			User D	etails: _						
Assessor Name:	Natalie Wheeler			Strom:	a Num	ber:		STRC	0027778	
Software Name:	Stroma FSAP 201	2		Softwa					on: 1.0.4.6	
		Р	roperty i	Address	Be Gre	en-Flat	3-1st floo	or		
Address :	Flat 3, Hampshire s	treet								
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m	³)
Ground floor			3	9.07	(1a) x	2	2.4	(2a) =	93.77	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1r	1) 3	9.07	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	93.77	(5)
2. Ventilation rate:										
		econdar neating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	T + F	0		0	x :	20 =	0	(6b)
Number of intermittent fa	ans				_ 	2	x ·	10 =	20	(7a)
Number of passive vents	3					0	x	10 =	0	(7b)
Number of flueless gas f					Ļ			40 =		= ' '
Number of flueless gas i	iles					0		10 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	a)+(6b)+(7	'a)+(7b)+(7c) =	Γ	20		÷ (5) =	0.21	(8)
If a pressurisation test has I	been carried out or is intende	ed, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	uction			0	(11)
deducting areas of open	present, use the value corres ings); if equal user 0.35	sponaing to	tne great	er waii are	a (arter					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	• • • • • • • • • • • • • • • • • • • •	, , ,	. ,		0	(16)
•	, q50, expressed in cub		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•					. , .	,		0.46	(18)
Number of sides shelter	es if a pressurisation test ha	s been aon	ie or a deg	gree air pei	теарину	is being u	sea		2	(19)
Shelter factor	ou			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.39	(21)
Infiltration rate modified	for monthly wind speed	t								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7				-	•	-		-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
1.0	1	•					•		4	
Wind Factor $(22a)m = (2a)m =$	'			0.00		T 4.05	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]	

0.5	0.49	0.48	0.43	0.42	0.37	0.37	0.36	(22a)m _{0.39}	0.42	0.44	0.46]	
Calculate effe					1	1	0.00	0.00	0.12	0.11	0.10		
If mechanica	al ventila	ition:										0	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(23
a) If balance	ed mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	ed mecha	anical ve	ntilation	without	heat rec	covery (N	ЛV) (24b)m = (22	2b)m + (23b)	r	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r	nouse ex n < 0.5 ×			-	-				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilation			•	•				0.51	•	•		
24d)m= 0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24
Effective air	change	rate - er	ıter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	<u> </u>	<u> </u>	ļ.	l	
25)m= 0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(2
3. Heat losse ELEMENT	es and he Gros	·	oaramete Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e	ΑXk
	area	(m^2)	m		A ,r		W/m2		(W/I	K)	kJ/m²-l		kJ/K
Doors					1.87	Х	1	=	1.87				(26
Vindows Type	e 1				6.12	x1,	/[1/(1.4)+	0.04] =	8.11				(27
Nindows Type	e 2				2.3	x1,	/[1/(1.4)+	0.04] =	3.05				(27
Floor													`
					39.07	7 X	0.065	=	2.5395	<u> </u>			(28
Nalls	35.4	12	10.29	9	39.07 25.13	=	0.065 0.18	= [= [2.53955 4.52	<u>5</u> [(28
			10.29	9		x		=		5 [(28
Nalls Fotal area of ∈ Party wall			10.29	9	25.13	3 x		=		5 [] [(28
Fotal area of e Party wall			10.29)	25.13 74.49	3 x	0.18] = [4.52	5 [] [(28)
Fotal area of e Party wall Party ceiling	elements	, m² ows, use e	ffective wil	ndow U-va	25.13 74.49 39.62 39.07	3 x 9 x	0.18	= [4.52] [] []	paragraph	3.2	(28)
Fotal area of earty wall Party ceiling for windows and include the area	elements I roof winder as on both	, m² ows, use e sides of in	ffective wi	ndow U-va	25.13 74.49 39.62 39.07	X 2 X dated using	0.18 0	= [= [/[(1/U-valu	4.52] [] []	paragraph		(28) (32) (32) (32)
Fotal area of earty wall Party ceiling For windows and The include the area Fabric heat los	elements I roof winder as on both ss, W/K =	ows, use e sides of in = S (A x	ffective wi	ndow U-va	25.13 74.49 39.62 39.07	X 2 X dated using	0.18	= [= [/[(1/U-valu + (32) =	4.52 0 re)+0.04] a	as given in		20.1	(28) (29) (31) (32) (32) (33)
Fotal area of earty wall Party ceiling for windows and include the area Fabric heat lost	elements I roof winder as on both as, W/K = Cm = S(ows, use e sides of in = S (A x (A x k)	ffective wi eternal wall	ndow U-va	25.13 74.49 39.62 39.07 alue calculatitions	3 × 2 × 7 ated using	0.18 0	= [= [/[(1/U-value) + (32) = ((28)	4.52 0 re)+0.04] a	as given in		20.1	(28)
Fotal area of earty wall Party ceiling for windows and include the area Fabric heat los Heat capacity Thermal mass	elements I roof winde as on both ss, W/K = Cm = S(ows, use e sides of in = S (A x (A x k)	ffective winternal wall U) P = Cm ÷	ndow U-va s and part	25.13 74.49 39.62 39.07 alue calculatitions	X 2 X dated using	0.18 0 1 formula 1. (26)(30)	= [= [/[(1/U-valu + (32) = ((28) Indica	4.52 0 re)+0.04] a .(30) + (32 tive Value	as given in 2) + (32a). : Medium	(32e) =	20.1	(3)
Fotal area of earty wall Party ceiling for windows and include the area Fabric heat los Heat capacity Thermal mass For design assess	elements I roof winder as on both ss, W/K = Cm = S(s parame	ows, use e sides of in = S (A x (A x k) ster (TMF	ffective winternal wall U) $P = Cm \div tails of the$	ndow U-va s and part	25.13 74.49 39.62 39.07 alue calculatitions	X 2 X dated using	0.18 0 1 formula 1. (26)(30)	= [= [/[(1/U-valu + (32) = ((28) Indica	4.52 0 re)+0.04] a .(30) + (32 tive Value	as given in 2) + (32a). : Medium	(32e) =	20.1	(3)
Party wall Party ceiling For windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste	elements I roof winder as on both as, W/K = Cm = S(as parame asments where and of a december.	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calcu	ffective winternal wall U) P = Cm ÷ tails of the ulation.	ndow U-ve ls and part - TFA) ir constructi	25.13 74.49 39.62 39.07 alue calculatitions n kJ/m²K ion are not	X 2 X dated using	0.18 0 1 formula 1. (26)(30)	= [= [/[(1/U-valu + (32) = ((28) Indica	4.52 0 re)+0.04] a .(30) + (32 tive Value	as given in 2) + (32a). : Medium	(32e) =	20.1	(3)
Party wall Party ceiling for windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste	elements I roof winder as on both as, W/K = Cm = S(as parame asments where and of a decrease is S (L al bridging	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calc	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated t	ndow U-va ls and part - TFA) ir constructi using Ap	25.13 74.49 39.62 39.07 alue calculatitions n kJ/m²K ion are not	X 2 X dated using	0.18 0 1 formula 1. (26)(30)	= [4.52 0 ne)+0.04] a .(30) + (32 tive Value e values of	as given in 2) + (32a). : Medium	(32e) =	20.1	(24) (25) (33) (33) (34) (34) (34) (34)
Fotal area of earty wall Party ceiling For windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste Thermal bridge f details of therma Total fabric he	elements If roof winder as on both ass, W/K = Cm = S(as parame assents where and of a december is S (L al bridging at loss	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi using Ap	25.13 74.49 39.62 39.07 alue calculatitions n kJ/m²K ion are not	X 2 X dated using	0.18 0 1 formula 1. (26)(30)	= [= [/[(1/U-valu + (32) = ((28) Indica indicative	4.52 0 (30) + (32) tive Value e values of	as given in 2) + (32a). : Medium	(32e) =	20.1	(24) (25) (33) (33) (34) (34) (34) (34)
Party wall Party ceiling For windows and initial include the area Fabric heat los Heat capacity Thermal mass For design assess can be used inste Thermal bridge If details of therma Total fabric head Jentilation head	elements I roof winder as on both ss, W/K = Cm = S(s parame sments wheread of a decrease : S (L al bridging eat loss at loss ca	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) ir constructi using Ap	25.13 74.49 39.62 39.07 alue calculatitions n kJ/m²K ion are not opendix k	x 2 x dated using	0.18 0 formula 1 (26)(30)	= [4.52 0 (30) + (32) tive Value e values of (36) = = 0.33 × (2) + (32a).: Medium	(32e) =	20.1 0 250	(36)
Fotal area of exparty wall Party ceiling For windows and Finclude the area Fabric heat loss Heat capacity Thermal mass For design assess F	elements I roof winder as on both as, W/K = Cm = S(as parame asments where and of a decension	ows, use e sides of in = S (A x (A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) = I monthly	ndow U-vals and part - TFA) ir constructi using Ap = 0.15 x (3	25.13 74.49 39.62 39.07 alue calculatitions h kJ/m²K ion are not pendix h	x 2 x detect using	0.18 0 formula 1. (26)(30) ecisely the	= [4.52 0 (30) + (32) tive Value e values of (36) = = 0.33 × (as given in 2) + (32a). : Medium TMP in T	(32e) = Sable 1f	20.1 0 250	(26 (3) (3) (3) (3) (3) (3) (3) (3)
Fotal area of exparty wall Party ceiling For windows and Fabric heat loss Heat capacity Thermal mass For design assess can be used inste Thermal bridge f details of therma Fotal fabric heav Ventilation heav Jan 38)m= 19.37	elements I roof winder as on both ss, W/K = Cm = S(s parame sments where ad of a decent	ows, use e sides of in = S (A x (A x k) ster (TMF ere the de tailed calcu x Y) calcu are not kn alculated Mar 19.07	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vels and part - TFA) ir constructi using Ap	25.13 74.49 39.62 39.07 alue calculatitions n kJ/m²K ion are not opendix k	x 2 x dated using	0.18 0 formula 1 (26)(30)	= [4.52 0 (30) + (32) tive Value e values of (36) = = 0.33 × (2) + (32a).: Medium	(32e) =	20.1 0 250	(28 (29 (31 (32 (32
Fotal area of exparty wall Party ceiling for windows and include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste Thermal bridge f details of therma Total fabric he Ventilation hea	elements I roof winder as on both ss, W/K = Cm = S(s parame sments where ad of a decent	ows, use e sides of in = S (A x (A x k) ster (TMF ere the de tailed calcu x Y) calcu are not kn alculated Mar 19.07	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) = I monthly	ndow U-vals and part - TFA) ir constructi using Ap = 0.15 x (3	25.13 74.49 39.62 39.07 alue calculatitions h kJ/m²K ion are not pendix h	x 2 x detect using	0.18 0 formula 1. (26)(30) ecisely the	= [= [/[(1/U-valu + (32) = ((28) Indica indicative (33) + (38)m Sep 17.87	4.52 0 (30) + (32) tive Value e values of (36) = = 0.33 × (25)m x (5 Nov 18.51	(32e) = Sable 1f	20.1 0 250	(26 (3) (3) (3) (3) (3) (3) (3) (3)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.36	1.36	1.35	1.33	1.33	1.32	1.32	1.31	1.32	1.33	1.34	1.35		
				l .		l .	l .		Average =	Sum(40) ₁ .	12 /12=	1.33	(40)
Number of day	<u> </u>	nth (Tab	le 1a)					ı		i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		38		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		7.02		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								·'	!				
(44)m= 73.72	71.04	68.36	65.68	63	60.32	60.32	63	65.68	68.36	71.04	73.72		
									Total = Su	m(44) ₁₁₂ =		804.23	(44)
Energy content of	f hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 109.33	95.62	98.67	86.02	82.54	71.23	66	75.74	76.64	89.32	97.5	105.88		
If inctentone are use	votor boot	ina at naint	of upo /pr	hat water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	- [1054.47	(45)
If instantaneous w		· ·	,	ı	,.	ı	, ,	, , , I		1	i		(40)
(46)m= 16.4 Water storage	14.34 loss:	14.8	12.9	12.38	10.68	9.9	11.36	11.5	13.4	14.62	15.88		(46)
Storage volum) includir	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•		•			Ū							` '
Otherwise if no	_			_			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufactHot water store			-										(51)
If community h	•			IC 2 (KVV)	ii/iiti C/GC	' y)					0		(31)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)									0		(55)
Water storage	loss cal	culated t	or each	month			((56)m = ((55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	 - 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss	calculated	for each	month (61)m -	$(60) \div 36$	35 × (41)	١m						
(61)m= 37.5		34.84	32.39	32.1	29.75	30.74	32.1	32.39	34.84	35.03	37.57]	(61)
` '		water h	eating ca	alculated	I for eacl	h month	(62)m =	0.85 × (ـــــــــــــــــــــــــــــــــــــ	(46)m +	<u> </u>	ı (59)m + (61)m	
(62)m= 146.8	-i	133.5	118.41	114.64	100.97	96.74	107.84	109.03	124.15	132.53	143.44		(62)
Solar DHW inp	ut calculated	using App	endix G or	· Appendix	: H (negati	ve quantity	/) (enter '0	if no sola	r contributi	on to wate	r heating)		
(add additio													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHRS -29.9	91 -26.31	-26.85	-22.16	-20.61	-17.03	-14.46	-17.49	-17.98	-22.18	-25.62	-28.89		(63) (G10)
Output from	water hea	iter											
(64)m= 116.9	98 102.01	106.65	96.25	94.03	83.94	82.28	90.35	91.05	101.97	106.91	114.55		_
•							Outp	ut from wa	ater heater	(annual)	12	1186.97	(64)
Heat gains	rom water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	ı] + 0.8 x	([(46)m	+ (57)m	+ (59)m]	
(65)m= 45.7	4 39.97	41.52	36.7	35.47	31.12	29.63	33.21	33.58	38.41	41.18	44.6		(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):									
Metabolic g	ai <u>ns (Table</u>	e <u>5), Wat</u>	.ts										
Jai		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 82.9	1 82.91	82.91	82.91	82.91	82.91	82.91	82.91	82.91	82.91	82.91	82.91		(66)
Lighting gai	ns (calcula	ted in Ar	opendix '	L, equati	ion L9 or	 r L9a), a	lso see	Fable 5				•	
(67)m= 26.5	7 23.6	19.19	14.53	10.86	9.17	9.91	12.88	17.28	21.95	25.61	27.31		(67)
Appliances	gains (calc	:ulated in	1 Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ble 5		ı	1	
(68)m= 177.9	91 179.76	175.11	165.2	152.7	140.95	133.1	131.25	135.91	145.81	158.31	170.06		(68)
Cooking gai	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5			•	
	(5050					44.67	44.07	44.07	44.67	44.67	44.67	1	(69)
(69)m= 44.6	`	44.67	44.67	44.67	44.67	44.67	44.67	44.67	44.07	44.07	44.07		(03)
(69)m= 44.6 Pumps and	7 44.67	44.67		44.67	44.67	44.67	44.67	44.67	44.07	44.07	44.07		(09)
` '	7 44.67	44.67		44.67	3	3	3	3	3	3	3]	(70)
Pumps and	7 44.67 fans gains	44.67 (Table 5	5a) 3	3	3]	, ,
Pumps and (70)m= 3	7 44.67 fans gains 3 evaporation	44.67 (Table 5	5a) 3	3	3							 	, ,
Pumps and (70)m= 3 Losses e.g.	7 44.67 fans gains 3 evaporation 27 -55.27	44.67 s (Table 5 3 on (negat	5a) 3 tive value	3 es) (Tab	3 le 5)	3	3	3	3	3	3]	(70)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2	fans gains 3 evaporation 27 -55.27 ng gains (T	44.67 s (Table 5 3 on (negat	5a) 3 tive value	3 es) (Tab	3 le 5)	3	3	3	3	3	3]]]	(70)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati	7 44.67 fans gains 3 evaporation 27 -55.27 ng gains (T 8 59.47	44.67 3 on (negat -55.27 Table 5) 55.8	5a) 3 tive value	3 es) (Tab -55.27	3 ole 5) -55.27	3 -55.27 39.82	-55.27 44.63	-55.27 46.64	3 -55.27	-55.27 57.19	-55.27 59.94		(70) (71)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati (72)m= 61.4	7 44.67 fans gains 3 evaporation 27 -55.27 ng gains (Table 1) 8 59.47 nal gains =	44.67 3 on (negat -55.27 Table 5) 55.8	5a) 3 tive value	3 es) (Tab -55.27	3 ole 5) -55.27	3 -55.27 39.82	-55.27 44.63	-55.27 46.64	3 -55.27 51.62	-55.27 57.19	-55.27 59.94]]]	(70) (71)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati (72)m= 61.4 Total interr	7 44.67 fans gains evaporation 27 -55.27 ng gains (Table 1) 8 59.47 nal gains = 27 338.14	44.67 (Table 5 3 on (negate -55.27 Table 5) 55.8	5a) 3 tive value -55.27	3 es) (Tab -55.27	3 ble 5) -55.27 43.22 (66)	3 -55.27 39.82 m + (67)m	3 -55.27 44.63 1+ (68)m+	3 -55.27 46.64 - (69)m + (3 -55.27 51.62 (70)m + (7'	3 -55.27 57.19 1)m + (72)	3 -55.27 59.94		(70) (71) (72)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati (72)m= 61.4 Total interr (73)m= 341.2	7 44.67 fans gains 3 evaporation 27 -55.27 ng gains (Table 1) 8 59.47 nal gains = 27 338.14 ins:	44.67 3 on (negation -55.27 Table 5) 55.8 325.41	5a) 3 tive value -55.27 50.97	3 es) (Tab -55.27 47.67	3 ble 5) -55.27 43.22 (66) 268.65	3 -55.27 39.82 m + (67)m 258.14	3 -55.27 44.63 n + (68)m + 264.08	3 -55.27 46.64 - (69)m + (275.14	3 -55.27 51.62 (70)m + (7) 294.69	3 -55.27 57.19 1)m + (72) 316.43	3 -55.27 59.94 m 332.62		(70) (71) (72)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati (72)m= 61.4 Total interr (73)m= 341.3 6. Solar ga	7 44.67 fans gains 3 evaporation 27 -55.27 ng gains (Table 1) 8 59.47 nal gains = 27 338.14 ins: re calculated	44.67 (Table 5 3 on (negate 5) 55.8 325.41 using solar actor	5a) 3 tive value -55.27 50.97	3 es) (Tab -55.27 47.67 286.55	3 ole 5) -55.27 43.22 (66) 268.65 and associ	39.82 39.82 m + (67)m 258.14	3 -55.27 44.63 1+ (68)m+ 264.08	3 -55.27 46.64 - (69)m + (275.14	3 -55.27 51.62 (70)m + (7) 294.69	3 -55.27 57.19 1)m + (72) 316.43	3 -55.27 59.94 m 332.62	Gains (W)	(70) (71) (72)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati (72)m= 61.4 Total interr (73)m= 341.3 6. Solar gains a	fans gains a evaporation 27 -55.27 ng gains (Table 6d 3 evaporation 4 coss factorial example for a second control of the factorial example for a second control	44.67 3 on (negate -55.27 Table 5) 55.8 325.41 using solar	5a) 3 tive value -55.27 50.97 306.01 ar flux from Area m²	3 es) (Tab -55.27 47.67 286.55	3 ole 5) -55.27 43.22 (66) 268.65 and associ	39.82 39.82 39.82 258.14 iated equal	3 -55.27 44.63 1+ (68)m+ 264.08	3 -55.27 46.64 - (69)m + (275.14 envert to the g_	3 -55.27 51.62 (70)m + (7) 294.69	3 -55.27 57.19 1)m + (72) 316.43	3 -55.27 59.94 m 332.62		(70) (71) (72)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati (72)m= 61.4 Total interr (73)m= 341.3 6. Solar gains a Orientation:	7 44.67 fans gains 3 evaporation 27 -55.27 ng gains (Table 6d x 0.77	44.67 3 on (negat -55.27 Table 5) 55.8 325.41 using solar	5a) 3 tive value -55.27 50.97 306.01 ar flux from Area m² 2.3	3 es) (Tab -55.27 47.67 286.55 Table 6a a	3 ole 5) -55.27 43.22 (66) 268.65 and associ Flu Tak	39.82 39.82 39.82 258.14 iated equality ble 6a	3 -55.27 44.63 n + (68)m + 264.08 tions to co	3 -55.27 46.64 - (69)m + (275.14 envert to the g_ able 6b	3 -55.27 51.62 (70)m + (7) 294.69 Teapplicab	3 -55.27 57.19 1)m + (72) 316.43 le orientat FF able 6c	3 -55.27 59.94 m 332.62 ion.	(W)	(70) (71) (72) (73)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati (72)m= 61.4 Total interr (73)m= 341.3 6. Solar gains a Orientation: Southeast 0.9	7 44.67 fans gains 3 evaporation 27 -55.27 ng gains (Table 6d x 0.77	44.67 3 on (negation -55.27 Table 5) 55.8 325.41 using solar actor	5a) 3 tive value -55.27 50.97 306.01 ar flux from Area m² 2.3 2.3	3 es) (Tab -55.27 47.67 286.55 Table 6a a	3 ble 5) -55.27 43.22 (66) 268.65 and associ Flu Tak x 3 x 6	39.82 39.82 39.82 39.84 258.14 iated equal X ole 6a	3 -55.27 44.63 1+(68)m+ 264.08	3 -55.27 46.64 - (69)m + (275.14 envert to the g_ able 6b 0.35	3 -55.27 51.62 (70)m + (7') 294.69 re applicab Ta	3 -55.27 57.19 1)m + (72) 316.43 lle orientat FF able 6c 0.8	3 -55.27 59.94 m 332.62 ion.	(W)	(70) (71) (72) (73)
Pumps and (70)m= 3 Losses e.g. (71)m= -55.2 Water heati (72)m= 61.4 Total interr (73)m= 341.3 6. Solar gains a Orientation: Southeast 0.9 Southeast 0.9	fans gains a evaporation 7 44.67 fans gains 8 evaporation 27 -55.27 ng gains (Table 338.14 ins: re calculated Access Fable 6d x 0.77 x 0.77	44.67 3 on (negation -55.27 Table 5) 55.8 325.41 using solar actor	5a) 3 tive value -55.27 50.97 306.01 ar flux from Area m² 2.3 2.3	3 es) (Tab -55.27 47.67 286.55 Table 6a a 3 3 3	3 ble 5) -55.27 43.22 (66) 268.65 and associ Flu Tat x	3 -55.27 39.82 m + (67)m 258.14 iated equal X ble 6a 36.79 32.67	3 -55.27 44.63 1+(68)m+ 264.08 tions to co	3 -55.27 46.64 (69)m + (275.14 envert to the g_ able 6b 0.35 0.35	3 -55.27 51.62 (70)m + (7') 294.69 Ta x x	3 -55.27 57.19 1)m + (72) 316.43 le orientat FF able 6c 0.8 0.8	3 -55.27 59.94 m 332.62 ion.	(W) 16.42 27.97	(70) (71) (72) (73) (77)

