  3  -102.23	33.99 262.41 262.41 262.49 3 -102.23	ble 5 281.54 5 52.89 3 -102.23	305.68 52.89 3 -102.23	328.37 52.89 3 -102.23		(68) (69) (70) (71)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -102.23 Water heating (72)m= 86.31 Total internal	347.09 s (calcula 52.89 ns gains 3 vaporatio -102.23 gains (T 84.12 l gains = 584.61	ulated in 338.11 sted in Ap 52.89 (Table 5 3 on (negate -102.23 sable 5) 79.02	318.98 ppendix 52.89 5a) 3 tive value -102.23	dix L, equate 294.84 L, equate 52.89 3 es) (Tabe -102.23	18.03 uation L <sup>2</sup> 272.15 tion L15 52.89  3 ble 5) -102.23  61.2 (66)	19.48 13 or L1 257 or L15a) 52.89 3 -102.23 56.39 om + (67)m	25.32 3a), also 253.43 ), also se 52.89  3  -102.23  63.2 1 + (68)m +	33.99 262.41 262.41 2e Table 52.89 3 -102.23 66.04 - (69)m + (	ble 5 281.54 5 52.89 3 -102.23 73.1 (70)m + (7	305.68 52.89 3 -102.23 80.88 1)m + (72)	328.37 52.89 3 -102.23		(68) (69) (70) (71) (72)
Appliances ga (68)m= 343.52  Cooking gains (69)m= 52.89  Pumps and fa (70)m= 3  Losses e.g. ex (71)m= -102.23  Water heating (72)m= 86.31  Total internal (73)m= 589.08	ains (calcula 347.09 s (calcula 52.89 s) s gains gains -102.23 gains (T 84.12 s 584.61 s:	ulated in 338.11 sted in Ap 52.89 (Table 5 3 on (negate -102.23 able 5) 79.02 steep 561.86	318.98 ppendix 52.89 5a) 3 tive value -102.23  72.18	dix L, equate 294.84 L, equate 52.89 3 es) (Tab -102.23 67.51	18.03  uation L <sup>2</sup> 272.15  tion L15 52.89  3 ble 5) -102.23  61.2 (66) 458.39	19.48 13 or L1 257 or L15a) 52.89  3  -102.23  56.39 )m + (67)m 439.87	25.32 3a), also 253.43 ), also se 52.89  3  -102.23  63.2  1 + (68)m + 448.96	33.99 262.41 262.41 2ee Table 52.89 3 -102.23 66.04 - (69)m + (469.45	ble 5 281.54 5 52.89 3 -102.23 73.1 (70)m + (7504.79)	305.68 52.89 3 -102.23 80.88 1)m + (72) 543.93	328.37 52.89 3 -102.23 84.12 m 573.19		(68) (69) (70) (71) (72)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -102.23 Water heating (72)m= 86.31 Total internal (73)m= 589.08 6. Solar gain Solar gains are Orientation:	s (calcular second seco	ulated in Aport 1 and 1	318.98 ppendix 52.89 5a) 3 tive value -102.23 72.18 526.73 r flux from Area	3 es) (Tab -102.23  490.71	18.03  uation L <sup>2</sup> 272.15  tion L15 52.89  3 ole 5) -102.23  61.2 (66) 458.39  and associ	19.48 13 or L1 257 or L15a) 52.89 3 -102.23 56.39 )m + (67)m 439.87 iated equality	25.32 3a), also 253.43 ), also se 52.89  3  -102.23  63.2  1 + (68)m + 448.96	33.99 262.41 262.41 262.41 262.49 3 -102.23 66.04 - (69)m + (469.45 269.45 269.45	ble 5 281.54 5 52.89 3 -102.23 73.1 (70)m + (7 504.79	305.68  52.89  3  -102.23  80.88  1)m + (72)  543.93  ele orientati	328.37 52.89 3 -102.23 84.12 m 573.19	Gains (W)	(68) (69) (70) (71) (72)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -102.23 Water heating (72)m= 86.31 Total internal (73)m= 589.08 6. Solar gain Solar gains are Orientation:	ains (calcula 347.09 s (calcula 52.89 s s gains 3 vaporatio -102.23 gains (T 84.12 s 584.61 s: calculated calculated	ulated in Aport 1 and 1	318.98 ppendix 52.89 5a) 3 tive value -102.23 72.18	3 es) (Tab -102.23  490.71  Table 6a a	18.03  uation L <sup>2</sup> 272.15  tion L15 52.89  3 ole 5) -102.23  61.2 (66) 458.39  and associ	19.48 13 or L1 257 or L15a) 52.89 3 -102.23 56.39 om + (67)m 439.87	25.32 3a), also 253.43 ), also se 52.89  3  -102.23  63.2  1 + (68)m + 448.96	33.99 262.41 262.41 262.41 262.49 3 -102.23 66.04 - (69)m + (469.45	ble 5 281.54 5 52.89 3 -102.23 73.1 (70)m + (7 504.79	305.68  52.89  3  -102.23  80.88  1)m + (72)  543.93	328.37 52.89 3 -102.23 84.12 m 573.19	Gains (W)	(68) (69) (70) (71) (72)

