User Details:												
Assessor Name: Software Name: S	troma FSAP 201	2		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49			
		P	roperty A	Address:	Block A	- Groui	nd Floor					
Address : A	, BIOCK A, Ham Cic	ose, Lono	don, I VV	10								
Ground floor	JII5.		Area	a(m²) 0.84	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 227.1	(3a)		
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n	I) 9	0.84	(4)							
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	(3n) =	227.1	(5)		
2. Ventilation rate:				_								
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} & \text{se} \\ \text{heating} & \text{h} \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array} $	econdar eating 0 0	y] + [] + [0 0] = [total 0 0	x	40 = 20 =	m³ per hour 0 0	(6a) (6b)		
Number of intermittent fans						0	X	10 =	0	(7a)		
Number of passive vents					Γ	0	x	10 =	0	(7b)		
Number of passive vents 0 x 10 = 0 Number of flueless gas fires 0 x 40 = 0 Air changes per												
Air change Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 \div (5) = If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) \div (5) =												
Number of storeys in the d Additional infiltration Structural infiltration: 0.25	w <mark>elling</mark> (ns) for steel or timber f	rame or	0.35 for	masonr	ry constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)		
if both types of wall are preser deducting areas of openings); If suspended wooden floor	nt, use the value corresp if equal user 0.35 c enter 0.2 (unseal	ponding to	the greate	er wall area	a (after enter 0](12)		
If no draught lobby, enter ().05. else enter 0	00) 01 0.	1 (00010	a), 0100					0	(12)		
Percentage of windows an	d doors draught st	ripped							0	(14)		
Window infiltration	Ũ			0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)		
Infiltration rate				(8) + (10) ·	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)		
Air permeability value, q50	, expressed in cub	ic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)		
If based on air permeability v	alue, then (18) = [(1	7) ÷ 20]+(8	3), otherwis	se (18) = (16)				0.2	(18)		
Air permeability value applies if a	pressurisation test has	been don	e or a deg	ree air pei	rmeability	is being u	sed			-		
Number of sides sheltered				(20) = 1 - [[0.075 x (1	9)] =			4	(19)		
Infiltration rate incorporating	shelter factor			(21) = (18)	(20) = (20) =	-/1			0.14	(20)		
Infiltration rate modified for m	onthly wind speed			() ()	,()				0.14			
Jan Feb Ma	r Apr May	Jun	Jul	Aua	Sep	Oct	Nov	Dec]			
Monthly average wind speed	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 = (22)m	I					L	1	I	J			
(22a)m= 1.27 1.25 1.23	1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]			