Southeast 0.98	Southeast 0.9x		_								_						
Southeast 0, sk	Southeast 0 ss	Southea	ast _{0.9x}	0.77	X	2.3	3	X	1	19.01	x	0.35	X	0.8	=	53.11	(77)
Southeast 0, sk	Southeast 0 as	Southea	ast _{0.9x}	0.77	X	2.3	3	x	11	18.15	x	0.35	X	0.8	=	52.73	(77)
Southeast 0.9x	Southeast 0.9x	Southea	ast _{0.9x}	0.77	X	2.3	3	x	1	13.91	x	0.35	x	0.8	=	50.84	(77)
Southeast 0, sk	Southeast 0.3x	Southea	ast _{0.9x}	0.77	X	2.3	3	x	10	04.39	x	0.35	x	0.8	=	46.59	(77)
Southeast 0, sx	Southeast 0.9x	Southea	ast _{0.9x}	0.77	x	2.3	3	x	9	2.85	x	0.35	x	0.8	_ =	41.44	(77)
Southeast 0.9x	Southeast 0, sk	Southea	ast _{0.9x}	0.77	X	2.3	3	X	6	9.27	x	0.35	x	0.8	=	30.91	(77)
Northwest 0.9x	Northwest 0, 9x	Southea	ast 0.9x	0.77	x	2.3	3	x	4	4.07	x	0.35	x	0.8	=	19.67	(77)
Northwest 0.9x	Northwest 0, sk	Southea	ast _{0.9x}	0.77	x	2.3	3	x	3	1.49	x	0.35	×	0.8		14.05	(77)
Northwest 0.9x	Northwest 0.9x	Northwe	est _{0.9x}	0.77	x	6.1	2	x	1	1.28	x	0.35	x	0.8		13.4	(81)
Northwest 0.9x	Northwest 0.9x	Northwe	est 0.9x	0.77	x	6.1	2	X	2	2.97	x	0.35	×	0.8	=	27.27	(81)
Northwest 0.9x	Northwest 0.9x	Northwe	est _{0.9x}	0.77	X	6.1	2	x	4	1.38	x	0.35	×	0.8	_ =	49.14	(81)
Northwest 0.9x	Northwest 0.9x	Northwe	est _{0.9x}	0.77	X	6.1	2	x	6	7.96	x	0.35	×	0.8		80.7	(81)
Northwest 0,9x	Northwest 0.9x	Northwe	est _{0.9x}	0.77	x	6.1	2	x	9	1.35	x	0.35	×	0.8	-	108.48	(81)
Northwest 0,9x	Northwest 0.9x	Northwe	est _{0.9x}	0.77	X	6.1	2	x	9	7.38	x	0.35	×	0.8	_ =	115.65	(81)
Northwest 0.9x	Northwest 0.9x	Northwe	est _{0.9x}	0.77	X	6.1	2	x	9	91.1	x	0.35	×	0.8		108.18	(81)
Northwest 0.9x	Northwest 0.9x	Northwe	est _{0.9x}	0.77	x	6.1	2	x	7	2.63	x	0.35	×	0.8	=	86.25	(81)
Northwest 0.9x	Northwest 0.9x	Northwe	est _{0.9x}	0.77	x	6.1	2	x	5	0.42	x	0.35	×	0.8	= =	59.88	(81)
Northwest 0.9x	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	Northwe	est _{0.9x}	0.77	X	6.1	2	x	2	8.07	x	0.35	×	0.8	_ =	33.33	(81)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m [83)m = 29.82 55.24 87.41 128.12 161.59 168.38 159.02 132.83 101.31 64.24 36.53 24.99 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 371.09 393.38 412.82 434.13 448.13 437.02 417.16 396.91 376.45 358.93 352.95 357.61 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 0.98 0.99 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 0.98 0.99 0.98 0.98 0.99 0.98 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 19.81 0.98 0.99	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 29.82 55.24 87.41 128.12 161.59 168.38 159.02 132.83 101.31 64.24 36.53 24.99 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 371.09 393.38 412.82 434.13 448.13 437.02 417.16 396.91 376.45 358.93 352.95 357.61 (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) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (80)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.82 19.81 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01	Northwe	est _{0.9x}	0.77	x	6.1	2	X	<u> </u>	14.2	x	0.35	×	0.8	=	16.86	(81)
(83)m= 29.82 55.24 87.41 128.12 161.59 168.38 159.02 132.83 101.31 64.24 36.53 24.99 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 371.09 393.38 412.82 434.13 448.13 437.02 417.16 396.91 376.45 358.93 352.95 357.61 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90)	(83)m= 29.82 55.24 87.41 128.12 161.59 168.38 159.02 132.83 101.31 64.24 36.53 24.99 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 371.09 393.38 412.82 434.13 448.13 437.02 417.16 396.91 376.45 358.93 352.95 357.61 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.97 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01	Northwe	est _{0.9x}	0.77	x	6.1	2	X	9	9.21	x	0.35	×	0.8	= =	10.94	(81)
(83)m= 29.82 55.24 87.41 128.12 161.59 168.38 159.02 132.83 101.31 64.24 36.53 24.99 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 371.09 393.38 412.82 434.13 448.13 437.02 417.16 396.91 376.45 358.93 352.95 357.61 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90)	(83)m= 29.82 55.24 87.41 128.12 161.59 168.38 159.02 132.83 101.31 64.24 36.53 24.99 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 371.09 393.38 412.82 434.13 448.13 437.02 417.16 396.91 376.45 358.93 352.95 357.61 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.97 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01		_								1		_	<u> </u>			
(83)m= 29.82 55.24 87.41 128.12 161.59 168.38 159.02 132.83 101.31 64.24 36.53 24.99 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 371.09 393.38 412.82 434.13 448.13 437.02 417.16 396.91 376.45 358.93 352.95 357.61 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90)	(83)m= 29.82 55.24 87.41 128.12 161.59 168.38 159.02 132.83 101.31 64.24 36.53 24.99 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 371.09 393.38 412.82 434.13 448.13 437.02 417.16 396.91 376.45 358.93 352.95 357.61 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.97 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01	Solar o	ains in	watts cal	culated	for each	n montl	h			(83)m	n = Sum(74)m .	(82)m				
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Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area + (4) = 0.51 (91)	Temperature during heating periods in the living area from Table 9, Th1 (°C) 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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01	Total g	ains – ir	55.24 nternal an	87.41 nd solar	128.12 (84)m =	: (73)m	+ (8	83)m	, watts			I		<u> </u>]	
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	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 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) ### FLA = Living area ÷ (4) = 0.51 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01	Total garage (84)m=	ains — ir 371.09	55.24 nternal an 393.38	87.41 nd solar 412.82	128.12 (84)m = 434.13	: (73)m 448.13	1 + (8	83)m	, watts			I		<u> </u>]	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Total ga (84)m= [ains – ir 371.09 an inter	55.24 nternal an 393.38 nal tempe	87.41 nd solar 412.82 erature (128.12 (84)m = 434.13 (heating	(73)m 448.13 seaso	1 + (8 3 43	83)m 37.02	, watts 417.16	396	.91 376.45	I		<u> </u>	21	(84)
(86)m= 0.99 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area ÷ (4) = 0.51 (91)	(86)m= 0.99 0.98 0.97 0.93 0.85 0.69 0.53 0.57 0.8 0.94 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total garage (84)m= [7. Mean Temper	ains – ir 371.09 an inter erature	55.24 Internal and 393.38 Inal temper during he	87.41 and solar 412.82 erature (eating po	128.12 (84)m = 434.13 (heating eriods in	448.13 seaso the liv	n)	83)m 37.02 area f	watts 417.16 from Tab	396	.91 376.45	I		<u> </u>	21	(84)
(87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 19.81 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area ÷ (4) = 0.51 (91)	(87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total garage (84)m= [7. Mean Temper	ains – in 371.09 an inter erature ation fac	55.24 Internal and 393.38 Inal temper during he tor for gain	87.41 and solar 412.82 erature (eating points for li	128.12 (84)m = 434.13 (heating eriods in	= (73)m 448.13 seaso the livea, h1,r	n) ving	83)m 37.02 area f ee Ta	watts 417.16 from Tabble 9a)	396 ole 9	.91 376.45 , Th1 (°C)	358.9	3 352.95	357.61	21	(84)
(87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 19.81 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area ÷ (4) = 0.51 (91)	(87)m= 19.79 19.92 20.15 20.47 20.76 20.93 20.98 20.98 20.87 20.53 20.11 19.77 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total g (84)m= 7. Mea Tempo Utilisa	ains – ir 371.09 an inter erature ation fac Jan	55.24 Internal and 393.38 Inal temper during heater for gains	87.41 and solar 412.82 erature (eating poins for li	128.12 (84)m = 434.13 (heating eriods in ving are Apr	= (73)m 448.13 seaso the livea, h1,r May	n) ring m (s	83)m 37.02 area f ee Ta Jun	watts 417.16 from Tab ble 9a) Jul	396 ole 9	.91 376.45 , Th1 (°C) ug Sep	358.9	3 352.95 t Nov	357.61 Dec	21	(84)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) FLA = Living area ÷ (4) = 0.51 (91)	Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.79 19.8 19.8 19.8 19.8 19.8 19.83 19.83 19.83 19.83 19.82 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total g (84)m= 7. Mea Tempo Utilisa (86)m=	ains – ir 371.09 an inter erature ation fac Jan 0.99	55.24 Internal and 393.38 Inal temper during her tor for gain Feb 0.98	87.41 and solar 412.82 erature (eating poins for li Mar 0.97	128.12 (84)m = 434.13 (heating eriods in ving are Apr 0.93	e (73)m 448.13 seaso the livea, h1,r May 0.85	n) ving m (s	83)m 37.02 area f ee Ta Jun 0.69	watts 417.16 from Tab ble 9a) Jul 0.53	396 ole 9	.91 376.45 , Th1 (°C) ug Sep 57 0.8	358.9	3 352.95 t Nov	357.61 Dec	21	(84)
(88)m= 19.79 19.8 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area ÷ (4) = 0.51 (91)	(88)m= 19.79 19.8 19.8 19.81 19.82 19.83 19.83 19.83 19.82 19.82 19.81 19.81 19.81 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total g (84)m= 7. Met Tempo Utilisa (86)m= Mean	ains – ir 371.09 an inter erature tion fac Jan 0.99 interna	55.24 Internal and 393.38 Inal temperal tor for gain Feb 0.98 Itemperal	87.41 and solar 412.82 erature (eating points for limits for limit	128.12 (84)m = 434.13 (heating eriods in ving are 0.93 iving are iving are 1.93	e (73)m 448.13 seaso the livea, h1,r May 0.85	n) ring m (s	area fee Ta Jun 0.69	watts 417.16 from Tak ble 9a) Jul 0.53 ps 3 to 7	396 ole 9 A 0.5	.91 376.45 , Th1 (°C) ug Sep 57 0.8	Oct 0.94	3 352.95 t Nov 0.98	357.61 Dec 0.99	21	(84)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area ÷ (4) = 0.51 (91)	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total g (84)m= 7. Met Tempo Utilisa (86)m= Mean (87)m=	ains – ir 371.09 an inter erature tion fac Jan 0.99 interna 19.79	55.24 Internal and 393.38 Inal temperaturing here. 19.92	erature (eating poins for limited management) Mar 0.97 ture in l 20.15	128.12 (84)m = 434.13 (heating eriods in ving are Apr 0.93 iving are 20.47	e (73)m 448.13 seaso the livea, h1,r May 0.85 ea T1 (120.76	n) (s) (s) (s) (s) (s) (s) (s) (83)m 37.02 area f ee Ta Jun 0.69 w ste	watts 417.16 from Tak ble 9a) Jul 0.53 ps 3 to 7	396 DIE 9 A 0.5 7 in T 20.	.91 376.45 , Th1 (°C) ug Sep 57 0.8 Table 9c) 98 20.87	Oct 0.94	3 352.95 t Nov 0.98	357.61 Dec 0.99	21	(84)
(89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area ÷ (4) = 0.51 (91)	(89)m= 0.98 0.98 0.96 0.91 0.79 0.59 0.39 0.44 0.71 0.91 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total g (84)m= 7. Mea Tempo Utilisa (86)m= Mean (87)m= Tempo	ains – ir 371.09 an inter erature ation fac Jan 0.99 interna 19.79 erature	55.24 Internal and 393.38 Internal temper during here tor for gain Feb 0.98 Itemperates 19.92 Itemperates during here	erature (eating poins for limited in leading points and leading points are in leading po	128.12 (84)m = 434.13 (heating eriods in Apr 0.93 iving are 20.47 eriods in a control of the con	e (73)m 448.13 seaso n the liv ea, h1,r May 0.85 ea T1 (20.76	n) ring m (s follo	area free Ta Jun 0.69 w stee 20.93	watts 417.16 from Table 9a) Jul 0.53 ps 3 to 7 20.98 from Ta	396 A 0.57 in T 20.	.91 376.45 , Th1 (°C) ug Sep 57 0.8 Table 9c) 98 20.87 9, Th2 (°C)	Oct 0.94	3 352.95 Nov 0.98 20.11	Dec 0.99	21	(84)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area ÷ (4) = 0.51 (91)	Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= $\begin{bmatrix} 18.24 & 18.42 & 18.76 & 19.22 & 19.59 & 19.79 & 19.82 & 19.82 & 19.72 & 19.3 & 18.72 & 18.22 & (90) \\ & & & & & & & & & & & & & & & & & & $	Total graph (84)m= [7. Mean (86)m= [Mean (87)m= [Tempo (88)m= [ains – ir 371.09 an inter erature tion fac Jan 0.99 interna 19.79 erature 19.79	55.24 Internal and 393.38 Internal temper during here tor for gain Feb 0.98 Itemperates 19.92 Itempera	erature (eating poins for limited in leading	128.12 (84)m = 434.13 (heating eriods in Apr 0.93 iving are 20.47 eriods in 19.81	e (73)m 448.13 seaso n the liv ea, h1,r May 0.85 ea T1 (20.76 n rest o	n) ring m (s follo	83)m 37.02 area f ee Ta Jun 0.69 w ste 20.93 velling	watts 417.16 from Table 9a) Jul 0.53 ps 3 to 7 20.98 from Ta	396 A 0.5 7 in T 20.	.91 376.45 , Th1 (°C) ug Sep 57 0.8 Table 9c) 98 20.87 9, Th2 (°C)	Oct 0.94	3 352.95 Nov 0.98 20.11	Dec 0.99	21	(84)
(90)m= 18.24 18.42 18.76 19.22 19.59 19.79 19.82 19.82 19.72 19.3 18.72 18.22 (90) fLA = Living area ÷ (4) = 0.51 (91)	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Total g (84)m= 7. Met Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa	ains – ir 371.09 an inter erature tion fac Jan 0.99 interna 19.79 erature 19.79	55.24 Internal and 393.38 Inal temper during he tor for gain Feb 0.98 I tempera 19.92 I during he 19.8 Itor for gain tor for gain tempera 19.92	erature (eating poins for limber in leading poins for limber in leading poins for right limber in leading po	128.12 (84)m = 434.13 (heating eriods in Eving are 20.47 eriods in 19.81 est of dv	e (73)m 448.13 seaso the lives, h1,r May 0.85 ea T1 (120.76 to rest of 19.82 welling,	n) ring m (s follo 2 f dw 1, h2,	83)m 37.02 area f ee Ta Jun 0.69 w ste 20.93 velling 19.83	watts 417.16 from Take ble 9a) Jul 0.53 ps 3 to 7 20.98 from Take 19.83	396 A 0.5 7 in T 20. 19. 9a)	.91 376.45 , Th1 (°C) ug Sep 57 0.8 Table 9c) 98 20.87 9, Th2 (°C) 83 19.82	Oct 0.94 20.53	3 352.95 Nov 0.98 2 19.81	Dec 0.99 19.77		(84) (85) (86) (87) (88)
$fLA = Living area \div (4) = 0.51$ (91)	Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total g (84)m= 7. Met Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa	ains – ir 371.09 an inter erature tion fac Jan 0.99 interna 19.79 erature 19.79	55.24 Internal and 393.38 Inal temper during he tor for gain Feb 0.98 I tempera 19.92 I during he 19.8 Itor for gain tor for gain tempera 19.92	erature (eating poins for limber in leading poins for limber in leading poins for right limber in leading po	128.12 (84)m = 434.13 (heating eriods in Eving are 20.47 eriods in 19.81 est of dv	e (73)m 448.13 seaso the lives, h1,r May 0.85 ea T1 (120.76 to rest of 19.82 welling,	n) ring m (s follo 2 f dw 1, h2,	83)m 37.02 area f ee Ta Jun 0.69 w ste 20.93 velling 19.83	watts 417.16 from Take ble 9a) Jul 0.53 ps 3 to 7 20.98 from Take 19.83	396 A 0.5 7 in T 20. 19. 9a)	.91 376.45 , Th1 (°C) ug Sep 57 0.8 Table 9c) 98 20.87 9, Th2 (°C) 83 19.82	Oct 0.94 20.53	3 352.95 Nov 0.98 2 19.81	Dec 0.99 19.77		(84) (85) (86) (87) (88)
	Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total g (84)m= [7. Met Tempo Utilisa (86)m= [Mean (87)m= [Tempo (88)m= [Utilisa (89)m= [ains – ir 371.09 an inter erature tion fac Jan 0.99 interna 19.79 erature 19.79 tion fac 0.98 interna	55.24 Internal and 393.38 Inal temper during her tor for gain 19.92 Industry temperary during her 19.8 Internal and 19.8 Internal and 19.92 Intern	erature (eating poins for lime in leating poins for lime in leating poins for rough ins for rough in	128.12 (84)m = 434.13 (heating eriods in Apr 0.93 iving are 20.47 eriods in 19.81 est of do 0.91 he rest	e (73)m 448.13 seaso the lives, h1,r May 0.85 ea T1 (120.76 to rest of 19.82 welling, 10.79	n) ring m (s follo 2 f dw 1 1 1 1 1 1 1 1 1 1 1 1 1	83)m 37.02 area f ee Ta Jun 0.69 w ste 20.93 velling 19.83 ,m (se 0.59	watts 417.16 from Tak ble 9a) Jul 0.53 ps 3 to 7 20.98 from Ta 19.83 ee Table 0.39	396 A 0.57 in T 20. able 9 19. 9a) 0.4	.91 376.45 , Th1 (°C) ug Sep 57 0.8 Table 9c) 98 20.87 9, Th2 (°C) 83 19.82	Oct 0.94 20.53	3 352.95 Nov 0.98 2 19.81	Dec 0.99 19.77		(84) (85) (86) (87) (88)
Magazinternal temperature (for the whole dwelling) fl A v T4 v (4 - fl A) v T2	(92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Total g (84)m= 7. Mea Tempe Utilisa (86)m= Mean (87)m= Tempe (88)m= Utilisa (89)m= Mean	ains – ir 371.09 an inter erature tion fac Jan 0.99 interna 19.79 erature 19.79 tion fac 0.98 interna	55.24 Internal and 393.38 Inal temper during her tor for gain 19.92 I temperal 19.8	erature (eating poins for limited poins for limited poins for limited poins for limited poins for roughly limited poins fo	128.12 (84)m = 434.13 (heating eriods in Apr 0.93 iving are 20.47 eriods in 19.81 est of do 0.91 he rest	e (73)m 448.13 seaso n the liv ea, h1,r May 0.85 ea T1 (20.76 n rest o 19.82 welling 0.79 of dwel	n) ring m (s follo 2 f dw 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	83)m 37.02 area f ee Ta Jun 0.69 w ste 20.93 velling 19.83 m (se 0.59	watts 417.16 From Table 9a) Jul 0.53 ps 3 to 7 20.98 from Table 19.83 ee Table 0.39 pollow ste	396 A 0.8 7 in T 20. able 9 0.4 0.9 0.4	.91 376.45 , Th1 (°C) ug Sep 67 0.8 Table 9c) 98 20.87 9, Th2 (°C) 83 19.82 14 0.71 1 to 7 in Tabl 82 19.72	Oct 0.94 20.53 19.82 0.91 e 9c) 19.3	3 352.95 1 Nov 0.98 2 19.81 0.97	Dec 0.99 19.77 19.81 0.99		(84) (85) (86) (87) (88) (89)
wear internal temperature (for the whole dwelling) = $1LA \times 1.1 + (1 - 1LA) \times 1.2$		Total g (84)m= 7. Mea Tempe Utilisa (86)m= Mean (87)m= Tempe (88)m= Utilisa (89)m= Mean	ains – ir 371.09 an inter erature tion fac Jan 0.99 interna 19.79 erature 19.79 tion fac 0.98 interna	55.24 Internal and 393.38 Inal temper during her tor for gain 19.92 I temperal 19.8	erature (eating poins for limited poins for limited poins for limited poins for limited poins for roughly limited poins fo	128.12 (84)m = 434.13 (heating eriods in Apr 0.93 iving are 20.47 eriods in 19.81 est of do 0.91 he rest	e (73)m 448.13 seaso n the liv ea, h1,r May 0.85 ea T1 (20.76 n rest o 19.82 welling 0.79 of dwel	n) ring m (s follo 2 f dw 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	83)m 37.02 area f ee Ta Jun 0.69 w ste 20.93 velling 19.83 m (se 0.59	watts 417.16 From Table 9a) Jul 0.53 ps 3 to 7 20.98 from Table 19.83 ee Table 0.39 pollow ste	396 A 0.8 7 in T 20. able 9 0.4 0.9 0.4	.91 376.45 , Th1 (°C) ug Sep 67 0.8 Table 9c) 98 20.87 9, Th2 (°C) 83 19.82 14 0.71 1 to 7 in Tabl 82 19.72	Oct 0.94 20.53 19.82 0.91 e 9c) 19.3	3 352.95 1 Nov 0.98 2 19.81 0.97	Dec 0.99 19.77 19.81 0.99		(84) (85) (86) (87) (88) (89)
(92)m= 19.04 19.19 19.47 19.86 20.19 20.38 20.42 20.42 20.31 19.93 19.43 19.01 (92)	Apply adjustment to the mean internal temperature from Table 4e, where appropriate	Total g (84)m= 7. Met Tempo Utilisa (86)m= Mean (87)m= [Tempo (88)m= Utilisa (89)m= Mean (90)m=	ains – ir 371.09 an inter erature tion fac Jan 0.99 interna 19.79 erature 19.79 tion fac 0.98 interna 18.24	55.24 Internal and 393.38 Inal temper during he tor for gain 19.92 Itemperation 19.8 Itemperation 19.8 Itemperation 19.8 Itemperation 19.8 Itemperation 18.42	erature (eating poins for line 19.8 ins for rough) and solar ture in land ture in the 18.76	128.12 (84)m = 434.13 (heating eriods in a seriods in a seriod in a	e (73)m 448.13 seaso the lives, h1,r May 0.85 ea T1 (120.76 to rest of 19.82 welling, 19.59 of dwelling, 19.59	n) ring m (s follo 2 f dw 1 1 1 1 1 1 1 1 1	83)m 37.02 area f ee Ta Jun 0.69 w ste 20.93 velling 19.83 ,m (se 0.59 T2 (fo	watts 417.16 from Take ble 9a) Jul 0.53 ps 3 to 7 20.98 from Take 19.83 pe Table 0.39 bllow steen 19.82	396 A 0.5 7 in T 20. 9a) 0.4 19.	.91 376.45 , Th1 (°C) ug Sep 67 0.8 Table 9c) 98 20.87 9, Th2 (°C) 83 19.82 14 0.71 1 to 7 in Tabl 82 19.72	Oct 0.94 20.53 19.82 0.91 e 9c) 19.3	3 352.95 1 Nov 0.98 2 19.81 0.97	Dec 0.99 19.77 19.81 0.99		(84) (85) (86) (87) (88) (89)
		Total g (84)m= 7. Mea Tempo Utilisa (86)m= Mean (87)m= Tempo (88)m= Utilisa (89)m= Mean (90)m= Mean	ains – ir 371.09 an inter erature ation fac Jan 0.99 interna 19.79 erature 19.79 ation fac 0.98 interna 18.24	55.24 Internal and 393.38 Internal temper during her tor for gain 19.92 Internal temper during her 19.8 Internal temper during	erature (eating poins for limits for rough) eating poins for limits for limits for rough) eating poins for rough) eating poins for rough) ture in to 18.76	128.12 (84)m = 434.13 (heating eriods in Apr 0.93 iving are 20.47 eriods in 19.81 est of do 0.91 he rest of 19.22 r the wh	e (73)m 448.13 seaso the lives, h1,r May 0.85 ea T1 (for 20.76 to rest of 19.82 welling, 0.79 of dwelling, 19.59	n) ring m (s follo 2 f dw 1 h, h2,	83)m 37.02 area f ee Ta Jun 0.69 bw ste 20.93 velling 9.83 m (se 0.59 T2 (fo 9.79	watts 417.16 from Table 9a) Jul 0.53 ps 3 to 7 20.98 from Ta 19.83 pe Table 0.39 pollow ste 19.82	396 A	91 376.45 Th1 (°C) ug Sep 70.8 Table 9c) 98 20.87 9, Th2 (°C) 83 19.82 44 0.71 1 to 7 in Table 1 19.72 f - fLA) × T2	Oct 0.94 20.53 19.82 0.91 e 9c) 19.3 fLA = Li	3 352.95 Nov 0.98 2 19.81 0.97 18.72 ving area ÷ (-	Dec 0.99 19.77 19.81 0.99 18.22 4) =		(84) (85) (86) (87) (88) (89) (90) (91)
		Total g (84)m= [7. Met Tempo Utilisa (86)m= [Mean (87)m= [Utilisa (89)m= [Mean (90)m= [Mean (90)m= [ains – ir 371.09 an inter erature stion fact Jan 0.99 interna 19.79 erature 19.79 stion fact 0.98 interna 18.24 interna 19.04	55.24 Internal and 393.38 Internal temper during he tor for gain 19.92 Internal 19.8 Internal 19.92 Internal 19.19 Internal 19.19	erature (eating poins for limber of	128.12 (84)m = 434.13 (heating eriods in ving are 20.47 eriods in 19.81 est of do 0.91 he rest 19.22 r the wh 19.86	e (73)m 448.13 seaso the lives, h1,r May 0.85 ea T1 (the control of the con	n) ring m (s follo 2 f dw 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	83)m 37.02 area f ee Ta Jun 0.69 w ste 20.93 velling 19.83 m (se 0.59 T2 (fc 19.79	watts 417.16 from Tak ble 9a) Jul 0.53 ps 3 to 7 20.98 from Ta 19.83 ee Table 0.39 bllow ste 19.82 A × T1 20.42	396 A 0.5 7 in 7 20. 9a) 0.4 + (1 20.	.91 376.45 , Th1 (°C) ug Sep 57 0.8 Table 9c) 98 20.87 9, Th2 (°C) 83 19.82 14 0.71 1 to 7 in Tabl 82 19.72 f - fLA) × T2 42 20.31	358.9 Oct 0.94 20.53 19.82 0.91 e 9c) 19.3 fLA = Li	3 352.95 Nov 0.98 2 19.81 0.97 18.72 ving area ÷ (Dec 0.99 19.77 19.81 0.99 18.22 4) =		(84) (85) (86) (87) (88) (89) (90) (91)

(93)m= 19	.04 19.19	19.47	19.86	20.19	20.38	20.42	20.42	20.31	19.93	19.43	19.01		(93)
8. Space	heating req	uirement											
Set Ti to	the mean in	ternal ter	mperatui	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisa	tion factor f	or gains	using Ta	ble 9a		-							
	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	factor for g	ains, hm			1	1						1	
` '	98 0.97	0.95	0.91	0.81	0.64	0.46	0.51	0.75	0.92	0.97	0.98		(94)
	ins, hmGm	` ` ` 			г	i						ı	
` ′	3.68 382.57	394.2	394.88	363.56	278.05	192.81	200.72	281.34	328.97	341.66	351.42		(95)
	average exte	T T	. 									I	
` '	.3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	rate for me	1			i							I	()
` '	3.13 757.19	685.47	571.64	441.49	296.87	196.32	205.94	320.73	485.24	644.75	778.52		(97)
· —	ating requir	1	·		i	1	`	``	(' `		1	I	
(98)m= 312	2.07 251.75	216.7	127.27	57.98	0	0	0	0	116.27	218.23	317.76		_
							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1618.02	(98)
Space he	ating requir	ement in	kWh/m²	/year								41.41	(99)
9a. Energy	/ requireme	nts – Indi	ividual h	eating s	vstems i	ncludino	micro-C	CHP)					
Space he	· ·			.	,		,	,					
•	of space hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction	of space hea	at from m	nain svst	em(s)			(202) = 1	- (201) =				1	(202)
	of total heati		-	. ,			(204) = (2	02) x [1 –	(203)1 =			1	(204)
		_	-				() (-	,[.	(===/1				╡゛
•	of main spa											89.5	(206)
Efficiency	of seconda	ry/suppl	ementar	y heating	g system	າ, % 			-	-	_	0	(208)
J	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space he	ating requir	ement (c	alculate	d above))							1	
312	2.07 251.75	216.7	127.27	57.98	0	0	0	0	116.27	218.23	317.76		
(211)m = {	[(98)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
348	3.68 281.28	242.13	142.2	64.78	0	0	0	0	129.91	243.83	355.04		
	•	•					Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	<u></u>	1807.85	(211)
Space he	ating fuel (s	econdar	y), kWh/	month									_
•	(201)] } x 1		• •										
(215)m=	0 0	0	0	0	0	0	0	0	0	0	0		
	•	•					Tota	l (kWh/yea	ar) =Sum(2	215),5,1012	<u></u>	0	(215)
Water hea	iting										ļ		_
	m water hea	ter (calc	ulated al	oove)									
116	6.98 102.01	106.65	96.25	94.03	83.94	82.28	90.35	91.05	101.97	106.91	114.55		
Efficiency	of water hea	ater	-		-		-		-	-		89.5	(216)
(217)m= 89	9.5 89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5		(217)
Fuel for wa	ater heating	kWh/mo	onth									l	
(219)m =	(64)m x 100) ÷ (217)	m		1	1	·					1	
(219)m= 130	0.71 113.98	119.16	107.54	105.06	93.79	91.93	100.95	101.73	113.94	119.45	127.99		_
							Tota	I = Sum(2	19a) ₁₁₂ =			1326.22	(219)
Annual to									k'	Wh/year	•	kWh/year	7
Space hea	atina fuel usa	ed. main	system	1								1807.85	1
	illing raci asi	o a,a	,										J

Water heating fuel used			1326.22
Electricity for pumps, fans and electric ke	eep-hot		
central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (23	30a)(230g) =	75 (231)
Electricity for lighting			187.67 (232)
Electricity generated by PVs			-572.73 (233)
10a. Fuel costs - individual heating syst	tems:		
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.48 x 0.01 :	62.91 (240)
Space heating - main system 2	(213) x	0 x 0.01 :	0 (241)
Space heating - secondary	(215) x	13.19 × 0.01 :	0 (242)
Water heating cost (other fuel)	(219)	3.48 x 0.01 :	46.15 (247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 :	9.89 (249)
(if off-peak tariff, list each of (230a) to (23 Energy for lighting	30g) separately as applicable and a	pply fuel price according to	
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 :	= 0 (252)
Appendix Q items: repeat lines (253) and	d (254) as needed		
Total energy cost	(245)(247) + (250)(254) =		263.71 (255)
11a. SAP rating - individual heating sys	tems		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF)	$[(255) \times (256)] \div [(4) + 45.0] =$		1.32 (257)
SAP rating (Section 12)			81.62 (258)
12a. CO2 emissions – Individual heatin	g systems including micro-CHP		
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	390.49 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	286.46 (264)
Space and water heating	(261) + (262) + (263) + (264)	=	676.96 (265)
Electricity for pumps, fans and electric ke	eep-hot (231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	97.4 (268)
Energy saving/generation technologies Item 1		0.519 =	-297.25 (269)

Total CO2, kg/year	sum of (265)(271) =	516.04	(272)
CO2 emissions per m ²	(272) ÷ (4) =	13.21	(273)
El rating (section 14)		92	(274)

120 F	Primary	Engrava.
1.321 F	marv.	Energy

	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22	2205.57 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22	1617.99 (264)
Space and water heating	(261) + (262) + (263) + (264) =		3823.56 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	230.25 (267)
Electricity for lighting	(232) x	0 =	576.16 (268)
Energy saving/generation technologies Item 1		3.07	-1758.27 (269)
'Total Primary Energy	sum	of (265)(271) =	2871.7 (272)
Primary energy kWh/m²/year	(272)) ÷ (4) =	73.5 (273)