Northeast 0.9x	0.77	] x	2.3	l x	22.97	] <sub>x</sub>	0.35	x	0.8	1 =	10.25	(75)
Northeast 0.9x	0.77	」^ ] ×	2.3	] ^ ] x	41.38	] ^ ] x	0.35	X	0.8	]	18.47	(75)
Northeast 0.9x	0.77	」^ ] ×	2.3	] ^ ] x	67.96	] ^ ] x	0.35	X	0.8	] - ] =	30.33	(75)
Northeast 0.9x	0.77	] ^ ] x	2.3	] ^ ] x	91.35	] ^ ] x	0.35	X	0.8	]	40.77	(75)
Northeast 0.9x	0.77	」 ^ ] x	2.3	] ^ ] x	97.38	] ^ ] <sub>x</sub>	0.35	X	0.8	]	43.46	(75)
Northeast 0.9x	0.77	」^ ] ×	2.3	] ^ ] x	91.1	] ^ ] x	0.35	X	0.8	] - ] =	40.66	(75)
Northeast 0.9x	0.77	」^ ] ×	2.3	] ^ ] x	72.63	] ^ ] x	0.35	X	0.8	] - ] =	32.41	(75)
Northeast 0.9x	0.77	] ^ ] <sub>x</sub>	2.3	] ^ ] x	50.42	] ^ ] <sub>x</sub>	0.35	X	0.8	]	22.5	(75)
Northeast 0.9x	0.77	」^ ] ×	2.3	] ^ ] x	28.07	] ^ ] x	0.35	X	0.8	] - ] =	12.53	(75)
Northeast 0.9x	0.77	] ^ ] x	2.3	] ^ ] x	14.2	] ^ ] x	0.35	X	0.8	]	6.34	(75)
Northeast 0.9x	0.77	] ^ ] x	2.3	l ^ l x	9.21	] ^ ] <sub>x</sub>	0.35	X	0.8	]	4.11	(75)
Southeast 0.9x	0.77	] ^ ] x	1.82	] ^ ] x	36.79	] ^ ] <sub>x</sub>	0.35	X	0.8	]	12.99	(77)
Southeast 0.9x	0.77	] ^ ] x	1.82	] ^ ] x	62.67	] ^ ] <sub>x</sub>	0.35	X	0.8	]	22.13	(77)
Southeast 0.9x	0.77	] ^ ] <sub>X</sub>	1.82	] ^ ] x	85.75	] ^ ] <sub>x</sub>	0.35	X	0.8	]	30.28	(77)
Southeast 0.9x	0.77	] ^ ] x	1.82	] ^ ] x	106.25	] ^ ] <sub>x</sub>	0.35	X	0.8	]	37.52	(77)
Southeast 0.9x	0.77	]	1.82	] ^ ] <sub>x</sub>	119.01	] ^ ] <sub>x</sub>	0.35	X	0.8	] ] <sub>=</sub>	42.03	(77)
Southeast 0.9x	0.77	] ^ ] x	1.82	] ^ ] x	118.15	] ^ ] <sub>x</sub>	0.35	X	0.8	]	41.73	(77)
Southeast 0.9x	0.77	] ^ ] x	1.82	] ^ ] x	113.91	] ^ ] <sub>x</sub>	0.35	X	0.8	]	40.23	(77)
Southeast 0.9x	0.77	]	1.82	] ^ ] <sub>x</sub>	104.39	] ^ ] <sub>x</sub>	0.35	X	0.8	] ] <sub>=</sub>	36.87	(77)
Southeast 0.9x	0.77	]	1.82	] ^ ] <sub>X</sub>	92.85	] ^ ] x	0.35	x	0.8	] ] <sub>=</sub>	32.79	(77)
Southeast 0.9x	0.77	] x	1.82	] x	69.27	] x	0.35	x	0.8	] ] =	24.46	(77)
Southeast 0.9x	0.77	] ]	1.82	] ]	44.07	] ] <sub>x</sub>	0.35	x	0.8	]   <sub>=</sub>	15.56	(77)
Southeast 0.9x	0.77	] ]	1.82	l X	31.49	] ]	0.35	X	0.8	]   _	11.12	(77)
Northwest <sub>0.9x</sub>	0.77	] ]	5.22	)   x	11.28	] ]	0.35	X	0.8	]   =	11.43	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	)   x	11.28	]   x	0.35	X	0.8	]   =	9.52	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.22	x	22.97	)   x	0.35	X	0.8	]   =	23.26	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	)   x	22.97	)   x	0.35	x	0.8	)   =	19.39	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.22	X	41.38	)   X	0.35	x	0.8	=	41.91	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	x	41.38	X	0.35	x	0.8	;   =	34.93	(81)
Northwest 0.9x	0.77	X	5.22	x	67.96	X	0.35	X	0.8	=	68.83	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	x	67.96	X	0.35	x	0.8	,   =	57.36	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.22	x	91.35	X	0.35	X	0.8	=	92.52	(81)
Northwest 0.9x	0.77	X	4.35	x	91.35	x	0.35	X	0.8	=	77.1	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.22	x	97.38	x	0.35	X	0.8	=	98.64	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	x	97.38	x	0.35	x	0.8	j   =	82.2	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.22	x	91.1	x	0.35	X	0.8	=	92.28	(81)
Northwest <sub>0.9x</sub>	0.77	×	4.35	x	91.1	x	0.35	x	0.8	i   =	76.9	(81)
Northwest <sub>0.9x</sub>	0.77	×	5.22	x	72.63	×	0.35	x	0.8	i =	73.56	(81)
Northwest <sub>0.9x</sub>	0.77	×	4.35	x	72.63	×	0.35	x	0.8	=	61.3	(81)
Northwest <sub>0.9x</sub>	0.77	×	5.22	x	50.42	×	0.35	x	0.8	j =	51.07	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	x	50.42	x	0.35	x	0.8	j =	42.56	(81)
_		_		•		•		ı		•	•	_

