			User D	Notoila:						
Assessor Name: Software Name:	Natalie Wheeler Stroma FSAP 201			Strom Softwa	are Vei	rsion:		Versio	0027778 on: 1.0.4.6	
Address :	Flat 3, Hampshire s		roperty	Address	Be Lea	n-Flat 3	-1st floo	r		
1. Overall dwelling dim	•	, i cot								
. . .			Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor					(1a) x		2.4	(2a) =	93.77	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n	1) 3	39.07	(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	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	X :	20 =	0	(6b)
Number of intermittent f	ans					2	X	10 =	20	(7a)
Number of passive vent	S				Γ	0	x	10 =	0	(7b)
Number of flueless gas	fires				Ī	0	x -	40 =	0	(7c)
								A : I		-
		(01.) . (7		- \	_				nanges per ho	_
Infiltration due to chimne	eys, flues and fans = (6 been carried out or is intend				continuo fr	20		÷ (5) =	0.21	(8)
Number of storeys in		ea, proceed	u 10 (17), 1	ourer wise (onunue m	om (9) to	(10)		0	(9)
Additional infiltration	and an emily (i.e)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timber	frame or	0.35 fo	r masoni	y constr	uction	- ,		0	(11)
	present, use the value corres	sponding to	the great	ter wall are	a (after					
•	nings); if equal user 0.35	امط/ مد ۵	1 (acal	مما مامم	antar A				_	— (40)
·	floor, enter 0.2 (unsea nter 0.05, else enter 0	ied) or 0.	i (Seale	ea), eise	enter o				0	(12)
• •	vs and doors draught s	tripped							0	(13)
Window infiltration	vs and doors draught s	шррец		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
	e, q50, expressed in cub	oic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	5	(17)
If based on air permeab			•	•	•			- C	0.46	(18)
·	ies if a pressurisation test ha					is being u	sed			` ′
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) =				0.39	(21)
Infiltration rate modified	for monthly wind speed	d		_					-	
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 = (2	22)m ÷ 4									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
` ,									J	

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)
Fotal area of e Party wall Party ceiling for windows and 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) (3) (3) (3) (3) (3) (3) (3) (3)
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) (3) (3) (3) (3) (3) (3) (3) (3)
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 thermal 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	(36)
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 as, W/K = Cm = S(as parame asments who and 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 Finclude the area Fabric heat loss Heat capacity Thermal mass For design assess Fan be used insteant Fotal fabric head Jan	elements I roof winder as on both ss, W/K = Cm = S(s parame sments where ad of a decease : S (L al bridging eat loss at loss ca Feb 19.22	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	(36)

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 instantaneous w	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			(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	(<u>[(46)</u> 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 lle 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	×	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	X	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 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 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 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				
(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) 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 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 20.98 19.89 19.81 19.81 19.81 19.81 19.81 19.81 19.81 19.81 19.81<	Red m =	Colai 9	anio iii								(00)	. • • • • • • • • • • • • • • • • • • •	()				
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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	` ′		55.24	87.41	128.12					132	.83 101.31	64.24	36.53	24.99]	(83)
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)	7. Med Tempo	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)	7. Med Tempo	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)	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	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 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 poins for limited limited in leading poins for limited in	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	ywatts 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	ywatts 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 Itemperary temperary during her 19.8 Itemperary 19.8 Itemperary 19.8 Itemperary 19.8 Itemperary 19.8 Itemperary 19.8	erature (eating poins for limited in leating poins for limited in leating poins for rough limited in leating poins for ro	128.12 (84)m = 434.13 (heating eriods in ving 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 line 19.8 ins for rough)	128.12 (84)m = 434.13 (heating eriods in ving 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 line 19.8 ins for rough)	128.12 (84)m = 434.13 (heating eriods in ving 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 Internal temperal during here. 19.92 Internal during here. 19.8 Internal dur	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	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 tor for gain 19.8 Internal temper during her tor for gain 19.8 Internal temper during her tor for gain 19.8 Internal temper during her temper during her tor for gain 19.8 Internal temper during her tem	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 or 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	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 g) = fl 20.38	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= 19.0 ⁴	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 he	eating requ	uirement											
Set Ti to the			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	on factor for	or gains	using Ta	ble 9a		,			,			•	
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation f		ains, hm				1			1			•	
(94)m= 0.98	0.97	0.95	0.91	0.81	0.64	0.46	0.51	0.75	0.92	0.97	0.98		(94)
Useful gain	<u> </u>	·	`			г			т			1	
(95)m= 363.6		394.2	394.88	363.56	278.05	192.81	200.72	281.34	328.97	341.66	351.42		(95)
Monthly av		1										I	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra	_											Ī	
(97)m= 783.1		685.47	571.64	441.49	296.87	196.32	205.94	320.73	485.24	644.75	778.52		(97)
Space heat	-ř		i			1	`	``	- 			Ī	
(98)m= 312.0	7 251.75	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 heat	ing require	ement in	kWh/m²	² /year								41.41	(99)
9a. Energy r	eguiremer	nts – Indi	ividual h	eating sy	vstems i	ncluding	ı micro-C	CHP)					
Space hea		no ma	rradai ii	oamig o		rioraanig	, , , , , , ,	,					
Fraction of	•	at from s	econdar	v/supple	mentary	system						0	(201)
Fraction of	•				,	•	(202) = 1	- (201) =				1	(202)
	•		-	. ,			(204) = (2		(203)] =				╡゛
Fraction of		•	-				(204) - (2	02) 🗶 [1 —	(203)] =			1	(204)
Efficiency of	t main spa	ace heat	ing syste	em 1								89.5	(206)
Efficiency of	f seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space heat	ing require	ement (c	alculate	d above))								
312.0	7 251.75	216.7	127.27	57.98	0	0	0	0	116.27	218.23	317.76		
(211)m = {[(9	98)m x (20)4)] } x 1	00 ÷ (20	06)		•	•		•	•	•	•	(211)
348.6	i `	242.13	142.2	64.78	0	0	0	0	129.91	243.83	355.04		
	-1		<u> </u>			Į.	Tota	l (kWh/yea	ar) =Sum(2	1 211) _{15,1012}	<u> </u>	1807.85	(211)
Space heat	ina fuel (s	econdar	v) kWh/	month									J
$= \{[(98) \text{m x }($	•		• •										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
	I	<u>!</u>				<u> </u>	Tota	l I (kWh/yea	ar) =Sum(2	L 215) _{15.1012}	<u>. </u>	0	(215)
Water heati	na]` '
Output from	_	ter (calc	ulated a	hove)									
116.9		106.65	96.25	94.03	83.94	82.28	90.35	91.05	101.97	106.91	114.55		
Efficiency of	water 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 for water		<u> </u>	<u> </u>										
(219)m = (6)	•												
(219)m= 130.7		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 tota	ls								k'	Wh/year	•	kWh/year	_
Space heating	ng fuel use	ed, main	system	1						-		1807.85]
											ļ	-	_

Water heating fuel used			1326.22
Electricity for pumps, fans and electric keep-hot			_
central heating pump:		30	(2300
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)
10a. Fuel costs - individual heating systems:			
	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 x 0.01	0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01	= 46.15 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	9.89 (249)
(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	arately as applicable and app (232)	oly fuel price according to	
Additional standing charges (Table 12)			120 (251)
Appendix Q items: repeat lines (253) and (254) as	s needed		
Appendix Q items: repeat lines (253) and (254) as Total energy cost (245)(247)	s needed 7) + (250)(254) =		263.71 (255)
			263.71 (255)
Total energy cost (245)(247)			263.71 (255) 0.42 (256)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12)			
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12)	7) + (250)(254) =		0.42 (256)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) x (257)	7) + (250)(254) = 56)] ÷ [(4) + 45.0] =		0.42 (256) 1.32 (257)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12)	7) + (250)(254) = 56)] ÷ [(4) + 45.0] =	Emission factor kg CO2/kWh	0.42 (256) 1.32 (257)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12)	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy		0.42 (256) 1.32 (257) 81.62 (258) Emissions
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) x (25) SAP rating (Section 12) 12a. CO2 emissions - Individual heating system	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy kWh/year	kg CO2/kWh	0.42 (256) 1.32 (257) 81.62 (258) Emissions kg CO2/year
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) x (25) SAP rating (Section 12) 12a. CO2 emissions - Individual heating system Space heating (main system 1)	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy kWh/year (211) x	kg CO2/kWh 0.216 =	0.42 (256) 1.32 (257) 81.62 (258) Emissions kg CO2/year 390.49 (261)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12) 12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy kWh/year (211) x (215) x	kg CO2/kWh 0.216 = 0.519 =	0.42 (256) 1.32 (257) 81.62 (258) Emissions kg CO2/year 390.49 (261) 0 (263)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12) 12a. CO2 emissions - Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy kWh/year (211) x (215) x (219) x	kg CO2/kWh 0.216 = 0.519 =	0.42 (256) 1.32 (257) 81.62 (258) Emissions kg CO2/year 390.49 (261) 0 (263) 286.46 (264)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (Section 12) 12a. CO2 emissions - Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) =	kg CO2/kWh 0.216 = 0.519 = 0.216 =	0.42 (256) 1.32 (257) 81.62 (258) Emissions kg CO2/year 390.49 (261) 0 (263) 286.46 (264) 676.96 (265)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) x (25) SAP rating (Section 12) 12a. CO2 emissions - Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	kg CO2/kWh 0.216 = 0.519 = 0.519 =	0.42 (256) 1.32 (257) 81.62 (258) Emissions kg CO2/year 390.49 (261) 0 (263) 286.46 (264) 676.96 (265) 38.93 (267)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) x (255) x (2	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x sun	kg CO2/kWh 0.216 = 0.519 = 0.519 = 0.519 =	0.42 (256) 1.32 (257) 81.62 (258) Emissions kg CO2/year 390.49 (261) 0 (263) 286.46 (264) 676.96 (265) 38.93 (267) 97.4 (268)
Total energy cost 11a. SAP rating - individual heating systems Energy cost deflator (Table 12) Energy cost factor (ECF) [(255) x (25) SAP rating (Section 12) 12a. CO2 emissions - Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Total CO2, kg/year	7) + (250)(254) = 56)] ÷ [(4) + 45.0] = s including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x sun	kg CO2/kWh 0.216 = 0.519 = 0.519 = 0.519 = 0.519 = 0.519 =	0.42 (256) 1.32 (257) 81.62 (258) Emissions kg CO2/year 390.49 (261) 0 (263) 286.46 (264) 676.96 (265) 38.93 (267) 97.4 (268) 813.29 (272)