			User D	etails: _						
Assessor Name:	Natalie Wheeler			Strom:	a Num	ber:		STRC	0027778	
Software Name:	Stroma FSAP 201	2		Softwa					on: 1.0.4.6	
		Р	roperty i	Address	Be Gre	en-Flat	3-1st floo	or		
Address :	Flat 3, Hampshire s	treet								
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m	³)
Ground floor			3	9.07	(1a) x	2	2.4	(2a) =	93.77	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1r	1) 3	9.07	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	93.77	(5)
2. Ventilation rate:										
		econdar neating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	T + F	0		0	x :	20 =	0	(6b)
Number of intermittent fa	ans				_ 	2	x ·	10 =	20	(7a)
Number of passive vents	3					0	x	10 =	0	(7b)
Number of flueless gas f					Ļ			40 =		= ' '
Number of flueless gas i	iles					0		10 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	a)+(6b)+(7	'a)+(7b)+(7c) =	Γ	20		÷ (5) =	0.21	(8)
If a pressurisation test has I	been carried out or is intende	ed, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	uction			0	(11)
deducting areas of open	present, use the value corres ings); if equal user 0.35	sponaing to	tne great	er waii are	a (arter					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	• • • • • • • • • • • • • • • • • • • •	, , ,	. ,		0	(16)
•	, q50, expressed in cub		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•					. , .	,		0.46	(18)
Number of sides shelter	es if a pressurisation test ha	s been aon	ie or a deg	gree air pei	теарину	is being u	sea		2	(19)
Shelter factor	ou			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.39	(21)
Infiltration rate modified	for monthly wind speed	t								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7				-	•	-		-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
1.0	1	•					•		4	
Wind Factor $(22a)m = (2a)m =$	'			0.00		T 4.05	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]	

0.5	ation rat	0.48	0.43	0.42	0.37	0.37	0.36	0.39	0.42	0.44	0.46]	
Calculate effe		•	rate for t	he appli	cable ca	se					ļ	J	
If mechanic							.=					0	(23
If exhaust air h		0 11		, ,	,	. `	,, .	,) = (23a)			0	(23
If balanced wit		•	•	Ū		`		,				0	(23
a) If balance	1					- 		ŕ	 		<u>` </u>	· ÷ 100] 1	(0.
24a)m= 0	0	0	0	0	. 0	0	0	0	0	0	0		(24
b) If balance						- 	- ^ `	´`	 			1	(2
24b)m= 0	0	0	0	0	. ,	0	0	0	0	0	0	J	(2
c) If whole h	nouse ex n < 0.5 ×			•	•				5 v (23h	.\			
$\frac{11(220)1}{24c)m=0}$	0.5 7	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural			·									J	,_
,	n = 1, the				•				0.5]				
24d)m= 0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61]	(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	•		•	•	
25)m= 0.63	0.62	0.62	0.59	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61]	(2
2. Hoot loos	o ond bd	est lege r	aramata	~ P.								•	
3. Heat losse		•			Not Am		امدالا		A V I I		المديدات		A V I.
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	〈)	k-value kJ/m²-l		A X k kJ/K
Ooors					1.87	x	1		1.87	, 			(2
Vindows Type	e 1				6.12	x1,	/[1/(1.4)+	0.04] =	8.11				(2
Vindows Type	e 2				2.3	x ₁ ,	/[1/(1.4)+	0.04] =	3.05				(2
loor					39.07	, x	0.065	[2.53955	<u> </u>			(2
Valls	35.4	12	10.29	<u> </u>	25.13	=	0.18	<u> </u>	4.52			7 H	(2
otal area of e	<u> </u>				74.49	=	00						` (3
arty wall		,			39.62	=	0		0	— [(3
Party ceiling					39.07	=				L		-	(3
for windows and	d roof wind	ows use e	ffective wi	ndow H-va			ı formula 1	/[(1/Ll-valu	ie)+0 041 a	L Is aiven in	naragranh		(3
* include the are						atou uomg	romaia i	/[(// O Talla	0,10.01,0	o givoii iii	paragrapi	7 0.2	
abric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				20.1	(3
	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
leat capacity	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(3
		4									ahla 1f		_
hermal mass				construct	ion are not	t known pr	ecisely the	e indicative	values of	IMP in Ta	able II		
Thermal mass for design assess an be used inste	ead of a de	tailed calc	ulation.				ecisely the	indicative	values of	IMP in Ta	able II	40.07	
Thermal mass for design asses an be used inste Thermal bridg	ead of a dea es : S (L	tailed calci x Y) cal	ulation. culated (using Ap	pendix ł		ecisely the	indicative	values of	IMP In Ta	able II	13.67	(3
hermal mass or design asses an be used inste hermal bridg details of therm	ead of a de es : S (L al bridging	tailed calci x Y) cal	ulation. culated (using Ap	pendix ł		ecisely the		values of (36) =	IMP In 18	име п		
hermal mass or design asses an be used inste hermal bridg details of thermal otal fabric he	ead of a deleas: S (L al bridging eat loss	tailed calcu x Y) cal are not kn	ulation. culated (own (36) =	using Ap = 0.15 x (3	pendix ł		ecisely the	(33) +				13.67	
Thermal mass for design assess an be used inste Thermal bridg details of thermal Total fabric he	ead of a deleas: S (L al bridging eat loss	tailed calcu x Y) cal are not kn	ulation. culated to	using Ap = 0.15 x (3	pendix ł			(33) + (38)m	(36) =				
Thermal mass For design asses an be used inste Thermal bridg details of therma Total fabric he Ventilation hea	ead of a deleas: S (Leal bridging eat loss cat	tailed calcu x Y) cal- are not kn	ulation. culated (own (36) =	using Ap = 0.15 x (3	ppendix k	<	Aug	(33) +	(36) = = 0.33 × (25)m x (5))		(3
Thermal mass for design assess an be used instead fabric hermal bridg details of thermal fotal fabric hermal fabri	es : S (L al bridging eat loss at loss ca Feb	x Y) calconnected x Y) calconn	ulation. culated to own (36) = I monthly	using Ap = 0.15 x (3 / May	ppendix ł 1) Jun	Jul	Aug	(33) + (38)m Sep 17.87	(36) = = 0.33 × (Oct 18.24	25)m x (5) Nov 18.51	Dec		(3
Thermal mass for design assessan be used instead for thermal bridged details of thermal fotal fabric hermal fabric	es : S (L al bridging eat loss at loss ca Feb	x Y) calconnected x Y) calconn	ulation. culated to own (36) = I monthly	using Ap = 0.15 x (3 / May	ppendix ł 1) Jun	Jul	Aug	(33) + (38)m Sep 17.87	(36) = = 0.33 × (25)m x (5) Nov 18.51	Dec		(3

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.36	1.36	1.35	1.33	1.33	1.32	1.32	1.31	1.32	1.33	1.34	1.35		
				l .		l .	l .		Average =	Sum(40) ₁ .	12 /12=	1.33	(40)
Number of day	<u> </u>	nth (Tab	le 1a)					ı		i			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		38		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		7.02		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								·'	!				
(44)m= 73.72	71.04	68.36	65.68	63	60.32	60.32	63	65.68	68.36	71.04	73.72		
									Total = Su	m(44) ₁₁₂ =		804.23	(44)
Energy content of	f hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 109.33	95.62	98.67	86.02	82.54	71.23	66	75.74	76.64	89.32	97.5	105.88		
If inctentone are use	votor boot	ina at naint	of upo /pr	hat water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	- [1054.47	(45)
If instantaneous w		· ·	,	ı	,.	ı	, ,	, , , I		1	i		(40)
(46)m= 16.4 Water storage	14.34 loss:	14.8	12.9	12.38	10.68	9.9	11.36	11.5	13.4	14.62	15.88		(46)
Storage volum) includir	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•		•			Ū							` '
Otherwise if no	_			_			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufactHot water store			-										(51)
If community h	•			IC 2 (KVV)	ii/iiti C/GC	' y)					0		(31)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (55)									0		(55)
Water storage	loss cal	culated t	or each	month			((56)m = ((55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	 - 3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss cal	loulated	for each	month ((61)m =	(60) ÷ 36	e5 √ (41	/m						
(61)m=	37.57	32.7	34.84	32.39	32.1	29.75	30.74	32.1	32.39	34.84	35.03	37.57	1	(61)
L						<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>. </u>	<u> </u>		J (59)m + (61)m	
(62)m=	146.89	128.31	133.5	118.41	114.64	100.97	96.74	107.84	109.03	124.15	132.53	143.44		(62)
L		calculated			Appendix	x H (negativ							l	
						applies,						·		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHRS	-29.91	-26.31	-26.85	-22.16	-20.61	-17.03	-14.46	-17.49	-17.98	-22.18	-25.62	-28.89	ı	(63) (G10)
Output	from wa	ater hea	ter											
(64)m=	116.98	102.01	106.65	96.25	94.03	83.94	82.28	90.35	91.05	101.97	106.91	114.55	<u></u>	
-		-	-	-				Outp	out from w	ater heater	r (annual) ₁	12	1186.97	(64)
Heat ga	ains fror	n water	heating,	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)n	1] + 0.8 >	x [(46)m	+ (57)m	+ (59)m	1]	
(65)m=	45.74	39.97	41.52	36.7	35.47	31.12	29.63	33.21	33.58	38.41	41.18	44.6		(65)
inclu	de (57)r	n in calc	culation (of (65)m	only if c	cylinder is	s in the	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Inte	ernal ga	ins (see	Table 5	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=	69.09	69.09	69.09	69.09	69.09	69.09	69.09	69.09	69.09	69.09	69.09	69.09		(66)
Lighting	g gains	(calcula	ted in Ar	opendix '	L, equat	tion L9 or	r L9a), a	lso see	Table 5				•	
(67)m=	10.63	9.44	7.68	5.81	4.34	3.67	3.96	5.15	6.91	8.78	10.25	10.92		(67)
Appliar	nces gai	ns (calc	ulated in	1 Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	119.2	120.44	117.32	110.69	102.31	94.44	89.18	87.94	91.06	97.69	106.07	113.94		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a), also se	e Table	5			'	
(69)m=	29.91	29.91	29.91	29.91	29.91	29.91	29.91	29.91	29.91	29.91	29.91	29.91		(69)
Pumps	and far	ns gains	(Table 5	<u></u> 5а)									•	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatic	n (negat	tive valu	es) (Tab	ole 5)							•	
(71)m=	-55.27	-55.27	-55.27	-55.27	-55.27	-55.27	-55.27	-55.27	-55.27	-55.27	-55.27	-55.27		(71)
Water h	neating	gains (T	able 5)			•			,			•	•	
(72)m=	61.48	59.47	55.8	50.97	47.67	43.22	39.82	44.63	46.64	51.62	57.19	59.94		(72)
Total in	nternal	gains =	:			(66)	m + (67)r	ı + (68)m -	+ (69)m + ((70)m + (7	1)m + (72))m	•	
(73)m=	238.04	236.08	227.53	214.2	201.06	188.05	179.69	184.45	191.34	204.82	220.23	231.53		(73)
6. Sol	ar gains	s:												
Solar ga	ains are c	alculated	using sola	r flux from	Table 6a	and associ	iated equa	itions to co	nvert to th	ıe applicab	le orientat	ion.		
Orienta		Access F Table 6d		Area m²		Flu Tab	ıx ble 6a	Т	g_ able 6b	T	FF able 6c		Gains (W)	
Southea	ast 0.9x	0.77	x	2.3	3	x 3	36.79	x	0.35	х	0.8	=	16.42	(77)
Southea	ast 0.9x	0.77	x	2.3	3	x 6	62.67	x	0.35	x	0.8	=	27.97	(77)
Southea	ast 0.9x	0.77	X	2.3	3	x 8	35.75	x	0.35	_ x _	0.8		38.27	(77)
Southea														

		_													_
Southeast 0.9x	0.77	X	2.3	3	X	1	19.01	X	0.35		X	0.8	=	53.11	(77)
Southeast _{0.9x}	0.77	X	2.3	3	X	1	18.15	X	0.35		X	0.8	=	52.73	(77)
Southeast _{0.9x}	0.77	X	2.3	3	X	1	13.91	X	0.35		x	0.8	=	50.84	(77)
Southeast _{0.9x}	0.77	X	2.3	3	X	1	04.39	X	0.35		x	0.8	=	46.59	(77)
Southeast _{0.9x}	0.77	X	2.3	3	X	6	92.85	x	0.35		x	0.8	=	41.44	(77)
Southeast _{0.9x}	0.77	X	2.3	3	X	6	9.27	x	0.35		x	0.8	=	30.91	(77)
Southeast 0.9x	0.77	X	2.3	3	X		14.07	X	0.35		x [0.8	=	19.67	(77)
Southeast _{0.9x}	0.77	x	2.3	3	X	3	31.49	x	0.35		x	0.8	=	14.05	(77)
Northwest 0.9x	0.77	X	6.1	2	X	1	1.28	x	0.35		x	0.8	=	13.4	(81)
Northwest 0.9x	0.77	x	6.1	2	X	2	22.97	x	0.35		x	0.8	=	27.27	(81)
Northwest 0.9x	0.77	X	6.1	2	X		11.38	x	0.35		x	0.8	=	49.14	(81)
Northwest _{0.9x}	0.77	х	6.1	2	X	6	67.96	х	0.35		x	0.8	=	80.7	(81)
Northwest _{0.9x}	0.77	×	6.1	2	X	9	91.35	x	0.35		x	0.8	=	108.48	(81)
Northwest _{0.9x}	0.77	x	6.1	2	X	9	7.38	x	0.35		x	0.8	=	115.65	(81)
Northwest _{0.9x}	0.77	×	6.1	2	X		91.1	x	0.35		x	0.8	_ =	108.18	(81)
Northwest _{0.9x}	0.77	×	6.1	2	X	7	72.63	x	0.35		x	0.8	=	86.25	(81)
Northwest _{0.9x}	0.77	×	6.1	2	X	5	50.42	x	0.35		x	0.8	_ =	59.88	(81)
Northwest _{0.9x}	0.77	×	6.1	2	X	2	28.07	x	0.35		x	0.8		33.33	(81)
Northwest _{0.9x}	0.77	x	6.1	2	X		14.2	x	0.35		x	0.8		16.86	(81)
Northwest _{0.9x}	0.77	x	6.1	2	X		9.21	х	0.35		x	0.8	=	10.94	(81)
															_
Solar gains in	watts calcu	lated	for eacl	n montl	h			(83)m	ı = Sum(74)ı	m(82	2)m				
(83)m= 29.82		7.41	128.12	161.59	$\overline{}$	68.38	159.02	132		_	1.24	36.53	24.99		(83)
Total gains – i	nternal and	solar	(84)m =	: (73)m	+ (83)m	, watts					1	<u> </u>	_	
(84)m= 267.86	291.32 31	4.94	342.31	362.64	3	56.43	338.71	317	.29 292.6	55 26	9.07	256.76	256.53		(84)
7. Mean inter	nal tempera	ture ((heating	seaso	n)			•	•	•					
Temperature	•		`			area	from Tal	ole 9	Th1 (°C)					21	(85)
Utilisation fac	•	•			_				, ,						
Jan		Mar	Apr	May	Ť	Jun	Jul	Α	ug Sei	рТ	Oct	Nov	Dec		
(86)m= 1	0.99 0	.99	0.97	0.91	+	0.78	0.63	0.6		_	.98	0.99	1	_	(86)
Mean interna	l temperatu	re in I	iving ar	ea T1 /	follo	w ste	ns 3 to 7	in T	able 9c)					<u>-</u>	
(87)m= 19.56	 	9.95	20.3	20.65	_	20.88	20.97	20.		8 20	0.35	19.9	19.54		(87)
	<u> </u>						<u>ļ</u>							_	
Temperature (88)m= 19.79		9.8	19.81	19.82	$\overline{}$	9.83	19.83	19.	<u> </u>		9.82	19.81	19.81	1	(88)
	<u> </u>								13.02		J.02	13.01	13.01	_	(00)
Utilisation fac					$\overline{}$			<u> </u>				1 0 00		7	(00)
(89)m= 1	0.99 0	.98	0.96	0.87		0.69	0.48	0.5	0.82		.97	0.99	1		(89)
Mean interna	l temperatu	re in t	he rest	of dwel	ling	T2 (f	ollow ste	ps 3	to 7 in Ta	able 9	c)			7	
(90)m= 17.91	18.1 18	3.47	18.99	19.46	1	9.75	19.82	19.	81 19.64		9.07	18.42	17.89		(90)
										fLA =	= Liv	ing area ÷ (4	1) =	0.51	(91)
Mean interna	ıl temperatu	re (fo	r the wh	ole dw	ellin	g) = f	LA × T1	+ (1	– fLA) × ٦	Γ2					
(92)m= 18.76	 	9.23	19.66	20.07	$\overline{}$	20.33	20.41	20		\neg	9.73	19.18	18.74		(92)
Apply adjusts	• • • • • •						-					•		_	
Apply adjusti	ment to the r	nean	internal	tempe	ratu	ire fro	m Table	4e,	where ap _l	propri	ate				

ı	-					T		1		T			ı	
(93)m=	18.76	18.92	19.23	19.66	20.07	20.33	20.41	20.4	20.22	19.73	19.18	18.74		(93)
			uirement											
			ernal ter or gains	•		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
inc at	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		iviay	Ouri	<u> </u>	l mag	СОР		1101	500		
(94)m=	0.99	0.99	0.98	0.95	0.88	0.73	0.56	0.61	0.85	0.96	0.99	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (9 ⁴	4)m x (84	4)m	<u>!</u>	<u>!</u>			<u>I</u>	<u>!</u>		l	
(95)m=	266.17	288.46	308.99	326.61	320.35	261.41	188.45	194.01	248.26	259.47	253.99	255.19		(95)
Month	nly 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 I	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			•	
(97)m=	768.22	742.79	672.4	561.29	435.18	294.64	195.74	205.06	316.08	474.75	631.46	763.95		(97)
Space		g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4				
(98)m=	373.52	305.31	270.37	168.97	85.43	0	0	0	0	160.17	271.78	378.52		_
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	2014.08	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								51.55	(99)
9a. En	eray red	uiremer	nts – Indi	ividual h	eating s	vstems i	ncludino	micro-C	CHP)					
	e heatir				<u> </u>	,			,					
-		•	at from s	econdar	y/supple	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 heati	ng from	main svs	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
			ace heat	-									89.5	(206)
	•	-	ry/suppl			n evetan	n %						0	(208)
Lindic								Aug	Con	Oct	Nov	Doo		」 ` ′
Space	Jan	Feb	Mar ement (c	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ai
Opace	373.52	305.31	270.37	168.97	85.43	0	0	0	0	160.17	271.78	378.52		
(211)m												0.0.02		(244)
(211)11	417.35)III X (20 341.13	4)] } x 1	188.79	95.46	0	0	0	0	178.96	303.67	422.93		(211)
	417.55	341.13	302.09	100.79	33.40				l (kWh/yea				2250.37	(211)
Cnaa	o bootin	a fuel (e		v/ 14//h/	manth				(, Ga (-	- · · /15,1012	2	2230.37	_(211)
•		•	econdar 00 ÷ (20	• •	monun									
(215)m=		0	0 . (20	0	0	0	0	0	0	0	0	0		
` '							<u> </u>	Tota	l I (kWh/yea	ar) =Sum(2	<u>l</u> 215), _{510 13}	<u> </u> =	0	(215)
Water	heating										,		<u> </u>	」 ` '
	_	•	ter (calc	ulated al	oove)									
'	116.98	102.01	106.65	96.25	94.03	83.94	82.28	90.35	91.05	101.97	106.91	114.55		
Efficier	ncy of w	ater hea	iter				•	•	•	•	•	•	89.5	(216)
(217)m=	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5		(217)
Fuel fo	r water	heating,	kWh/mo	onth			•	•	•	•	•		•	
) ÷ (217)				1						I	
(219)m=	130.71	113.98	119.16	107.54	105.06	93.79	91.93	100.95	101.73	113.94	119.45	127.99		_
								Tota	I = Sum(2				1326.22	(219)
	l totals	fuol ···	nd ma!-	ovete ==	1					k'	Wh/year	I	kWh/year	7
opace	neaung	iuei use	ed, main	system	I								2250.37	╛

					_
Water heating fuel used				1326.22	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230)a)(230g) =		75	(231)
Electricity for lighting				187.67	(232)
Electricity generated by PVs				-572.73	(233)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh		Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	486.08	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	286.46	(264)
Space and water heating	(261) + (262) + (263) + (264) =			772.54	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	97.4	(268)
Energy saving/generation technologies Item 1		0.519	=	-297.25	(269)
Total CO2, kg/year	sur	m of (265)(271) =		611.63	(272)
Dwelling CO2 Emission Rate	(27	(2) ÷ (4) =		15.65	(273)

El rating (section 14)

(274)

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SAP 2012 Overheating Assessment

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

Dwelling type: Flat Located in: **England**

Region: South East England

Cross ventilation possible: Yes Number of storeys:

Front of dwelling faces: North East

Overshading: Average or unknown Overhangs: as detailed below Thermal mass parameter: **Indicative Value Medium**

Night ventilation: False

Blinds, curtains, shutters:

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

Summer ventilation heat loss coefficient: (P1) 92.83

Transmission heat loss coefficient: 33.8

Summer heat loss coefficient: 126.6 (P2)

Overhangs:

Orientation: Ratio: **Z_overhangs:**

North West (Lounge terrace 1doors) 0.78 South East (Bedroom) 0.57 0.64

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North West (Lounge	terralce doors)	0.9	0.78	0.68	(P8)
South East (Bedroon	n) 1	0.9	0.64	0.54	(P8)

South East (Bedroom)

0.9 0.64 0.54

Orientation	Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains
North West (Lounge terrace of	oors).12	105.45	0.35	0.8	0.68	110.48
South East (Bedroom) 0.9 x	2.3	126.97	0.35	0.8	0.54	39.55
					Total	150.03 (P3/P4)

	June	July	August	
Internal gains	265.65	255.14	261.08	
Total summer gains	426.51	405.17	386.85	(P5)
Summer gain/loss ratio	3.37	3.2	3.06	(P6)
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	19.02	20.85	20.81	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

			User D	etails: _						
Assessor Name:	Natalie Wheeler			Strom:	a Num	ber:		STRC	0027778	
Software Name:	Stroma FSAP 20°	12		Softwa					on: 1.0.4.6	
		Р	roperty i	Address:	Be Gre	en-Flat	6 - 1st F	loor		
Address :	Flat 6, Hampshire s	street								
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)	_	Volume(m ³	<u>-</u>
Ground floor			8	35.3	(1a) x	2	2.4	(2a) =	204.72	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1r	n) [35.3	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	(3n) =	204.72	(5)
2. Ventilation rate:										
		econdar heating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0] = [0	X ·	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ns				, <u> </u>	2	x	10 =	20	(7a)
Number of passive vents					L	0	x	10 =	0	(7b)
·					Ļ					=
Number of flueless gas fi	res					0		40 =	0	(7c)
								Air ch	hanges per ho	our
Infiltration due to chimney	ys, flues and fans = (6	6a)+(6b)+(7	'a)+(7b)+(7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has b	een carried out or is intend	ed, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in the	ne dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
if both types of wall are prideducting areas of openir	resent, use the value corres nas): if eaual user 0.35	sponding to	the great	er wall are	a (atter					
If suspended wooden f	• / .	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0								0	(13)
Percentage of windows	s and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cul	bic metre	s per ho	our per so	quare m	etre of e	envelope	area	5	(17)
If based on air permeabil	ity value, then $(18) = [(7)]$	17) ÷ 20]+(8	B), otherwi	ise (18) = (16)				0.35	(18)
Air permeability value applie		s been don	ne or a deg	gree air pei	meability	is being u	sed			_
Number of sides sheltere Shelter factor	ed			(20) = 1 -	0 075 x (1	9)1 –			2	(19)
Infiltration rate incorporat	ing shelter factor			(21) = (18)		0/] =			0.85	(20)
•		d		(21) = (10)	X (20) =				0.3	(21)
Infiltration rate modified for	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	7	
L 1		Juli	Jui	Aug	Sep	Oct	INOV	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	7	
(22)m= 5.1 5	4.4 4.3	3.0	3.0	3.1	4	۲.۵	1 4.3	4./	J	
Wind Factor (22a)m = $(22a)$ m =	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		

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	
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			- ` ` 	- ` ` - 	í `	<u> </u>	- 	```	÷ 100] I	(24a)
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanced n					- 		ŕ	 		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>	<u> </u>	_			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	A 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	– [(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 0 - vaic	ic)+0.0+j a	is given in	paragrapi	1 0.2	
Fabric heat loss,	N/K = S (A x)	(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) ₁		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) ₁	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 ₋ 13 Ω)2)]	1013 v /	Γ Ε Λ ₋ 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) ₁₁₂ =	<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) ₁₁₂ =	=	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 :c.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	-					
(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) _{1.}	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 ² 272.15	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 ² 272.15	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 ² 272.15 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 ² 272.15 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 ² 272.15 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 ² 272.15 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 ² 272.15 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 ² 272.15 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 ² 272.15 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 ² 272.15 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 ² 272.15 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 ² 272.15 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 + (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		(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 ² 272.15 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 anvert to the g_	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 ² 272.15 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] _x	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] ^] _x	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] ^] _x	2.3] ^] x	50.42] ^] _x	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] ^] _x	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 0.9x	0.77] ^] x	1.82] ^] x	106.25] ^] _x	0.35	X	0.8]	37.52	(77)
Southeast 0.9x	0.77]	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]	1.82] ^] _x	104.39] ^] _x	0.35	X	0.8]] ₌	36.87	(77)
Southeast 0.9x	0.77]	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]]	1.82]]	44.07]] _x	0.35	x	0.8] ₌	15.56	(77)
Southeast 0.9x	0.77]]	1.82	l X	31.49]]	0.35	X	0.8] _	11.12	(77)
Northwest _{0.9x}	0.77]]	5.22) x	11.28]]	0.35	X	0.8] =	11.43	(81)
Northwest _{0.9x}	0.77	X	4.35) x	11.28] x	0.35	X	0.8] =	9.52	(81)
Northwest _{0.9x}	0.77	X	5.22	x	22.97) x	0.35	X	0.8] =	23.26	(81)
Northwest _{0.9x}	0.77	X	4.35) x	22.97) x	0.35	x	0.8) =	19.39	(81)
Northwest _{0.9x}	0.77	X	5.22	X	41.38) X	0.35	x	0.8	=	41.91	(81)
Northwest _{0.9x}	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 _{0.9x}	0.77	X	4.35	x	67.96	X	0.35	x	0.8	, =	57.36	(81)
Northwest _{0.9x}	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 _{0.9x}	0.77	X	5.22	x	97.38	x	0.35	x	0.8	=	98.64	(81)
Northwest _{0.9x}	0.77	X	4.35	x	97.38	x	0.35	x	0.8	j =	82.2	(81)
Northwest _{0.9x}	0.77	X	5.22	x	91.1	x	0.35	X	0.8	=	92.28	(81)
Northwest _{0.9x}	0.77	×	4.35	x	91.1	x	0.35	x	0.8	i =	76.9	(81)
Northwest _{0.9x}	0.77	×	5.22	x	72.63	×	0.35	x	0.8	i =	73.56	(81)
Northwest _{0.9x}	0.77	×	4.35	x	72.63	×	0.35	x	0.8	=	61.3	(81)
Northwest _{0.9x}	0.77	×	5.22	x	50.42	×	0.35	x	0.8	j =	51.07	(81)
Northwest _{0.9x}	0.77	X	4.35	x	50.42	x	0.35	x	0.8	j =	42.56	(81)
_		_		•		•		ı		•	•	_

Northwes	st _{0.9x}	0.77	X	5.2	22	x	2	28.07	X		0.35	x	0.8	=	28.43	(81)
Northwes	st _{0.9x}	0.77	х	4.3	35	x	2	28.07	х		0.35	x	0.8		23.69	(81)
Northwes	st _{0.9x}	0.77	X	5.2	22	x		14.2	х		0.35	x	0.8	=	14.38	(81)
Northwes	st _{0.9x}	0.77	X	4.3	35	x		14.2	x		0.35	x	0.8	=	11.98	(81)
Northwes	st _{0.9x}	0.77	x	5.2	22	x	,	9.21	x		0.35	_ x [0.8	_ =	9.33	(81)
Northwes	st _{0.9x}	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)
_			<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:	- -	- (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 [``	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	

			Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3058.89	(98)
Space heating requirement in kWh/m²/year								35.86	(99)
9a. Energy requirements – Individual heating sy	/stems i	ncluding	micro-C	HP)					
Space heating:		1					Г		¬,,,,,
Fraction of space heat from secondary/suppler	mentary	-		(204)			Ĺ	0	(201)
Fraction of space heat from main system(s)			(202) = 1 -	,	(202)] _		Ĺ	1	(202)
Fraction of total heating from main system 1			(204) = (204)	02) x [1 –	(203)] =		Ĺ	1	(204)
Efficiency of main space heating system 1		. 0/					Ĺ	89.5	(206)
Efficiency of secondary/supplementary heating					1	1		0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated above) 581.44 473.92 412.63 246.21 110.33	0	0	0	0	225.83	413.89	594.63		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$					1				(211)
649.66 529.52 461.04 275.09 123.27	0	0	0	0	252.32	462.45	664.4		(= : : /
		<u> </u>	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	3417.76	(211)
Space heating fuel (secondary), kWh/month							_		
= {[(98)m x (201)] } x 100 ÷ (208)						1			
(215)m= 0 0 0 0 0	0	0	0 Tota	0	0 ar) =Sum(2	0	0		7(0.15)
Mater heating			Tota	i (KVVII/yea	ai) =3uiii(2	213) _{15,1012}		0	(215)
Water heating Output 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		
Efficiency of water heater								89.5	(216)
(217)m= 89.5 89.5 89.5 89.5 89.5	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 ÷ (217)m									
(219)m= 174.84 154.26 161.77 146.65 143.6	128.58	126.66	138.67	139.62	155.79	162.29	171.23		
			Tota	I = Sum(2	19a) ₁₁₂ =			1803.97	(219)
Annual totals					k\	Wh/year		kWh/yea	<u></u>
Space heating fuel used, main system 1								3417.76	╛
Water heating fuel used								1803.97	
Electricity for pumps, fans and electric keep-hot	t								
central heating pump:							30		(2300
boiler with a fan-assisted flue							45		(230
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								369.03	<u> </u>
Electricity generated by PVs							L T	-937.15	` / (233)
10a. Fuel costs - individual heating systems:							L	307.10	`'
	Fu	el			Fuel P			Fuel Cost	

kWh/year

£/year

(Table 12)

Space heating - main system 1	(211) x	3.48 × 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 x 0.01 =	9.89 (249)
(if off-peak tariff, list each of (230a) to Energy for lighting	(230g) separately as applicable and a	apply fuel price according to 13.19 x 0.01 =	
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	0 (252)
Appendix Q items: repeat lines (253) a	and (254) as needed	10.10	
Total energy cost	(245)(247) + (250)(254) =		360.28 (255)
11a. SAP rating - individual heating s	ystems		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =		1.16 (257)
SAP rating (Section 12)			83.8 (258)
12a. CO2 emissions – Individual hea	ting systems including micro-CHP		
	Energy	Emission factor	Emissions
			LIIIISSIUIIS
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating (main system 1)	<u> </u>	kg CO2/kWh	kg CO2/year
Space heating (main system 1) Space heating (secondary)	kWh/year		
	kWh/year	0.216 =	738.24 (261)
Space heating (secondary)	kWh/year (211) x (215) x	0.216 = 0.519 = 0.216 =	738.24 (261)
Space heating (secondary) Water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	0.216 = 0.519 = 0.216 =	738.24 (261) 0 (263) 389.66 (264)
Space heating (secondary) Water heating Space and water heating	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264)	0.216 = 0.519 = 0.216 = = = = = = = = = = = = = = = = = = =	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies Item 1	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269) 871.96 (272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x	0.216 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269) 871.96 (272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year CO2 emissions per m²	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x	0.216 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269) 871.96 (272) 10.22 (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14)	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x s	$\begin{array}{c} 0.216 \\ 0.519 \\ 0.216 \end{array} = \begin{array}{c} 0.519 \\ 0.519 \\ 0.519 \end{array} = \begin{array}{c} 0.519 \\ 0.519 \\ 0.519 \end{array} = \begin{array}{c} 0.519 \\$	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269) 871.96 (272) 10.22 (273) 91 (274)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14)	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x	0.216 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269) 871.96 (272) 10.22 (273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14)	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x S Energy	0.216 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269) 871.96 (272) 10.22 (273) 91 (274) P. Energy
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x s Energy kWh/year	0.216 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269) 871.96 (272) 10.22 (273) 91 (274) P. Energy kWh/year
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy Space heating (main system 1)	kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) keep-hot (231) x (232) x s Energy kWh/year (211) x	0.216 = 0.519	738.24 (261) 0 (263) 389.66 (264) 1127.89 (265) 38.93 (267) 191.53 (268) -486.38 (269) 871.96 (272) 10.22 (273) 91 (274) P. Energy kWh/year 4169.66 (261)

Primary energy kWh/m²/year		(272) ÷ (4) =	56.94 (273)
'Total Primary Energy		sum of (265)(271) =	4856.63 (272)
Energy saving/generation technologies Item 1		3.07	-2877.05 (269)
Electricity for lighting	(232) x	0 =	1132.92 (268)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	230.25 (267)

			User D	etails:						
Assessor Name:	Natalie Wheeler			Strom					0027778	
Software Name:	Stroma FSAP 20			Softwa			_		on: 1.0.4.6	
	5 1.0.11		roperty	Address	: Be Gre	en-Flat	6 - 1st F	loor		
Address:	Flat 6, Hampshire	street								
1. Overall dwelling dime	ensions:		۸۳۵	o/m²\		۸۰, ۵۰	iaht/m\		Volume(m ³	11
Ground floor				a(m²) 85.3	(1a) x		ight(m) 2.4	(2a) =	204.72	(3a)
	-) . (4 -) . (4 -) . (4 -) . (4						2.4	_(2u) =	204.72	(04)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	re)+(II	')	85.3	(4)					_
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	204.72	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [0] = [0	X	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0		0	x :	20 =	0	(6b)
Number of intermittent fa	ans					2	x	10 =	20	一 (7a)
Number of passive vents	3				<u> </u>	0	x	10 =	0	(7b)
·					L					= ' '
Number of flueless gas f	ires					0		40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	we flues and fans -	(6a)+(6b)+(7	7a)+(7h)+(7c) =	Г					_
If a pressurisation test has					continue fr	20 rom (9) to		÷ (5) =	0.1	(8)
Number of storeys in t		aca, p. cccc	a 10 (),			o (o) to	(1.9)		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timbe	r frame or	0.35 fo	r masoni	ry consti	uction			0	(11)
	present, use the value corre	esponding to	the great	ter wall are	a (after					
deducting areas of open If suspended wooden		aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	,	,	(000	, c.cc	00.				0	(13)
Percentage of window	•								0	(14)
Window infiltration	_			0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cu	ubic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	-								0.35	(18)
Air permeability value applie		as been dor	ne or a de	gree air pe	rmeability	is being u	sed			7
Number of sides sheltered Shelter factor	ea			(20) = 1 -	[0.075 x (*	19)1 =			0.85	(19)
Infiltration rate incorpora	ting shelter factor			(21) = (18		- /1			0.83	(21)
Infiltration rate modified	•	ed.		()	, (==,				0.3	(21)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	ı	1	1 222	1	1	1 - 55	J	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
, , , , , , , , , , , , , , , , , , , ,	1 1	1	L		<u> </u>	<u> </u>		<u> </u>	J	
Wind Factor $(22a)m = (2a)m =$	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	`	ì ´	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>	i	· ` `	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	〈)	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	= :	10.93	=		7	(2
otal area of e					161.5	=							^` (;
arty wall		,			32.7	=	0		0	– [(3
arty ceiling					85.3	_			U			- -	(
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	 1 3.2	(
include the area							,	71(17 - 1511	,	J	, g p.		
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		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) ₁	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) ₁	12 /12=	1.1	(40)
Jan Feb		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.	!			!	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		¬
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) ₁₁₂ : 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) ₁₁₂ :	=	1493.14	(45)
If instantaneous water hea		· ·						1	i	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:	الممسماء		!	(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 ^o	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 _{0.9x}	0.77	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 _{0.9x}	0.77	X	2.3	X	97.38	X	0.35	X	0.8	=	43.46	(75)
Northeast _{0.9x}	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 _{0.9x}	0.77	X	2.3	X	50.42	X	0.35	X	0.8	=	22.5	(75)
Northeast _{0.9x}	0.77	X	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	X	9.21	X	0.35	X	0.8	=	4.11	(75)
Southeast 0.9x	0.77	X	1.82	X	36.79	Х	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 _{0.9x}	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 _{0.9x}	0.77	X	5.22	x	11.28	x	0.35	x	0.8	=	11.43	(81)
Northwest _{0.9x}	0.77	X	4.35	X	11.28	X	0.35	X	0.8	=	9.52	(81)
Northwest _{0.9x}	0.77	X	5.22	x	22.97	x	0.35	x	0.8	=	23.26	(81)
Northwest _{0.9x}	0.77	X	4.35	x	22.97	х	0.35	x	0.8	=	19.39	(81)
Northwest _{0.9x}	0.77	X	5.22	x	41.38	х	0.35	x	0.8	=	41.91	(81)
Northwest _{0.9x}	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 _{0.9x}	0.77	x	4.35	x	67.96	x	0.35	x	0.8] =	57.36	(81)
Northwest _{0.9x}	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 _{0.9x}	0.77	x	5.22	x	97.38	x	0.35	x	0.8	=	98.64	(81)
Northwest _{0.9x}	0.77	x	4.35	x	97.38	х	0.35	х	0.8	j =	82.2	(81)
Northwest _{0.9x}	0.77	x	5.22	x	91.1	x	0.35	x	0.8	j =	92.28	(81)
Northwest _{0.9x}	0.77	×	4.35	x	91.1	x	0.35	x	0.8	j =	76.9	(81)
Northwest _{0.9x}	0.77	×	5.22	x	72.63	x	0.35	x	0.8	i =	73.56	(81)
Northwest _{0.9x}	0.77	x	4.35	×	72.63	x	0.35	x	0.8	j =	61.3	(81)
Northwest _{0.9x}	0.77	×	5.22	×	50.42	x	0.35	x	0.8	=	51.07	(81)
Northwest _{0.9x}	0.77	x	4.35	X	50.42	x	0.35	x	0.8	, =	42.56	(81)
L_		1				1		ı				

Northwe	est _{0.9x}	0.77	X	5.2	22	x	2	8.07	x		0.35	x	0.8	=	28.43	(81)
Northwe	est _{0.9x}	0.77	X	4.3	35	x	2	8.07	x		0.35	x	0.8	=	23.69	(81)
Northwe	est _{0.9x}	0.77	X	5.2	22	x		14.2	x		0.35	x	0.8	=	14.38	(81)
Northwe	est _{0.9x}	0.77	X	4.3	35	x		14.2	x		0.35	x	0.8	=	11.98	(81)
Northwe	est _{0.9x}	0.77	X	5.2	22	x	(9.21	x		0.35	x	0.8	_ =	9.33	(81)
Northwe	est _{0.9x}	0.77	х	4.3	35	x	Ç	9.21	x		0.35	x	0.8	=	7.78	(81)
	_								•							
Solar g	ains in	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	26	6.03	250.06	204	.14	148.92	89.11	48.26	32.34		(83)
Total g	ains – iı	nternal a	nd solar	(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)										
				eriods ir		<i>'</i>	area f	from Tab	ole 9	, Th	1 (°C)				21	(85)
•		J	٠.	living are		•					()					
	Jan	Feb	Mar	Apr	May	r	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.95	C).85	0.7	0.7	Ŭ	0.94	0.99	1	1		(86)
Mean	intorna	l tompor	ature in	living are	na T1 /f/	ىمالد	w cto	ns 3 to 7	in T				1	I.		
(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						L				1 -0.0.	1		(- /
٠,				eriods ir							<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)
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	C).77	0.56	0.6	63	0.9	0.99	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing	T2 (f	ollow ste	ps 3	3 to 7	7 in Tabl	e 9c)				
(90)m=	18.28	18.43	18.74	19.19	19.63	1	9.92	20	19.	.99	19.8	19.26	18.7	18.26		(90)
•						•					f	LA = Livir	ng area ÷ (4	4) =	0.36	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	llind	r) = fl	A × T1	+ (1	– fl	A) x T2					
(92)m=	18.8	18.94	19.21	19.61	20	_	9 <i>)</i> – 1. 0.27	20.35	20.		20.15	19.67	19.17	18.78		(92)
		nent to t	L he mear	internal	temper	ı atu	re fro	m Table	4e.	whe		opriate		ļ	l	
(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. Spa	ace hea	ting requ	uirement													
Set Ti	i to the r	mean int	ernal ter	mperatui	e obtair	ned	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a	_							1		1	
	Jan	Feb	Mar	Apr	May	L.	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
			ains, hm			_							1		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)
ı			· `	4)m x (84		_				-			1	ı	1	(0-)
(95)m=		473.1	507.06	544.05	549.11	<u> </u>	52.68	336	345	5.02	424.77	426.07	416.95	421.64		(95)
I			i	perature		_									1	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7		4.6	16.6	16		14.1	10.6	7.1	4.2		(96)
1			r	al tempe		_			- `	_	<u> </u>		4405.00	4075 70	1	(07)
` ´			l	1005.03			26.93	348.24	365		563.83	849.76		1375.76		(97)
· .			·	r each n		vvn, T				- `	<u> </u>	<u> </u>	r	700.06]	
(98)m=	698.64	577.19	518.29	331.9	169.98		0	0	C	,	0	315.23	517.2	709.86		

	Tota	al per year	(kWh/year) = Sum(9	8) _{15,912} =	3838.29	(98)
Space heating requirement in kWh/m²/year						45	(99)
a. Energy requirements – Individual heating systems in	cluding micro-(CHP)					
Space heating:					_		_
Fraction of space heat from secondary/supplementary s	•					0	(201)
Fraction of space heat from main system(s)	,	- (201) =				1	(202)
Fraction of total heating from main system 1	$(204) = (2)^{-1}$	202) × [1 –	(203)] =			1	(204
Efficiency of main space heating system 1					L	89.5	(206
Efficiency of secondary/supplementary heating system,	%					0	(208
Jan Feb Mar Apr May Jun	Jul Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated above)				1	-		
698.64 577.19 518.29 331.9 169.98 0	0 0	0	315.23	517.2	709.86		
211)m = {[(98)m x (204)] } x 100 ÷ (206)	1			1	 1		(211
780.6 644.9 579.1 370.84 189.92 0	0 0	0	352.21	577.88	793.14		_
	Tota	al (kWh/yea	ar) =Sum(2	211) _{15,1012}	F	4288.6	(211
Space heating fuel (secondary), kWh/month							
$\{[(98)m \times (201)]\} \times 100 \div (208)$ $(15)m = $	0 0	0	0	0	0		
		al (kWh/yea				0	(21
Value 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		
fficiency of water heater	-		-			89.5	(216
117)m= 89.5 89.5 89.5 89.5 89.5 89.5	89.5 89.5	89.5	89.5	89.5	89.5		(21
uel for water heating, kWh/month							
(219) m = (64) m x $100 \div (217)$ m (19) m = $(174.84 \mid 154.26 \mid 161.77 \mid 146.65 \mid 143.6 \mid 128.58 \mid 143.6 \mid 143.6$	126.66 138.67	139.62	155.79	162.29	171.23		
		al = Sum(2		.02.20		1803.97	(219
nnual totals			k\	Wh/year		kWh/yea	
pace heating fuel used, main system 1				•		4288.6	
/ater heating fuel used					Ī	1803.97	ī
lectricity for pumps, fans and electric keep-hot					L		
central heating pump:					30		(23
boiler with a fan-assisted flue					45		(23
otal electricity for the above, kWh/year	sun	n of (230a).	(230g) =			75	(23
lectricity for lighting					Ī	369.03	(232
lectricity for lighting					<u> </u>		=
lectricity generated by PVs						-937.15	(233

Energy

kWh/year

Emissions

kg CO2/year

Emission factor

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216 =	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)
Energy saving/generation technologies Item 1		0.519 =	-486.38	(269)
Total CO2, kg/year	sum	of (265)(271) =	1060.07	(272)
Dwelling CO2 Emission Rate	(272	2) ÷ (4) =	12.43	(273)
El rating (section 14)			89	(274)

SAP 2012 Overheating Assessment

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

Dwelling type: Flat Located in: **England**

Region: South East England

Cross ventilation possible: Yes Number of storeys: 1

Front of dwelling faces: North East

Overshading: Average or unknown Overhangs: as detailed below Thermal mass parameter: **Indicative Value Medium**

Night ventilation: False

Blinds, curtains, shutters:

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

Summer ventilation heat loss coefficient: (P1) 202.67

Transmission heat loss coefficient: 56.5

Summer heat loss coefficient: 259.19 (P2)

Overhangs:

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

North West (Lounge terrace 1doors) 0.79 North West (bedroom ter@a@@ doors) 0.79 South East (Bedroom) 0.57 0.64 North East (Bedroom) 1

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North West (Lounge	e terrace doors)	0.9	0.79	0.69	(P8)
North West (bedroo	m terface doors)	0.9	0.79	0.69	(P8)
South East (Bedroom	m) 1	0.9	0.64	0.54	(P8)
North East (Bedroor	m) 1	0.9	1	0.9	(P8)

Solar gains:

Orientation A	rea	Flux	g_{-}	FF	Shading	Gains
North West (Lounge terrace aloors)	.22	105.45	0.35	0.8	0.69	95.59
North West (bedroom ter@a@exdoors	335	105.45	0.35	8.0	0.69	79.66
South East (Bedroom) 0.9 x 1	.82	126.97	0.35	8.0	0.54	31.29
North East (Bedroom) 0.9 x 2	.3	105.45	0.35	8.0	0.9	55.01
				T	otal	261 55 (P3/P4)

Internal gains:

	June	July	August
Internal gains	455.39	436.87	445.96
Total summer gains	736.94	698.43	661.04 (P5)
Summer gain/loss ratio	2.84	2.69	2.55 (P6)
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 (P7)
Likelihood of high internal temperature	Not significant	Not significant	Not significant

SAP 2012 Overheating Assessment

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

			Hear F	otaile: -						
Assessor Name: Software Name:	Natalie Wheeler Stroma FSAP 201						0027778 on: 1.0.4.6			
Address :	Flat 7, Hampshire s		roperty .	Address	Be Gre	en-Flat	7-2nd Fl	oor		
1. Overall dwelling dim	•	ti cot								
J			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor				<u> </u>	(1a) x		2.4	(2a) =	150.96	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n	1)	62.9	(4)			_		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	150.96	(5)
2. Ventilation rate:										
		econdary neating	у	other		total			m³ per hoι	ır
Number of chimneys	0 +	0	+	0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	- - - -	0	Ī = Ē	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans					2	x ·	10 =	20	(7a)
Number of passive vent	S				F	0	x ·	10 =	0	(7b)
Number of flueless gas						0	x 4	40 =	0	(7c)
Trainice: er meerees gee					L					(, o)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	Sa)+(6b)+(7	a)+(7b)+(7c) =	Γ	20		÷ (5) =	0.13	(8)
	been carried out or is intend	ed, proceed	d to (17), d	otherwise (ontinue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)						[(0)	41.0.4	0	(9)
Additional infiltration [(9)-1]x0.1 = Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction							0	(10)		
	o.25 for steer or timber present, use the value corres				•	uction			0	(11)
deducting areas of open	nings); if equal user 0.35									
·	floor, enter 0.2 (unsea	led) or 0.	1 (seale	ed), else	enter 0				0	(12)
• •	nter 0.05, else enter 0								0	(13)
· ·	vs and doors draught s	tripped		0.25 [0.2	v (14) · 1	001 -			0	(14)
Window infiltration $0.25 - [0.2 \times (14)]$ Infiltration rate (8) + (10) + (11)							+ (15) =		0	(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area						5	(16)			
If based on air permeab	• • •		•	•	•	ou o o	листорс	arca	0.38	(18)
·	ies if a pressurisation test ha					is being u	sed		0.00	()
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.33	(21)
Infiltration rate modified	for monthly wind speed	t t						1	7	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (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]	
				ь		<u> </u>		L	1	

djusted infiltration rate (allowing for shelte	er and wind s	peed) =	(21a) x	(22a)m	·	ı	1	-	
	35 0.31	0.31	0.3	0.33	0.35	0.37	0.38]	
alculate effective air change rate for the a If mechanical ventilation:	аррисавіе са	SE						0	
If exhaust air heat pump using Appendix N, (23b) =	= (23a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	
If balanced with heat recovery: efficiency in % allow	wing for in-use fa	actor (from	Table 4h) =				0	
a) If balanced mechanical ventilation with	h heat recove	ery (MVH	HR) (24a	a)m = (22)	2b)m + (2	23b) × [1 – (23c)		
	0 0	0	0	0	0	0	0	1	(
b) If balanced mechanical ventilation with	hout heat rec	overy (N	иV) (24b)m = (22	2b)m + (2	23b)	1	1	
4b)m= 0 0 0 0	0 0	0	0	0	0	0	0]	(
c) If whole house extract ventilation or po	ositive input v	entilatio/	n from c	outside	<u>. </u>	1		•	
if $(22b)m < 0.5 \times (23b)$, then $(24c) =$	(23b); otherv	vise (24d	c) = (22b	o) m + 0.	5 × (23b)	_	_	
c)m= 0 0 0 0	0 0	0	0	0	0	0	0]	(
d) If natural ventilation or whole house point if (22b)m = 1, then (24d)m = (22b)m					0.5]				
d)m= 0.59 0.58 0.58 0.56 0.	56 0.55	0.55	0.55	0.55	0.56	0.57	0.57]	(
Effective air change rate - enter (24a) or	(24b) or (24d	c) or (24d	d) in box	x (25)	-	-	-	_	
i)m= 0.59 0.58 0.58 0.56 0.	56 0.55	0.55	0.55	0.55	0.56	0.57	0.57		(
. Heat losses and heat loss parameter:									
_EMENT Gross Openings area (m²) m²	Net Ar		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-		A X k kJ/K
oors	1.87	x	1	=	1.87	,			(
ndows Type 1	7.92	x1/	/[1/(1.4)+	0.04] =	10.5	=			(
indows Type 2	2.25	_{x1/}	/[1/(1.4)+	0.04] =	2.98	Ħ			(
indows Type 3	1.52	_		l l	2.02	=			(
alls 68.98 13.56	55.42	x [0.18		9.98	=			
tal area of elements, m ²	68.98	= '	0.10		0.00				
arty wall	27.98	=	0		0	[· · · · · · · · · · · · · · · · · · ·
arty floor		<u>'</u>	U			l		╡ 누	'\
arty ceiling	62.9	=				[[북 누	
or windows and roof windows, use effective window	62.9		formula 1	/[/1/ ₋ val	na)+0 041 a	e aiven ir	naragrani		
include the areas on both sides of internal walls an		alca asing	TOTTIGIA 1	/[(1/ O - Vaic	0)+0.0+j a	is giveir iii	rparagrapi	7 0.2	
bric heat loss, $W/K = S(A \times U)$			(26)(30)) + (32) =				27.3	4
eat capacity Cm = S(A x k)				((28)	.(30) + (32	2) + (32a)	(32e) =	0	
ermal mass parameter (TMP = Cm ÷ TF	A) in kJ/m²K			Indica	tive Value:	: Medium		250) (
r design assessments where the details of the cons n be used instead of a detailed calculation.	struction are not	known pre	ecisely the	e indicative	values of	TMP in T	able 1f		
	a Appendix k	<						8.97	7
ermal bridges : S (L x Y) calculated usin	9								
letails of thermal bridging are not known (36) = 0.13	•			(00)	(0.0)				
letails of thermal bridging are not known (36) = 0.13 stal fabric heat loss	•				(36) =	OE) (=	、	36.3	1 (
letails of thermal bridging are not known (36) = 0.1s otal fabric heat loss entilation heat loss calculated monthly	5 x (31)	., 1		(38)m	= 0.33 × (1] 36.3	1 (
etails of thermal bridging are not known (36) = 0.18 etail fabric heat loss entilation heat loss calculated monthly Jan Feb Mar Apr N	5 x (31) May Jun	Jul	Aug	(38)m Sep	= 0.33 × (Nov	Dec	36.3	
details of thermal bridging are not known (36) = 0.18 atal fabric heat loss entilation heat loss calculated monthly $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	5 x (31)	Jul 27.28	Aug 27.16	(38)m Sep 27.54	= 0.33 × (Oct 27.95	Nov 28.24	1	36.3	1 (
8)m= 29.19 29.02 28.86 28.09 27 eat transfer coefficient, W/K	5 x (31) May Jun	-		(38)m Sep 27.54	= 0.33 × (Nov 28.24	Dec	36.3	