Northwes	st <sub>0.9x</sub>	0.77	X	5.2	22	x	2	28.07	X		0.35	x	0.8	=	28.43	(81)
Northwes	st <sub>0.9x</sub>	0.77	х	4.3	35	x	2	28.07	х		0.35	x	0.8		23.69	(81)
Northwes	st <sub>0.9x</sub>	0.77	X	5.2	22	x		14.2	х		0.35	x	0.8	=	14.38	(81)
Northwes	st <sub>0.9x</sub>	0.77	X	4.3	35	x		14.2	x		0.35	x	0.8	=	11.98	(81)
Northwes	st <sub>0.9x</sub>	0.77	x	5.2	22	x	,	9.21	x		0.35	_ x [	0.8	_ =	9.33	(81)
Northwes	st <sub>0.9x</sub>	0.77	X	4.3	35	x	9	9.21	x		0.35	x	0.8	=	7.78	(81)
	_		<u></u>													
Solar ga	ins in v	watts, ca	alculated	I for eacl	h month				(83)m	n = Si	um(74)m .	(82)m				
(83)m=	38.98	75.03	125.59	194.04	252.42	20	66.03	250.06	204	.14	148.92	89.11	48.26	32.34		(83)
Total ga	ins – ir	nternal a	nd solar	(84)m =	= (73)m	+ (8	33)m	, watts								
(84)m=	628.06	659.64	687.45	720.77	743.13	72	24.41	689.93	653	.11	618.37	593.9	592.19	605.53		(84)
7. Mea	n interr	nal temp	erature	(heating	season	)										
				`			area t	from Tab	ole 9	, Th	1 (°C)				21	(85)
•		Ū	٠.	living are		•				,	` '					``
Γ	Jan	Feb	Mar	Apr	May	Ė	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.99	0.96	0.9	(	0.75	0.58	0.6	Ť	0.86	0.97	0.99	1		(86)
L Moan i	ntornal	tompor	atura in	living or	na T1 /f/	مالد	w cto	ps 3 to 7	in T	-able	2 00)	<u> </u>	1			
	19.93	20.03	20.23	20.51	20.77	_	w Sie	20.99	20.	$\overline{}$	20.87	20.56	20.2	19.91		(87)
` ′ ∟						<u> </u>						20.00	20.2	10.01		(=- /
· · · -						_		from Ta		_	<u> </u>		T		1	(00)
(88)m=	19.99	19.99	19.99	20	20	2	0.01	20.01	20.	01	20.01	20	20	20		(88)
Utilisati	ion fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)				_		•	
(89)m=	0.99	0.99	0.98	0.95	0.86	(	0.66	0.46	0.5	51	0.79	0.95	0.99	0.99		(89)
Mean ii	nternal	temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	ps 3	to 7	7 in Tabl	e 9c)				
(90)m=	18.58	18.73	19.01	19.42	19.77	1	9.97	20	2	0	19.9	19.49	18.98	18.55		(90)
	•										f	LA = Livir	ng area ÷ (	4) =	0.36	(91)
Mean ii	nternal	temper	ature (fo	r the wh	ole dwe	llin	a) = fl	LA × T1	+ (1	– fl	A) x T2					_
_	19.07	19.19	19.45	19.81	20.13	т —	0.32	20.36	20.		20.25	19.87	19.42	19.04		(92)
` ′		nent to the	ne mear	ı ı internal	temper	_		m Table	<u></u> 4е.	whe		Doriate		ļ	l	
· · · · · -	19.07	19.19	19.45	19.81	20.13	_	0.32	20.36	20.	$\overline{}$	20.25	19.87	19.42	19.04		(93)
8. Spac	ce heat	ting requ	uirement													
Set Ti t	to the n	nean int	ernal ter	mperatui	e obtair	ned	at ste	ep 11 of	Tabl	le 9t	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
the utili	sation	factor fo	or gains	using Ta	ble 9a			1					т	1	Ī	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
			ains, hm			_							ī		1	
(94)m=	0.99	0.99	0.98	0.95	0.86		0.69	0.5	0.5	55	0.81	0.95	0.98	0.99		(94)
_	<del></del>		<u> </u>	4)m x (84		T							T		1	(05)
	622.52	651.34	671.86	682.12	641.81	_	98.88	344.35	358	.97	498.66	565.38	583.2	601.06		(95)
				perature		_		40.0	40	4	444	40.0	7.4	4.0		(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16		14.1	10.6	7.1	4.2		(96)
(97)m= 1					790.1	_	31.43	=[(39)m : 349.26	x [(9:	<del>-</del> -	- (96)m 573.51	868.91	1158 05	1400.29	]	(97)
` '						_		$\frac{349.26}{1}$ th = 0.02						1400.29		(01)
	581.44	473.92	412.63	246.21	110.33	7 7 1 1	0	0.02	24 X [	<del>``</del>	0 0	225.83	413.89	594.63		
(00)111-	JU 1.74	710.32	712.00	2-70.21	1 10.00	_		l			U	220.00	1 -10.03	1 007.00	I	