	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)
'Total Primary Energy	sum	of (265)(271) =		4629.97	(272)
Primary energy kWh/m²/year	(272	2) ÷ (4) =		118.5	(273)

		UserJ	Details:						
Assessor Name: Software Name:	Natalie Wheeler Stroma FSAP 2012	<u> </u>	Strom Softwa					0027778 on: 1.0.4.6	
		Property	Address	Be Lea	n-Flat 3	-1st floor			
Address: 1. Overall dwelling dime	Flat 3, Hampshire street								
1. Overall dwelling dime	ensions.	Δrc	ea(m²)		Δν Ηρ	ight(m)		Volume(m	3)
Ground floor			` '	(1a) x		2.4	(2a) =	93.77	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	39.07	(4)]		
Dwelling volume		′ <u> </u>	00.01)+(3c)+(3c	d)+(3e)+	.(3n) =	93.77	(5)
				(==) - (==	, (, , , , , , , , , , , , , , , , , ,	., . ()		93.77	(3)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating + 0	- + F	0] = [0	x	40 =	0	(6a)
Number of open flues		- + - - + -	0]	0	x 2	20 =	0	(6b)
Number of intermittent fa				J L	2	x ^	10 =		(7a)
Number of passive vents				Ļ			10 =	20	=
·				Ļ	0		40 =	0	(7b)
Number of flueless gas f	ires				0	^	+0 =	0	(7c)
							Air ch	nanges per h	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+	·(7c) =	Г	20		÷ (5) =	0.21	(8)
	peen carried out or is intended, procee	ed to (17),	otherwise o	continue fr	om (9) to	(16)			<u> </u>
Number of storeys in the	he dwelling (ns)					r(0)	41.04	0	(9)
Additional infiltration	0.25 for steel or timber frame o	r 0 35 fc	nr masoni	v constr	ruction	[(9)-	-1]x0.1 =	0	(10)
	resent, use the value corresponding t			•	dottori			0	(\\
deducting areas of openia	• /- /	\	I\ -I						 ,,,,
If suspended wooden to the sus	floor, enter 0.2 (unsealed) or (ster 0.05, else enter 0).1 (seai	ea), eise	enter u				0	(12)
•	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metro	es per h	our per s	quare m	etre of e	nvelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] +$							0.46	(18)
	es if a pressurisation test has been do	ne or a de	egree air pe	rmeability	is being u	sed			— (40)
Number of sides sheltere Shelter factor	ea ea		(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.39	(21)
Infiltration rate modified f	_							0.00	` ′
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7							-	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Easter (22a) (2	2)m · 4								
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23	0.95	0.92	1	1.08	1.12	1.18	1	
1.27	1.30 0.33	1 0.00	1 0.02		L	L ''2	Lo	J	

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 x	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 logo 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	[2.5395	<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 Apr	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 Apr	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 instantaneous w	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			(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	А	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 (23	80a)(230g) =		75	(231)
Electricity for lighting				187.67	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh		Emissions kg CO2/yea	
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)
Total CO2, kg/year	SU	um of (265)(271) =		908.87	(272)

El rating (section 14)

(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) 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	terrace doors)	0.9	0.78	0.68	(P8)
South East (Bedroor	n) 1	0.9	0.64	0.54	(P8)

0.9 0.64 0.54 South East (Bedroom)

Orientation	Area	Flux	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	Details:						
Assessor Name: Software Name:	Natalie Wheeler Stroma FSAP 2012		Strom Softwa					0027778 on: 1.0.4.6	
	F	Property	Address	Be Lea	ın-Flat 6	- 1st Flo	or		
Address :	Flat 6, Hampshire street								
1. Overall dwelling dime	ensions:	Δ	a (ma 2)		Asz IIa	: au la 4/10a \		Valuma (m.	3)
Ground floor			a(m²) 85.3	(1a) x		eight(m) 2.4	(2a) =	Volume(m ²	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1		85.3	(4)](==/	204.12	()
·	a)1(1b)1(1c)1(1a)1(1c)1(1		00.3)エ(30)エ(30	d)+(3e)+	(3n) -		7 (5)
Dwelling volume				(3a)+(3b)+(30)+(30	a)+(3e)+	(311) =	204.72	(5)
2. Ventilation rate:	main seconda	rv	other		total			m³ per hou	ır
Number of chicagons	heating heating	· 		1 <u>-</u> F			40 =		_
Number of chimneys	0 + 0	_] +	0	<u> </u>	0			0	(6a)
Number of open flues	0 + 0	+	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	ires				0	X	40 =	0	(7c)
							A : l.		
		_	_ 、	_				nanges per he	_
	eys, flues and fans = (6a)+(6b)+(been carried out or is intended, proceed			continue fr	20		÷ (5) =	0.1	(8)
Number of storeys in t		<i>a to (11),</i> (ourer wise t	onunae n	om (9) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t	o the great	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) 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 window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	_			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic metro		•	•	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$ es if a pressurisation test has been do				is heina u	sed		0.35	(18)
Number of sides sheltere			groo an po	mousinty	io boilig a	oou		2	(19)
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	x (20) =				0.3	(21)
Infiltration rate modified t	for monthly wind speed						•	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7						•	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	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]	
		1		<u> </u>		1		J	

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) 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	ains (calcula 347.09 s (calcula 52.89 ns gains 3 vaporatio -102.23 gains (T 84.12 s 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 + (7504.79)	305.68 52.89 3 -102.23 80.88 1)m + (72) 543.93	328.37 52.89 3 -102.23 84.12 m 573.19		(68) (69) (70) (71) (72)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -102.23 Water heating (72)m= 86.31 Total internal (73)m= 589.08 6. Solar gain Solar gains are Orientation:	s (calcular second seco	ulated in Apost State of the st	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 + (469.45 269.45 269.45	ble 5 281.54 5 52.89 3 -102.23 73.1 (70)m + (7 504.79	305.68 52.89 3 -102.23 80.88 1)m + (72) 543.93 ele orientati	328.37 52.89 3 -102.23 84.12 m 573.19	Gains (W)	(68) (69) (70) (71) (72)
Appliances ga (68)m= 343.52 Cooking gains (69)m= 52.89 Pumps and fa (70)m= 3 Losses e.g. ev (71)m= -102.23 Water heating (72)m= 86.31 Total internal (73)m= 589.08 6. Solar gain Solar gains are Orientation:	ains (calcula 347.09 s (calcula 52.89 s s gains 3 vaporatio -102.23 gains (T 84.12 s 584.61 s: calculated calculated s cal	ulated in Apost State of the st	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	_	, VV = 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	