40 m= 1.04 1.04 1.04 1.04 1.02 1.02 1.01 1.01 1.01 1.02 1.02 1.03	Heat loss para	ımeter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
Number of days in month (Table 1a) Jun	(40)m= 1.04	1.04	1.04	1.02	1.02	1.01	1.01	1.01	1.02	1.02	1.03	1.03		
A. Water heating energy requirement:		!	!		!					Average =	Sum(40) ₁	12 /12=	1.02	(40)
### Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA > 13.9, N = 1 h + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA £ 13.9, N = 1 h + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA £ 13.9, N = 1 h + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA £ 13.9, N = 1 h + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) Annual average ho twater usage in litres per day Vd_average = (25 x N) + 36		1	<u> </u>	· ·					-					
### A. Water heating energy requirement: ### Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA E 13.9, N = 1 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day for each month Vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per person per day (all water use. hot and cold) ### Annual average hot water usage in litres per day for each month Vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per day for each month Vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per day for each month Vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per day for each month Vd.m = factor from 7 fable (2 x (43)) ### Annual average hot water usage in litres per day for each month vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot vat		_			<u> </u>		-	Ť		-	+			
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA E 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 or not more that 125 fitnes per person per day (all water use), not and oold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water use of the annual average in litres per day for each month Vd.m = factor from Table 1c x (43) (44)m= 91.5 88.17 84.84 81.52 78.19 74.86 74.86 78.19 81.52 84.84 88.17 91.5 Total = Sum(44) = 998.16 (44) 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= 35.69 118.67 122.46 106.77 102.44 88.4 81.92 94 95.12 110.86 12.10 131.41 Total = Sum(45) = 93.56 118.67 122.46 106.77 102.44 88.4 81.92 94 95.12 110.86 12.10 131.41 Vater 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 0 (50) Energy lost from water storage, kWh/year (48) x (49) = 0 (50) Diff community heating see section 4.3 Volume factor from Table 2a 0 (50) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from w	(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA E 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 or not more that 125 fitnes per person per day (all water use), not and oold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water use of the annual average in litres per day for each month Vd.m = factor from Table 1c x (43) (44)m= 91.5 88.17 84.84 81.52 78.19 74.86 74.86 78.19 81.52 84.84 88.17 91.5 Total = Sum(44) = 998.16 (44) 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= 35.69 118.67 122.46 106.77 102.44 88.4 81.92 94 95.12 110.86 12.10 131.41 Total = Sum(45) = 93.56 118.67 122.46 106.77 102.44 88.4 81.92 94 95.12 110.86 12.10 131.41 Vater 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 0 (50) Energy lost from water storage, kWh/year (48) x (49) = 0 (50) Diff community heating see section 4.3 Volume factor from Table 2a 0 (50) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from w														
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Reduce the annual average hot water usage by 5% if the divelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use). And and cold	if TFA > 13.9	9, N = 1		[1 - exp	0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		06		(42)
Hot water usage in litres per day for each month \(Vd, m = factor from Table 1c x \(V43 \)	Annual averag	je hot wa al average	hot water	usage by	5% if the α	welling is	designed t	,		se target o		.18		(43)
Hot water usage in litres per day for each month \(Vd, m = factor from Table 1c x \(V43 \)	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Total = Sum(44) Let Sum(45) Let									1		1			
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)me	(44)m= 91.5	88.17	84.84	81.52	78.19	74.86	74.86	78.19	81.52	84.84	88.17	91.5		
(45)me	` '	<u> </u>			l		l	l		I Total = Su	m(44) ₁₁₂ =	-	998.16	(44)
Total = Sum(45) = 1308.75 (45)	Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
# instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) ### (46)m= 20.35	(45)m= 135.69	118.67	122.46	106.77	102.44	88.4	81.92	94	95.12	110.86	121.01	131.41		
(46)m= 20.35 17.8 18.37 16.01 15.37 13.26 12.29 14.1 14.27 16.63 18.15 19.71 (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 0 (49) Energy lost from water storage, kWh/year (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 0 (52) Temperature factor from Table 2a 0 (52) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/ye										Total = Su	m(45) ₁₁₂ =	= [1308.75	(45)
Water storage loss: 0 (47) 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) (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: 0 (48) a) If manufacturer's declared loss factor is known (kWh/day): 0 (49) Energy lost from Water storage, kWh/year (48) × (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: 0 (51) Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 0 (52) Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) 0 0 0 0 0 0 0 0	It instantaneous w	vater heati	ng at point •	of use (no	o hot water	storage),	enter 0 in	boxes (46)	to (61)			1		
Storage volume (litres) including any solar or WWHRS storage within same vessel	` '	_	18.37	16.01	15.37	13.26	12.29	14.1	14.27	16.63	18.15	19.71		(46)
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): Compete the factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 0 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	_) includin	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ച				(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): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) f community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Energy lost from water storage, kWh/year Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•	` '					_		a	00.		0		(41)
a) If manufacturer's declared loss factor is known (kWh/day): O	•	-			-			, ,	ers) ente	er '0' in ((47)			
Temperature factor from Table 2b	Water storage	loss:		`					,	,	,			
Energy lost from water storage, kWh/year (48) × (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 0 (52) Temperature factor from Table 2b (33) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) (55) Water storage loss calculated for each month ((56)m = (55) × (41)m) (56)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a) If manufact	turer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month $((56)m = 0 0 0 0 0 0 0 0 0 0$	Temperature fa	actor fro	m Table	2b								0		(49)
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 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ (56) $m = 0 0 0 0 0 0 0 0 0 0$	•		_	-				(48) x (49)) =			0		(50)
If community heating see section 4.3 Volume factor from Table 2a				-										(54)
Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0 (54) Enter (50) or (54) in (55) 0 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m = $(56)m \times (56)m \times $		•			ie Z (KVV	n/litre/da	ly)					0		(51)
Temperature factor from Table 2b $ 0 \qquad (53) \\ \text{Energy lost from water storage, kWh/year} \qquad (47) \times (51) \times (52) \times (53) = 0 \qquad (54) \\ \text{Enter (50) or (54) in (55)} \qquad 0 \qquad (55) \\ \text{Water storage loss calculated for each month} \qquad ((56)m = (55) \times (41)m) \\ (56)m = 0 0 0 0 0 0 0 0 0 0$	•	_		011 4.0								0		(52)
Enter (50) or (54) in (55)	Temperature f	actor fro	m Table	2b										
Enter (50) or (54) in (55)	Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	••		_	,										
If cylinder contains dedicated solar storage, (57) m = (56) m x $[(50)$ – $(H11)]$ ÷ (50) , else (57) m = (56) m where $(H11)$ is from Appendix H (57) m = $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 $	Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
If cylinder contains dedicated solar storage, (57) m = (56) m x $[(50)$ – $(H11)]$ ÷ (50) , else (57) m = (56) m where $(H11)$ is from Appendix H (57) m = $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 $	(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
Primary circuit loss (annual) from Table 3 0 (58) Primary circuit loss calculated for each month (59)m = (58) \div 365 x (41)m		s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (<u>I</u> H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m		loss (s	nual) fra	m Table		I								(58)
	•	,	•			59)m = ((58) ± 36	35 × (41)	ım			<u> </u>		()
(modined by factor from Table fio it there is sold) water fleathly and a cyllider themiostal)	•				,	•	. ,	, ,		r thermo	stat)			
(59)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (59)	`			i							'	0		(59)

Combi los	se calc	hatelu ^a	inr each	month (.61\m <i>- /</i>	(60) ± 36	35 V 141'							
_	6.63	40.58	43.24	40.2	39.84	36.92	38.15	39.84	40.2	43.24	43.48	46.63]	(61)
` '		red for	water he	eating ca	alculated	for each	h month	(62)m =	0.85 × (45)m +		(57)m +	ı (59)m + (61)m	
_	 -	159.26	165.7	146.97	142.29	125.32	120.07	133.85	135.32	154.09	164.49	178.03		(62)
Solar DHW	input ca	alculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no sola	r contributi	on to wate	er heating)	I	
(add addi														
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHRS -4	11.14	-36.19	-36.94	-30.43	-28.27	-23.33	-19.77	-23.93	-24.61	-30.41	-35.19	-39.75	•	(63) (G10)
Output fro	om wa	ter heaf	ter											
(64)m= 14	41.18	123.07	128.76	116.54	114.02	101.99	100.3	109.92	110.71	123.69	129.3	138.28		_
								Outp	ut from wa	ater heater	(annual) ₁	12	1437.75	(64)
Heat gain	s from	water	heating,	kWh/ma	onth 0.25	5 ´ [0.85	× (45)m	+ (61)m] + 0.8 x	(<u>[(46)</u> m	+ (57)m	+ (59)m	1]	
(65)m= 56	6.77	49.61	51.53	45.55	44.02	38.62	36.77	41.22	41.68	47.67	51.11	55.35		(65)
include	(57)m	in calc	ulation c	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Intern	nal gai	ns (see	Table 5	and 5a):									
Metabolic	gains	(Table	5), <u>Wat</u>	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 12	23.74	123.74	123.74	123.74	123.74	123.74	123.74	123.74	123.74	123.74	123.74	123.74		(66)
Lighting g	gains (calculat	ed in Ap	pendix	L, equati	on L9 or	r L9a), a	lso see	Γable 5				•	
(67)m= 40	0.24	35.74	29.07	22.01	16.45	13.89	15.01	19.51	26.18	33.24	38.8	41.36		(67)
Appliance	es gain	ns (calc	ulated in	Append	Jix L, eq	uation L	13 or L1		see Tal	ble 5			ı	
(68)m= 26	68.95	271.74	264.71	249.74	230.84	213.07	201.21	198.42	205.45	220.42	239.32	257.08		(68)
Cooking o	gains (calcula	ted in Ar	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m= 49	9.44	49.44	49.44	49.44	49.44	49.44	49.44	49.44	49.44	49.44	49.44	49.44		(69)
Pumps ar	nd fans	s gains	(Table 5	 ja)				-	-	-			•	
(70)m=	3													
Losses e.		3	3	3	3	3	3	3	3	3	3	3]	(70)
	.g. eva		I	l l	l l	l l	3	3	3	3	3	3		(70)
(71)m= -8			I	l l	l l	l l	-82.49	-82.49	-82.49	-82.49	-82.49	-82.49]	(70)(71)
(71)m= -8 Water hea	32.49	aporation -82.49	n (negat -82.49	tive value	es) (Tab	le 5)]	, ,
Water hea	32.49	aporation -82.49	n (negat -82.49	tive value	es) (Tab	le 5)]]]	, ,
Water hea	ating g	aporation -82.49 gains (T	n (negat -82.49 able 5)	tive value	es) (Tab -82.49	-82.49 53.64	-82.49 49.43	-82.49	-82.49 57.89	-82.49 64.07	-82.49 70.98	-82.49 74.39]	(71)
Water heat (72)m= 70 Total inte	ating g 6.31	aporation -82.49 gains (T	n (negat -82.49 able 5)	tive value	es) (Tab -82.49	-82.49 53.64	-82.49 49.43	-82.49 55.4	-82.49 57.89	-82.49 64.07	-82.49 70.98	-82.49 74.39]] 	(71)
Water heat (72)m= 70 Total inter	ating g 6.31 ernal g	aporation -82.49 gains (T 73.82 gains = 474.98	n (negat -82.49 able 5)	-82.49 -83.26	es) (Tab -82.49	le 5) -82.49 53.64 (66)	-82.49 49.43)m + (67)m	-82.49 55.4 n + (68)m +	-82.49 57.89 - (69)m + (-82.49 64.07 (70)m + (7	-82.49 70.98 1)m + (72)	-82.49 74.39]] 	(71) (72)
Water heat (72) m= $\boxed{70}$ Total interest (73) m= $\boxed{47}$	ating g (6.31 ernal g 79.18 gains:	aporation -82.49 gains (T 73.82 gains = 474.98	n (negat -82.49 able 5) 69.26	-82.49 63.26	es) (Tab -82.49 59.17	53.64 (66) (66)	-82.49 49.43 0m + (67)m 359.32	-82.49 55.4 1 + (68)m +	-82.49 57.89 - (69)m + (383.2	-82.49 64.07 (70)m + (7 ⁻ 411.42	-82.49 70.98 1)m + (72) 442.78	-82.49 74.39 m 466.52		(71) (72)
Water hea (72)m= 70 Total inte (73)m= 47 6. Solar	ating g 6.31 ernal g 79.18 gains: s are ca on: Ac	aporation -82.49 gains (T 73.82 gains = 474.98	n (negat -82.49 fable 5) 69.26 456.72	-82.49 63.26	es) (Tab -82.49 59.17 400.14	53.64 (66): 374.29	-82.49 49.43)m + (67)m 359.32	-82.49 55.4 n + (68)m + 367	-82.49 57.89 - (69)m + (383.2	-82.49 64.07 (70)m + (7 411.42 e applicab	-82.49 70.98 1)m + (72) 442.78	-82.49 74.39 m 466.52	Gains (W)	(71) (72)
Water hea (72)m= 70 Total inte (73)m= 47 6. Solar Solar gains	ating g 6.31 ernal g 79.18 gains: s are ca Ta	aporation -82.49 gains (T 73.82 gains = 474.98 gains ccess F.	n (negat -82.49 fable 5) 69.26 456.72	63.26 63.26 428.69	es) (Tab -82.49 59.17 400.14	53.64 (66) 374.29 and associ	-82.49 49.43 m + (67)m 359.32 iated equality	-82.49 55.4 n + (68)m + 367	-82.49 57.89 - (69)m + (383.2 nvert to the	-82.49 64.07 (70)m + (7 411.42 e applicab	-82.49 70.98 1)m + (72) 442.78 tle orientat FF	-82.49 74.39 m 466.52		(71) (72)
Water hea (72)m= 70 Total inte (73)m= 47 6. Solar Solar gains Orientatio	ating greating greating greating greating greating greating greating grains: s are care care care care care care care	aporation -82.49 gains (T 73.82 gains = 474.98 dalculated cocess Fable 6d	n (negat -82.49 Table 5) 69.26 456.72 using solar	-82.49 63.26 428.69 r flux from Area m²	es) (Tab -82.49 59.17 400.14	53.64 (66) 374.29 and associated the second seco	-82.49 49.43 m + (67)m 359.32 iated equality ble 6a	-82.49 55.4 1 + (68)m + 367 ations to co	-82.49 57.89 - (69)m + (383.2 nvert to the g_ able 6b	-82.49 64.07 (70)m + (7') 411.42 e applicab	-82.49 70.98 1)m + (72) 442.78 Ile orientat FF able 6c	-82.49 74.39 m 466.52 ion.	(W)	(71) (72) (73)
Water hea (72)m= 70 Total inte (73)m= 47 6. Solar Solar gains Orientatio	ating g 6.31 ernal g 79.18 gains: s are ca Ta 0.9x 0.9x	aporation -82.49 gains (T 73.82 gains = 474.98 alculated c ccess F able 6d 0.77	n (negat -82.49 Fable 5) 69.26 456.72 using solar factor	63.26 428.69 r flux from Area m² 1.5	es) (Tab -82.49 59.17 400.14 Table 6a a	53.64 (66) 374.29 and associant Flux Tabox X 3	-82.49 49.43 m + (67)m 359.32 iated equality ble 6a 36.79	-82.49 55.4 55.4 367 ations to co	-82.49 57.89 - (69)m + (383.2 nvert to the 9_ able 6b 0.35	-82.49 64.07 (70)m + (7) 411.42 e applicab Ta	-82.49 70.98 1)m + (72) 442.78 ele orientat FF able 6c 0.8	-82.49 74.39 M 466.52 ion.	(W)	(71) (72) (73)
Water hea (72)m= 70 Total inte (73)m= 47 6. Solar Solar gains Orientation Southeast Southeast	ating g 6.31 ernal g 79.18 gains: s are ca Ta 0.9x 0.9x 0.9x	pains (T. 73.82 gains = 474.98 decess F. able 6d 0.77 0.77	-82.49 - 69.26 - 69.26 - 456.72 - cattor - x	-82.49 63.26 428.69 r flux from Area m² 1.5	es) (Tab -82.49 59.17 400.14 Table 6a a	53.64 (66) 374.29 and associated the second	-82.49 49.43 0m + (67)m 359.32 iated equality ble 6a 36.79 32.67	-82.49 55.4 1 + (68)m + 367 ations to co	-82.49 57.89 - (69)m + (383.2 nvert to the g_ able 6b 0.35 0.35	-82.49 64.07 (70)m + (7') 411.42 e applicab Ta	-82.49 70.98 1)m + (72) 442.78 lle orientat FF able 6c 0.8 0.8	-82.49 74.39 m 466.52 ion.	(W) 10.85 18.48	(71) (72) (73) (77) (77)

Southeast 0.9x	0.77				., г	440.04		l ,, l		0.05	ا ا		_	05.4	(77)
Southeast 0.9x	0.77	x	1.5		X [119.01		X		0.35	_ ×	0.8	_ = -	35.1	= ` ′
Southeast 0.9x	0.77	X	1.5		X [118.15		X		0.35	_ ×	0.8	_ = -	34.85	(77)
Southeast 0.9x	0.77	x	1.5		X [113.91		X		0.35	X	0.8	=	33.6	(77)
	0.77	X	1.5		X [104.39		X		0.35	× [0.8	_ =	30.79	(77)
Southeast 0.9x	0.77	X	1.5		X	92.85		X		0.35	_ ×	0.8	_ =	27.39	(77)
Southeast 0.9x	0.77	X	1.5		X	69.27		X		0.35	_ × [0.8	_ =	20.43	(77)
Southeast 0.9x	0.77	x	1.5	2	X	44.07		X		0.35	_ ×	0.8	_ =	13	(77)
Southeast 0.9x	0.77	X	1.5	2	X	31.49		X		0.35	X	8.0	=	9.29	(77)
Southwest _{0.9x}	0.77	X	2.2	5	X	36.79				0.35	×	0.8	=	16.06	(79)
Southwest _{0.9x}	0.77	X	2.2	5	X	62.67				0.35	x	0.8	=	27.36	(79)
Southwest _{0.9x}	0.77	X	2.2	5	X	85.75				0.35	х	8.0	=	37.44	(79)
Southwest _{0.9x}	0.77	×	2.2	5	X	106.25	5			0.35	X	0.8	=	46.39	(79)
Southwest _{0.9x}	0.77	х	2.2	5	X	119.01	I			0.35	х	0.8	=	51.96	(79)
Southwest _{0.9x}	0.77	х	2.2	5	X	118.15	5			0.35	x	0.8	=	51.58	(79)
Southwest _{0.9x}	0.77	X	2.2	5	x	113.91				0.35	X	0.8	=	49.73	(79)
Southwest _{0.9x}	0.77	x	2.2	5	x	104.39)			0.35	x	0.8	=	45.58	(79)
Southwest _{0.9x}	0.77	x	2.2	5	x	92.85				0.35	x	0.8	=	40.54	(79)
Southwest _{0.9x}	0.77	X	2.2	5	x	69.27				0.35	x	0.8	=	30.24	(79)
Southwest _{0.9x}	0.77	X	2.2	5	x	44.07				0.35	x	0.8	_	19.24	(79)
Southwest _{0.9x}	0.77	x	2.2	5	x	31.49				0.35	x	0.8		13.75	(79)
Northwest 0.9x	0.77	x	7.9	2	x	11.28		х		0.35	x	0.8	=	17.34	(81)
Northwest 0.9x	0.77	x	7.9	2	х	22.97		х		0.35	x	0.8	=	35.3	(81)
Northwest 0.9x	0.77	x	7.9	2	х	41.38		х		0.35	x	0.8	=	63.59	(81)
Northwest 0.9x	0.77	х	7.9	2	x	67.96		x		0.35	×	0.8		104.43	(81)
Northwest 0.9x	0.77	X	7.9	2	x	91.35		x		0.35	T x	0.8	-	140.38	(81)
Northwest 0.9x	0.77	x	7.9	2	х	97.38		х		0.35	T x	0.8	╡ -	149.66	(81)
Northwest 0.9x	0.77	x	7.9	2	х	91.1		х		0.35	= x	0.8	╡ -	140	(81)
Northwest 0.9x	0.77	x	7.9	2	x	72.63		х		0.35	T x	0.8	-	111.61	(81)
Northwest 0.9x	0.77	Х	7.9	2	x	50.42		X		0.35	x	0.8	= =	77.49	(81)
Northwest 0.9x	0.77	x	7.9		x [28.07		X		0.35	x	0.8	╡ -	43.13	(81)
Northwest 0.9x	0.77	X	7.9		x	14.2		х		0.35	x	0.8	╡ .	21.82	(81)
Northwest 0.9x	0.77	X	7.9		X	9.21		х		0.35	x	0.8	╡ .	14.16	(81)
l	0		- 1.0		L			l I		0.00					` ′
Solar gains in	watts, ca	alculated	for each	n month				(83)m	ı = Su	m(74)m	(82)m				
(83)m= 44.26	81.14	126.32	182.16	227.44	_	6.09 223	3.33	187	-	145.41	93.8	54.06	37.19		(83)
Total gains –	internal a	nd solar	(84)m =	: (73)m	+ (8	3)m , wa	itts						•	1	
(84)m= 523.44	556.13	583.04	610.85	627.58	61	0.38 582	2.66	554	.98	528.61	505.22	496.84	503.72		(84)
7. Mean inte	rnal temr	erature	(heating	season)							•			
Temperature			`		<i>'</i>	area from	ı Tab	ole 9.	Th1	(°C)				21	(85)
Utilisation fa	•	•			•			,	,	· -/				<u> </u>	` ′
Jan	Feb	Mar	Apr	May	Ť		ul	Aı	ug	Sep	Oct	Nov	Dec		
(86)m= 0.99	0.99	0.97	0.93	0.83	+		48	0.5		0.76	0.94	0.98	0.99		(86)
	1		[I						1	1	I	

Maan	:	l 4a man a m	atura ia	livina av	a a T4 /64	مام سمال	no 0 to 7	7 in Tabl	o () o \					
I	20.12	20.23	20.42	20.68	20.88	20.98	ps 3 to 7	20.99		20.7	20.20	20.4		(87)
(87)m=		<u> </u>	<u> </u>			<u> </u>	from Ta		20.94 h2 (°C)	20.7	20.38	20.1		(07)
(88)m=	20.05	20.05	20.05	20.06	20.07	20.07	20.07	20.08	20.07	20.07	20.06	20.06		(88)
		<u> </u>	ļ	<u> </u>		<u>!</u>	<u> </u>		20.07	20.07	20.00	20.00		()
ı							e Table			1	1			
(89)m=	0.99	0.98	0.96	0.91	0.77	0.56	0.38	0.42	0.68	0.91	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.9	19.06	19.33	19.69	19.95	20.06	20.07	20.07	20.03	19.74	19.27	18.87		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2			•		
(92)m=	19.31	19.45	19.7	20.02	20.26	20.37	20.38	20.38	20.34	20.06	19.65	19.29		(92)
Apply	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.31	19.45	19.7	20.02	20.26	20.37	20.38	20.38	20.34	20.06	19.65	19.29		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the r	mean int	ernal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9l	b, 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		
Utilisa	ition fac	tor for g	ains, hm	1:										
(94)m=	0.98	0.98	0.96	0.91	0.79	0.59	0.41	0.45	0.71	0.91	0.97	0.99		(94)
Usefu	l gains,	hmGm	W = (94)	4)m x (8	4)m									
(95)m=	515.4	543.36	558.68	553.12	493.42	357.97	239.61	251.13	374.06	461.53	483.27	497.25		(95)
Month	ly 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 I	oss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	-			
(97)m=	983.32	950.86	860.29	716.48	550.26	366.83	240.63	252.84	398.12	608.06	809.82	978.41		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	348.13	273.84	224.39	117.62	42.29	0	0	0	0	109.02	235.11	357.99		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	1708.39	(98)
Space	e heatin	g require	ement in	kWh/m²	² /vear								27.16	(99)
·		• .				veteme i	noludina	mioro C	יחם/					
			its – iriu	ividual II	ealing s	ystems i	ncluding	micro-C	JΠP)					
•	e heatir on of sp	_	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	nt from m	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								89.5	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g systen	ո, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	— ear
Space		g require	l			L			· '	Į	Į		,	
·	348.13	273.84	224.39	117.62	42.29	0	0	0	0	109.02	235.11	357.99		
(211)m	= {[(98)m x (20	4)] } x 1	00 ÷ (20	06)	•								(211)
` '	388.97	305.97	250.72	131.42	47.25	0	0	0	0	121.8	262.7	399.98		. ,
I		!	!	!	<u> </u>	!		Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1908.81	(211)

$= \{[(98)m \times (201)] \} \times 100 \div (208)$ $(215)m = $	0 0	0	0	0	0	0	0	1	
`		_ !	Tota	l I (kWh/yea	ar) =Sum(2	L 215) _{15,101}		0	(215
Water heating									
Output from water heater (calculated ab		_				1		1	
141.18 123.07 128.76 116.54	114.02 101.99	9 100.3	109.92	110.71	123.69	129.3	138.28		7,04
Efficiency of water heater 217)m= 89.5 89.5 89.5 89.5	89.5 89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	(21)
Fuel for water heating, kWh/month	00.0	00.0	00.0	00.0	00.0	00.0	00.0]	(= :
(219)m = (64)m x 100 ÷ (217)m			,			•		-	
219)m= 157.74 137.5 143.86 130.21	127.4 113.9	5 112.07	122.81	123.7	138.2	144.47	154.5		_
			Tota	I = Sum(2				1606.42	(21
Annual totals Space heating fuel used, main system 1	1				K۱	Wh/yea	r	kWh/year 1908.81	기
Water heating fuel used								1606.42	\exists
· ·	roon hot							1000.42	
Electricity for pumps, fans and electric k	кеер-пос							1	(00)
central heating pump:							30]	(23)
boiler with a fan-assisted flue							45		(23 –
Total electricity for the above, kWh/year	r		sum	of (230a).	(230g) =			75	(23
Electricity for lighting								284.27	(23
Electricity generated by DVs									_
Lieutions generated by PVS								-724.26	(233
10a. Fuel costs - individual heating sys	stems:							-724.26	(233
, ,	F	i uel Wh/year			Fuel P			Fuel Cost	(233
10a. Fuel costs - individual heating sys	F k	Wh/year			(Table	12)	x 0.01 =	Fuel Cost £/year	
10a. Fuel costs - individual heating sys	F k (2	Wh/year			(Table	12)		Fuel Cost £/year	(240
10a. Fuel costs - individual heating sys Space heating - main system 1 Space heating - main system 2	F k (2	Wh/year 211) x 213) x			(Table 3.4	12)	x 0.01 =	Fuel Cost £/year 66.43	(24)
10a. Fuel costs - individual heating sys Space heating - main system 1 Space heating - main system 2 Space heating - secondary	F k (2 (2	Wh/year 211) x 213) x 215) x			(Table 3.4 0 13.4	12) 8	x 0.01 = x 0.01 =	Fuel Cost £/year 66.43 0	(24) (24) (24)
10a. Fuel costs - individual heating sys Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel)	F k (2 (2 (2	Wh/year 211) x 213) x 215) x 219)			(Table 3.4 0 13.4 3.4	12) 8 19	x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 66.43 0 0 55.9	(24) (24) (24)
10a. Fuel costs - individual heating system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot	F k (2 (2 (2 (2	Wh/year 211) x 213) x 215) x 219)			(Table 3.4 0 13.4 13.4 13.4 13.4 13.4 13.4 13.4 13.4	12) 8 19 8	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 66.43 0 0 55.9 9.89	(24 (24 (24 (24
10a. Fuel costs - individual heating system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot if off-peak tariff, list each of (230a) to (2	F k (2 (2 (2 (2 (2 230g) separate	Wh/year 211) x 213) x 215) x 219)		nd apply	(Table 3.4 0 13.4 13.4 13.4 13.4 13.4 13.4 13.4 13.4	12) 8 19 8 19 19 ce accord	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	Fuel Cost £/year 66.43 0 0 55.9 9.89	(24 (24 (24 (24 (24
10a. Fuel costs - individual heating system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot if off-peak tariff, list each of (230a) to (250 energy for lighting)	F k (2 (2 (2 (2 (2 230g) separate	Wh/year 211) x 213) x 215) x 219) 231) ely as app		nd apply	(Table 3.4 0 13.4 3.4 13.7 fuel prior	12) 8 19 8 19 19 ce accord	x = 0.01 = 0.001 = 0	Fuel Cost £/year 66.43 0 0 55.9 9.89 Table 12a	(24 (24 (24 (24 (24 (25
10a. Fuel costs - individual heating system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot if off-peak tariff, list each of (230a) to (250 energy for lighting)	F k (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	Wh/year 211) x 213) x 215) x 219) 231) ely as app	olicable a	nd apply	(Table 3.4 0 13.7 3.4 13.7 fuel pric 13.7	12) 8 19 8 19 ce accol	x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to x 0.01 =	Fuel Cost £/year 66.43 0 0 55.9 9.89 Table 12a 37.5	(24 (24 (24 (24 (25 (25
Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot if off-peak tariff, list each of (230a) to (2 Energy for lighting Additional standing charges (Table 12)	F k (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	Wh/year 211) x 213) x 215) x 219) 231) ely as app 232)	olicable a	nd apply	(Table 3.4 0 13.4 3.4 13.7 fuel prior	12) 8 19 8 19 ce accol	x = 0.01 = 0.001 = 0	Fuel Cost £/year 66.43 0 55.9 9.89 Table 12a 37.5	(24) (24)
Space heating - main system 1 Space heating - main system 2 Space heating - main system 2 Space heating - secondary Vater heating cost (other fuel) Pumps, fans and electric keep-hot if off-peak tariff, list each of (230a) to (2 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) ar	F k (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	Wh/year 211) x 213) x 215) x 219) 231) ely as app 232) ne of (233) t eded	olicable a	nd apply	(Table 3.4 0 13.7 3.4 13.7 fuel pric 13.7	12) 8 19 8 19 ce accol	x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to x 0.01 =	Fuel Cost £/year 66.43 0 0 55.9 9.89 Table 12a 37.5 120 0	(24 (24 (24 (24 (25 (25 (25
Space heating - main system 1 Space heating - main system 2 Space heating - secondary Vater heating cost (other fuel) Pumps, fans and electric keep-hot if off-peak tariff, list each of (230a) to (2 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) ar Total energy cost	F k (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	Wh/year 211) x 213) x 215) x 219) 231) ely as app 232) ne of (233) t eded	olicable a	nd apply	(Table 3.4 0 13.7 3.4 13.7 fuel pric 13.7	12) 8 19 8 19 ce accol	x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to x 0.01 =	Fuel Cost £/year 66.43 0 0 55.9 9.89 Table 12a 37.5	(24 (24 (24 (24 (25 (25 (25
Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (2 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) ar Total energy cost 11a. SAP rating - individual heating sy	F k (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	Wh/year 211) x 213) x 215) x 219) 231) ely as app 232) ne of (233) t eded	olicable a	nd apply	(Table 3.4 0 13.7 3.4 13.7 fuel pric 13.7	12) 8 19 8 19 ce accol	x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to x 0.01 =	Fuel Cost £/year 66.43 0 0 55.9 9.89 Table 12a 37.5 120 0	(24 (24 (24 (24 (25 (25 (25 (25
Electricity generated by PVs 10a. Fuel costs - individual heating sys Space heating - main system 1 Space heating - main system 2 Space heating - secondary Water heating cost (other fuel) Pumps, fans and electric keep-hot (if off-peak tariff, list each of (230a) to (2 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) ar Total energy cost 11a. SAP rating - individual heating sy Energy cost deflator (Table 12) Energy cost factor (ECF)	F k (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2 (2	Wh/year 211) x 213) x 215) x 219) 231) ely as app 232) ne of (233) t eded (250)(254)	olicable a	nd apply	(Table 3.4 0 13.7 3.4 13.7 fuel pric 13.7	12) 8 19 8 19 ce accol	x 0.01 = x 0.01 = x 0.01 = x 0.01 = rding to x 0.01 =	Fuel Cost £/year 66.43 0 0 55.9 9.89 Table 12a 37.5 120 0	(24 (24 (24 (24 (25 (25 (25