Space heating requirement in kWh/m²/year  35,86 [98]  3. Energy requirements — Individual heating systems including micro-CHP)  Space heating:  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of space heat from main system 1  (204) = (202) × [1 - (203)] =						Tota	l por voar	(k\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	r) - Sum/0	.o\ _	3058.89	(98)
3. Energy requirements — Individual heating systems including micro-CHP)  Space heating:  Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s)  (202) = 1 - (201) =	On and heading a service as		26			1018	ii pei yeai	(KVVII/yeai	i) = Suiii(s	0)15,912		╡``
Space   Neating   Fraction of space   heat from secondary/supplementary system			•								35.86	(99)
Fraction of space heat from secondary/supplementary system  Fraction of space heat from sain system(S)  Fraction of total heating from main system 1  (202) = 1 - (201) =		Individual h	neating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system (s)  (202) = 1 - (201) =	•	m secondar	v/supple	mentary	v svstem						0	<b>1</b> (201)
Efficiency of main space heating system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above)  Space heating requirement (calculated above)  [81:44 473.92   412.63   246.21   110.33   0   0   0   0   225.83   413.89   594.63    211)m = {{(98)m x (204)}} } x 100 + (206)  [41:65 529.52   461.04   275.09   123.27   0   0   0   0   0   252.32   462.45   664.4    Total (kWh/year) = Sum(211)xxr = 0   (215)xxr = 0   (215)xx = 0   (215)xx = 0   (215)xx = 0   (215)xx	·				•	(202) = 1	- (201) =					(202)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above)  Sepace heating requirement (2alculated above)  [88] 44 473.92 412.63 246.21 110.33 0 0 0 0 225.83 413.89 594.63  2211)m = {{(98)m x (204)} } x 100 ÷ (206)  [649.66 529.52 461.04 275.09 123.27 0 0 0 0 0 252.32 462.45 664.4  Total (kWh/year) =Sum(211), x.s	·	•	` '			(204) = (2	02) × [1 –	(203)] =				(204)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above)	_	•										(206)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   Expansion   Space heating requirement (calculated above)   S81.44   473.92   412.63   246.21   110.33   0   0   0   0   255.83   413.89   594.63   211)m = {[(98)m x (204)] } x 100 ÷ (206)   (211)				g systen	n, %						0	(208)
Space heating requirement (calculated above)    581.44   473.92   412.63   246.21   110.33   0   0   0   0   225.83   413.88   594.63		<del>· · · · · · · · · · · · · · · · · · · </del>	·	· ·		Aua	Sep	Oct	Nov	Dec	l kWh/ve	⊒` ear
211   m = {[[(88)m x (204)]] } x 100 ÷ (206)   (211)   (249)   (245)	<u> </u>		<u> </u>		<u> </u>	7.09			1.101	1 200	]	, ca.
E49.66   529.52   461.04   275.09   123.27   0   0   0   0   252.32   462.45   664.4   Total (kWh/year) =Sum(211)_Lsqs=   3417.76   (211)   (198)m x (201)] } x 100 + (208)   (215)m x (208)   (216)m x (216)m x (217)m   (218)m x (21	581.44 473.92 412	.63 246.21	110.33	0	0	0	0	225.83	413.89	594.63		
Total (kWh/year) =Sum(211)  Late_1 = T   3417.76   (211)	$(211)m = \{[(98)m \times (204)] \}$	x 100 ÷ (2	06)								_	(211)
Space heating fuel (secondary), kWh/month {{[(98)m x (201)]}} x 100 ÷ (208) ***  **Total (kWh/year) =Sum(215), **  **Total (kWh	649.66 529.52 461	.04 275.09	123.27	0	0							_
(1/98)m x (2011)  x 100 ÷ (208)						Tota	ıl (kWh/ye	ar) =Sum(2	211) <sub>15,1012</sub>	2=	3417.76	(211)
Total (kWh/year) = Sum(215)   Total = Sum(219)   Total =	, ,	• /	/month									
Total (kWh/year) =Sum(215),   Laborator   2   2   2   2   2   2   2   2   2			l 0	l 0	l 0	n	<u></u> ο	<u></u> ο	l 0	l 0	]	
Vater heating Putput from water heater (calculated above)    156.49   138.06   144.79   131.25   128.52   115.08   113.37   124.11   124.96   139.43   145.25   153.25     167.17   167.08   138.06   144.79   131.25   128.52   115.08   113.37   124.11   124.96   139.43   145.25   153.25     167.17   167.08   189.5   189.5   189.5   189.5   189.5   189.5   189.5   189.5   189.5   189.5     187.17   189.18	(210)										0	<b>1</b> (215)
Autput from water heater (calculated above)    156.49   138.06   144.79   131.25   128.52   115.08   113.37   124.11   124.96   139.43   145.25   153.25     156.49   138.06   144.79   131.25   128.52   115.08   113.37   124.11   124.96   139.43   145.25   153.25     156.49   138.06   144.79   131.25   128.52   115.08   113.37   124.11   124.96   139.43   145.25   153.25     157.01   145.	Water heating								10,101	-		<b>`</b> ′
fficiency of water heater		calculated a	bove)								•	
### 189.5		.79 131.25	128.52	115.08	113.37	124.11	124.96	139.43	145.25	153.25		_
uel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m 119)m = (74.84   154.26   161.77   146.65   143.6   128.58   126.66   138.67   139.62   155.79   162.29   171.23    Total = Sum(219a)_1_12 =			T	1		ı	1	1	1	1	89.5	(216)
219)m = (64)m x 100 ÷ (217)m  174.84	` '		89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5		(217)
174.84   154.26   161.77   146.65   143.6   128.58   126.66   138.67   139.62   155.79   162.29   171.23	•											
Innual totals pace heating fuel used, main system 1  Vater heating fuel used  lectricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue  otal electricity for the above, kWh/year  lectricity for lighting  Fuel costs - individual heating systems:  Fuel kWh/year  KWh/year    SWh/year			143.6	128.58	126.66	138.67	139.62	155.79	162.29	171.23		
pace heating fuel used, main system 1  Vater heating fuel used  Iso3.97  Ilectricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue  otal electricity for the above, kWh/year  Ilectricity for lighting  Sum of (230a)(230g) =  75  (231)  10a. Fuel costs - individual heating systems:  Fuel kWh/year  Fuel Price (Table 12)  Fuel Cost £/year	•					Tota	ıl = Sum(2	19a) <sub>112</sub> =			1803.97	(219)
Vater heating fuel used  lectricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue  otal electricity for the above, kWh/year  lectricity for lighting  fuel kWh/year  Fuel kWh/year  1803.97  30 (230) (230) (230) (230) (230) (231) (231) (231) (232)	Annual totals							k'	Wh/yeaı	•		<u>r</u>
lectricity for pumps, fans and electric keep-hot central heating pump:  boiler with a fan-assisted flue  otal electricity for the above, kWh/year  lectricity for lighting  fuel kWh/year  Fuel kWh/year  Fuel Price kWh/year  (230a)(230g) =  Fuel Price kWh/year  Fuel Cost £/year		ain system	1								3417.76	╛
central heating pump:  boiler with a fan-assisted flue  total electricity for the above, kWh/year  lectricity for lighting  fuel kWh/year     Sum of (230a)(230g) =   T5	Water heating fuel used										1803.97	
boiler with a fan-assisted flue  otal electricity for the above, kWh/year  lectricity for lighting  fuel  which is a fan-assisted flue  sum of (230a)(230g) =	Electricity for pumps, fans a	and electric	keep-ho	t								
otal electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) lectricity for lighting 369.03 (232)  10a. Fuel costs - individual heating systems:  Fuel Fuel Price (Table 12)  Fuel Cost £/year	central heating pump:									30		(2300
lectricity for lighting  10a. Fuel costs - individual heating systems:    Fuel   Fuel Price   Fuel Cost   £/year   £/yea	boiler with a fan-assisted	lue								45		(230e
10a. Fuel costs - individual heating systems:  Fuel  kWh/year  Fuel Price  (Table 12)  Fuel Cost  £/year	Total electricity for the above	ve, kWh/yea	ar			sum	of (230a).	(230g) =			75	(231)
10a. Fuel costs - individual heating systems:  Fuel  kWh/year  Fuel Price  (Table 12)  Fuel Cost  £/year	Electricity for lighting	-									369.03	(232)
Fuel Fuel Price Fuel Cost kWh/year (Table 12) £/year	, , ,	l heating sy	/stems:									
kWh/year (Table 12) £/year				E	ıol			Fuel P	rico		Fuel Cost	
pace heating - main system 1 (211) x $3.48$ $\times 0.01 = 1.18.94$ (240)												
	Space heating - main syste	m 1			-					x 0.01 =	118.94	(240)

Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01 =	62.78 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	9.89 (249)
(if off-peak tariff, list each of (230a) to (230g) sep		· · · · <u>— ·                                     </u>	
Energy for lighting	(232)	13.19 × 0.01 =	48.07
Additional standing charges (Table 12)			120 (251)
Appendix Q items: repeat lines (253) and (254) a	s needed		
3,	7) + (250)(254) =		360.28 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
g, ( /	56)] ÷ [(4) + 45.0] =		1.16 (257)
SAP rating (Section 12)			83.8 (258)
12a. CO2 emissions – Individual heating system	ns including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	738.24 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	389.66 (264)
Space and water heating	(261) + (262) + (263) + (2	264) =	1127.89 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	191.53 (268)
Total CO2, kg/year		sum of (265)(271) =	1358.34 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	15.92 (273)
El rating (section 14)			86 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	Primary factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	4169.66 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22 =	2200.85 (264)
Space and water heating	(261) + (262) + (263) + (2	264) =	6370.51 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	230.25 (267)
Electricity for lighting	(232) x	0 =	1132.92 (268)
'Total Primary Energy		sum of (265)(271) =	7733.68 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	90.66 (273)
			<del></del>