Space heating requirement in kWh/m²/year 35,86 [98] 3. Energy requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from main system(s) Fraction of space heat from main system(s) Fraction of space heat from main system 1 (204) = (202) × [1 - (203)] =						Tota	l por voar	(k\Mb\voo	r) – Sum/0	.o\ _	3058.89	(98)
3. Energy requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) =	On and heading a service as		26			1018	ii pei yeai	(KVVII/yeai	i) = Suiii(s	0)15,912		╡``
Space Neating Fraction of space heat from secondary/supplementary system			•								35.86	(99)
Fraction of space heat from secondary/supplementary system Fraction of space heat from sain system(S) Fraction of total heating from main system 1 (202) = 1 - (201) =	·	Individual h	neating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system (s) (202) = 1 - (201) =	•	m secondar	v/supple	mentary	v svstem						0	1 (201)
Efficiency of main space heating system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) Space heating requirement (calculated above) [81:44 473.92 412.63 246.21 110.33 0 0 0 0 225.83 413.89 594.63 211)m = {{(98)m x (204)}} } x 100 + (206) [41:65 529.52 461.04 275.09 123.27 0 0 0 0 0 252.32 462.45 664.4 Total (kWh/year) = Sum(211)xxr = 0 (215)xxr = 0 (215)xx = 0 (215)xx = 0 (215)xx = 0 (215)xx	·				•	(202) = 1	- (201) =					(202)
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) Sepace heating requirement (2alculated above) [881.44 473.92 412.63 246.21 110.33 0 0 0 0 225.83 413.89 594.63 2211)m = {([98]m x (204]) } x 100 ÷ (206) [849.66 529.52 461.04 275.09 123.27 0 0 0 0 0 252.32 462.45 664.4 701.4 (207.09)] } x 100 ÷ (206) [849.66 529.52 461.04 275.09 123.27 0 0 0 0 0 252.32 462.45 664.4 701.4 (207.09)] } x 100 ÷ (208) Space heating fuel (secondary), kWh/month [849.67 139.06 144.79 131.25 128.52 115.08 113.37 124.11 124.96 139.43 145.25 153.25 161.20 141.7 (207.09) [840.68 138.06 144.79 131.25 128.52 115.08 113.37 124.11 124.96 139.43 145.25 153.25 161.20 141.7 (207.09) [850.68 138.06 144.79 131.25 128.52 115.08 130.37 124.11 124.96 139.43 145.25 153.25 161.20 141.7 (207.09) [850.68 138.06 144.79 131.25 128.52 115.08 130.37 124.11 124.96 139.43 145.25 153.25 161.20 141.7 (207.09) [850.68 138.06 144.79 131.25 128.52 115.08 130.37 124.11 124.96 139.43 145.25 153.25 161.20 141.7 (207.09) [850.68 138.06 144.79 131.25 128.52 115.08 130.37 124.11 124.96 139.43 145.25 153.25 161.20 141.7 (207.09) [850.68 138.06 144.79 131.25 128.52 115.08 130.37 124.11 124.96 139.43 145.25 153.25 161.20 141.7 (207.09) [850.68 138.06 144.79 131.25 128.52 115.08 130.37 124.11 124.96 139.43 145.25 153.25 161.20 141.7 (207.09) [850.68 138.06 138.06 139.08 139	·	•	` '			(204) = (2	02) × [1 –	(203)] =				(204)
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above)	_	•										(206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Expansion Space heating requirement (calculated above) S81.44 473.92 412.63 246.21 110.33 0 0 0 0 255.83 413.89 594.63 211)m = {[(98)m x (204)] } x 100 ÷ (206) (211)				g systen	n, %						0	(208)
Space heating requirement (calculated above) 581.44 473.92 412.63 246.21 110.33 0 0 0 0 225.83 413.88 594.63		· · · · · · · · · · · · · · · · · · · 	·	· ·		Aua	Sep	Oct	Nov	Dec	l kWh/ve	⊒` ear
211 m = {[[(88)m x (204)]] } x 100 ÷ (206) (211) (249) (245)	<u> </u>		<u> </u>		<u> </u>	7.09			1.101	1 200]	, ca.
E49.66 529.52 461.04 275.09 123.27 0 0 0 0 252.32 462.45 664.4 Total (kWh/year) =Sum(211)_Lsqs= 3417.76 (211) (198)m x (201)] } x 100 + (208) (215)m x (208) (216)m x (216)m x (217)m (218)m x (21	581.44 473.92 412	.63 246.21	110.33	0	0	0	0	225.83	413.89	594.63		
Total (kWh/year) =Sum(211) Late_1 = T 3417.76 (211)	$(211)m = \{[(98)m \times (204)] \}$	x 100 ÷ (2	06)								_	(211)
Space heating fuel (secondary), kWh/month {{[(98)m x (201)]}} x 100 ÷ (208) *** **Total (kWh/year) =Sum(215), ** **Total (kWh	649.66 529.52 461	.04 275.09	123.27	0	0							_
(1/98)m x (2011) x 100 ÷ (208)						Tota	ıl (kWh/ye	ar) =Sum(2	211) _{15,1012}	2=	3417.76	(211)
Total (kWh/year) = Sum(215) Total = Sum(219) Total =	, ,	• /	/month									
Total (kWh/year) = Sum(215), Laborator 2 2 2 2 2 2 2 2 2			T 0	<u></u> ο	l 0	n	<u></u> ο	Ι ο	l 0	l 0]	
Vater heating Putput from water heater (calculated above) 156.49 138.06 144.79 131.25 128.52 115.08 113.37 124.11 124.96 139.43 145.25 153.25 167.17 167.08 138.06 144.79 131.25 128.52 115.08 113.37 124.11 124.96 139.43 145.25 153.25 167.17 167.08 189.5 189.5 189.5 189.5 189.5 189.5 189.5 189.5 189.5 189.5 187.17 189.18	(210)										0	1 (215)
Autput from water heater (calculated above) 156.49 138.06 144.79 131.25 128.52 115.08 113.37 124.11 124.96 139.43 145.25 153.25 156.49 138.06 144.79 131.25 128.52 115.08 113.37 124.11 124.96 139.43 145.25 153.25 156.49 138.06 144.79 131.25 128.52 115.08 113.37 124.11 124.96 139.43 145.25 153.25 157.01 145.	Water heating								10,101	-		` ′
fficiency of water heater		calculated a	bove)								•	
### 189.5		.79 131.25	128.52	115.08	113.37	124.11	124.96	139.43	145.25	153.25		_
uel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m 119)m = (74.84 154.26 161.77 146.65 143.6 128.58 126.66 138.67 139.62 155.79 162.29 171.23 Total = Sum(219a)_1_12 =			T	1		ı	1	 	1	1	89.5	(216)
219)m = (64)m x 100 ÷ (217)m 174.84	` '		89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5		(217)
174.84 154.26 161.77 146.65 143.6 128.58 126.66 138.67 139.62 155.79 162.29 171.23	•											
Innual totals pace heating fuel used, main system 1 Vater heating fuel used lectricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue otal electricity for the above, kWh/year lectricity for lighting Fuel costs - individual heating systems: Fuel kWh/year KWh/year SWh/year			143.6	128.58	126.66	138.67	139.62	155.79	162.29	171.23		
pace heating fuel used, main system 1 Vater heating fuel used Iso3.97 Ilectricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue otal electricity for the above, kWh/year Ilectricity for lighting Sum of (230a)(230g) = 75 (231) 10a. Fuel costs - individual heating systems: Fuel kWh/year Fuel Price (Table 12) Fuel Cost £/year	•					Tota	ıl = Sum(2	19a) ₁₁₂ =			1803.97	(219)
Vater heating fuel used lectricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue otal electricity for the above, kWh/year lectricity for lighting fuel kWh/year Fuel kWh/year 1803.97 30 (230) (230) (230) (230) (230) (231) (231) (231) (232)	Annual totals							k'	Wh/yeaı	•		<u>r</u>
lectricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue otal electricity for the above, kWh/year lectricity for lighting fuel kWh/year Fuel kWh/year Fuel Price kWh/year (230a)(230g) = Fuel Price kWh/year Fuel Cost £/year		ain system	1								3417.76	╛
central heating pump: boiler with a fan-assisted flue total electricity for the above, kWh/year lectricity for lighting fuel kWh/year Sum of (230a)(230g) = T5	Water heating fuel used										1803.97	
boiler with a fan-assisted flue otal electricity for the above, kWh/year lectricity for lighting fuel which is a fan-assisted flue sum of (230a)(230g) =	Electricity for pumps, fans a	and electric	keep-ho	t								
otal electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) lectricity for lighting 369.03 (232) 10a. Fuel costs - individual heating systems: Fuel Fuel Price (Table 12) Fuel Cost £/year	central heating pump:									30		(2300
lectricity for lighting 10a. Fuel costs - individual heating systems: Fuel Fuel Price Fuel Cost £/year £/yea	boiler with a fan-assisted	lue								45		(230e
10a. Fuel costs - individual heating systems: Fuel kWh/year Fuel Price (Table 12) £/year	Total electricity for the above	ve, kWh/yea	ar			sum	of (230a).	(230g) =			75	(231)
10a. Fuel costs - individual heating systems: Fuel kWh/year Fuel Price (Table 12) £/year	Electricity for lighting	-									369.03	(232)
Fuel Fuel Price Fuel Cost kWh/year (Table 12) £/year	, , ,	l heating sy	/stems:									
kWh/year (Table 12) £/year				E	ıol			Fuel P	rico		Fuel Cost	
pace heating - main system 1 (211) x 3.48 $\times 0.01 = 1.18.94$ (240)												
	Space heating - main syste	m 1			-					x 0.01 =	118.94	(240)

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

			User D	etails: _						
Assessor Name:	Natalie Wheeler			Strom:	a Num	her:		STRC	0027778	
Software Name:	Stroma FSAP 20	12		Softwa					on: 1.0.4.6	
				Address			- 1st Flo			
Address :	Flat 6, Hampshire s	street								
1. Overall dwelling dime	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			8	35.3	(1a) x	2	2.4	(2a) =	204.72	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e	e)+(1n) [35.3	(4)			_		<u> </u>
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	204.72	(5)
2. Ventilation rate:										
		econdary	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	j + F	0] = [0	x	20 =	0	(6b)
Number of intermittent fa	ans				J [2	x	10 =	20	(7a)
Number of passive vents					L			10 =		╡``
·					Ļ	0			0	(7b)
Number of flueless gas f	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans =	6a)+(6b)+(7a	a)+(7b)+(7c) =	Г	20		÷ (5) =	0.1	(8)
If a pressurisation test has b					ontinue fr			- (-)	0.1	(``
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber	frame or	0.35 for	r masonr	y constr	uction			0	(11)
if both types of wall are p deducting areas of openi	present, use the value corres	sponding to	the great	er wall are	a (after					
If suspended wooden	• / .	iled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	•	,	`	,,					0	(13)
Percentage of window	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 s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabi	lity value, then $(18) = [(18)]$	17) ÷ 20]+(8	3), otherwi	ise (18) = (16)				0.35	(18)
Air permeability value applie		s been don	e or a deg	gree air pe	meability	is being u	sed			_
Number of sides sheltere Shelter factor	ed			(20) = 1 -	n n75 v (1	Q)1 —			2	(19)
Infiltration rate incorpora	ting shelter factor			(21) = (18)		O)] =			0.85	(20)
Infiltration rate modified t		d		(21) = (10)	X (20) =				0.3	(21)
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
		j Juli j	Jui	Aug	Оер	Oct	1407	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(/	7.7	1 0.0		J		I ^{4.0}	I5	I /	J	
Wind Factor $(22a)m = (2a)m =$	22)m ÷ 4								-	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