Adjuste	ed infiltra	ation rat	e (allow	ing for sł	nelter an	nd wind s	peed) =	(21a) x	(22a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula If me	ate etteo chanica	ctive air	change	rate for t	he appli	cable ca	se						0.5	(23a)
If exh	aust air he	eat pump	usina App	endix N. (2	3b) = (23a	a) × Fmv (e	equation (1	N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
lf bala	anced with	heat reco	overv: effic	ciencv in %	allowing f	for in-use fa	actor (fron	n Table 4h) =	, (,			0.5	(23c)
a) If	balance	d mech	anical v	entilation	with he	at recove	erv (MVI	HR) (24a	(2)	2b)m + (23h) x ['	1 – (23c)		(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(24a)
b) If	balance	d mech	ı anical v	entilation	without	heat rec	: overv (N	и ЛV) (24t	m = (22)	1 2b)m + (2	23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ve	ntilation of	or positiv	/e input \	/entilatio	n from o	outside				1	
i	f (22b)n	ר < 0.5 א	(23b),	then (24	c) = (23b	o); otherv	vise (24	c) = (22b	o) m + 0.	5 × (23b)		_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	nole hous	e positiv	ve input	ventilatio	on from	oft	o - 1				
(0.1.1)	f (22b)n	n = 1, th	en (24d)m = (22l	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0	0	0	0	0		0	0	0	0	0	0		(240)
Effec	ctive air	change	rate - e	nter (24a) or (24	o) or (240	c) or (24	d) in box	x (25)	0.07	0.07	0.00	1	(25)
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. Hea	at l <mark>osse</mark> :	s and he	eat loss	paramet	er:									
ELEN		Gros are <mark>a</mark>	ss (m²)	Openin m	gs 1 ²	Net Ar A ,r	ea n²	U-val W/m2	ue !K	A X U (W/I	≺)	k-value kJ/m²·l	e K	A X k kJ/K
Doo <mark>rs</mark>						1.91	x	1	= [1.91				(26)
Windov	<mark>ws</mark> Type	e 1				2.43	x1	/[1/(1.2)+	0.04] =	2.78				(27)
Windov	ws Type	2				9.24	x1	/[1/(1.2)+	0.04] =	10.58				(27)
Window	ws Type	3				2.23	x1	/[1/(1.2)+	0.04] =	2.55	5			(27)
Window	ws Type	e 4				2.43	x1	/[1/(1.2)+	0.04] =	2.78				(27)
Window	ws Type	5				2.43	x1	/[1/(1.2)+	0.04] =	2.78				(27)
Window	ws Type	6				5.64	x1	/[1/(1.2)+	0.04] =	6.46				(27)
Window	ws Type	e 7				3.96	x1	/[1/(1.2)+	0.04] =	4.53				(27)
Window	ws Type	8				3.24	x1	/[1/(1.2)+	0.04] =	3.71	=			(27)
Floor						90.84	x	0.1		9.084	Ξ r			(28)
Walls 7	Гуре1	73.4	17	31.6	;	41.87	, x	0.16		6.7	ה ה		i –	(29)
Walls 7	Гуре2	35.8	33	1.91		33.92	2 X	0.15		5.1	ה ה		i –	(29)
Total a	rea of e	lements	, m²	L		200.14	4	L	I		L			(31)
Party c	eiling					90.84					Г			(32b)
-	-													

 Fabric heat loss, W/K = S (A x U)
 (26)...(30) + (32) = 58.98 (33)

 Heat capacity Cm = S(A x k)
 ((28)...(30) + (32) + (32a)...(32e) = 13399.71 (34)

 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K
 Indicative Value: Low
 100 (35)