			User D	etails:						
Assessor Name:	Natalie Wheeler			Strom					027778	
Software Name:	Stroma FSAP 201			Softwa					n: 1.0.4.6	
	<b>5</b> 1.10.11		roperty .	Address	Be Cle	an-Flat 6	6 - 1st flo	oor		
Address:	Flat 6, Hampshire s	street								
Overall dwelling dime	ensions.		Aro	n/m²\		۸۰٬ ۵۰	iaht/m\		Volume(m³	1
Ground floor				a(m²) 85.3	(1a) x		ight(m) 2.4	(2a) =	204.72	(3a)
	-) . (4  - ) . (4 -) . (4 -  ) . (4 .	-\. (4					2.4	_(2u) =	204.72	(00)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1r	1) [	85.3	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	204.72	(5)
2. Ventilation rate:										
		econdar heating	У	other		total			m³ per hou	r
Number of chimneys	0 +	0	<b>]</b> + [	0	] = [	0	X e	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	ī <i>-</i> Ē	0	x	20 =	0	(6b)
Number of intermittent fa	ns L				,	2	x	10 =	20	(7a)
Number of passive vents					L		x	10 =		╡``
•					Ļ	0			0	(7b)
Number of flueless gas fi	res					0	X 4	40 =	0	(7c)
								Δir ch	nanges per ho	nur
Infiltration due to chimne	us flues and fans - (6	Sa)+(6h)+(7	/a)エ( <b>7</b> b)エ(	70) -	Г					_
If a pressurisation test has b	-				continue fr	20		÷ (5) =	0.1	(8)
Number of storeys in the		cu, procee	a 10 (11), 1	ourier wise (	onunae n	om (5) to	(10)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber	frame or	0.35 fo	r masoni	y constr	ruction			0	(11)
	resent, use the value corres	sponding to	the great	er wall are	a (after					<del></del>
deducting areas of opening If suspended wooden f		led) or 0	1 (seale	ed) else	enter 0				0	(12)
If no draught lobby, en	,		ir (ooaic	, oloo	ontor o				0	(13)
Percentage of windows	·	tripped							0	(14)
Window infiltration	C	• •		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cul	oic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabil	ity value, then $(18) = [(18)]$	17) ÷ 20]+(8	B), otherw	ise (18) = (	16)				0.35	(18)
Air permeability value applie		s been dor	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed			(20) = 1 -	[0.0 <b>75</b> x (1	19)1 =			2	(19)
Infiltration rate incorporat	ing shelter factor			(21) = (18)					0.85	(20)
Infiltration rate modified f		Ч		(21) - (10)	/ X (20) =				0.3	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec	]	
		I Juli	l Jui	ı Aug	Обр	1 001	1 1404	l Dec	I	
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	]	
()	7.7   4.3	1 0.0	I 5.5	I 5.7		I 7.5		I 7./	J	
Wind Factor (22a)m = (22	2)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.38	ation rat	e (allowi	0.33	0.32	0.28	0.28	<del>`</del>	<del>ì ´</del>	0.22	0.22	0.25	1	
Calculate effec					1	I	0.27	0.3	0.32	0.33	0.35	J	
If mechanica		_										0	(2
If exhaust air he	eat pump (	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(2
If balanced with	n heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h	) =				0	(2
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
b) If balance	ed mecha	anical ve	entilation	without	heat red	covery (I	ИV) (24b	m = (22)	2b)m + (2	23b)	1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(2
c) If whole h				•					F (00)	,			
if (22b)n		(23b), t	· ` ·	<u> </u>	<del>i</del>	· ` `	ŕ	ŕ	· `	í –	Ι ,	1	(2
24c)m= 0	0		0	0	0	0	0	0	0	0	0	J	(2
d) If natural if (22b)n				•	•				0.5]				
24d)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	]	(2
Effective air	change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	d) in bo	x (25)				1	
25)m= 0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56	]	(2
2 Heat lease	o ond be	ot loss i	ooromot	0.51	•	•	•	•	•		•		
3. Heat losse	S and he Gros		Openin		Net Ar	.00	U-val	110	AXU		k-value	<u> </u>	ΑΧk
LEMENT	area	_	r	=	A,r		W/m2		(W/I	<b>〈</b> )	kJ/m²-		kJ/K
oors					1.87	х	1	=	1.87				(2
/indows Type	e 1				5.22	x1	/[1/( 1.4 )+	0.04] =	6.92				(2
/indows Type	2				4.35	x1	/[1/( 1.4 )+	0.04] =	5.77				(2
/indows Type	3				1.82	x1	/[1/( 1.4 )+	0.04] =	2.41				(2
/indows Type	e 4				2.3	x1	/[1/( 1.4 )+	0.04] =	3.05	=			(2
oor					85.3	X	0.065	- i	5.5445	=			(2
/alls	76.2	7	15.5	6	60.7	=	0.18	<b>=</b> :	10.93	<b>=</b>		7	(2
otal area of e	L				161.5	=							^` (;
arty wall		,			32.7	=	0		0	<b>–</b> [			(3
arty ceiling					85.3	_			U			<b>-</b>    -	(
for windows and	roof winde	ows. use e	effective wi	ndow U-v			a formula 1	/[(1/U-valu	ıe)+0.041 a	L ns aiven in	paragraph		(
include the area							,	71(17 - 1511	,	J	J		
abric heat los	ss, W/K =	= S (A x	U)				(26)(30	) + (32) =				36.49	9 (3
eat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(3
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(3
or design assess In be used inste				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
nermal bridge				using Ar	pendix I	K						20.02	2 (3
details of therma	,	,		• .	•								(
otal fabric he			. ,	•	•			(33) +	(36) =			56.5°	1 (
entilation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (	25)m x (5)	)		
							T						

					ı		ı	ı				(22)
(38)m= 38.58 38.39		37.35	37.19	36.44	36.44	36.3	36.73	37.19	37.51	37.85		(38)
Heat transfer coeffici	<del></del>	1 00 00	T 00 7	00.00	00.00			= (37) + (		04.07		
(39)m= 95.09 94.9	94.72	93.86	93.7	92.96	92.96	92.82	93.24	93.7	94.03 Sum(39) <sub>1</sub>	94.37	93.86	(39)
Heat loss parameter	(HLP), W	/m²K	_	-	-			= (39)m ÷		12 / 12=	93.00	(00)
(40)m= 1.11 1.11	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11		_
Number of days in m	onth (Tah	la 1a)					•	Average =	Sum(40) <sub>1</sub>	12 /12=	1.1	(40)
Jan Feb	<del></del>	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31 28	31	30	31	30	31	31	30	31	30	31		(41)
		!	!	!	<u> </u>	!			!	ļ.		
4. Water heating en	ergy regu	irement:								kWh/ye	ear:	
Assumed occupancy if TFA > 13.9, N =	1 + 1.76 x	([1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13		.56		(42)
if TFA £ 13.9, N = Annual average hot		ao in litra	ne nor de	ny Vd av	orago –	(25 v N)	. 26			4.0		(42)
Reduce the annual average								se target o		4.9		(43)
not more that 125 litres pe	r person pe	r day (all พ	vater use, i	hot and co	ld)							
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres p	er day for e	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	ı	ı	T	1		
(44)m= 104.39 100.5	96.8	93	89.21	85.41	85.41	89.21	93	96.8	100.59	104.39		<b>¬</b>
Energy content of hot wat	er used - ca.	lculated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> : ables 1b, 1		1138.8	(44)
(45)m= 154.81 135.4	139.72	121.81	116.88	100.86	93.46	107.24	108.53	126.48	138.06	149.92		
			•	, ,		. (40		Total = Su	m(45) <sub>112</sub> :	=	1493.14	(45)
If instantaneous water hea		· ·						1	1	1		(10)
(46)m= 23.22 20.31 Water storage loss:	20.96	18.27	17.53	15.13	14.02	16.09	16.28	18.97	20.71	22.49		(46)
Storage volume (litre	s) includir	ng any s	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community heating	and no ta	ank in dv	velling, e	enter 110	litres in	(47)						
Otherwise if no store	d hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storage loss:	al a al a u a al I		!	(1.) (1.)	. /-							(15)
a) If manufacturer's			or is kno	wn (Kvvr	n/day):					0		(48)
Temperature factor f			005			(40) × (40)				0		(49)
Energy lost from wat b) If manufacturer's	-	-		or is not		(48) x (49)	) =			0		(50)
Hot water storage los		•								0		(51)
If community heating		on 4.3										
Volume factor from T		OL							-	0		(52)
Temperature factor f										0		(53)
Energy lost from wat Enter (50) or (54) in	_	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =	_	0		(54)
Water storage loss of	` '	for each	month			((56)m - (	55) × (41):	m		0		(55)
	0 0	0		<u> </u>	i	0	0	1	Ι			(56)
(56)m= 0 0  If cylinder contains dedica	-	_	0 = (56)m	0 x [(50) – (	0 H11)] ÷ (5	_		0 m where (	0 H11) is fro	0 om Append	ix H	(30)
(57)m= 0 0	0	0	0	0	0	0	0	0	0	0		(57)
(37)111- 0 0	Ι "			L "	L <sup>o</sup>	L "	L "	L "	<u> </u>	l o		(01)