0.38	0.37	0.36	0.33	0.32	0.28	0.28	(21a) x	ì ´	0.22	0.22	0.25	1	
Calculate effec	1 1				1	I	0.27	0.3	0.32	0.33	0.35	J	
If mechanica		_										0	(2
If exhaust air he	eat pump u	ising Appe	endix N, (2	3b) = (23a	a) × Fmv (equation (I	N5)) , othe	rwise (23b) = (23a)			0	(2
If balanced with	heat reco	very: effic	eiency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance	d mecha	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)	•	,	
(4b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h				•	•				5 (00)	,			
	n < 0.5 ×	, ,	· ` `	<u> </u>	í –	· ` `	ŕ	ŕ	· `	í –	Ι ,	1	le.
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(2
d) If natural if (22b)n	ventilation n = 1, the			•					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	b) or (24	c) or (24	d) in bo	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]	(2
) Heat lease	o and ha	ot loop i	o o romot	0.51	•	•	•	•	•		•	-	
B. Heat losse	s and ne Gros	•	Openin		Net Ar	.03	U-val	110	AXU		k-value	2	ΑXk
LEMENT	area	_	r	=	1, A		W/m2		(W/I	〈)	kJ/m ² ·		kJ/K
oors					1.87	х	1	=	1.87				(2
/indows Type	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	=			(:
oor					85.3	x	0.065		5.5445	=			(
/alls	76.2	7	15.5	<u></u>	60.7	=	0.18	=	10.93	=		-	(;
otal area of e	L				161.5	=	00						\` (;
arty wall	,	,			32.7	=	0		0	– 1			(:
arty ceiling					85.3	_			U	[┥ 누	(;
or windows and	roof windo	ows use e	effective wi	ndow I I-va			n formula 1	/[(1/LI-vali	ıe)+0 041 a	L ns aiven in	naragrani		(,
include the area						atou domig	, romaia i	7[(17 0 Vale	,0) 10.0 ij d	io givoii iii	paragrapi	7 0.2	
abric heat los	ss, W/K =	= S (A x	U)				(26)(30) + (32) =				36.49	9 (
eat capacity	Cm = S(a)	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(:
nermal mass	paramet	ter (TMF	= Cm =	- TFA) ir	n kJ/m²K	•		Indica	tive Value:	Medium		250	(:
or design assess n be used inste				construct	tion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
nermal bridge				using Ap	pendix	K						20.0	2 (
details of therma	,	•		• .	•								`
otal fabric he	at loss							(33) +	(36) =			56.5	1 (3
entilation hea	at loss ca	lculated	monthly	y				(38)m	= 0.33 × (25)m x (5))	_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ī	

					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	ər 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}		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	x	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	х	0.35	х	0.8	j =	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	х	0.8	j =	92.28	(81)
Northwest _{0.9x}	0.77	×	4.35	×	91.1	x	0.35	x	0.8	=	76.9	(81)
Northwest _{0.9x}	0.77	x	5.22	×	72.63	x	0.35	x	0.8	=	73.56	(81)
Northwest _{0.9x}	0.77	X	4.35	X	72.63	X	0.35	x	0.8	=	61.3	(81)
Northwest _{0.9x}	0.77	X	5.22	X	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)
_								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		2 00)		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		(- /
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	A	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									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	l per year	(kWh/year	') = Sum(9	8) _{15,912} =	3838.29	(98)
Space heating requirement in kWh/m²/yea	ar							45	(99)
9a. Energy requirements – Individual heati	ng systems	including	micro-C	CHP)					
Space heating: Fraction of space heat from secondary/su	nnlomontan	, cyctom						0	7(201)
		•	(202) = 1 -	_ (201) _				0	(201)
Fraction of space heat from main system(,		(202) = 13 (204) = (2	, ,	(202)] _			1	(202)
Fraction of total heating from main system			(204) = (2	02) 🗴 [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1		0/						89.5	(206)
Efficiency of secondary/supplementary he	- i -	1	l .					0	(208)
	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (calculated ab	9.98 0	0	0	0	315.23	517.2	709.86		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$		<u> </u>	<u> </u>		1				(211)
	9.92 0	0	0	0	352.21	577.88	793.14		(=)
	I	ļ	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	4288.6	(211)
Space heating fuel (secondary), kWh/mor	nth						!		
= {[(98)m x (201)] } x 100 ÷ (208)								Ī	
(215)m= 0 0 0 0	0 0	0	0	0	0	0	0		¬
			Tota	ı (kvvn/yea	ar) =Sum(2	215) _{15,1012}	.	0	(215)
Water heating Output from water heater (calculated above	a)								
	3.52 115.08	113.37	124.11	124.96	139.43	145.25	153.25		
Efficiency of water heater	•		!		!			89.5	(216)
(217)m= 89.5 89.5 89.5 89.5 89.5	9.5 89.5	89.5	89.5	89.5	89.5	89.5	89.5		(217)
Fuel for water heating, kWh/month									
(219) m = (64) m x $100 \div (217)$ m (219)m = 174.84 154.26 161.77 146.65 14	3.6 128.58	126.66	138.67	139.62	155.79	162.29	171.23		
` '	<u> </u>			I = Sum(2			l	1803.97	(219)
Annual totals					k\	Wh/year	•	kWh/yea	<u></u>
Space heating fuel used, main system 1								4288.6	
Water heating fuel used								1803.97	
Electricity for pumps, fans and electric keep	o-hot								
central heating pump:							30		(230c
boiler with a fan-assisted flue							45		(230e
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								369.03	(232)
12a. CO2 emissions – Individual heating s	systems incl	udina mi	cro-CHE) <u> </u>					
12a. CO2 emissions – mulvidual fleatility s			cio- Crir						
		nergy Vh/year			Emiss kg CO	ion fac 2/kWh	tor	Emission: kg CO2/ye	
Space heating (main system 1)	(21	1) x			0.2	16	=	926.34	(261)

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

SAP 2012 Overheating Assessment

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

Property Details: Be Lean-Flat 6 - 1st Floor

Dwelling type: Flat Located in: England

Region: South East England

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: North East

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

Night ventilation: False

Blinds, curtains, shutters:

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

Overheating Details:

Summer ventilation heat loss coefficient: 202.67 (P1)

Transmission heat loss coefficient: 56.5

Summer heat loss coefficient: 259.19 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
Orientation:	Ratio:	Z_overnanç

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

Solar shading:

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 (Bedroo	m) 1	0.9	0.64	0.54	(P8)
North East (Bedroon	m) 1	0.9	1	0.9	(P8)

Solar gains:

Orientation	Area	Flux	g _	FF	Shading	Gains
North West (Lounge terrace) d	oors\$.22	105.45	0.35	0.8	0.69	95.59
North West (bedroom ter@a@ex	door4s)35	105.45	0.35	0.8	0.69	79.66
South East (Bedroom) 0.9 x	1.82	126.97	0.35	0.8	0.54	31.29
North East (Bedroom) 0.9 x	2.3	105.45	0.35	0.8	0.9	55.01
					Total	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

luna

Links

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SAP 2012 Overheating Assessment

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

			Heer D	otoilo:						
Assessor Name: Software Name:	Natalie Wheeler Stroma FSAP 2012							Versio	TRO027778 ersion: 1.0.4.6	
Address :	Flat 7, Hampshire s		roperty .	Address	Be Lea	n-Flat 7	-2nd Flo	or		
1. Overall dwelling dim	•	, i cot								
			Area	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor			(62.9	(1a) x		2.4	(2a) =	150.96	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n	ı)	62.9	(4)			1		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	150.96	(5)
2. Ventilation rate:										`
2. Volulation fate.	main s	econdar	у	other		total			m³ per hou	ır
Number of chimneys	heating b	neating 0	+ [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	j + F	0	; ; = [0	x	20 =	0	(6b)
Number of intermittent f	ans				_ 	2	x	10 =	20	(7a)
Number of passive vent					L	0	x	10 =		(7b)
·					Ļ			40 =	0	=======================================
Number of flueless gas	Tires					0	^ ^ '	+0 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	Sa)+(6b)+(7	a)+(7b)+(7c) =	Г	20		÷ (5) =	0.13	(8)
If a pressurisation test has	been carried out or is intend	ed, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to				``
Number of storeys in the dwelling (ns)							0	(9)		
Additional infiltration [(9)-1]x0.1 =						0	(10)			
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after							0	(11)		
	present, use the value corres nings); if equal user 0.35	sporiality to	ine great	er wan are	a (aner					
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0							0	(12)		
If no draught lobby, enter 0.05, else enter 0						0	(13)			
ŭ	Percentage of windows and doors draught stripped							0	(14)	
				$0.25 - [0.2 \times (14) \div 100] =$					0	(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$							0	(16)		
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area. If based on air permeability value, then $(18) = [(17) \pm 20] \pm (8)$ otherwise $(18) = (16)$							5	(17)		
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ O.38 O.38 O.38								(18)		
Number of sides shelter			·	,	,	Ü			2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$							0.33	(21)		
Infiltration rate modified	for monthly wind speed	d							1	
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 $(22a)m = (22)m \div 4$										
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
						L		L	1	