SAP rating (Section 12)			84.27 (258)
12a. CO2 emissions – Individual heating system	s including micro-CH	IP .	
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	412.3 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216 =	346.99 (264)
Space and water heating	(261) + (262) + (263)	+ (264) =	759.29 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	38.93 (267)
Electricity for lighting	(232) x	0.519	147.54 (268)
Energy saving/generation technologies Item 1		0.519 =	-375.89 (269)
Total CO2, kg/year		sum of (265)(271) =	569.86 (272)
CO2 emissions per m²		(272) ÷ (4) =	9.06 (273)
El rating (section 14)			93 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22	2328.75 (261)
Space heating (secondary)	(215) x	3.07	0 (263)
Energy for water heating	(219) x	1.22	1959.83 (264)
Space and water heating	(261) + (262) + (263)	+ (264) =	4288.58 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	230.25 (267)
Electricity for lighting	(232) x	0 =	872.72 (268)
Energy saving/generation technologies Item 1		3.07	-2223.47 (269)
'Total Primary Energy		sum of (265)(271) =	3168.08 (272)

 $(272) \div (4) =$

Primary energy kWh/m²/year

50.37

			User D	etails: _						
Assessor Name:	Natalie Wheeler			Stroma	a Nium	hor:		STDC	0027778	
Software Name:	Stroma FSAP 201	2		Softwa					on: 1.0.4.6	
oortware Hame.	Ottorna i Orti 201						7-2nd Fl		511. 1.0. 1.0	
Address :	Flat 7, Hampshire s		oporty ,	1441000	50 0.0	onriat	. Liid i i	001		
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			6	62.9	(1a) x	2	2.4	(2a) =	150.96	(3a)
Total floor area TFA = (1	1a)+(1b)+(1c)+(1d)+(1e	e)+(1n) 6	62.9	(4)			_		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	150.96	(5)
2. Ventilation rate:										
		econdary leating	y	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	ī + Ē	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				,	2	x -	10 =	20	(7a)
Number of passive vents	s					0	x	10 =	0	(7b)
Number of flueless gas f					Ļ			40 =		= ' '
Number of flueless gas i	illes					0		10 -	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	a)+(6b)+(7a	a)+(7b)+(7c) =	Г	20		÷ (5) =	0.13	(8)
If a pressurisation test has	been carried out or is intende	ed, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	uction			0	(11)
deducting areas of open	oresent, use the value corres ings); if equal user 0.35	ponaing to	tne great	er waii are	a (arter					
If suspended wooden	floor, enter 0.2 (unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught st	ripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	, q50, expressed in cub		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	· ·								0.38	(18)
Air permeability value applie Number of sides shelter	es if a pressurisation test has	s been don	e or a deg	gree air pei	meability	is being u	sed			(19)
Shelter factor	eu			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18)	x (20) =				0.33	(21)
Infiltration rate modified	-	d							0.00	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp	peed from Table 7					•			4	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
					I	ı	1	1	4	
Wind Factor $(22a)m = (2a)m =$		0.55	0.05						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]	

djusted infiltration rate	(allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	•	,	1	,	
0.41 0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.38]	
<i>alculate effective air c If mechanical ventilati</i>	•	rate ior t	пе арри	саріе са	se						0	(
If exhaust air heat pump us		endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	`
If balanced with heat recov	ery: effic	iency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =				0	(
a) If balanced mechai	nical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (2:	2b)m + (23b) x [1 – (23c)		
1a)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(
b) If balanced mechai	nical ve	entilation	without	heat rec	overy (N	л ЛV) (24b	m = (22)	2b)m + (23b)		1	
Hb)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(
c) If whole house extr	ract ver	ntilation o	or positiv	re input v	ventilatio	on from o	outside			-1	.	
if (22b)m < 0.5 x			-	-				.5 × (23b	o)			
c)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(
d) If natural ventilation if (22b)m = 1, the			•					0.5]				
d)m= 0.59 0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57]	(
Effective air change r	ate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)	•	•	•	•	
i)m= 0.59 0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57]	(
. Heat losses and hea	at lose r	naramet	or:								-	
_EMENT Gross area (S	Openin m	gs	Net Ar		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
oors	,			1.87	_	1		1.87				(
ndows Type 1				7.92	_	/[1/(1.4)+	0.04] =	10.5	=			(
indows Type 2				2.25	=	- /[1/(1.4)+		2.98	\exists			(
indows Type 3				1.52	=	/[1/(1.4)+		2.02	=			(
alls 68.98	,	13.50		55.42	=	0.18		9.98				(
otal area of elements,		13.30	<u> </u>	68.98	=	0.16		9.90				
arty wall					=		<u> </u>		— r			(
arty floor				27.98	x	0	=	0	l			(
-				62.9					Į		╡ ⊨	(
orty ceiling or windows and roof window		. ee - 4i i		62.9	-4-4		15/4/11	\. 0 041 -				(
nclude the areas on both s					ated using	i iorriiula i	/[(I/ U- vait	<i>1e)</i> +0.04] a	as giveri ir	ı paragrapı	1 3.2	
bric heat loss, W/K =	S (A x	U)				(26)(30)) + (32) =				27.3	4 (
eat capacity Cm = S(A	\xk)						((28).	(30) + (32	2) + (32a)	(32e) =	0	(
ermal mass paramete	er (TMF	o = Cm ÷	TFA) ir	n kJ/m²K			Indica	itive Value	: Medium		250	 (
r design assessments whe n be used instead of a deta			construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
ermal bridges : S (L >	κ Y) cal	culated (using Ap	pendix k	<						8.97	· (
etails of thermal bridging a	re not kn	own (36) =	= 0.15 x (3	1)								
tal fabric heat loss								(36) =			36.3	1 (
		بالطاه مصاد					(38)m	$=0.33\times($	25)m x (5)	_	
entilation heat loss cal							_	_		T _		
ntilation heat loss cal	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
entilation heat loss cal				Jun 27.28	Jul 27.28	Aug 27.16	Sep 27.54	Oct 27.95	Nov 28.24	Dec 28.54		(
ntilation heat loss cal	Mar 28.86	Apr	May			⊢ <u> </u>	27.54	-	28.24	+		(

40 m= 1.04 1.04 1.04 1.04 1.02 1.02 1.01 1.01 1.01 1.02 1.02 1.03	Heat loss para	ımeter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
Number of days in month (Table 1a) Jun	(40)m= 1.04	1.04	1.04	1.02	1.02	1.01	1.01	1.01	1.02	1.02	1.03	1.03		
A. Water heating energy requirement:		!	!		!					Average =	Sum(40) ₁	12 /12=	1.02	(40)
### Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA > 13.9, N = 1 h + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA £ 13.9, N = 1 h + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA £ 13.9, N = 1 h + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA £ 13.9, N = 1 h + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) Annual average ho twater usage in litres per day Vd_average = (25 x N) + 36		1	<u> </u>	· ·					-					
### A. Water heating energy requirement: ### Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) If TFA E 13.9, N = 1 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day Vd.average = (25 x N) + 36 ### Annual average hot water usage in litres per day for each month Vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per person per day (all water use. hot and cold) ### Annual average hot water usage in litres per day for each month Vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per day for each month Vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per day for each month Vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per day for each month Vd.m = factor from 7 fable (2 x (43)) ### Annual average hot water usage in litres per day for each month vd.m = factor from Table (2 x (43)) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot water usage in litres per day Vd.average (46) to (81) ### Annual average hot vat		_			<u> </u>		-	Ť		-	+			
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA E 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 or not more that 125 fitnes per person per day (all water use), not and oold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water use of the annual average in litres per day for each month Vd.m = factor from Table 1c x (43) (44)m= 91.5 88.17 84.84 81.52 78.19 74.86 74.86 78.19 81.52 84.84 88.17 91.5 Total = Sum(44) = 998.16 (44) 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= 35.69 118.67 122.46 106.77 102.44 88.4 81.92 94 95.12 110.86 12.10 131.41 Total = Sum(45) = 93.56 118.67 122.46 106.77 102.44 88.4 81.92 94 95.12 110.86 12.10 131.41 Vater 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 0 (50) Energy lost from water storage, kWh/year (48) x (49) = 0 (50) Diff community heating see section 4.3 Volume factor from Table 2a 0 (50) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from w	(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2]] + 0.0013 x (TFA -13.9) if TFA E 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 or not more that 125 fitnes per person per day (all water use), not and oold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water use of the annual average in litres per day for each month Vd.m = factor from Table 1c x (43) (44)m= 91.5 88.17 84.84 81.52 78.19 74.86 74.86 78.19 81.52 84.84 88.17 91.5 Total = Sum(44) = 998.16 (44) 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= 35.69 118.67 122.46 106.77 102.44 88.4 81.92 94 95.12 110.86 12.10 131.41 Total = Sum(45) = 93.56 118.67 122.46 106.77 102.44 88.4 81.92 94 95.12 110.86 12.10 131.41 Vater 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 0 (50) Energy lost from water storage, kWh/year (48) x (49) = 0 (50) Diff community heating see section 4.3 Volume factor from Table 2a 0 (50) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from w														
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 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 nor more that 152 fitres per person per day (all water uses, hot and cold) Jan	4. Water heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Reduce the annual average hot water usage by 5% if the divelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use). And and cold	if TFA > 13.9	9, N = 1		[1 - exp	0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		06		(42)
Hot water usage in litres per day for each month \(Vd, m = factor from Table 1c x \(V43 \)	Annual averag	je hot wa al average	hot water	usage by	5% if the α	welling is	designed t	,		se target o		.18		(43)
Hot water usage in litres per day for each month \(Vd, m = factor from Table 1c x \(V43 \)	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Total = Sum(44) Let Sum(45) Let									1		1			
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)me	(44)m= 91.5	88.17	84.84	81.52	78.19	74.86	74.86	78.19	81.52	84.84	88.17	91.5		
(45)me	` '	<u> </u>			l		l	l		I Total = Su	m(44) ₁₁₂ =	-	998.16	(44)
Total = Sum(45) = 1308.75 (45)	Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
# instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) ### (46)m= 20.35	(45)m= 135.69	118.67	122.46	106.77	102.44	88.4	81.92	94	95.12	110.86	121.01	131.41		
(46)m= 20.35 17.8 18.37 16.01 15.37 13.26 12.29 14.1 14.27 16.63 18.15 19.71 (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 0 (49) Energy lost from water storage, kWh/year (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 0 (52) Temperature factor from Table 2a 0 (52) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Energy lost from water storage, kWh/ye										Total = Su	m(45) ₁₁₂ =	= [1308.75	(45)
Water storage loss: 0 (47) 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) (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: 0 (48) a) If manufacturer's declared loss factor is known (kWh/day): 0 (49) Energy lost from Water storage, kWh/year (48) × (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: 0 (51) Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 0 (52) Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) 0 0 0 0 0 0 0 0	It instantaneous w	vater heati	ng at point •	of use (no	o hot water	storage),	enter 0 in	boxes (46)	to (61)			1		
Storage volume (litres) including any solar or WWHRS storage within same vessel	` '	_	18.37	16.01	15.37	13.26	12.29	14.1	14.27	16.63	18.15	19.71		(46)
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): Compete the factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 0 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	_) includin	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ച				(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): Temperature factor from Table 2b Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) f community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Energy lost from water storage, kWh/year Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•	` '					_		a	00.		0		(41)
a) If manufacturer's declared loss factor is known (kWh/day): O	•	-			-			, ,	ers) ente	er '0' in ((47)			
Temperature factor from Table 2b	Water storage	loss:		`					,	,	,			
Energy lost from water storage, kWh/year (48) × (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 0 (52) Temperature factor from Table 2b (33) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) (55) Water storage loss calculated for each month ((56)m = (55) × (41)m) (56)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a) If manufact	turer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month $((56)m = 0 0 0 0 0 0 0 0 0 0$	Temperature f	actor fro	m Table	2b								0		(49)
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 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ (56) $m = 0 0 0 0 0 0 0 0 0 0$	•		_	-				(48) x (49)) =			0		(50)
If community heating see section 4.3 Volume factor from Table 2a				-										(54)
Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0 (54) Enter (50) or (54) in (55) 0 (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m = $(56)m \times (56)m \times $		•			ie Z (KVV	n/litre/da	ly)					0		(51)
Temperature factor from Table 2b $ 0 \qquad (53) \\ \text{Energy lost from water storage, kWh/year} \qquad (47) \times (51) \times (52) \times (53) = 0 \qquad (54) \\ \text{Enter (50) or (54) in (55)} \qquad 0 \qquad (55) \\ \text{Water storage loss calculated for each month} \qquad ((56)m = (55) \times (41)m) \\ (56)m = 0 0 0 0 0 0 0 0 0 0$	•	_		011 4.0								0		(52)
Enter (50) or (54) in (55)	Temperature f	actor fro	m Table	2b										
Enter (50) or (54) in (55)	Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	••		_	,										
If cylinder contains dedicated solar storage, (57) m = (56) m x $[(50)$ – $(H11)]$ ÷ (50) , else (57) m = (56) m where $(H11)$ is from Appendix H (57) m = $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 $	Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
If cylinder contains dedicated solar storage, (57) m = (56) m x $[(50)$ – $(H11)]$ ÷ (50) , else (57) m = (56) m where $(H11)$ is from Appendix H (57) m = $\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 $	(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
Primary circuit loss (annual) from Table 3 0 (58) Primary circuit loss calculated for each month (59)m = (58) \div 365 x (41)m		s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (<u>I</u> H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хН	
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m		loss (s	nual) fra	m Table		I								(58)
	•	,	•			59)m = ((58) ± 36	35 × (41)	ım			<u> </u>		()
(modined by factor from Table fio it there is sold) water fleathly and a cyllider themiostal)	•				,	•	. ,	, ,		r thermo	stat)			
(59)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 (59)	`			i							'	0		(59)

Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	46.63	40.58	43.24	40.2	39.84	36.92	38.15	39.84	40.2	43.24	43.48	46.63]	(61)
Total he	eat requ	uired for	water he	 eating ca	alculated	for eac	h month	(62)m	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	182.32	159.26	165.7	146.97	142.29	125.32	120.07	133.85	-	154.09	164.49	178.03]	(62)
Solar DH	IW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter	'0' if no sola	r contribut	ion to wate	er heating)	ı	
(add ad	dditiona	I lines if	FGHRS	and/or V	//WHRS	applies,	, see Ap	pendix	G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHRS	-41.14	-36.19	-36.94	-30.43	-28.27	-23.33	-19.77	-23.93	-24.61	-30.41	-35.19	-39.75		(63) (G10)
Output	from w	ater hea	ter										_	
(64)m=	141.18	123.07	128.76	116.54	114.02	101.99	100.3	109.92	110.71	123.69	129.3	138.28		_
								Ou	itput from wa	ater heater	r (annual)₁	i12	1437.75	(64)
Heat ga	ains fro	m water	heating,	kWh/ma	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	۲ [(46)m	+ (57)m	+ (59)m	[]	
(65)m=	56.77	49.61	51.53	45.55	44.02	38.62	36.77	41.22	41.68	47.67	51.11	55.35		(65)
includ	de (57)	m in calc	culation o	of (65)m	only if c	ylinder i	s in the o	nillawk	g or hot w	ater is fr	om com	munity h	eating	
5. Inte	ernal ga	ains (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=	103.12	103.12	103.12	103.12	103.12	103.12	103.12	103.12	103.12	103.12	103.12	103.12		(66)
Lighting	g gains	(calculat	ted in Ar	pendix l	L, equat	tion L9 or	r L9a), a	lso see	Table 5				_	
(67)m=	16.1	14.3	11.63	8.8	6.58	5.56	6	7.8	10.47	13.3	15.52	16.54		(67)
Applian	nces ga	ins (calc	ulated in	Append	lix L, eq	uation L	13 or L1	3a), als	so see Tal	ble 5				
(68)m=	180.2	182.07	177.35	167.32	154.66	142.76	134.81	132.94	137.65	147.68	160.35	172.25		(68)
Cooking	g gains	(calcula	ted in A	ppendix	L, equat	lion L15	or L15a)), also s	see Table	5				
(69)m=	33.31	33.31	33.31	33.31	33.31	33.31	33.31	33.31	33.31	33.31	33.31	33.31		(69)
Pumps	and fai	ns gains	(Table 5	ja)										
(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	ole 5)								
(71)m=	-82.49	-82.49	-82.49	-82.49	-82.49	-82.49	-82.49	-82.49	-82.49	-82.49	-82.49	-82.49		(71)
Water h	neating	gains (T	able 5)										•	
(72)m=	76.31	73.82	69.26	63.26	59.17	53.64	49.43	55.4	57.89	64.07	70.98	74.39		(72)
Total ir	nternal	gains =	;			(66)	m + (67)m	ı + (68)m	n + (69)m + ((70)m + (7	1)m + (72))m	•	
(73)m=	329.54	327.12	315.17	296.32	277.35	258.89	247.17	253.07	262.94	281.98	303.78	320.12		(73)
6. Sola	ar gains	S:												
Solar ga	ains are o	calculated (using sola	r flux from	Table 6a	and assoc	iated equa	tions to a	convert to th	ıe applicab		tion.		
Orienta		Access F Fable 6d		Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	T	FF able 6c		Gains (W)	
Southea	ast _{0.9x}	0.77	X	1.5	52	x 3	36.79	x	0.35	х	0.8	=	10.85	(77)
Southea	ast _{0.9x}	0.77	x	4.5	52	x 6	62.67	x =	0.35		0.8	=	18.48	(77)
		0.77	^	1.5	,			ч ∟	0.00	J L				
Southea	Ļ	0.77	x				35.75	x _	0.35	x	0.8		25.29	
Southea Southea	ast _{0.9x}			1.5	52	x 8		┆┝		≓ ⊨		= =	25.29 31.34](77)](77)

Southeast 0.9x	0.77	x	1.52	7 x	119.01	x	0.35	x [0.8		35.1	(77)
Southeast 0.9x	0.77	x	1.52	ا ×	118.15	\exists x	0.35	╡╻	0.8	= =	34.85	(77)
Southeast 0.9x	0.77	×	1.52	≓ ×	113.91	= x	0.35	╡ょ┝	0.8	= =	33.6	(77)
Southeast _{0.9x}	0.77	x	1.52	×	104.39	×	0.35	_ x	0.8		30.79	(77)
Southeast _{0.9x}	0.77	×	1.52	= x	92.85	= x	0.35	= x	0.8	=	27.39	(77)
Southeast 0.9x	0.77	x	1.52	×	69.27	×	0.35	_ × [0.8	=	20.43	(77)
Southeast 0.9x	0.77	x	1.52	×	44.07	×	0.35	x	0.8	=	13	(77)
Southeast 0.9x	0.77	x	1.52	×	31.49	x	0.35	x	0.8	=	9.29	(77)
Southwest _{0.9x}	0.77	X	2.25	x	36.79		0.35	x	0.8	=	16.06	(79)
Southwest _{0.9x}	0.77	X	2.25	x	62.67		0.35	x	0.8	=	27.36	(79)
Southwest _{0.9x}	0.77	X	2.25	x	85.75		0.35	x	0.8	=	37.44	(79)
Southwest _{0.9x}	0.77	X	2.25	×	106.25		0.35	x	0.8	=	46.39	(79)
Southwest _{0.9x}	0.77	X	2.25	×	119.01		0.35	x	0.8	=	51.96	(79)
Southwest _{0.9x}	0.77	X	2.25	×	118.15		0.35	x [0.8	=	51.58	(79)
Southwest _{0.9x}	0.77	X	2.25	×	113.91		0.35	x	0.8	=	49.73	(79)
Southwest _{0.9x}	0.77	X	2.25	x	104.39		0.35	x	0.8	=	45.58	(79)
Southwest _{0.9x}	0.77	X	2.25	X	92.85		0.35	х	0.8	=	40.54	(79)
Southwest _{0.9x}	0.77	X	2.25	X	69.27		0.35	х	0.8	=	30.24	(79)
Southwest _{0.9x}	0.77	X	2.25	x	44.07		0.35	х	0.8	=	19.24	(79)
Southwest _{0.9x}	0.77	X	2.25	x	31.49		0.35	x	0.8	=	13.75	(79)
Northwest _{0.9x}	0.77	X	7.92	X	11.28	X	0.35	x	0.8	=	17.34	(81)
Northwest _{0.9x}	0.77	X	7.92	x	22.97	X	0.35	x	0.8	=	35.3	(81)
Northwest _{0.9x}	0.77	X	7.92	×	41.38	X	0.35	x	0.8	=	63.59	(81)
Northwest _{0.9x}	0.77	X	7.92	X	67.96	X	0.35	х	0.8	=	104.43	(81)
Northwest _{0.9x}	0.77	X	7.92	×	91.35	X	0.35	x	0.8	=	140.38	(81)
Northwest _{0.9x}	0.77	X	7.92	X	97.38	X	0.35	x	0.8	=	149.66	(81)
Northwest _{0.9x}	0.77	X	7.92	X	91.1	×	0.35	x	0.8	=	140	(81)
Northwest _{0.9x}	0.77	X	7.92	X	72.63	X	0.35	x	0.8	=	111.61	(81)
Northwest _{0.9x}	0.77	X	7.92	X	50.42	×	0.35	x	0.8	=	77.49	(81)
Northwest 0.9x	0.77	X	7.92	X	28.07	X	0.35	x	0.8	=	43.13	(81)
Northwest _{0.9x}	0.77	X	7.92	X	14.2	×	0.35	x	0.8	=	21.82	(81)
Northwest 0.9x	0.77	X	7.92	X	9.21	X	0.35	X	8.0	=	14.16	(81)
Solar gains in w $(83)m = 44.26$		culated 126.32	for each mo 182.16 227.	-	36.09 223.3	_	98 145.41	(82)m 93.8	54.06	37.19		(83)
Total gains – in							.90 145.41	93.6	34.00	37.19	İ	(00)
		441.5	478.48 504.	<u> </u>	94.98 470.5		.05 408.36	375.79	357.84	357.31		(84)
` '			!			ļ						
7. Mean intern Temperature of		,			area from T	able 0	Th1 (°C)				24	(85)
Utilisation factor	_			_			1111 (C)				21	(00)
Jan	Feb	Mar		ay	Jun Jul	 	ug Sep	Oct	Nov	Dec		
Jan	1 00	iviai	יאון ואי	uy	July July	1 7	ישו סבף	1	1 1101	טייט ו	1	
(86)m= 1	1	0.99	0.97 0.9	1	0.75 0.58	0.6	4 0.88	0.98	1	1		(86)

Moon	intorno	l tompor	aturo in	livina or	oo T1 (fa	allow eta	nc 2 to 7	7 in Tabl	0 ()0)					
	19.9	l temper 20.02	20.23	20.52	20.79	20.95	20.99	20.98		20.54	20.17	19.88	1	(87)
(87)m=		during h	<u> </u>			<u> </u>	<u> </u>		20.87 h2 (°C)	20.54	20.17	19.88		(67)
(88)m=	20.05	20.05	20.05	20.06	20.07	20.07	20.07	20.08	20.07	20.07	20.06	20.06		(88)
. ,		tor for g	<u>!</u>			<u>!</u>	<u> </u>							,
(89)m=	1	1	0.99	0.96	0.87	0.67	0.47	0.52	0.82	0.97	0.99	1		(89)
	intorno	l temper	aturo in	the rest	of dwalli	na T2 (f	ollow etc	nc 2 to	L 7 in Tabl	L (0c)	ļ			
(90)m=	18.58	18.75	19.06	19.48	19.85	20.04	20.07	20.07	19.96	19.52	18.99	18.56		(90)
(50)111=	10.00	10.75	13.00	13.40	10.00	20.04	20.07	20.07	<u> </u>	<u> </u>	g area ÷ (4		0.34	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	I A × T1	+ (1 – fl			J (,	0.54	(0.)
(92)m=	19.03	19.18	19.45	19.83	20.16	20.34	20.38	20.38	20.27	19.87	19.39	19		(92)
		nent to the				<u> </u>								• •
(93)m=	19.03	19.18	19.45	19.83	20.16	20.34	20.38	20.38	20.27	19.87	19.39	19		(93)
	ace hea	iting requ	uirement			l .								
		mean int			re obtain	ned at ste	ep 11 of	Table 9	b, so tha	ıt Ti,m=(76)m an	d re-calc	culate	
		factor fo				,				, ,	,		ı	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		tor for g						1					1	
(94)m=	1	0.99	0.99	0.96	0.88	0.7	0.5	0.56	0.83	0.97	0.99	1		(94)
		hmGm ,	` ` ` 			I	I	I	l	·	l			(05)
(95)m=	372.48	405.72	435.31	458.73	442.53	345	237.59	247.52	339.76	364.35	355.38	356.33		(95)
		age exte		i –		r	40.0	40.4		100	7.4	4.0		(06)
(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)
(97)m=	964.47	932.68	843.95	704.16	543.92	Lm , vv =	=[(39)m 2 240.4	x [(93)m	- (96)m 394.01	595.4	793.08	960		(97)
												900		(37)
(98)m=	440.44	g require 354.12	304.03	176.71	75.44	0	$\ln = 0.02$	24 X [(97))m = (95 0	171.9	315.15	449.13		
(90)111=	440.44	354.12	304.03	176.71	75.44		0						0000.04	(98)
								Tota	Il per year	(KWII/yeai) = Sum(9	O) _{15,912} =	2286.91	=
Space	e heatin	g require	ement in	kWh/m²	² /year								36.36	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
-	e heatir	_										1		_
Fracti	on of sp	pace hea	at from s	econdar	y/supple	mentary	•						0	(201)
Fracti	on of sp	pace 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) x [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								89.5	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	າ, %						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)								
	440.44	354.12	304.03	176.71	75.44	0	0	0	0	171.9	315.15	449.13		
(211)m	n = {[(98)m x (20	(4)] } x	00 ÷ (20	06)									(211)
	492.11	395.67	339.7	197.44	84.29	0	0	0	0	192.06	352.12	501.82		
	_		_	_	-	-	_	Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2555.21	(211)

Space heating fuel (secondary), kWh/month					
$= \{[(98)m \times (201)]\} \times 100 \div (208)$					
(215)m= 0 0 0 0 0	0 0 0	0 0 0	0		_
	Tot	al (kWh/year) =Sum(215) _{15,10}	.12	0	(215)
Water heating Output from water heater (calculated above)					
Output from water heater (calculated above) 141.18 123.07 128.76 116.54 114.02 1	01.99 100.3 109.92	110.71 123.69 129.3	138.28		
Efficiency of water heater	!		·	89.5	(216)
(217)m= 89.5 89.5 89.5 89.5 89.5	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 ÷ (217)m					
` '	13.95 112.07 122.81	123.7 138.2 144.47	154.5		
	Tot	al = Sum(219a) ₁₁₂ =		1606.42	(219)
Annual totals		kWh/yea	ır	kWh/year	7
Space heating fuel used, main system 1				2555.21	
Water heating fuel used				1606.42	
Electricity for pumps, fans and electric keep-hot					(000-)
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sun	n of (230a)(230g) =		75	(231)
Electricity for lighting				284.27	(232)
Electricity generated by PVs				-724.26	(233)
12a. CO2 emissions – Individual heating system	s including micro-CHI	Þ			
	Energy kWh/year	Emission fackg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	551.92	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	346.99	(264)
Space and water heating	(261) + (262) + (263) +	(264) =		898.91	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	147.54	(268)
Energy saving/generation technologies Item 1		0.519	=	-375.89	(269)
Total CO2, kg/year		sum of (265)(271) =		709.48](272)
Dwelling CO2 Emission Rate					_
z cg c c z zcc.c tate		$(272) \div (4) =$		11.28	(273)
El rating (section 14)		(272) ÷ (4) =		11.28 91	(273) (274)