Primary	y circuit	loss (an	nual) fro	m Table	3							0		(58)
Primary	y circuit	loss cal	culated f	or each	month (	59)m =	(58) ÷ 36	65 × (41)	m				•	
(mod	lified by	factor fr	rom Tabl	e H5 if t	here is	solar wa	ter heati	ng and a	cylinde	r thermo	ostat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	culated	for each	month (	(61)m =	(60) ÷ 3	65 × (41	)m						
(61)m=	50.96	46.03	49.33	45.86	45.46	42.12	43.52	45.46	45.86	49.33	49.32	50.96		(61)
Total h	eat requ	ired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	205.77	181.42	189.04	167.67	162.34	142.98	136.98	152.7	154.39	175.8	187.37	200.88		(62)
Solar DH	IW input c	alculated	using App	endix G o	Appendix	H (negat	ive quantity	y) (enter '0	' if no sola	r contribut	tion to wate	er heating)		
(add ad	dditional	lines if	FGHRS	and/or \	vwhrs	applies	s, see Ap	pendix (	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHRS	-49.28	-43.36	-44.25	-36.42	-33.82	-27.9	-23.62	-28.59	-29.43	-36.37	-42.12	-47.63		(63) (G1
Output	from wa	ater hea	ter											
(64)m=	156.49	138.06	144.79	131.25	128.52	115.08	113.37	124.11	124.96	139.43	145.25	153.25		_
_						-		Outp	out from w	ater heate	r (annual)	12	1614.56	(64)
Heat ga	ains fror	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	
(65)m=	64.21	56.53	58.79	51.97	50.23	44.06	41.96	47.02	47.55	54.38	58.23	62.59		(65)
inclu	de (57)r	n in calc	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Inte	ernal ga	ins (see	Table 5	and 5a	):									
Metabo	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79	127.79		(66)
Lighting	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				-	
(67)m=	20.9	18.56	15.09	11.43	8.54	7.21	7.79	10.13	13.59	17.26	20.15	21.48		(67)
Appliar	nces gai	ns (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), also	see Ta	ble 5	-	-		
(68)m=	230.16	232.55	226.53	213.72	197.54	182.34	172.19	169.8	175.82	188.63	204.8	220.01		(68)
Cookin	g gains	(calcula	ted in Ap	pendix	L, equa	tion L15	or L15a	), also se	ee Table	5				
(69)m=	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78	35.78		(69)
Pumps	and far	ns gains	(Table 5	ia)			-		-		-	-		
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)							•	
(71)m=	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23	-102.23		(71)
Water I	heating	gains (T	able 5)										•	
(72)m=	86.31	84.12	79.02	72.18	67.51	61.2	56.39	63.2	66.04	73.1	80.88	84.12		(72)
Total ii	nternal	gains =				(66	)m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	71)m + (72)	m	•	
(73)m=	401.7	399.56	384.98	361.66	337.93	315.09	300.71	307.47	319.79	343.33	370.17	389.94		(73)
6. Sol	ar gains	t .				•	•	•		•	•			
Solar ga	ains are c	alculated	using solaı	flux from	Table 6a	and assoc	ciated equa	ations to co	onvert to th	ne applical	ole orienta	ion.		
Orienta	ation: A T	ccess Fable 6d	actor	Area m²		Flu Ta	ıx ble 6a	Т	g_ able 6b	Т	FF able 6c		Gains (W)	
Northor	_							, —					· ,	7,75
Northea	ιοι ().9x	0.77	X	2.	3	х	11.28	x	0.35	X	0.8	=	5.04	(75)