djusted infiltration rate (a			d wind s	peed) =	(21a) x	(22a)m		,	1	1	
• • • • • • • • • • • • • • • • • • •	0.4 0.36		0.31	0.31	0.3	0.33	0.35	0.37	0.38]	
<i>alculate effective air cha If mechanical ventilatio</i>	•	и ине арри	саріе са	Se						0	
If exhaust air heat pump usin		, (23b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	
If balanced with heat recover	y: efficiency ir	% allowing t	for in-use f	actor (fron	n Table 4h) =				0	(2
a) If balanced mechanic	cal ventilati	on with he	at recove	erv (MVI	HR) (24a	a)m = (2:	2b)m + (23b) x [1 – (23c)		
4a)m= 0 0	0 0	0	0	0	0	0	0	0	0]	(
b) If balanced mechanic	cal ventilati	on without	heat rec	overy (N	л ЛV) (24b	m = (22)	2b)m + (23b)	<u>Į</u>	J	
lb)m= 0 0	0 0	0	0	0	0	0	0	0	0]	(
c) If whole house extra	ct ventilatio	n or positiv	/e input v	ventilatio	on from o	outside			Į.	_	
if (22b)m < 0.5 x (2		-	-				.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, then		•					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 rat	:e - enter (2	4a) or (24l	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 heat	loce perem	otor:	•		•	•	•	•		4	
EMENT Gross area (m	Ope	nings m²	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
oors	,		1.87	_	1		1.87	$\stackrel{\prime}{\Box}$			(
ndows Type 1			7.92		/[1/(1.4)+	0.04] =	10.5	Ħ			(
indows Type 2			2.25	x1.	/[1/(1.4)+	0.04] =	2.98	=			(
indows Type 3			1.52	=			2.02	\dashv			(
alls 68.98		3.56	55.42	=	0.18		9.98	=			(
otal area of elements, m		5.50	68.98	=	0.16		9.90				······································
arty wall	ı			=		_ ,		— [
•			27.98	x	0	=	0			၂ 누	(
arty floor			62.9							╡ ⊨	(
arty ceiling or windows and roof windows			62.9	-4-4		15/4/11	\. 0.041				(
nclude the areas on both side				ated using	i iorriiula i	/[(I/ U- vait	ie)+0.04] a	as given in	і рагаўгарі	1 3.2	
bric heat loss, W/K = S	(A x U)				(26)(30)) + (32) =				27.3	4 (
eat capacity Cm = S(A)	ĸk)					((28).	(30) + (32	2) + (32a).	(32e) =	0	(
ermal mass parameter	(TMP = Cr	n ÷ TFA) ir	n kJ/m²K			Indica	itive Value	: Medium		250	(
r design assessments where n be used instead of a detaile		the construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
ermal bridges : S (L x \	Y) calculate	d using Ap	pendix ł	<						8.97	. (
etails of thermal bridging are	not known (3	$6) = 0.15 \times (3)$	31)								
tal fabric heat loss							(36) =			36.3	1(
entilation heat loss calcu		-i				- ` ` ` 	= 0.33 × (1	1	
Jan Feb	Mar Ap		Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
			1 27 20	27.28	27.16	27.54	27.95	28.24	28.54	I	(
s)m= 29.19 29.02 2	28.86 28.0	27.95	27.28	27.20	27.10	27.54	27.93	20.21	20.34		(
eat transfer coefficient,		9 27.95	21.20	27.20	27.10		= (37) + (37)	<u> </u>	20.34	_	(

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 water 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 times per person per day (all water used oct) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1 c 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 2b 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 water storage, kWh/year (47) x	(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 times per person per day (all water used oct) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1 c 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 2b 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 water storage, kWh/year (47) x														
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) Joint 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 (53) Energy lost fr										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 fleating 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>– 1</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	1	(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	paporation -82.49 gains (T 73.82 gains = 474.98 gains eaccess 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 x x	-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	8.0	=	27.36	(79)
Southwest _{0.9x}	0.77	X	2.2	5	X	85.75				0.35	X	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		x		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	!		,	
·	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)

Space heating fuel (secondary), kWh.	/month									
$= \{[(98)\text{m x } (201)]\} \text{ x } 100 \div (208)$ $(215)\text{m} = 0 0 0 0$	0	0	0	0	0	0	0	Ιο	1	
		U			_	ar) =Sum(2	_		0	(215)
Water heating								-		`
Output from water heater (calculated a	bove)								•	
141.18 123.07 128.76 116.54	114.02	101.99	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 $(219)m = (64)m \times 100 \div (217)m$										
(219)m= 157.74 137.5 143.86 130.21	127.4	113.95	112.07	122.81	123.7	138.2	144.47	154.5]	
	•			Tota	I = Sum(2	19a) ₁₁₂ =		!	1606.42	(219)
Annual totals						k\	Wh/yeaı	r	kWh/yea	<u></u>
Space heating fuel used, main system	1								1908.81	
Water heating fuel used									1606.42	
Electricity for pumps, fans and electric	keep-ho	t								
central heating pump:								30]	(230c)
boiler with a fan-assisted flue								45]	(230e)
Total electricity for the above, kWh/yea	ar			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting									284.27	(232)
10a. Fuel costs - individual heating sy	vstems:									
		Fu kW	el /h/year			Fuel P (Table			Fuel Cost £/year	
Space heating - main system 1		kW	-				12)	x 0.01 =	£/year	(240)
Space heating - main system 1 Space heating - main system 2		kW (211	/h/year			(Table	12)	x 0.01 = x 0.01 =	£/year 66.43	_
,		kW (211 (213	/h/year			(Table	12)		£/year 66.43	(240)
Space heating - main system 2		kW (211 (213	/h/year 1) x 3) x 5) x			(Table	12)	x 0.01 =	£/year 66.43	(240)
Space heating - main system 2 Space heating - secondary		kW (211 (213 (218	/h/year 1) x 3) x 5) x			(Table 3.4 0 13.	12)	x 0.01 = x 0.01 =	£/year 66.43 0	(240) (241) (242)
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	(230g) se	kW (211 (213 (215 (219 (234)	/h/year 1) x 3) x 5) x 9) 1) / as app	licable a	nd apply	(Table 3.4 0 13. 3.4 13.	12)	x = 0.01 = 0.001 = 0	£/year 66.43 0 0 55.9 9.89 Table 12a	(240) (241) (242) (247) (249)
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 Energy for lighting		(213 (215 (218 (234	/h/year 1) x 3) x 5) x 9) 1) / as app	licable a	nd apply	(Table 3.4 0 13.4 13.4	12)	x 0.01 = x 0.01 = x 0.01 = x 0.01 =	£/year 66.43 0 0 55.9 9.89 Table 12a 37.5	(240) (241) (242) (247) (249) (250)
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 Energy for lighting Additional standing charges (Table 12))	(215 (215 (215 (237 (237 (232	/h/year 1) x 3) x 5) x 9) 1) y as app	licable a	nd apply	(Table 3.4 0 13. 3.4 13.	12)	x = 0.01 = 0.001 = 0	£/year 66.43 0 0 55.9 9.89 Table 12a	(240) (241) (242) (247) (249)
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 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) a	nd (254)	(213 (215 (215 (232 eparately (232 as need	/h/year 1) x 3) x 5) x 9) 1) y as app		nd apply	(Table 3.4 0 13. 3.4 13.	12)	x = 0.01 = 0.001 = 0	£/year 66.43 0 0 55.9 9.89 Table 12a 37.5	(240) (241) (242) (247) (249) (250) (251)
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 energy for lighting Additional standing charges (Table 12)	nd (254) (245)((213 (215 (215 (232 eparately (232 as need	/h/year 1) x 3) x 5) x 9) 1) y as app		nd apply	(Table 3.4 0 13. 3.4 13.	12)	x = 0.01 = 0.001 = 0	£/year 66.43 0 0 55.9 9.89 Table 12a 37.5	(240) (241) (242) (247) (249) (250)
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 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) a Total energy cost 11a. SAP rating - individual heating s	nd (254) (245)((213 (215 (215 (232 eparately (232 as need	/h/year 1) x 3) x 5) x 9) 1) y as app		nd apply	(Table 3.4 0 13. 3.4 13.	12)	x = 0.01 = 0.001 = 0	£/year 66.43 0 0 55.9 9.89 Table 12a 37.5 120	(240) (241) (242) (247) (249) (250) (251) (255)
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 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) at Total energy cost 11a. SAP rating - individual heating seconds.	nd (254) (245)(ystems	(213 (215 (215 (232 eparately (232 as need (247) + (25	/h/year 1) x 3) x 5) x 9) 1) y as app ded 50)(254)	=	nd apply	(Table 3.4 0 13. 3.4 13.	12)	x = 0.01 = 0.001 = 0	£/year 66.43 0 0 55.9 9.89 Table 12a 37.5 120 289.72	(240) (241) (242) (247) (249) (250) (251) (255)
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 Energy for lighting Additional standing charges (Table 12) Appendix Q items: repeat lines (253) a Total energy cost 11a. SAP rating - individual heating s	nd (254) (245)(ystems	(213 (215 (215 (232 eparately (232 as need (247) + (25	/h/year 1) x 3) x 5) x 9) 1) y as app	=	nd apply	(Table 3.4 0 13. 3.4 13.	12)	x = 0.01 = 0.001 = 0	£/year 66.43 0 0 55.9 9.89 Table 12a 37.5 120	(240) (241) (242) (247) (249) (250) (251) (255)

	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)
Total CO2, kg/year	sum	of (265)(271) =	945.75 (272)
CO2 emissions per m²	(272)) ÷ (4) =	15.04 (273)
El rating (section 14)			88 (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)
Space heating (secondary) Energy for water heating	(215) x (219) x	3.07 =	
		3.07	0 (263)
Energy for water heating	(219) x	3.07	0 (263) 1959.83 (264)

sum of (265)...(271) =

 $(272) \div (4) =$

'Total Primary Energy

Primary energy kWh/m²/year

(272)

(273)