SAP 2012 Overheating Assessment

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

Property Details: Be Green-Flat 7-2nd Floor

Dwelling type:FlatLocated 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: 149.45 (P1)

Transmission heat loss coefficient: 36.3

Summer heat loss coefficient: 185.76 (P2)

Overhangs:

Orientation: Ratio: Z_overhangs:

North West (Lounge terractations) 0.79 South West (Bedroom) 0.57 0.64 South East (Bedroom) 0 1

Solar shading

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North West (Lounge t	erralce doors)	0.9	0.79	0.69	(P8)
South West (Bedroom) 1	0.9	0.64	0.54	(P8)
South East (Bedroom)	1	0.9	1	0.9	(P8)

Solar gains:

Orientation	Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains
North West (Lounge terrace of old	ors) .92	105.45	0.35	0.8	0.69	146.07
South West (Bedroom) 0.9 x	2.25	126.97	0.35	0.8	0.54	38.69
South East (Bedroom) 0.9 x	1.52	126.97	0.35	0.8	0.9	43.77
					Total	228.53 (P3/P4)

Internal gains:

	June	July	August
Internal gains	371.29	356.32	364
Total summer gains	615.67	584.85	558.07 (P5)
Summer gain/loss ratio	3.31	3.15	3 (P6)
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	18.96	20.8	20.75 (P7)
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight

			User D	etails: _						
Assessor Name:	Natalie Wheeler			Stroma	a Num	her:		STRO	0027778	
Software Name:	Stroma FSAP 201	2		Softwa					on: 1.0.4.6	
Continuito Italiio.	G. G. M. 201			Address:			13 - 3rd		71101110	
Address :	Flat 13, Hampshire									
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			7	9.33	(1a) x	2	2.4	(2a) =	190.39	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1e	e)+(1n	1) 7	9.33	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	190.39	(5)
2. Ventilation rate:										
		econdar leating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	- -	0	Ī = [0	x	20 =	0	(6b)
Number of intermittent fa	ans				,	2	x -	10 =	20	(7a)
Number of passive vents	S				F	0	x	10 =	0	(7b)
Number of flueless gas f					L		x	40 =		= ' '
Number of flueless gas i	iiles					0		10 –	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	20		÷ (5) =	0.11	(8)
If a pressurisation test has	been carried out or is intende	ed, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber				•	uction			0	(11)
deducting areas of open	oresent, use the value corres ings); if equal user 0.35	ponaing to	tne great	er waii are	a (anter					
If suspended wooden	floor, enter 0.2 (unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught st	ripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	. , , ,	, , ,	. ,		0	(16)
•	, q50, expressed in cub		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.36	(18)
Air permeability value applie Number of sides shelter	es if a pressurisation test has	s been don	e or a deg	gree air pei	meability	is being u	sed			(19)
Shelter factor	cu			(20) = 1 -	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)	x (20) =				0.3	(21)
Infiltration rate modified	-	i							0.0	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7								4	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
			·			ı	1	ı	4	
Wind Factor $(22a)m = (2a)m =$	'	0.55	0.0=						1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	

Adjusted infiltr	ation rate (allow	vina for sl	nelter an	nd wind s	:need) =	(21a) x	(22a)m					
0.38	0.38 0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35]	
	ctive air change	rate for t	he appli	cable ca	se	ļ				<u> </u>	J	
If mechanica											0	(23a)
	eat pump using App) = (23a)			0	(23b)
	heat recovery: effi	-	_								0	(23c)
· ·	d mechanical v	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		(24a)
· -	d mechanical v	entilation		1	covery (N	ЛV) (24b	ŕ	 	- 		1	
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0]	(24b)
,	ouse extract ve		•	•				F (00)	,			
<u> </u>	$0 < 0.5 \times (23b),$	· ` `	c) = (230)	o); otner	wise (24)	C) = (22t)	o) m + 0.	· `			1	(24c)
(24c)m= 0		0						0	0	0	J	(240)
,	ventilation or wl n = 1, then (24d			•				0.5]			_	
(24d)m= 0.57	0.57 0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effective air	change rate - e	nter (24a	n) or (24k	o) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.57	0.57 0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
3 Heat losse	s and heat loss	paramet	er.									
ELEMENT	Gross	Openir		Net Ar	ea	U-val	ue	AXU		k-value	9	ΑΧk
	area (m²)		1 ²	A ,r		W/m2		(W/I	<)	kJ/m²•		kJ/K
Doors				1.87	X	1	=	1.87				(26)
Windows Type	: 1			5.04	x1.	/[1/(1.4)+	0.04] =	6.68				(27)
Windows Type	2			4.96	x1.	/[1/(1.4)+	0.04] =	6.58				(27)
Windows Type	3			2.3	x1.	/[1/(1.4)+	0.04] =	3.05				(27)
Windows Type	<u>.</u> 4			2.3	x1.	/[1/(1.4)+	0.04] =	3.05				(27)
Walls	78.1	16.4	7	61.63	3 X	0.18	□ -i	11.09				(29)
Roof	79.33	0		79.33	3 x	0.11	-	8.73	T i		i i	(30)
Total area of e	lements, m ²			157.4	3							(31)
Party wall				24.1	x	0		0	п г			(32)
Party floor				79.33	\equiv						7 H	(32a)
* for windows and	roof windows, use			alue calcul		formula 1	/[(1/U-valu	ıе)+0.04] а	L ns given in	paragrapl	1 3.2	((==0)
	as on both sides of S SS, W/K = S (A $>$		іѕ апи раг	uuons		(26)(30)) + (32) =				44.05	(33)
Heat capacity	•	(0)				(==):::(==)		(30) + (32	2) + (32a)	(32e) =	41.05	(34)
	parameter (TM	P – Cm -	- TFΔ\ ir	n k I/m²K			., ,	itive Value:	, , ,	(020) =	0	
	sments where the d		•			ecisely the				able 1f	250	(35)
· ·	ad of a detailed cal		0011011401	ion are no	crarown pr	colooly unc	maioative	, values of		2010 11		
Thermal bridge	es : S (L x Y) ca	lculated	using Ap	pendix I	K						13.13	(36)
if details of therma	al bridging are not k	nown (36) :	= 0.15 x (3	31)			(33) +	· (36) =			5. .=	(27)
		d month!	.,						25\m v (5)		54.17	(37)
	t loss calculate	1	<u> </u>	1	1,,1	۸		= 0.33 × (l	
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

(38) ~ 36.07	35.89	25 74	34.88	34.72	34	34	22.06	34.28	34.72	25.04	25.26		(38)
(38)m= 36.07		35.71	34.00	34.72	34	34	33.86			35.04	35.36		(30)
Heat transfer (39)m= 90.24	90.06	1t, VV/K 89.88	89.05	88.89	88.17	88.17	88.04	88.45	= (37) + (3 88.89	89.21	89.54		
(55)111= 55.24	30.00	03.00	05.05	00.00	00.17	00.17	00.04			Sum(39) ₁		89.05	(39)
Heat loss para	meter (H	HLP), W	m²K		_				= (39)m ÷				
(40)m= 1.14	1.14	1.13	1.12	1.12	1.11	1.11	1.11	1.11	1.12	1.12	1.13		_
Number of day	e in mo	nth (Tah	(12 ما					•	Average =	Sum(40) ₁	12 /12=	1.12	(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 .			<u> </u>		Į						
4. Water heat	ting ene	rav reaui	irement:								kWh/ye	ear:	
												, carr	
Assumed occu if TFA > 13.9			[1 - exn	(-0 0003	849 v (TF	-Δ -13 0	1211 + 0 (1013 x (Γ F Δ -13		.45	I	(42)
if TFA £ 13.9		1 1.70 X	i cxp	(0.0000	7-5 X (11	A 10.5	<i>)</i> 2)] 1 0.0) X 610X	11 / 15.	.5)			
Annual averag									o toract o		2.39		(43)
Reduce the annua							io acriieve	a water us	se largel o	1			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in			<u> </u>			<u> </u>				1.101			
(44)m= 101.63	97.93	94.24	90.54	86.84	83.15	83.15	86.84	90.54	94.24	97.93	101.63		
									Γotal = Su	m(44) ₁₁₂ =	=	1108.66	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m= 150.71	131.81	136.02	118.58	113.78	98.19	90.98	104.41	105.65	123.13	134.4	145.95		_
If instantaneous w	ater heati	na at noint	of use (no	hot water	r storage)	enter () in	hoxes (46		Γotal = Su	m(45) ₁₁₂ =	=	1453.62	(45)
(46)m= 22.61	19.77	20.4	17.79	17.07	14.73	13.65	15.66	15.85	18.47	20.16	21.89		(46)
Water storage	l -	20.4	17.73	17.07	14.73	13.03	13.00	13.03	10.47	20.10	21.09		(10)
Storage volum	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_			. ,						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day).					0		(48)
Temperature f					(., u.u.y / .					0		(49)
Energy lost fro				ear			(48) x (49)) =			0		(50)
b) If manufact		•	•		or is not	known:							()
Hot water stor	_			e 2 (kW	h/litre/da	ıy)					0		(51)
If community had Volume factor	•		on 4.3								0		(52)
Temperature f			2b							-	0		(52) (53)
Energy lost fro				ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (-	,				. , (= .)	. (- / (,		0		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41):	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
								I					

Primar	y circuit	loss (an	nual) fro	om Table	∌ 3							0		(58)
	•				,	(59)m = (. ,	. ,						
,						solar wat		`			r –		I	(50)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0	I	(59)
				ı i	ì	(60) ÷ 36	- ` 	<u> </u>				•	ı	
(61)m=	50.96	45.08	48.02	44.65	44.26	41.01	42.37	44.26	44.65	48.02	48.29	50.96		(61)
Total h								` ´ 		<u>` </u>	ì	`	(59)m + (61)m	
(62)m=	201.67	176.89	184.04	163.23	158.04	139.19	133.36	148.66	150.3	171.15	182.7	196.91		(62)
						H (negativ				r contribut	ion to wate	r heating)		
•	dditional 0		FGHRS 0			applies,		pendix G					1	(63)
(63)m=		0 -41.82		25.13	33.63	26.02	22.70		0	35.00	0	0 45.04	I	(63) (G10)
	from w	-	-42.69	-35.13	-32.63	-26.92	-22.79	-27.59	-28.39	-35.09	-40.64	-45.94		(63) (610)
•	from wa		ter 141.35	129.1	125.41	112.27	110.56	121.07	121.91	136.06	142.06	150.97	1	
(64)m=	154.13	135.06	141.33	128.1	125.41	112.21	110.56				142.06 r (annual) ₁	L	1578.97	(64)
⊔oat a	aine fron	~ woter	hooting	M/h/m	anth () 2	E ' [O QE	~ (45)m	•			,	ı](04)
(65)m=	62.85	55.1	neating, 57.23	50.59	48.9	5 ´ [0.85 42.9	× (45)m	45.78	46.29	52.95	+ (57)m 56.76	+ (59)m 61.27] 	(65)
	<u> </u>					ylinder is							cating	(66)
					-	yiiriuei is	3 III II IE C	Jweiling	OI HOL W	alei is ii	OIII COM	Murilly 11	eaung	
		•		5 and 5a)):									
Metab	i i		5), Wat		May	Lin			San	l Oct	I Nov	Dag		
(66)m=	Jan 147	Feb 147	Mar 147	Apr 147	May 147	Jun 147	Jul 147	Aug 147	Sep 147	Oct	Nov 147	Dec 147		(66)
	ll			<u> </u>		<u> </u>		<u> </u>		17,	177	177	ı	(55)
(67)m=	g gains 48.72	43.28	35.19	26.64	L, equati	ion L9 or 16.81	18.17	23.62	31.7	40.25	46.97	50.08		(67)
						uation L					40.07	00.00	ı	(6.)
(68)m=	325.42	328.8	320.29	302.18	279.31	257.81	243.46	240.08	248.59	266.7	289.57	311.07		(68)
	L L					tion L15					200.01	011.07	ı	(63)
(69)m=	52.15	52.15	52.15	52.15	52.15	52.15	52.15	52.15	52.15	52.15	52.15	52.15		(69)
, ,	L		(Table 5		02.10	02.10	02.10	02.10	0£.10	02.10	02.10	02.10	ı	(55)
(70)m=	3	3	3	3 3	3	3	3	3	3	3	3	3		(70)
, ,	L l			Ll tive value				ا ٽ			Ü		ı	(/
(71)m=	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98		(71)
	LI heating							<u> </u>	V -			<u> </u>		(*)
(72)m=	84.48	81.99	76.92	70.27	65.72	59.58	54.9	61.53	64.29	71.16	78.84	82.35		(72)
, ,	nternal							n + (68)m +		<u> </u>		<u> </u>		,
(73)m=		558.22	536.56	503.24	469.1	438.36	420.68	429.38	448.73	482.27	519.54	547.65		(73)
	lar gains													
			using sola	r flux from	Table 6a	and associ	iated equa	itions to co	nvert to th	ıe applicat	ole orientat	ion.		
Orienta	ation: A	ccess Fable 6d		Area m²		Flu: Tak	ıx ble 6a	т	g_ able 6b	т	FF able 6c		Gains (W)	
Cautho	_							, —				<u> </u>	` ′	1,
Southe	ast 0.9x	0.77	Х	2.3	3	x 3	36.79	X	0.35	X	0.8	=	16.42	(77)

Southoost of C		1		1		1		ı		1		7,
Southeast 0.9x	0.77	X	2.3	X	62.67	X	0.35	X	0.8	=	27.97	(77)
Southeast 0.9x	0.77	X	2.3	X	85.75	X	0.35	X	0.8	=	38.27	(77)
Southeast 0.9x	0.77	X	2.3	X	106.25	X	0.35	Х	0.8	=	47.42	<u> </u> (77)
Southeast 0.9x	0.77	X	2.3	X	119.01	X	0.35	Х	0.8	=	53.11	(77)
Southeast 0.9x	0.77	X	2.3	X	118.15	X	0.35	X	0.8	=	52.73	(77)
Southeast 0.9x	0.77	X	2.3	X	113.91	X	0.35	Х	0.8	=	50.84	(77)
Southeast 0.9x	0.77	X	2.3	X	104.39	Х	0.35	Х	0.8	<u> </u>	46.59	(77)
Southeast 0.9x	0.77	X	2.3	X	92.85	X	0.35	X	0.8	=	41.44	(77)
Southeast _{0.9x}	0.77	X	2.3	X	69.27	X	0.35	X	0.8	=	30.91	(77)
Southeast 0.9x	0.77	X	2.3	X	44.07	X	0.35	X	0.8	=	19.67	(77)
Southeast _{0.9x}	0.77	X	2.3	X	31.49	X	0.35	X	0.8	=	14.05	(77)
Southwest _{0.9x}	0.77	X	2.3	X	36.79		0.35	X	0.8	=	16.42	(79)
Southwest _{0.9x}	0.77	X	2.3	X	62.67		0.35	X	0.8	=	27.97	(79)
Southwest _{0.9x}	0.77	X	2.3	X	85.75		0.35	X	0.8	=	38.27	(79)
Southwest _{0.9x}	0.77	X	2.3	X	106.25]	0.35	X	0.8	=	47.42	(79)
Southwest _{0.9x}	0.77	X	2.3	x	119.01]	0.35	x	0.8	=	53.11	(79)
Southwest _{0.9x}	0.77	X	2.3	x	118.15		0.35	х	0.8	=	52.73	(79)
Southwest _{0.9x}	0.77	X	2.3	x	113.91		0.35	х	0.8	=	50.84	(79)
Southwest _{0.9x}	0.77	X	2.3	x	104.39		0.35	х	0.8	=	46.59	(79)
Southwest _{0.9x}	0.77	x	2.3	x	92.85		0.35	х	0.8	=	41.44	(79)
Southwest _{0.9x}	0.77	X	2.3	x	69.27		0.35	х	0.8	=	30.91	(79)
Southwest _{0.9x}	0.77	x	2.3	x	44.07]	0.35	x	0.8	=	19.67	(79)
Southwest _{0.9x}	0.77	x	2.3	x	31.49]	0.35	x	0.8	=	14.05	(79)
Northwest _{0.9x}	0.77	X	5.04	x	11.28	x	0.35	х	0.8] =	11.03	(81)
Northwest _{0.9x}	0.77	x	4.96	x	11.28	x	0.35	х	0.8	=	10.86	(81)
Northwest _{0.9x}	0.77	x	5.04	x	22.97	x	0.35	х	0.8	=	22.46	(81)
Northwest _{0.9x}	0.77	x	4.96	x	22.97	x	0.35	x	0.8	j =	22.1	(81)
Northwest _{0.9x}	0.77	x	5.04	x	41.38	x	0.35	x	0.8	=	40.47	(81)
Northwest _{0.9x}	0.77	x	4.96	x	41.38	x	0.35	x	0.8	=	39.82	(81)
Northwest 0.9x	0.77	x	5.04	x	67.96	x	0.35	x	0.8	j =	66.46	(81)
Northwest _{0.9x}	0.77	x	4.96	x	67.96	x	0.35	x	0.8	=	65.4	(81)
Northwest _{0.9x}	0.77	x	5.04	x	91.35	x	0.35	х	0.8	=	89.33	(81)
Northwest 0.9x	0.77	x	4.96	x	91.35	x	0.35	x	0.8	j =	87.91	(81)
Northwest _{0.9x}	0.77	X	5.04	x	97.38	x	0.35	х	0.8	j =	95.24	(81)
Northwest _{0.9x}	0.77	X	4.96	x	97.38	x	0.35	х	0.8	j =	93.73	(81)
Northwest _{0.9x}	0.77	×	5.04	x	91.1	x	0.35	x	0.8	j =	89.09	(81)
Northwest _{0.9x}	0.77	x	4.96	x	91.1	x	0.35	x	0.8	i =	87.68	(81)
Northwest _{0.9x}	0.77	x	5.04	×	72.63	x	0.35	x	0.8	=	71.03	(81)
Northwest _{0.9x}	0.77	X	4.96	X	72.63	X	0.35	х	0.8	=	69.9	(81)
Northwest _{0.9x}	0.77	X	5.04	X	50.42	X	0.35	х	0.8	=	49.31	(81)
Northwest _{0.9x}	0.77	X	4.96	X	50.42	X	0.35	х	0.8	, 	48.53	(81)
L		_						1				

Northwe	est _{0.9x}	0.77	X	5.0)4	x	2	28.07	X		0.35	х	0.8	=	27.45	(81)
Northwe	orthwest 0.9x															
Northwe	est _{0.9x}	0.77	X	5.0)4	x		14.2	х		0.35	x	0.8	_	13.88	(81)
Northwe	est _{0.9x}	0.77	X	4.9	96	x		14.2	х		0.35	x	0.8	=	13.66	(81)
Northwe	est _{0.9x}	0.77	х	5.0)4	x	,	9.21	x		0.35	_ x [0.8		9.01	(81)
Northwe	est _{0.9x}	0.77	X	4.9	96	x	9	9.21	x		0.35	_ x [0.8	=	8.87	(81)
	_					ļ										
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m	n = Si	um(74)m .	(82)m				
(83)m=	54.73	100.51	156.83	226.7	283.47	29	94.42	278.45	234	4.1	180.71	116.29	66.88	45.98		(83)
Total ga	ains – ir	nternal a	nd sola	r (84)m =	= (73)m	+ (8	33)m	, watts								
(84)m=	617.51	658.72	693.39	729.94	752.57	73	32.78	699.12	663	.48	629.45	598.56	586.42	593.63		(84)
7. Mea	an inter	nal temp	erature	(heating	season)							•			
				`		<i></i>	area i	from Tah	ole 9	Th	1 (°C)				21	(85)
•		J	٠.			•				,	. ()					(55)
		ı	I			È	_		Δ	ша	Sen	Oct	Nov	Dec		
(86)m=						\vdash		 		Ť	<u> </u>		+			(86)
` ′ L			l	l	l .	<u> </u>		l .				0.00	0.00	0.00		(00)
г										$\overline{}$			 		1	(0-)
(87)m=	19.94	20.05	20.26	20.54	20.8	2	0.95	20.99	20.	98	20.89	20.58	20.21	19.91		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Tł	n2 (°C)					
(88)m=	19.97	19.97	19.97	re in living area T1 (follow steps 3 to 7 in Table 9c) 0.26 20.54 20.8 20.95 20.99 20.98 20.89 20.58 20.21 19.91 (87) ting periods in rest of dwelling from Table 9, Th2 (°C) 9.97 19.98 19.98 19.99 19.99 19.99 19.99 19.98 19.98 19.98 19.98 19.98 s for rest of dwelling, h2,m (see Table 9a) 0.97 0.93 0.83 0.62 0.42 0.47 0.75 0.94 0.98 0.99 (89) re in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 9.04 19.45 19.79 19.96 19.99 19.99 19.9 19.51 18.98 18.54 (90) fLA = Living area ÷ (4) = 0.32 (91)												
Utilisa	ition fac	tor for g	ains for	rest of d	welling,	h2,	m (se	ee Table	9a)							
(89)m=	0.99	0.99	0.97	1	<u>_</u>	_		1	–	17	0.75	0.94	0.98	0.99		(89)
Moon	intorna	Ltompor	atura in	the rest	of dwall	ina	T2 (f	ollow sto	nc 2	to 7	7 in Tabl	0.00)			1	
(90)m=		 	i	1	i			1	·	_			18 98	18 54		(90)
(50)111=	10.00	10.74	10.04	10.40	10.70	<u> </u>	0.00	10.00	10.	00					0.32	一 ` ′
													3 (,	0.32	(0.)
Г			· `	r	1	_		r	<u> </u>				1	1	Ī	(00)
(92)m=					<u> </u>								19.37	18.98		(92)
· · · · r			i	1		_		1		$\overline{}$			10.07	40.00	1	(02)
(93)m=				L	20.11	2	0.27	20.3	20	.3	20.22	19.85	19.37	18.98		(93)
		·				اء ما	a4 a4	an 11 af	Tabl	ام ۸		4 T:	(70)	ما مماد	loto	
						iea	at ste	ерттог	rabi	ie 9t	o, so tha	t 11,ff1=((76)m an	d re-caid	culate	
Ι					I		Jun	Jul	Α	ua	Sep	Oct	Nov	Dec		
Utilisa			<u> </u>	<u> </u>	11141					- 3	334		1		l	
(94)m=	0.99	0.98	0.97	0.93	0.83	(0.65	0.46	0.5	51	0.77	0.94	0.98	0.99		(94)
Useful	I gains,	hmGm .	, W = (9	4)m x (8	4)m	_									l	
(95)m=	610.62	647.71	672.24	678.97	627.59	47	75.68	323.17	337	.91	483.44	561.32	575.01	588.1		(95)
Month	ly avera	age exte	rnal tem	perature	from T	abl	e 8						•	•	1	
(96)m=	4.3	4.9	6.5	8.9	11.7	-	14.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Heat lo	oss rate	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(9	3)m-	– (96)m]			•	
(97)m=	1327.19	1283.91	1161.9	970.32	747.25	50	00.05	326.62	343	.51	540.87	822.28	1094.87	1323.13		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	4 x	(97)	m – (95)m] x (4	1)m		-	
(98)m=	Second S															

CHP) - (201) = 202) × [1 - 6]	Oct 194.16 216.93	Nov 374.3	Dec 546.86	0 1 1 89.5 0 kWh/ye	(99) (201) (202) (204) (206) (208)
- (201) = 202) × [1 - (Oct 194.16 216.93	374.3		1 1 89.5	(202) (204) (206) (208)
Sep 0	Oct 194.16 216.93	374.3		1 1 89.5	(202) (204) (206) (208)
Sep 0	Oct 194.16 216.93	374.3		1 1 89.5	(202) (204) (206) (208)
Sep 0	Oct 194.16 216.93	374.3		1 89.5 0	(204)
Sep 0	Oct 194.16 216.93	374.3		89.5	(206)
0	194.16	374.3		0	(208)
0	194.16	374.3			
0	194.16	374.3		KVVn/y€	ear
0	216.93		546.86		
		418 21			
		418 21			(211)
al (kWh/yea	ar) =Sum(2	710.21	611.01		
		211) _{15,1012}	<u></u>	3060.42	(211)
0	0				
al (kWh/yea		0	0	0	(215)
	(- /15,1012	Ĺ		
121.91	136.06	142.06	150.97		_
	.			89.5	(216)
89.5	89.5	89.5	89.5		(217)
136.21	152.02	158.73	168.68		
al = Sum(2	19a) ₁₁₂ =			1764.21	(219)
	k۱	Nh/year	, 	kWh/yea	<u>r</u>
			Ļ	3060.42	╡
			L	1764.21	
			30		(2300
			45		(230
n of (230a).	(230g) =			75	(231)
			Γ	344.18	(232)
			Ė	-959.68	(233)
			L		
	89.5 136.21 tal = Sum(2	89.5 89.5 136.21 152.02 tal = Sum(219a) ₁₁₂ = kN	89.5 89.5 89.5 136.21 152.02 158.73 tal = Sum(219a) ₁₁₂ =	89.5 89.5 89.5 89.5 136.21 152.02 158.73 168.68 tal = Sum(219a) ₁₁₂ = kWh/year	89.5 89.5 89.5 89.5 89.5 89.5 89.5 89.5

kWh/year

£/year

(Table 12)

Space heating - main system 1	(211) x	3.48 x 0.01 =	106.5	240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (2-	241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (2-	242)
Water heating cost (other fuel)	(219)	3.48 x 0.01 =	61.39 (2	247)
Pumps, fans and electric keep-hot	(231)	13.19 x 0.01 =	9.89 (24	249)
(if off-peak tariff, list each of (230a) to (2 Energy for lighting	230g) separately as applicable and ap	oply fuel price according to $13.19 \times 0.01 =$		250)
Additional standing charges (Table 12)			120 (2	251)
	one of (233) to (235) x)	13.19 x 0.01 =	0 (2:	252)
Appendix Q items: repeat lines (253) ar	nd (254) as needed	10.10	,	,
Total energy cost	(245)(247) + (250)(254) =		343.19 (2	255)
11a. SAP rating - individual heating sy	stems			
Energy cost deflator (Table 12)			0.42	256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =		1.16 (2:	257)
SAP rating (Section 12)			83.83	258)
12a. CO2 emissions – Individual heati	ng systems including micro-CHP			
	Energy	Emission factor	Emissions	
	kWh/year	kg CO2/kWh	kg CO2/year	
Space heating (main system 1)	kWh/year (211) x	kg CO2/kWh 0.216 =		261)
Space heating (main system 1) Space heating (secondary)	•		661.05	261)
	(211) x	0.216 =	661.05 (2)	
Space heating (secondary)	(211) x (215) x	0.216 = 0.519 = 0.216 =	661.05 (2) 0 (2) 381.07 (2)	263)
Space heating (secondary) Water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 = 0.519 = 0.216 =	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2)	263) 264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 = 0.519 = 0.216 = -	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2)	263) 264) 265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keeps	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x	0.216 = 0.519 = 0.519 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2)	263) 264) 265) 267)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep the secondary to be secondary.	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2)	263) 264) 265) 267) 268)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric leader to be compared to the compa	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2) 761.6 (2)	263) 264) 265) 267) 268)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep the secondary is secondary. Electricity for lighting Energy saving/generation technologies litem 1 Total CO2, kg/year	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2) 761.6 (2) 9.6 (2)	263) 264) 265) 267) 268) 269)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep telectricity for lighting Energy saving/generation technologies litem 1 Total CO2, kg/year CO2 emissions per m²	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2) 761.6 (2) 9.6 (2)	263) 264) 265) 267) 268) 269) 272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep telectricity for lighting Energy saving/generation technologies litem 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2) 761.6 (2) 9.6 (2)	263) 264) 265) 267) 268) 269) 272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep telectricity for lighting Energy saving/generation technologies litem 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x Suite (27)	0.216 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2) 761.6 (2) 9.6 (2) 92 (2) P. Energy kWh/year	263) 264) 265) 267) 268) 269) 272)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep Electricity for lighting Energy saving/generation technologies Item 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x Sultation (27) Energy kWh/year	0.216 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2) 761.6 (2) 9.6 (2) 92 (2) P. Energy kWh/year 3733.71 (2)	263) 264) 265) 267) 268) 269) 272) 273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep telectricity for lighting Energy saving/generation technologies litem 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x Sul (27) Energy kWh/year (211) x	0.216 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2) 761.6 (2) 9.6 (2) 92 (2) P. Energy kWh/year 3733.71 (2) 0 (2)	263) 264) 265) 267) 268) 269) 272) 273)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep telectricity for lighting Energy saving/generation technologies litem 1 Total CO2, kg/year CO2 emissions per m² El rating (section 14) 13a. Primary Energy Space heating (main system 1) Space heating (secondary)	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x Sultation (27) Energy kWh/year (211) x (215) x	0.216 = 0.519	661.05 (2) 0 (2) 381.07 (2) 1042.12 (2) 38.93 (2) 178.63 (2) -498.07 (2) 761.6 (2) 9.6 (2) 92 (2) P. Energy kWh/year 3733.71 (2) 0 (2) 2152.33 (2)	263) 264) 265) 267) 268) 269) 272) 273) 274)