Northeast <sub>0.9x</sub>		1		1 .,	00.07	1	0.05	l		1	40.05	7(75)
Northeast 0.9x	0.77	X	2.3	X	22.97	X	0.35	X	0.8	] = 1	10.25	(75)
<u> </u>	0.77	X	2.3	X	41.38	X	0.35	X	0.8	] = 1	18.47	(75)
Northeast 0.9x	0.77	X	2.3	X	67.96	X	0.35	X	0.8	] = 1	30.33	(75)
Northeast 0.9x	0.77	X	2.3	X	91.35	X	0.35	X	0.8	=	40.77	(75)
Northeast <sub>0.9x</sub>	0.77	X	2.3	X	97.38	X	0.35	X	0.8	=	43.46	(75)
Northeast <sub>0.9x</sub>	0.77	X	2.3	X	91.1	X	0.35	X	0.8	=	40.66	(75)
Northeast 0.9x	0.77	X	2.3	X	72.63	X	0.35	X	0.8	=	32.41	(75)
Northeast <sub>0.9x</sub>	0.77	X	2.3	X	50.42	X	0.35	X	0.8	=	22.5	(75)
Northeast <sub>0.9x</sub>	0.77	X	2.3	X	28.07	X	0.35	X	0.8	=	12.53	(75)
Northeast <sub>0.9x</sub>	0.77	X	2.3	X	14.2	X	0.35	X	0.8	=	6.34	(75)
Northeast <sub>0.9x</sub>	0.77	X	2.3	X	9.21	Х	0.35	X	0.8	=	4.11	(75)
Southeast 0.9x	0.77	X	1.82	X	36.79	X	0.35	X	0.8	=	12.99	(77)
Southeast 0.9x	0.77	X	1.82	X	62.67	X	0.35	X	0.8	=	22.13	(77)
Southeast 0.9x	0.77	X	1.82	X	85.75	X	0.35	X	0.8	=	30.28	(77)
Southeast <sub>0.9x</sub>	0.77	X	1.82	X	106.25	X	0.35	X	0.8	=	37.52	(77)
Southeast 0.9x	0.77	X	1.82	X	119.01	X	0.35	x	0.8	=	42.03	(77)
Southeast 0.9x	0.77	X	1.82	X	118.15	X	0.35	X	0.8	=	41.73	(77)
Southeast 0.9x	0.77	X	1.82	X	113.91	x	0.35	X	0.8	=	40.23	(77)
Southeast 0.9x	0.77	X	1.82	X	104.39	X	0.35	X	0.8	=	36.87	(77)
Southeast 0.9x	0.77	X	1.82	X	92.85	X	0.35	X	0.8	=	32.79	(77)
Southeast 0.9x	0.77	X	1.82	X	69.27	X	0.35	X	0.8	=	24.46	(77)
Southeast 0.9x	0.77	X	1.82	x	44.07	x	0.35	x	0.8	=	15.56	(77)
Southeast 0.9x	0.77	X	1.82	X	31.49	x	0.35	x	0.8	=	11.12	(77)
Northwest <sub>0.9x</sub>	0.77	X	5.22	x	11.28	x	0.35	X	0.8	=	11.43	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	X	11.28	X	0.35	X	0.8	=	9.52	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.22	x	22.97	x	0.35	X	0.8	=	23.26	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	x	22.97	x	0.35	x	0.8	=	19.39	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.22	x	41.38	x	0.35	x	0.8	=	41.91	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	x	41.38	x	0.35	x	0.8	=	34.93	(81)
Northwest 0.9x	0.77	X	5.22	x	67.96	x	0.35	x	0.8	] =	68.83	(81)
Northwest <sub>0.9x</sub>	0.77	x	4.35	x	67.96	x	0.35	x	0.8	=	57.36	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.22	x	91.35	x	0.35	x	0.8	] =	92.52	(81)
Northwest 0.9x	0.77	x	4.35	x	91.35	x	0.35	x	0.8	] =	77.1	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.22	x	97.38	х	0.35	x	0.8	j =	98.64	(81)
Northwest <sub>0.9x</sub>	0.77	x	4.35	x	97.38	х	0.35	x	0.8	j =	82.2	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.22	x	91.1	x	0.35	x	0.8	j =	92.28	(81)
Northwest <sub>0.9x</sub>	0.77	×	4.35	×	91.1	x	0.35	x	0.8	=	76.9	(81)
Northwest <sub>0.9x</sub>	0.77	x	5.22	×	72.63	x	0.35	x	0.8	=	73.56	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	X	72.63	X	0.35	X	0.8	=	61.3	(81)
Northwest <sub>0.9x</sub>	0.77	X	5.22	X	50.42	X	0.35	x	0.8	=	51.07	(81)
Northwest <sub>0.9x</sub>	0.77	X	4.35	X	50.42	X	0.35	x	0.8	,   =	42.56	(81)
_		1		1		1		I		ı		<b>_</b> ' '

Northw	est <sub>0.9x</sub>	0.77	Х	5.2	22	x	2	8.07	X		0.35	x	0.8	=	28.43	(81)
Northw	est <sub>0.9x</sub>	0.77	X	4.3	35	x	2	8.07	x		0.35	x	0.8	=	23.69	(81)
Northw	est <sub>0.9x</sub>	0.77	X	5.2	22	x	,	14.2	x		0.35	x	0.8	=	14.38	(81)
Northw	est <sub>0.9x</sub>	0.77	X	4.3	35	x	,	14.2	x		0.35	x	0.8	=	11.98	(81)
Northw	est <sub>0.9x</sub>	0.77	Х	5.2	22	x	Ç	9.21	X		0.35	x	0.8	=	9.33	(81)
Northw	est <sub>0.9x</sub>	0.77	Х	4.3	35	x	Ş	9.21	x		0.35	х	0.8	=	7.78	(81)
						•			-							
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																
(83)m=	38.98	75.03	125.59	194.04	252.42	26	66.03	250.06	204	.14	148.92	89.11	48.26	32.34		(83)
Total g	ains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (8	33)m	, watts						_		
(84)m=	440.68	474.59	510.57	555.7	590.35	58	31.12	550.76	511	.61	468.71	432.43	418.43	422.29		(84)
7. Me	an inter	nal temp	erature	(heating	season	)										
Temp	erature	during h	eating p	periods in	n the livi	ng :	area f	from Tab	ole 9	, Th	1 (°C)				21	(85)
•		•	٠.	living are		_					, ,					
	Jan	Feb	Mar	Apr	May	ΤÌ	Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.95	(	0.85	0.7	0.7	76	0.94	0.99	1	1		(86)
Moan	intorna	l tompor	atura in	living are	22 T1 /f/	مالد	w sto	ns 3 to 7	7 in T	l	2 00)		1		<u> </u>	
(87)m=	19.73	19.83	20.04	20.35	20.66	_	0.89	20.97	20.	_	20.77	20.39	20.01	19.71		(87)
			l .	1		<u> </u>						20.00	20.01	15.71		(01)
				eriods ir		_							1		1	
(88)m=	19.99	19.99	19.99	20	20	2	0.01	20.01	20.	01	20.01	20	20	20		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)						_	
(89)m=	1	1	0.99	0.98	0.93	(	0.77	0.56	0.6	63	0.9	0.99	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	eps 3	3 to 7	7 in Tabl	e 9c)				
(90)m=	18.28	18.43	18.74	19.19	19.63	<del></del>	9.92	20	19.		19.8	19.26	18.7	18.26		(90)
											f	LA = Livir	ng area ÷ (	4) =	0.36	(91)
Moan	intorna	l tompor	atura (fo	or the wh	olo dwo	llin	a) – fl	Λ <b>ν</b> Τ1	<b></b> /1	fl	۸) ی T2					
(92)m=	18.8	18.94	19.21	19.61	20	т —	9) – 11 0.27	20.35	20.		20.15	19.67	19.17	18.78		(92)
				n interna									1			
(93)m=	18.8	18.94	19.21	19.61	20	_	0.27	20.35	20.		20.15	19.67	19.17	18.78		(93)
8. Sp	ace hea	ting requ	uiremen	t		_										
					e obtair	ned	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=(	76)m an	d re-cald	culate	
				using Ta									,		•	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	n:		_							•		1	
(94)m=	1	1	0.99	0.98	0.93		8.0	0.61	0.6	67	0.91	0.99	1	1		(94)
			<u>`</u>	4)m x (8		_							1	1	1	
(95)m=	439.84	473.1	507.06	544.05	549.11	<u> </u>	62.68	336	345	.02	424.77	426.07	416.95	421.64		(95)
			i	perature		Т			_				1		1	(0.0)
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16		14.1	10.6	7.1	4.2		(96)
			r	nal tempe		$\overline{}$			<del></del>	_	<u> </u>		1407 =:	10===:	1	(07)
	1378.87		<u> </u>	1005.03	777.58		26.93	348.24	365		563.83	849.76	1135.29	1375.76		(97)
		<del></del>		r each n		vvh T			_	÷		<u> </u>	<del>r</del>	700.00	1	
(98)m=	698.64	577.19	518.29	331.9	169.98		0	0	0	J	0	315.23	517.2	709.86		