5391.55

85.72

			User D	etails: _						
Assessor Name:	Natalie Wheeler			etalis: Stroma	a Nium	hor:		STDC	0027778	
Software Name:	Stroma FSAP 201	2		Softwa					on: 1.0.4.6	
Contware Hame.	Choma i Criti 201						-2nd Flo		511. 1.0.1.0	
Address :	Flat 7, Hampshire s		sporty /	1000	D 0 L 0a	TT TOLL T	Zna i io	J.		
1. Overall dwelling dime	ensions:									
			Area	n(m²)		Av. He	ight(m)		Volume(m ³	·)
Ground floor			6	52.9	(1a) x	2	2.4	(2a) =	150.96	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1e	e)+(1n)	6	52.9	(4)			_		<u> </u>
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	150.96	(5)
2. Ventilation rate:										
		econdary neating	•	other		total			m³ per hou	r
Number of chimneys		0	+ [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	i +	0] = [0	x	20 =	0	(6b)
Number of intermittent fa	ans		J L		J [2	x	10 =	20	(7a)
Number of passive vents					L	0	x	10 =		(7b)
·					Ļ			10 =	0	= 1
Number of flueless gas f	ires					0	x '	+0 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	a)+(6b)+(7a)+(7b)+(7	7c) =	Г	20		÷ (5) =	0.13	(8)
If a pressurisation test has	been carried out or is intende	ed, proceed	to (17), c	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	ponaing to t	ne greate	er wall are	a (anter					
If suspended wooden	floor, enter 0.2 (unseal	ed) 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 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	•								0.38	(18)
Air permeability value applie Number of sides shelter	es if a pressurisation test has	s been done	or a deg	iree 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) =				0.33	(21)
Infiltration rate modified	•	d							0.00	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp					· ·		•	•	_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
		1				ı	1	ı	4	
Wind Factor $(22a)m = (2a)m =$	'		0.5.7	0.55					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	

djusted infiltration rate	(allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m			1	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>alcul<mark>ate effective air c</mark> If mechanical ventila</i>	•	iale ioi l	пе арріі	capie ca	SE						0	(2
If exhaust air heat pump u	sing Appe	endix N, (2	(3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(2
If balanced with heat reco	very: effic	eiency in %	allowing f	or in-use fa	actor (fron	n Table 4h) =				0	(2
a) If balanced mecha	unical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (2:	2b)m + (23b) × [1 – (23c)		
4a)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(:
b) If balanced mecha	nical ve	entilation	without	heat rec	overy (N	иV) (24b	m = (22)	2b)m + (2	23b)	1	J	
1b)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(
c) If whole house ext	ract ver	ntilation o	or positiv	re input v	entilatio	n from o	outside				•	
if (22b)m < 0.5 x	(23b), t	hen (24d	c) = (23b); otherv	vise (24	c) = (22k	o) m + 0.	.5 × (23b)		_	
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	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(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 he	at loss i	narameti	or.									
_EMENT Gros	s	Openin m	gs	Net Ar A ,n		U-valı W/m2		A X U (W/I	K)	k-value		A X k kJ/K
oors	` ,			1.87	_	1		1.87	$\stackrel{\prime}{\Box}$			(
ndows Type 1				7.92		/[1/(1.4)+	0.04] =	10.5	=			(
indows Type 2				2.25	=	/[1/(1.4)+		2.98	=			(
indows Type 3				1.52	=			2.02	\dashv			(
alls 68.98		13.56	<u> </u>	55.42	=	0.18		9.98	=			(
tal area of elements,		13.30	<u> </u>	68.98	=	0.10		3.30				
arty wall	***				=		_	0	— r			(
arty floor				27.98	x	0	=	0			╡	(
				62.9							╡╞	(
orty ceiling or windows and roof windo		. 		62.9	-4-4	. fa	/F/4/11) . 0 0 41 -				(
nclude the areas on both					ated using	i iorriiula T	/[(I/ U- VaIU	ie)+0.04j a	as given in	і рагаўгарі	1 3.2	
bric heat loss, W/K =	: S (A x	U)				(26)(30)) + (32) =				27.34	. (
eat capacity Cm = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	0	(
ermal mass paramet	er (TMF	o = Cm ÷	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	
r design assessments whe			constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
ermal bridges : S (L	x Y) cal	culated (using Ap	pendix k	<						8.97	(
etails of thermal bridging a	are not kn	own (36) =	= 0.15 x (3	1)								
tal fabric heat loss	_							(36) =			36.31	(
ntilation heat loss ca							- ` ´	= 0.33 × (1	1	
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
 												
s)m= 29.19 29.02	28.86	28.09	27.95	27.28	27.28	27.16	27.54	27.95	28.24	28.54		(
 		28.09	27.95	27.28	27.28	27.16	<u> </u>	27.95 = (37) + (3	<u> </u>	28.54	,	(

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 water 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 times per person per day (all water used oct) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1 c 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 2b 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 water storage, kWh/year (47) x	(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 times per person per day (all water used oct) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd.m = factor from Table 1 c 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 2b 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 water storage, kWh/year (47) x														
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) Joint 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 (53) Energy lost fr										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 fleating 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 lo	oss cal	iculated	for each	ı month ((61)m =	(60) ÷ 3(65 × (41)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)
	at requ	 uired for	water h	eating ca	alculated	for eac	h month	(62)m	= 0.85 × 1	 (45)m +	(46)m +	(57)m +	ı (59)m + (61)m	
(62)m=	182.32	159.26	165.7	146.97	142.29	125.32	120.07	133.85	135.32	154.09	164.49	178.03		(62)
Solar DHV	N input c	alculated	using App	endix G or	Appendix	Η (negati	ve quantity	/) (enter '	'0' if no sola	r contribut	ion to wate	er heating)	ı	
(add add	diti <u>ona</u> l	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 fi	rom wa	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	tput from wa	ater heate	r (annual) ₁	112	1437.75	(64)
Heat gai	ins fror	n water	heating,	, <u>kWh/m</u> ຕ	ว <u>nth 0.2</u> ′	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 >	x <u>[(46)</u> m	+ (57)m	+ (59)m	1]	
(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	le (57)r	n in calc	culation o	of (65)m	only if c	ylinder i	s in the ເ	Jwelling	g or hot w	ater is fr	om com	munity h	neating	
5. Inter	rnal ga	ins (see	Table 5	5 and 5a)):									
Metaboli	lic <u>gain</u>	s (<u>Table</u>	5), <u>Wat</u>	.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	gains	(calcula	ted in Ar	opendix !	L, equat	ion L9 o	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	1	(67)
Applianc	ces gai	ns (calc	ulated ir	1 Append	Jix L, eq	uation L	13 or L1	 3a), als	so see Ta	ble 5	1		ı	
(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	gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a), also s	see Table	÷ 5	<u> </u>		ı	
(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 a	and far	ns gains	(Table §	 5a)					•				•	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e	e.g. ev	aporatio	n (nega	tive value	es) (Tab	ole 5)			•				ı	
(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 he	eating	gains (T	able 5)	-					•				ı	
	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 in	ternal	gains =	·	-		(66))m + (67)n	1 + (68)m	ı + (69)m + ((70)m + (7	1)m + (72))m	I	
_	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	ir gains	s:												
Solar gai	ins are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to o	convert to th	ne applicat	ole orientat	tion.		
Orientati		Access F Table 6d		Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	T	FF able 6c		Gains (W)	
								. —						7
Southeas	st _{0.9x}	0.77	x	1.5	2	x 3	36.79	X	0.35	X	0.8	=	10.85	(77)
Southeas Southeas	<u> </u>	0.77					36.79 32.67	x	0.35		0.8	= =	10.85](77)](77)
	st _{0.9x}			1.5	52	x 6		┆ ⊨		믁 누		=		<u></u>
Southeas	st _{0.9x}	0.77	x	1.5	52	x 6	62.67	×	0.35] × [0.8	=	18.48	(77)

Southeast 0.9x	0.77	x	1.52	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												• •
(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 (secon	dary) k\//h	/month									
$= \{[(98) \text{m x } (201)] \} \text{ x } 100 \div$	• .	monun									
(215)m = 0 0 0	0	0	0	0	0	0	0	0	0		
			-		Tota	l (kWh/yea	ar) =Sum(2	215) _{15,101}		0	(215)
Water heating											
Output from water heater (c		bove) 114.02	101.99	100.3	109.92	110.71	123.69	129.3	138.28]	
Efficiency of water heater	70 110.01	111102	101.00	100.0	100.02	110.71	120.00	120.0	100.20	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									ı	
(219) m = (64) m x $100 \div (2)$ (219)m = 157.74 137.5 143		127.4	113.95	112.07	122.81	123.7	138.2	144.47	154.5		
(219)111= 137.74 137.3 143	00 130.21	127.4	113.93	112.07	<u> </u>	I = Sum(2		144.47	134.3	1606.42	(219)
Annual totals								Wh/yea	r	kWh/year	」 `
Space heating fuel used, m	ain system	1						•		2555.21	
Water heating fuel used										1606.42	Ī
Electricity for pumps, fans a	nd electric	keep-ho	t								_
central heating pump:									30		(230c)
boiler with a fan-assisted f	lue								45		(230e)
Total electricity for the above	e, kWh/yea	ar			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										284.27	(232)
12a. CO2 emissions – Ind	vidual heat	ing syste	ems incl	uding mi	cro-CHF)					
				ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	
Space heating (main system	n 1)		(21	1) x			0.2	16	=	551.92	(261)
Space heating (secondary)			(21	5) x			0.5	19	=	0	(263)
Water heating			(21	9) x			0.2	16	=	346.99	(264)
Space and water heating			(26	1) + (262)	+ (263) + (264) =				898.91	(265)
Electricity for pumps, fans a	nd electric	keep-ho	t (23	1) x			0.5	19	=	38.93	(267)
Electricity for lighting			(23)	2) x			0.5	19	=	147.54	(268)
Total CO2, kg/year						sum o	of (265)(2	271) =		1085.37	(272)
Dwelling CO2 Emission R	ate					(272)	÷ (4) =			17.26	(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