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

can be ι	ised inste	ad of a dei	ailed calc	ulation.										
Therm	Thermal bridges : S (L x Y) calculated using Appendix K													(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			73.61	(37)
Ventila	tion hea	at loss ca	alculated	monthl	Ý	-		-	(38)m	= 0.33 × (25)m x (5)	_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	22.18	21.92	21.66	20.35	20.08	18.77	18.77	18.51	19.3	20.08	20.61	21.13		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	95.79	95.53	95.27	93.96	93.69	92.38	92.38	92.12	92.91	93.69	94.22	94.74		
11				(_		(10)	Average =	Sum(39)1.	12 /12=	93.89	(39)
Heat IC	oss para	meter (F	1LP), VV/	m²ĸ	((40)m	= (39)m ÷	• (4)			
(40)m=	1.05	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.04	1.04		
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	1.03	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
													-	
4. Water heating energy requirement: kWh/year:														
													1	
Assum		ipancy, I A N – 1	N + 1 76 x	[1 - exp	(-0.0003	249 x (TF	-13 Q	(2)1 + 0)013 x (⁻	TFA -13	2.	64		(42)
if TF	A £ 13.9	9, N = 1	1.10 /		(0.0000		// 10.0	/2/] 1 0.0			.0)			
Ann <mark>ua</mark>	l averag	e hot wa	ater usag	ge in <mark>litre</mark>	es per da	ay Vd,av	erage =	(25 x N)	+ 36		96	.83		(43)
Reduce	the annua that 125	al average litres per l	hot water	usage by : day (all w	5% if the a	welling is	designed i Id)	to achieve	a water us	se target o	f			
not more						iot und oo						_		
Hot wate	Jan	Feb	Mar day for e	Apr	May	Jun	Jul Jul	Aug	Sep	Oct	Nov	Dec		
not wate	n usage ii	r na co per			V 0,111 = 10			(+5)						
(44)m=	106.51	102.64	98.77	94.89	91.02	87.15	87.15	91.02	94.89	98.77	102.64	106.51		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)))))))))))))))))))	kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	1161.96	(44)
(45)m=	157.96	138.15	142.56	124.28	119.25	102.91	95.36	109.43	110.73	129.05	140.87	152.97		
										Total = Su	m(45) ₁₁₂ =	:	1523.51	(45)
lf instant	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46,) to (61)					
(46)m=	23.69	20.72	21.38	18.64	17.89	15.44	14.3	16.41	16.61	19.36	21.13	22.95		(46)
Water	storage	loss:											1	
Storag	e volum	e (litres)	includir	ig any so	Diar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	nd no ta	ink in dw	velling, e	nter 110	litres in	(47)	ara) ante	or (0' in (47)			
Water	storade		not wate		iciudes i	nstantai	ieous co		ers) ente		47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b		,	,					0		(49)
Energy lost from water storage kWb/year $(48) \times (49) = $												(50)		
b) If m	anufact	urer's de	eclared of	cylinder l	oss fact	or is not	known:	(10) // (10)				10		(00)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)				0.	02		(51)
If comr	nunity h	eating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a	0							1.	03		(52)
lempe	erature f	actor fro	m Table	2b							0	.6		(53)

Energy Enter	nergy lost from water storage, kWh/year nter (50) or (54) in (55)							(47) x (51)) x (52) x (53) =	1.	03 03		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			. ,
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contain	s dedicate	l d solar sto	l orage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	1 7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m					_	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	213.23	188.08	197.83	177.78	174.53	156.4	150.64	164.7	164.23	184.32	194.36	208.25		(62)
Solar Dł	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (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 (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter	-			-							
(64)m=	213.23	188.08	197.83	177.78	174.53	156.4	150.64	164.7	164.23	184.32	194.36	208.25		
								Outp	out from wa	ater heate	r (annual)₁	12	2174.35	(64)
Hea <mark>t g</mark>	<mark>jain</mark> s fro	m water	heating	, kWh/m	onth 0.2	5 [′] [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	9 <mark>6.74</mark>	85.88	91.62	84.12	83.87	77.01	75.93	80.61	79.61	87.13	89.63	9 <mark>5.08</mark>		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	<mark>or ho</mark> t w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table {	5 and 5a):									
Metab	olic gair	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	131.85	131.85	131.85	131.85	131.85	131.85	131.85	131.85	131.85	131.85	131.85	131.85		(66)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	21.45	19.05	15.49	11.73	8.77	7.4	8	10.4	13.96	17.72	20.68	22.05		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5			-	
(68)m=	240.61	243.11	236.82	223.42	206.52	190.62	180.01	177.51	183.8	197.2	214.11	230		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)), also se	e Table	5		-		
(69)m=	36.19	36.19	36.19	36.19	36.19	36.19	36.19	36.19	36.19	36.19	36.19	36.19		(69)
Pumps	s and fai	ns gains	(Table !	5a)				-				-		
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-105.48	-105.48	-105.48	-105.48	-105.48	-105.48	-105.48	-105.48	-105.48	-105.48	-105.48	-105.48		(71)
Water	heating	gains (T	able 5)											
(72)m=	130.03	127.79	, 123.15	116.83	112.73	106.96	102.05	108.34	110.57	117.11	124.49	127.8		(72)
Total i	internal	gains =	:			(66)	m + (67)m	• 1 + (68)m -	• ⊦ (69)m + ((70)m + (7	1)m + (72)	m	I	
(73)m=	454.65	452.51	438.02	414.54	390.57	367.54	352.62	358.81	370.89	394.58	421.83	442.4		(73)
6. So	lar gains	5:	1	1	1	1	1		1		1			