									<b>_</b>
			Tota	l per year	(kWh/year	') = Sum(9	8) <sub>15,912</sub> =	3838.29	(98)
Space heating requirement in kWh/m²/yea	ar							45	(99)
9a. Energy requirements – Individual heati	ng systems	including	micro-C	CHP)					
Space heating: Fraction of space heat from secondary/su	nnlomontan	, cyctom						0	7(201)
		•	(202) = 1 -	_ (201) _				0	(201)
Fraction of space heat from main system(	,		(202) = 13 (204) = (2	, ,	(202)] _			1	(202)
Fraction of total heating from main system			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1		0/						89.5	(206)
Efficiency of secondary/supplementary he	<del>- i -</del>	1	l .					0	(208)
	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated ab 698.64 577.19 518.29 331.9 169	9.98 0	0	0	0	315.23	517.2	709.86		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$			<u> </u>		1				(211)
	9.92 0	0	0	0	352.21	577.88	793.14		(= )
	<b>I</b>	ļ	Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	=	4288.6	(211)
Space heating fuel (secondary), kWh/mor	nth						!		
= {[(98)m x (201)] } x 100 ÷ (208)								Ī	
(215)m= 0 0 0 0	0 0	0	0	0	0	0	0		¬
			Tota	ı (kvvn/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<b>.</b>	0	(215)
Water heating Output from water heater (calculated above	a)								
	3.52 115.08	113.37	124.11	124.96	139.43	145.25	153.25		
Efficiency of water heater	•		!		!			89.5	(216)
(217)m= 89.5 89.5 89.5 89.5 89.5	9.5 89.5	89.5	89.5	89.5	89.5	89.5	89.5		(217)
Fuel for water heating, kWh/month									
$(219)$ m = $(64)$ m x $100 \div (217)$ m (219)m= $174.84$ $154.26$ $161.77$ $146.65$ $14$	3.6 128.58	126.66	138.67	139.62	155.79	162.29	171.23		
, ,	<u> </u>			I = Sum(2			l	1803.97	(219)
Annual totals					k\	Wh/year	•	kWh/yea	<u></u>
Space heating fuel used, main system 1								4288.6	
Water heating fuel used								1803.97	
Electricity for pumps, fans and electric keep	o-hot								
central heating pump:							30		(230c
boiler with a fan-assisted flue							45		(230e
Total electricity for the above, kWh/year sum of (230a)(230g) =							75	(231)	
Electricity for lighting								369.03	(232)
12a. CO2 emissions – Individual heating s	systems incl	udina mi	cro-CHE	)				000.00	(202)
12a. CO2 emissions – mulvidual fleatility s			<del>cio-</del> Crir						
		<b>nergy</b> Vh/year			Emiss kg CO	<b>ion fac</b> 2/kWh	tor	Emission: kg CO2/ye	
Space heating (main system 1)	(21	1) x			0.2	16	=	926.34	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	389.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1315.99	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	191.53	(268)
Total CO2, kg/year	sum	of (265)(271) =		1546.45	(272)
Dwelling CO2 Emission Rate	(272	) ÷ (4) =		18.13	(273)
El rating (section 14)				84	(274)

#### **SAP 2012 Overheating Assessment**

Calculated by Stroma FSAP 2012 program, produced and printed on 18 May 2017

#### Property Details: Be Clean-Flat 6 - 1st floor

Dwelling type: Flat Located in: England

**Region:** South East England

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: South West

Overshading:Average or unknownOverhangs:as detailed belowThermal mass parameter:Indicative Value Medium

**Night ventilation:** False

Blinds, curtains, shutters:

**Ventilation rate during hot weather (ach):** 3 ( Windows open half the time)

#### Overheating Details:

Summer ventilation heat loss coefficient: 202.67 (P1)

**Transmission heat loss coefficient:** 56.5

Summer heat loss coefficient: 259.19 (P2)

#### Overhangs:

Orientation:	Ratio:	Z_overhangs:
--------------	--------	--------------

North West (Lounge terrace toors) 0.79
North West (bedroom teroace doors) 0.79
South East (Bedroom) 0.57 0.64
North East (Bedroom) 0 1

#### Solar shading:

nds: Solar access:	Overhangs:	Z summer:	
oors) 0.9	0.79	0.69	(P8)
doors) 0.9	0.79	0.69	(P8)
0.9	0.64	0.54	(P8)
0.9	1	0.9	(P8)
	oors) 0.9 doors) 0.9 0.9	oors) 0.9 0.79 doors) 0.9 0.79 0.9 0.64	oors) 0.9 0.79 0.69 doors) 0.9 0.79 0.69 0.9 0.64 0.54

#### Solar gains:

Orientation	Area	Flux	<b>g</b> _	FF	Shading	Gains
North West (Lounge terrace)	loors\$.22	105.45	0.35	0.8	0.69	95.59
North West (bedroom ter0a@e	doors)35	105.45	0.35	0.8	0.69	79.66
South East (Bedroom) 0.9	1.82	126.97	0.35	0.8	0.54	31.29
North East (Bedroom) 0.9	2.3	105.45	0.35	0.8	0.9	55.01
					Total	261 55 <b>(P3/P4)</b>

#### Internal gains:

	June	July	August
Internal gains	455.39	436.87	445.96
Total summer gains	736.94	698.43	661.04 <b>(P5)</b>
Summer gain/loss ratio	2.84	2.69	2.55 <b>(P6)</b>
Mean summer external temperature (South East England)	15.4	17.4	17.5
Thermal mass temperature increment	0.25	0.25	0.25
Threshold temperature	18.49	20.34	20.3 <b>(P7)</b>
Likelihood of high internal temperature	Not significant	Not significant	Not significant

luna

1....

A . . . . . . . . . . . . . . .

# **SAP 2012 Overheating Assessment**

Assessment of likelihood of high internal temperature: <u>Not significant</u>