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

Dwelling type: Flat Located in: England

Region: South East England

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: South West

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

Night ventilation: False

Blinds, curtains, shutters:

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

Overheating Details:

Summer ventilation heat loss coefficient: 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 oto	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 <u>F</u>	Details:						
Assessor Name: Software Name:	Natalie Wheeler Stroma FSAP 2012		Strom Softwa					0027778 on: 1.0.4.6	
	F	Property	Address	: Be Lea	n-Flat 1	3 - 3rd fl	oor		
Address :	Flat 13, Hampshire street								
1. Overall dwelling dime	ensions:	_							
Ground floor			a(m²)	l(10) v		ight(m)	(2a) =	Volume(m	(3a)
	-> (41) - (4 -> - (4 -) - (4 -> - (4			(1a) x		2.4	(2a) =	190.39	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	79.33	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	190.39	(5)
2. Ventilation rate:	main accorde	w 1.	oth or		40401			m3 nor hou	
	main seconda heating heating	, –	other		total			m³ per hou	ır —
Number of chimneys	0 + 0	+	0	= [0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	X	20 =	0	(6b)
Number of intermittent fa	ins				2	X	10 =	20	(7a)
Number of passive vents	3			Γ	0	X	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X	40 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$			Į	20		÷ (5) =	0.11	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otherwise (continue fi	rom (9) to	(16)		0	(9)
Additional infiltration	ne awaiing (no)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction	· · · · · ·	•	0	(11)
	resent, use the value corresponding t	o the grea	ter wall are	ea (after					
deducting areas of openial If suspended wooden to	ngs); ir equal user 0.35 floor, enter 0.2 (unsealed) or 0).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	,	(,,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic metro	•	•	•	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$ es if a pressurisation test has been do				is boing u	end		0.36	(18)
Number of sides sheltere		ne or a de	gree air pe	ппеаышу	is being u	seu		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified f	for monthly wind speed	_							
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
, .,	1 1 1 1 1 1 1 1 1 1	1	1					J	

Adjusted infiltr	ation rate (allow	vina for sl	nelter an	ıd 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	1		cable ca	se	<u> </u>	<u>!</u>	<u>!</u>		<u> </u>]	
If mechanica											0	(23a)
	eat pump using App) = (23a)			0	(23b)
If balanced with	heat recovery: effi	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23c)
a) If balance	d mechanical v	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [′	1 – (23c)) ÷ 100]	
(24a)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24a)
· -	d mechanical v	entilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (2	23b)		1	
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24b)
,	ouse extract ve		•	•				- (00)				
<u> </u>	$1 < 0.5 \times (23b)$	· ` `	ŕ	ŕ		ŕ	ŕ	· ` ·			1	(24a)
(24c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24c)
,	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) or (24b	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)	'n		A ,r		W/m2		(W/ł	<)	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		7 F	(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							7 H	(32a)
* for windows and	roof windows, use			alue calcul		ı formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	 n 3.2	((===)
	as on both sides of R is, $W/K = S(A)$		is ariu par	uuoris		(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.l/m²K			., ,	itive Value:	, , ,	(020) =		(35)
	sments where the d		,			ecisely the				able 1f	250	(55)
· ·	ad of a detailed cal					, , ,						
Thermal bridge	es : S (L x Y) ca	lculated	using Ap	pendix I	<						13.13	(36)
	al bridging are not k	nown (36) :	= 0.15 x (3	11)			(0.5)	(0.0)				 1.
Total fabric he		1 21						(36) =	os) (***		54.17	(37)
	t loss calculate	1	<u> </u>					$= 0.33 \times ($			1	
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	

(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	l		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 (TE	-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 610	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 is			<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 = (` '	, ,					1	
,						solar wat					 		I	(==)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
				ı i	ì	(60) ÷ 36	<u>`</u>					1	1	
(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								`		` ′	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)
						KH (negativ				r contributi	ion to wate	er heating)		
•	dditional 0		FGHRS			applies,		pendix C			Π_0		I	(63)
(63)m=	ا	-41.82		25.13	33.63	26.02	22.70		0	0 35.00	0	0 45.04		(63) (G10)
	5 -47.53	-	-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	l	
(64)m=	154.13	135.06	141.55	128.1	125.41	112.21	110.56				r (annual) ₁	<u> </u>	1578.97	(64)
⊔oat o	oine fron	~ woter	booting	M/h/m	anth () 2	E ' [N QE	~ (45)m				,](04)
(65)m=	62.85	55.1	neating, 57.23	50.59	48.9	5 [0.85 42.9	× (45)m	45.78	1] + 0.8 X	52.95	+ (57)m 56.76	+ (59)m _{61.27}] 	(65)
	LI											munity h	cating	(66)
					-	yiinueria	s III u ie c	Jweiling	OI HOL W	alei is ii	OIII COM	Murilly 11	eaung	
1	Ĭ	·		5 and 5a)):									
Metab			5), Watt		May	Lin		Λ.ια	San	Cot	T 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)
			<u> </u>	<u> </u>			ļ.			177	177	17'		(55)
(67)m=	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		(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)
											200.01	011.07		(65)
(69)m=	19 gains	52.15	52.15	52.15	52.15	tion L15	52.15	52.15	52.15	52.15	52.15	52.15		(69)
, ,			(Table 5		02.10	02.10	02.10	02.10	02.10	02.10	02.10	02.10		(55)
(70)m=	3	3 3	3	3 3	3	3	3	3	3	3	3	3	1	(70)
, ,			<u> </u>	Ll tive value		<u> </u>				Ŭ.				(/
(71)m=	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	-98	1	(71)
	heating						.			.				()
(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						<u> </u>	<u> </u>		<u> </u>	(1)m + (72)			,
(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	e applicat	ole orientat	tion.		
Orienta	ation: A			Area		Flu		т	g_	т.	FF		Gains	
	_	able 6d		m²		l au	ble 6a	. <u> </u>	able 6b		able 6c		(W)	_
Southe	ast _{0.9x}	0.77	X	2.3	3	x 3	86.79	X	0.35	x	8.0	=	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	X	0.8	=	47.42	<u> </u> (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	Х	0.35	X	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	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]	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	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	×	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	х	0.35	х	0.8	j =	89.33	(81)
Northwest 0.9x	0.77	x	4.96	x	91.35	x	0.35	х	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	х	0.35	х	0.8	j =	93.73	(81)
Northwest _{0.9x}	0.77	x	5.04	x	91.1	x	0.35	x	0.8	j =	89.09	(81)
Northwest _{0.9x}	0.77	×	4.96	×	91.1	x	0.35	x	0.8	i =	87.68	(81)
Northwest _{0.9x}	0.77	×	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	X	0.8	=	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)
L_		_		1		1		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	est _{0.9x}	0.77	х	4.9	96	x	2	28.07	х		0.35	x	0.8		27.01	(81)
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	х	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 Tab	ole 9	Th	1 (°C)				21	(85)
•		J	٠.	living are		•				,	. (•)					(55)
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.98	0.95	0.87	\vdash	0.71	0.54	0.5	Ť	0.82	0.96	0.99	0.99		(86)
` ′ L			l	l	l .	<u> </u>		l .				0.00	0.00	0.00		(00)
г								ps 3 to 7		$\overline{}$					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	19.98	19.98	1	9.99	19.99	19.	99	19.99	19.98	19.98	19.98		(88)
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	0.93	0.83	_	0.62	0.42	0.4	17	0.75	0.94	0.98	0.99		(89)
Moon	intorna	Ltompor	atura in	the rest	of dwall	ina	T2 (f	ollow ste	nc 2	to 7	7 in Tabl	0.00)			1	
(90)m=	18.58	18.74	19.04	19.45	19.79		9.96	19.99	19.	_	19.9	19.51	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			ng area ÷ (4		0.32	(91)
													3 (,	0.32	(0.)
Г			· `	r	1	_		LA × T1	<u> </u>				1	1	Ī	(00)
(92)m=	19.01	19.16	19.43	19.8	20.11		0.27	20.3	20		20.22	19.85	19.37	18.98		(92)
· · · · r			i	1		_		m Table		$\overline{}$			10.07	40.00	1	(02)
(93)m=	19.01	19.16	19.43	19.8	20.11	2	0.27	20.3	20	.3	20.22	19.85	19.37	18.98		(93)
•		ting requ				اء ما	a4 a4	an 11 af	Tabl	ام ۸		4 T:	(70)	ما مماد	loto	
				nperaturusing Ta		iea	at ste	ерттог	rabi	ie 9t	o, so tha	t 11,ff1=((76)m an	d re-caid	culate	
Ι	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisa		tor for g	<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=	533.13	427.53	364.31	209.77	89.03		0	0	C)	0	194.16	374.3	546.86		