Primary energy kWh/m²/year		(272) ÷ (4) =		53.28	(273)
'Total Primary Energy		sum of (265)(271) =		4226.72	(272)
Energy saving/generation technologies Item 1		3.07	=	-2946.22	(269)
Electricity for lighting	(232) x	0	=	1056.64	(268)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)

		User D	Details:								
Assessor Name: Software Name:											
		Property	Address	Be Gre	en-Flat	13 - 3rd	floor				
Address: 1. Overall dwelling dime	Flat 13, Hampshire street										
1. Overall aweiling aime	molorio.	Area	a(m²)		Av. He	ight(m)		Volume(m ³	*)		
Ground floor			· ·	(1a) x		2.4	(2a) =	190.39	(3a)		
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 7	79.33	(4)			_				
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	190.39	(5)		
2. Ventilation rate:											
	main seconda heating heating	ry	other		total			m³ per hou	r		
Number of chimneys		T + [0] = [0	X	40 =	0	(6a)		
Number of open flues	0 + 0	- + -	0	Ī = Ē	0	x	20 =	0	(6b)		
Number of intermittent fa	ins			'	2	x	10 =	20	(7a)		
Number of passive vents	;			Ē	0	x	10 =	0	(7b)		
Number of flueless gas fi	ires			F	0	x	40 =	0	(7c)		
				L							
				_			Air ch	nanges per ho	our —		
	ys, flues and fans = (6a)+(6b)+(peen carried out or is intended, proceed			continuo fr	20		÷ (5) =	0.11	(8)		
Number of storeys in the		eu 10 (17), i	ourerwise (onunue n	OIII (9) 10	(10)		0	(9)		
Additional infiltration						[(9)	-1]x0.1 =	0	(10)		
	.25 for steel or timber frame o			•	uction			0	(11)		
if both types of wall are p deducting areas of openi	resent, use the value corresponding t ngs); if equal user 0.35	o the great	ter wall are	a (after							
If suspended wooden	floor, enter 0.2 (unsealed) or 0).1 (seale	ed), else	enter 0				0	(12)		
If no draught lobby, en	·							0	(13)		
•	s and doors draught stripped		0.25 [0.2	v (14) · 1	001 -			0	(14)		
Window infiltration Infiltration rate			0.25 - [0.2] (8) + (10)	. ,	_	+ (15) =		0	(15)		
	q50, expressed in cubic metre	es ner ho					area	5	(16)		
,	lity value, then $(18) = [(17) \div 20] + (18)$		•	•	out of c	лисюрс	arou	0.36	(18)		
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			` ′		
Number of sides sheltere	ed		(00) 4	10.07E (4	10)1			2	(19)		
Shelter factor	ting aboltor footor		(20) = 1 -		19)] =			0.85	(20)		
Infiltration rate incorporate	•		(21) = (18) X (20) =				0.3	(21)		
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1			
Monthly average wind sp	1 ' 1 ' 1	1 001	1 /lug	ОСР	1 000	1100	1 200	J			
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]			
`	1 1	1	1		I	1	1	J			
Wind Factor $(22a)m = (2a)m =$							T	1			
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	J			

Adjusted infiltr	ation rate	e (allowii	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.38	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35]	
Calculate effect		•	ate for t	he appli	cable ca	se	-	-		-			(23
If exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0	
If balanced with									, (===,			0	
a) If balance		-	-	_					2h)m + (23h) x [1	1 – (23c)		(23)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	d mecha	nical ve	ntilation	without	heat rec	coverv (N	//\/) (24h)m = (2)	2b)m + (;	L 23h)	<u>!</u>	J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole h	ouse extr			•	•				5 x (23h))	1	J	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
d) If natural	ventilatio	n or who	ole hous	e nositiv	ve input	ventilatio	n from I	oft.			<u> </u>	J	
,	n = 1, the			•					0.5]			_	
(24d)m= 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56]	(24
Effective air	change r	ate - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-	_	
(25)m= 0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56]	(25)
3. Heat losse	s and hea	at loss n	paramete	ār.									
ELEMENT	Gross area (s	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value		A X k kJ/K
Doors	`	,			1.87	X	1	=	1.87	,			(26)
Windows Type	. 1				5.04	x1,	/[1/(1.4)+	0.04] =	6.68				(27)
Windows Type	2				4.96	x1,	/[1/(1.4)+	0.04] =	6.58	=			(27)
Windows Type					2.3	x ₁ ,	/[1/(1.4)+	0.04] =	3.05				(27)
Windows Type					2.3	_	/[1/(1.4)+		3.05				(27)
Walls	78.1		16.4	7	61.63	=	0.18	'	11.09	=			(29)
Roof	79.33	=	0		79.33	=	0.10	=	8.73	ᆿ ¦		북 누	(30)
Total area of e						=	0.11		0.73				(31)
Party wall	iomonto,				157.4	=		- 1 _1	0	— r			
Party floor					24.1	×	0	=	0				(32)
* for windows and	roof windo		ffootivo wi	ndow II v	79.33		i formula 1	/F/1/II vol	10) 10 041 0	L no airean in	norograni		(32
** include the area						aleu usiriy	TOTTIUIA T	/[(1/ O- vaic	<i>ie)</i> +0.04j a	is giveri iii	paragrapi	1 3.2	
Fabric heat los	ss, W/K =	S (A x	U)				(26)(30)	+ (32) =				41.0	05 (33)
Heat capacity	Cm = S(A)	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	paramet	er (TMP	e Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L)	x Y) cald	culated u	using Ap	pendix l	<						13.1	(36)
if details of therma Total fabric he		are not kno	own (36) =	= 0.15 x (3	11)			(33) +	· (36) =			54.1	17 (37)
Ventilation hea	at loss cal	Iculated	monthly	/				(38)m	= 0.33 × (25)m x (5))		

							1					I	
(38)m= 36.07	35.89	35.71	34.88	34.72	34	34	33.86	34.28	34.72	35.04	35.36		(38)
Heat transfer	coefficier	nt, W/K					,	(39)m	= (37) + (38)m		•	
(39)m= 90.24	90.06	89.88	89.05	88.89	88.17	88.17	88.04	88.45	88.89	89.21	89.54		7,
Heat loss par	ameter (H	HLP), W/	/m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	89.05	(39)
(40)m= 1.14	1.14	1.13	1.12	1.12	1.11	1.11	1.11	1.11	1.12	1.12	1.13		_
Number of da	ve in moi	nth (Tab	lo 1a)					,	Average =	Sum(40) ₁	12 /12=	1.12	(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)
(11)	1	<u> </u>		<u> </u>		<u> </u>							,
4 \\/atox boo	4:000000										LAMB /s c		
4. Water hea	iting enei	rgy requi	rement:								kWh/ye	ear:	
Assumed occ											.45		(42)
if TFA > 13 if TFA £ 13	-	+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)			
Annual avera	•	ater usac	ne in litre	s per da	av Vd av	erage =	(25 x N)	+ 36		92	2.39		(43)
Reduce the annu	al average	hot water	usage by	5% if the α	dwelling is	designed			se target o				(1-)
not more that 12:	5 litres per p	oerson per	· day (all w	ater use, l	hot and co	ld)			•	,		•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres per	day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)					•	
(44)m= 101.63	97.93	94.24	90.54	86.84	83.15	83.15	86.84	90.54	94.24	97.93	101.63		_
Energy content o	f hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1108.66	(44)
45)m= 150.71	131.81	136.02	118.58	113.78	98.19	90.98	104.41	105.65	123.13	134.4	145.95		
	<u> </u>]]					-	Total = Su	m(45) ₁₁₂ =		1453.62	(45)
If instantaneous	water heatii	ng at point	of use (no) hot water	r storage),	enter 0 in	boxes (46) to (61)	_	_			
(46)m= 22.61	19.77	20.4	17.79	17.07	14.73	13.65	15.66	15.85	18.47	20.16	21.89		(46)
Nater storage		. :		-1 \^	/\// IDC	-4	itle i		1			1	
Storage volur	, ,		0 ,			Ü		ame ves	sei		0		(47)
lf community Otherwise if n	•			-			` '	ars) ante	ar 'O' in <i>(</i>	47)			
Water storage		not wate	/ (till ill	iciaacs i	iistaiitai	10003 00	ATTION DOIL	cra) crite) III (71)			
a) If manufac		eclared l	oss facto	or is kno	wn (kWr	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fr	om water	· storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If manufac		_	-		or is not	known:							` ,
Hot water sto	_			e 2 (kW	h/litre/da	ıy)					0		(51)
f community	_		on 4.3									1	4
/olume factor Femperature			. 2h								0		(52)
·							(47) (54)	· · · (50) · · · (50)		0		(53)
Energy lost fr Enter (50) or		_	, KVVN/ye	∍ar			(47) x (51)) X (52) X (53) =	-	0		(54)
Water storage	, , ,	,	for each	month			((56)m = (55) 🗸 (41):	m		0		(55)
	1						· · · · ·			_		Ī	(50)
(56)m= 0 If cylinder contain	0 os dedicate	d solar sto	0	0 = (56)m	0 x [(50) = (0 H11\1 ÷ (5	0) else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 Append	liv H	(56)
ii cyiinder contalf	is dedicate	น รบเลเ รเ0	raye, (57)ľ	m = (50)m	⊼ [(00) − (i i i i)] ÷ (5	oj, eise (5	,)III = (56)	ııı wnere (1111) IS IfC	m Append	IA []	
(57)m= 0													(57)

Primar	y circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primar	y circuit	loss cal	lculated t	for each	month ((59)m =	(58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is	solar wa	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 ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	50.96	45.08	48.02	44.65	44.26	41.01	42.37	44.26	44.65	48.02	48.29	50.96		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	201.67	176.89	184.04	163.23	158.04	139.19	133.36	148.66	150.3	171.15	182.7	196.91		(62)
Solar Di	-IW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)	•	
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHR	-47.53	-41.82	-42.69	-35.13	-32.63	-26.92	-22.79	-27.59	-28.39	-35.09	-40.64	-45.94		(63) (G1
Output	from w	ater hea	ater											
(64)m=	154.13	135.06	141.35	128.1	125.41	112.27	110.56	121.07	121.91	136.06	142.06	150.97		
					•		•	Outp	out from w	ater heate	r (annual) ₁	12	1578.97	(64)
Heat g	ains fro	m 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=	62.85	55.1	57.23	50.59	48.9	42.9	40.85	45.78	46.29	52.95	56.76	61.27		(65)
inclu	ide (57)	m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Int	ernal ga	ains (see	e Table 5	and 5a):									
Metab	olic gain	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	122.5	122.5	122.5	122.5	122.5	122.5	122.5	122.5	122.5	122.5	122.5	122.5		(66)
Lightin	g gains	(calcula	ited in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5			•	•	
(67)m=	19.49	17.31	14.08	10.66	7.97	6.73	7.27	9.45	12.68	16.1	18.79	20.03		(67)
Applia	nces ga	ins (calc	culated in	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5		•	•	
(68)m=	218.03	220.3	214.6	202.46	187.14	172.74	163.12	160.85	166.55	178.69	194.01	208.41		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a), also se	ee Table	5	•	•	•	
(69)m=	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25	35.25		(69)
Pumps	and fai	ns gains	(Table 5	Ба)	ļ.				ļ.		ļ.			
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	on (negat	tive valu	es) (Tab	le 5)			l					
(71)m=	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98		(71)
Water	heating	gains (1	rable 5)											
(72)m=	84.48	81.99	76.92	70.27	65.72	59.58	54.9	61.53	64.29	71.16	78.84	82.35		(72)
Total i	nternal	gains =				(66))m + (67)m	n + (68)m +	+ (69)m +	(70)m + (7	1)m + (72))m		
(73)m=		382.35	368.35	346.13	323.57	301.79	288.03	294.58	306.28	328.71	354.39	373.55		(73)
6. So	lar gains	S:												
Solar	ains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to co	nvert to th	ne applicat	ole orientat	tion.		
Orienta		Access F		Area		Flu			g_		FF		Gains	
	٦	Table 6d		m²		Tal	ble 6a	Т	able 6b	Т	able 6c		(W)	
Southe	ast _{0.9x}	0.77	X	2.	3	x 3	86.79	x	0.35	×	0.8	=	16.42	(77)

0		7		1		1		1	_	1		-
Southeast 0.9x	0.77	X	2.3	X	62.67	X	0.35	X	0.8	=	27.97	(77)
Southeast 0.9x	0.77	X	2.3	X	85.75	X	0.35	X	0.8	=	38.27	(77)
Southeast 0.9x	0.77	X	2.3	X	106.25	X	0.35	X	0.8	=	47.42	(77)
Southeast _{0.9x}	0.77	X	2.3	X	119.01	X	0.35	X	0.8	=	53.11	(77)
Southeast _{0.9x}	0.77	X	2.3	X	118.15	X	0.35	X	0.8	=	52.73	(77)
Southeast _{0.9x}	0.77	X	2.3	X	113.91	X	0.35	X	0.8	=	50.84	(77)
Southeast 0.9x	0.77	X	2.3	X	104.39	X	0.35	X	0.8	=	46.59	(77)
Southeast _{0.9x}	0.77	X	2.3	X	92.85	X	0.35	X	0.8	=	41.44	(77)
Southeast _{0.9x}	0.77	X	2.3	X	69.27	X	0.35	X	0.8	=	30.91	(77)
Southeast 0.9x	0.77	X	2.3	X	44.07	X	0.35	x	0.8	=	19.67	(77)
Southeast 0.9x	0.77	X	2.3	X	31.49	X	0.35	X	0.8	=	14.05	(77)
Southwest _{0.9x}	0.77	X	2.3	X	36.79]	0.35	X	0.8	=	16.42	(79)
Southwest _{0.9x}	0.77	X	2.3	x	62.67]	0.35	x	0.8	=	27.97	(79)
Southwest _{0.9x}	0.77	X	2.3	X	85.75]	0.35	x	0.8	=	38.27	(79)
Southwest _{0.9x}	0.77	X	2.3	x	106.25]	0.35	x	0.8	=	47.42	(79)
Southwest _{0.9x}	0.77	X	2.3	x	119.01]	0.35	x	0.8	=	53.11	(79)
Southwest _{0.9x}	0.77	X	2.3	X	118.15]	0.35	x	0.8	=	52.73	(79)
Southwest _{0.9x}	0.77	X	2.3	x	113.91]	0.35	x	0.8	=	50.84	(79)
Southwest _{0.9x}	0.77	x	2.3	x	104.39]	0.35	x	0.8] =	46.59	(79)
Southwest _{0.9x}	0.77	X	2.3	x	92.85]	0.35	x	0.8] =	41.44	(79)
Southwest _{0.9x}	0.77	X	2.3	x	69.27]	0.35	x	0.8	=	30.91	(79)
Southwest _{0.9x}	0.77	X	2.3	x	44.07	Ī	0.35	x	0.8	=	19.67	(79)
Southwest _{0.9x}	0.77	X	2.3	X	31.49]	0.35	x	0.8	=	14.05	(79)
Northwest _{0.9x}	0.77	x	5.04	x	11.28	x	0.35	x	0.8	=	11.03	(81)
Northwest _{0.9x}	0.77	X	4.96	x	11.28	X	0.35	x	0.8	=	10.86	(81)
Northwest _{0.9x}	0.77	X	5.04	x	22.97	x	0.35	X	0.8	=	22.46	(81)
Northwest _{0.9x}	0.77	X	4.96	X	22.97	x	0.35	x	0.8	=	22.1	(81)
Northwest _{0.9x}	0.77	X	5.04	X	41.38	X	0.35	x	0.8	=	40.47	(81)
Northwest _{0.9x}	0.77	X	4.96	X	41.38	x	0.35	x	0.8	=	39.82	(81)
Northwest 0.9x	0.77	X	5.04	X	67.96	x	0.35	x	0.8	=	66.46	(81)
Northwest _{0.9x}	0.77	x	4.96	x	67.96	X	0.35	x	0.8	=	65.4	(81)
Northwest _{0.9x}	0.77	X	5.04	x	91.35	X	0.35	x	0.8	=	89.33	(81)
Northwest 0.9x	0.77	X	4.96	x	91.35	x	0.35	x	0.8	=	87.91	(81)
Northwest _{0.9x}	0.77	x	5.04	x	97.38	x	0.35	x	0.8	=	95.24	(81)
Northwest _{0.9x}	0.77	x	4.96	x	97.38	x	0.35	x	0.8] =	93.73	(81)
Northwest _{0.9x}	0.77	x	5.04	x	91.1	x	0.35	x	0.8] =	89.09	(81)
Northwest _{0.9x}	0.77	x	4.96	x	91.1	x	0.35	x	0.8] =	87.68	(81)
Northwest _{0.9x}	0.77	x	5.04	x	72.63	x	0.35	x	0.8	=	71.03	(81)
Northwest _{0.9x}	0.77	x	4.96	x	72.63	x	0.35	x	0.8	j =	69.9	(81)
Northwest _{0.9x}	0.77	X	5.04	x	50.42	x	0.35	x	0.8	=	49.31	(81)
Northwest _{0.9x}	0.77	X	4.96	x	50.42	x	0.35	x	0.8] =	48.53	(81)
_		_		•		•		•		•		_

Northwe	est _{0.9x}	0.77	X	5.0)4	x	2	8.07	x		0.35	х	0.8	=	27.45	(81)
Northwe	est _{0.9x}	0.77	X	4.9	96	x	2	8.07	x		0.35	x	0.8	=	27.01	(81)
Northwe	est _{0.9x}	0.77	X	5.0)4	x		14.2	x		0.35	x	0.8	=	13.88	(81)
Northwe	est _{0.9x}	0.77	X	4.9	96	x		14.2	x		0.35	x	0.8	=	13.66	(81)
Northwe	est _{0.9x}	0.77	X	5.0)4	x	,	9.21	x		0.35	_ x [0.8		9.01	(81)
Northwe	est _{0.9x}	0.77	х	4.9	96	x	9	9.21	x		0.35	_ x [0.8	=	8.87	(81)
	_															
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m=	54.73	100.51	156.83	226.7	283.47	29	94.42	278.45	234	1.1	180.71	116.29	66.88	45.98		(83)
Total ga	ains – ir	nternal a	nd solar	r (84)m =	= (73)m	+ (8	33)m	, watts							-	
(84)m=	439.49	482.85	525.18	572.83	607.05	59	96.22	566.48	528	.68	486.99	444.99	421.28	419.53		(84)
7 Mea	an inter	nal temp	erature	(heating	season)							•		•	
				`			area i	from Tab	ole 9	Th	1 (°C)				21	(85)
•		tor for g	٠.			_			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	1 (0)				21	(00)
	Jan	Feb	Mar	Apr	May	ΤÌ	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec]	
(86)m=	1	1	0.99	0.98	0.94	-	0.81	0.65	0.7	Ť	0.92	0.99	1	1		(86)
` ′ L				l	l	I						0.00	'	<u> </u>	J	(00)
г					 	_		ps 3 to 7		$\overline{}$			 		1	(0-)
(87)m=	19.73	19.85	20.07	20.39	20.69	2	0.91	20.98	20.	96	20.8	20.42	20.02	19.71		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Tł	n2 (°C)				_	
(88)m=	19.97	19.97	19.97	19.98	19.98	1	9.99	19.99	19.	99	19.99	19.98	19.98	19.98		(88)
Utilisa	tion fac	tor for a	ains for	rest of d	wellina.	h2.	m (se	e Table	9a)							
(89)m=	1	1	0.99	0.97	0.91	_	0.73	0.52	0.5	58	0.86	0.98	1	1]	(89)
Moon	intorno	Ltompor	oturo in	the rest	of dwall	ina	T2 (f	ollow ste	no 2	+0.7	7 in Tabl	0.00)			ı	
(90)m=	18.28	18.45	18.77	19.23	19.66	┰	9.92	19.98	19.	_	19.81	19.29	18.71	18.25	1	(90)
(30)	10.20	10.40	10.77	10.20	10.00	L.	0.02	10.00	10.	00			ng area ÷ (4		0.32	(91)
													3 (,	0.32	(0.)
Г			· `	r	ĭ	_		LA × T1	<u> </u>				1		1	(22)
(92)m=	18.74	18.89	19.18	19.6	19.99		0.23	20.3	20.		20.13	19.65	19.13	18.71		(92)
г				1		_		m Table		$\overline{}$			1 40 40	10.74	1	(02)
(93)m=	18.74	18.89	19.18	19.6	19.99	²	0.23	20.3	20.	29	20.13	19.65	19.13	18.71		(93)
•		ting requ					-1 -1	44 . 6	.	- 01			(70)		. Into	
		nean int factor fo				nea	at ste	ер 11 от	rabi	e 9r	o, so tha	t 11,m=((76)m an	a re-caic	culate	
[Jan	Feb	Mar	Apr	May	Γ	Jun	Jul	A	ug	Sep	Oct	Nov	Dec]	
۱ Utilisa		tor for g		<u> </u>	I may	<u>!</u>	<u> </u>	<u> </u>	, ,	<u> </u>	Oop		1		J	
(94)m=	1	1	0.99	0.97	0.91		0.75	0.56	0.6	32	0.87	0.98	0.99	1]	(94)
Useful	I gains,	hmGm .	W = (94	4)m x (8	4)m								1	!	ı	
(95)m=	438.3	480.56	519.63	555.2	550.07	4	48.9	317.7	328	.67	425.07	435.2	419.13	418.64]	(95)
Month	lly avera	age exte	rnal tem	perature	from T	abl	e 8						1		ı	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.	.4	14.1	10.6	7.1	4.2		(96)
Heat le	oss rate	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(9:	3)m-	– (96)m]			_	
(97)m=	1302.66	1260.08	1140.05	952.69	736.54	49	96.66	325.93	342	.36	533.09	804.36	1072.8	1299.18		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	4 x [(97)	m – (95)m] x (4	·1)m		-	
(98)m=	643.08	523.83	461.59	286.19	138.74		0	0	0)	0	274.65	470.64	655.12		

	8)15,912 =	3453.85	(98)				
Space heating requirement in kWh/m²/year					Ī	43.54	(99)
9a. Energy requirements – Individual heating systems including	g micro-C	CHP)					
Space heating:					г		7(004)
Fraction of space heat from secondary/supplementary system		(204)			Ļ	0	(201)
Fraction of space heat from main system(s)	(202) = 1 -	` '	(000)1		Ļ	1	(202)
Fraction of total heating from main system 1	(204) = (204)	02) x [1 –	(203)] =		Ļ	1	(204)
Efficiency of main space heating system 1					Ĺ	89.5	(206)
Efficiency of secondary/supplementary heating system, %						0	(208)
Jan Feb Mar Apr May Jun Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated above) 643.08 523.83 461.59 286.19 138.74 0 0	0	0	274.65	470.64	655.12		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$			274.00	470.04	033.12		(211)
	0	0	306.88	525.86	731.98		(211)
	Tota	l (kWh/yea	ar) =Sum(2			3859.05	(211)
Space heating fuel (secondary), kWh/month					L		
= {[(98)m x (201)] } x 100 ÷ (208)							
(215)m= 0 0 0 0 0 0	0	0	0	0	0		
	Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	₂ =	0	(215)
Water heating							
Output from water heater (calculated above) 154.13 135.06 141.35 128.1 125.41 112.27 110.56	121.07	121.91	136.06	142.06	150.97		
Efficiency of water heater		l	l		!	89.5	(216)
(217)m= 89.5 89.5 89.5 89.5 89.5 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 ÷ (217)m	•	•	•	•			
(219)m= 172.22 150.91 157.94 143.13 140.12 125.44 123.54	135.27	136.21	152.02	158.73	168.68		
	Tota	I = Sum(2	19a) ₁₁₂ =	ı	•	1764.21	(219)
Annual totals			k\	Wh/yeaı	· _	kWh/yea	r_
Space heating fuel used, main system 1					L	3859.05	
Water heating fuel used						1764.21	
Electricity for pumps, fans and electric keep-hot							
central heating pump:					30		(2300
boiler with a fan-assisted flue					45		(230
Total electricity for the above, kWh/year	sum	of (230a).	(230g) =			75	(231)
Electricity for lighting					Γ	344.18	(232)
Electricity generated by PVs					Γ	-959.68	(233)
12a. CO2 emissions – Individual heating systems including mi	one OLIF	,					_

kWh/year

kg CO2/year

kg CO2/kWh

Space heating (main system 1)	(211) x	0.216	=	833.55	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	381.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1214.62	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	178.63	(268)
Energy saving/generation technologies Item 1		0.519	=	-498.07	(269)
Total CO2, kg/year	sun	n of (265)(271) =		934.11	(272)
Dwelling CO2 Emission Rate	(27)	2) ÷ (4) =		11.77	(273)
EI rating (section 14)				90	(274)

SAP 2012 Overheating Assessment

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

Property Details: Be Green-Flat 13 - 3rd 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 unknown

None

Thermal mass parameter: Indicative Value Medium

False

Blinds, curtains, shutters:

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

Overheating Details:

Summer ventilation heat loss coefficient: 188.49 (P1)

Transmission heat loss coefficient: 54.2

Summer heat loss coefficient: 242.66 (P2)

Overhangs:

Overhangs:

Night ventilation:

Orientation:	Ratio:	Z_overhangs:
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North West (Lounge terrace doors) 1
North West (Bedroom terrace doors) 1
South East (Bedroom) 0 1
South West (Bedroom) 0 1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North West (Lounge	e terralce doors)	0.9	1	0.9	(P8)
North West (Bedroo	m tertace doors)	0.9	1	0.9	(P8)
South East (Bedroom	m) 1	0.9	1	0.9	(P8)
South West (Bedroo	om) 1	0.9	1	0.9	(P8)

Solar gains:

Orientation	Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains
North West (Lounge terrace doc	ors 5.04	105.45	0.35	0.8	0.9	120.54
North West (Bedroom ter@acado	oo 4 s)96	105.45	0.35	0.8	0.9	118.63
South East (Bedroom) 0.9 x	2.3	126.97	0.35	0.8	0.9	66.23
South West (Bedroom) 0.9 x	2.3	126.97	0.35	0.8	0.9	66.23
					Total	371.63 (P3/P4)

Internal gains:

	June	July	August
Internal gains	435.36	417.68	426.38
Total summer gains	832.83	789.31	741.79 (P5)
Summer gain/loss ratio	3.43	3.25	3.06 (P6)
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	19.08	20.9	20.81 (P7)
Likelihood of high internal temperature	Not significant	Slight	Slight

SAP 2012 Overheating Assessment

Assessment of likelihood of high internal temperature:	<u>Slight</u>
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