					Tota	l per vear	(kWh/yeaı	·) – Sum(0	18) –	2739.08	(98)
Chase besting requiremen	t in IdA/b/m	2/11005			1010	ii per year	(KVVII) y Cai) = Ouni(o	0)15,912		╡``
Space heating requiremen										34.53	(99)
9a. Energy requirements –	Individual h	eating s	ystems i	including	micro-C	CHP)					
Space heating: Fraction of space heat from	n secondar	v/supple	ementary	/ system						0	(201)
Fraction of space heat from			,	•	(202) = 1	- (201) =				1	(202)
Fraction of total heating from	•	` ,			(204) = (2	(02) × [1 –	(203)] =			1	(204)
Efficiency of main space h	-									89.5	(206)
Efficiency of secondary/su			g systen	n, %						0	(208)
Jan Feb M	· ·	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	∟ ear
Space heating requiremen	_				19]	
533.13 427.53 364	31 209.77	89.03	0	0	0	0	194.16	374.3	546.86]	
$(211)m = \{[(98)m \times (204)] \}$	x 100 ÷ (20	06)		_				_		_	(211)
595.68 477.68 407.	05 234.38	99.47	0	0	0	0	216.93	418.21	611.01		_
					Tota	al (kWh/yea	ar) =Sum(2	211) _{15,101}	2=	3060.42	(211)
Space heating fuel (secon	• /	/month									
$= \{[(98)m \times (201)] \} \times 100 \div (215)m = 0 0 0$	 	0	0	0	0	0	0	0	0	1	
(=:5)							ar) =Sum(2	_		0	(215)
Water heating											_
Output from water heater (c	alculated a	bove)			ı		ı		T	1	
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		T	T	T	T	T	T		T	89.5	(216)
(217)m= 89.5 89.5 89.		89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5]	(217)
Fuel for water heating, kWh $(219)m = (64)m \times 100 \div (219)m$											
(219)m= 172.22 150.91 157.		140.12	125.44	123.54	135.27	136.21	152.02	158.73	168.68		
					Tota	al = Sum(2	19a) ₁₁₂ =			1764.21	(219)
Annual totals	-:	4					k'	Wh/yea	r	kWh/yea	r ¬
Space heating fuel used, m	ain system	1								3060.42	╡
Water heating fuel used										1764.21	
Electricity for pumps, fans a	nd electric	keep-ho	t								
central heating pump:									30]	(2300
boiler with a fan-assisted f	ue								45]	(230
Total electricity for the above	e, kWh/yea	ar			sum	of (230a)	(230g) =			75	(231)
Electricity for lighting										344.18	(232)
10a. Fuel costs - individua	l heating sv	/stem <u>s:</u>									
	<u> </u>		Fu				Fuel P			Fuel Cost	
Onese heating week a few	1			Vh/year			(Table		v 0.04	£/year	
Space heating - main syste	n 1		(21	1) x			3.4	8	x 0.01 =	106.5	(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 =	61.39	(247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (230	-, , , , , , , , , , , , , , , , , , ,	· · · · ·		,
Energy for lighting	(232)	13.19 x 0.01 =	45.4	(250)
Additional standing charges (Table 12)			120	(251)
Appendix Q items: repeat lines (253) and (253) and (253)	254) as needed 45)(247) + (250)(254) =		343.19	(255)
11a. SAP rating - individual heating system	ms			
Energy cost deflator (Table 12)			0.42	(256)
Energy cost factor (ECF) [(2	255) x (256)] ÷ [(4) + 45.0] =		1.16	(257)
SAP rating (Section 12)			83.83	(258)
12a. CO2 emissions – Individual heating s	systems including micro-CHP			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216 =	661.05	(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) =	1042.12	(265)
Electricity for pumps, fans and electric keep	p-hot (231) x	0.519 =	38.93	(267)
Electricity for lighting	(232) x	0.519 =	178.63	(268)
Total CO2, kg/year		sum of (265)(271) =	1259.68	(272)
CO2 emissions per m²		(272) ÷ (4) =	15.88	(273)
El rating (section 14)			86	(274)
13a. Primary Energy				
	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	3733.71	(261)
Space heating (secondary)	(215) x	3.07	0	(263)
Energy for water heating	(219) x	1.22	2152.33	(264)
Space and water heating	(261) + (262) + (263) + (264) =	5886.05	(265)
Electricity for pumps, fans and electric keep	p-hot (231) x	3.07	230.25	(267)
Electricity for lighting	(232) x	0 =	1056.64	(268)
'Total Primary Energy		sum of (265)(271) =	7172.94	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =	90.42	(273)

			User D	etails: _						
Assessor Name:	Natalie Wheeler			Stroma	o Mirros	bor		QTD(0027778	
Software Name:	Stroma FSAP 201	2		Softwa					on: 1.0.4.6	
Contware Hame.	Olioina i Orti 201						3 - 3rd fl		JII. 1.0. 1.0	
Address :	Flat 13, Hampshire		ioporty ,	1441000	D0 20a	ir riac r	0 01411	001		
1. Overall dwelling dime	•									
			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	1a)+(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	у	other		total			m³ per hou	ır
Number of chimneys	heating h	eating 0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	- - - - -	0] ₌ [0	x :	20 =	0	(6b)
Number of intermittent fa								10 =		ᆗ``
					Ļ	2			20	(7a)
Number of passive vents					L	0		10 =	0	(7b)
Number of flueless gas f	fires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	evs flues and fans = (6	a)+(6b)+(7	a)+(7b)+(7c) =	Г	20		÷ (5) =	0.11	(8)
	been carried out or is intende				continue fr	20 om (9) to		. (3) =	0.11	(6)
Number of storeys in t		,	(),			(-)	/		0	(9)
Additional infiltration	- · · ·						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber	frame or	0.35 for	masonr	y constr	uction			0	(11)
	oresent, use the value corres	ponding to	the great	er wall are	a (after					
deducting areas of open.	ings); if equal user 0.35 floor, enter 0.2 (unseal	od) or 0	1 (coala	nd) alca	ontor O					— (40)
If no draught lobby, er		eu) oi o.	i (Seale	u), eise	enter 0				0	(12)
•	s and doors draught st	rinned							0	(14)
Window infiltration	o and doors draught st	пррса		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
	, q50, expressed in cub	ic metre	s per ho	our per so	duare m	etre of e	envelope	area	5	(17)
If based on air permeabi			•	•	•		'		0.36	(18)
·	es if a pressurisation test has					is being u	sed			` ′
Number of sides shelter	ed								2	(19)
Shelter factor				(20) = 1 -	0.075 x (1	[9)] =			0.85	(20)
Infiltration rate incorpora	iting shelter factor			(21) = (18)	x (20) =				0.3	(21)
Infiltration rate modified	for monthly wind speed	<u> </u>							7	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (2	22)m <i>÷</i> 4									
VVIIId Factor (22a)III = (22a)IIII = (22a)III = (22a)III = (22a)III = (22a)III = (22a)III = (22a)	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
(ΣΕα)111- 1.21 1.20	1.20 1.1 1.00	0.90	0.50	0.92	'	1.00	1.12	1.10	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 <i>– (23c</i>)		(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						· · · · ·			_		İ	(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 cylinder 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	X	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	e 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		

			Tota	l nor your	(14) 1/16 / 16 0 0 1	e) – Sum/0	o) _	3453.85	(98)
0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			Tota	i per year	(kWh/year) = Sum(9	6) 15,912 =		= ` `
Space heating requirement in kWh/m²/year								43.54	(99)
9a. Energy requirements – Individual heating sy	stems i	ncluding	micro-C	HP)					
Space heating: Fraction of space heat from secondary/suppler	mentary	svstem						0	(201)
Fraction of space heat from main system(s)	normar y	-	(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (2		(203)] =			1	(204)
Efficiency of main space heating system 1			`	, -	, /-			89.5	(206)
Efficiency of secondary/supplementary heating	ı system	າ, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 `
Space heating requirement (calculated above)	Juli	Oui	7 tag	ОСР	1 001	1101		ixvvii/yx	Jui
643.08 523.83 461.59 286.19 138.74	0	0	0	0	274.65	470.64	655.12		
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$									(211)
718.53 585.29 515.74 319.77 155.01	0	0	0	0	306.88	525.86	731.98		
			Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	F	3859.05	(211)
Space heating fuel (secondary), kWh/month									
$= \{ [(98)\text{m x } (201)] \} \text{ x } 100 \div (208)$ $(215)\text{m} = \begin{bmatrix} 0 & 0 & 0 & 0 \end{bmatrix}$	0	0	0	0	0	0	0		
(215)m= 0 0 0 0 0	0	0	-		ar) =Sum(2		0	0	(215)
Water heating				(715,1012	2	0	(210)
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								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 $(219)m = (64)m \times 100 \div (217)m$									
(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	ı	1764.21	(219)
Annual totals					k\	Wh/year	•	kWh/yea	<u>r</u>
Space heating fuel used, main system 1								3859.05	
Water heating fuel used								1764.21	
Electricity for pumps, fans and electric keep-hot									
central heating pump:							30		(230c)
boiler with a fan-assisted flue							45		(230e)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting								344.18	(232)
12a. CO2 emissions – Individual heating syste	ms incli	ıdina mi	cro-CHP)				31	
TEG. 902 CHIISSIONS THUINIGUAL HEALING SYSTE		ergy	oro o rir		Fmiss	ion fac	tor	Emission	s
		/h/year			kg CO			kg CO2/ye	
Space heating (main system 1)	(211	1) x			0.2	16	=	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)
Total CO2, kg/year	sum	of (265)(271) =		1432.18	(272)
Dwelling CO2 Emission Rate	(272)) ÷ (4) =		18.05	(273)
EI rating (section 14)				85	(274)

SAP 2012 Overheating Assessment

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

Property Details: Be Lean-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

Overhangs: None

Thermal 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: 188.49 (P1)

Transmission heat loss coefficient: 54.2

Summer heat loss coefficient: 242.66 (P2)

Overhangs:

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	g_{-}	FF	Shading	Gains
North West (Lounge terrace doc	ors\$.04	105.45	0.35	8.0	0.9	120.54
North West (Bedroom ter@ace de	oor4s)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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