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

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.23	x	11.28	×	0.45	x	0.7] =	5.49	(75)
Northeast 0.9x	0.77	x	2.43	x	11.28	×	0.45	x	0.7	i =	5.99	(75)
Northeast 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	_ (75)
Northeast 0.9x	0.77	x	5.64	x	11.28	×	0.45	x	0.7	=	13.89	(75)
Northeast 0.9x	0.77	x	2.23	x	22.97	×	0.45	×	0.7] =	11.18	(75)
Northeast 0.9x	0.77	x	2.43	x	22.97	×	0.45	x	0.7] =	12.18	(75)
Northeast 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7] =	12.18	(75)
Northeast 0.9x	0.77	x	5.64	x	22.97	x	0.45	x	0.7] =	28.28	(75)
Northeast 0.9x	0.77	x	2.23	x	41.38	×	0.45	×	0.7	=	20.14	(75)
Northeast 0.9x	0.77	x	2.43	x	41.38	×	0.45	×	0.7	=	21.95	- (75)
Northeast 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7] =	21.95	(75)
Northeast 0.9x	0.77	x	5.64	x	41.38	×	0.45	×	0.7	=	50.94	(75)
Northeast 0.9x	0.77	x	2.23	x	67.96	×	0.45	x	0.7	=	33.08	(75)
Northeast 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(75)
Northeast 0.9x	0.77	x	2.43	x	67.96	×	0.45	×	0.7	j =	36.05	_ (75)
Northeast 0.9x	0.77	x	5.64	x	67.96	x	0.45	x	0.7	=	83.67	(75)
Northeast 0.9x	0.77	x	2.23	x	91.35	x	0.45	x	0.7	i -	44.47	(75)
Northeast 0.9x	0.77	x	2.43	x	91.35	×	0.45	x	0.7] =	48.46	(75)
Northeast 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	j =	48.46	(75)
Northeast 0.9x	0.77	x	5.64	x	91.3 <mark>5</mark>	x	0.45	x	0.7	=	112.46	(75)
Northeast 0.9x	0.77	x	2.23	x	97.38	×	0.45	x	0.7	j =	47.41	(75)
Northeast 0.9x	0.77	x	2.43	x	97.38	×	0.45	x	0.7] =	51.66	(75)
Northeast 0.9x	0.77	x	2.43	×	97.38	×	0.45	x	0.7] =	51.66	(75)
Northeast 0.9x	0.77	x	5.64	x	97.38	×	0.45	×	0.7] =	119.9	(75)
Northeast 0.9x	0.77	x	2.23	x	91.1	x	0.45	x	0.7	=	44.35	(75)
Northeast 0.9x	0.77	x	2.43	x	91.1	x	0.45	x	0.7	=	48.33	(75)
Northeast 0.9x	0.77	x	2.43	x	91.1	x	0.45	x	0.7	=	48.33	(75)
Northeast 0.9x	0.77	x	5.64	x	91.1	x	0.45	x	0.7	=	112.16	(75)
Northeast 0.9x	0.77	x	2.23	x	72.63	x	0.45	x	0.7	=	35.35	(75)
Northeast 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	x	5.64	x	72.63	x	0.45	x	0.7	=	89.42	(75)
Northeast 0.9x	0.77	x	2.23	x	50.42	x	0.45	x	0.7	=	24.54	(75)
Northeast 0.9x	0.77	x	2.43	x	50.42	x	0.45	x	0.7	=	26.75	(75)
Northeast 0.9x	0.77	x	2.43	x	50.42	×	0.45	×	0.7] =	26.75	(75)
Northeast 0.9x	0.77	x	5.64	x	50.42	×	0.45	×	0.7] =	62.08	(75)
Northeast 0.9x	0.77	x	2.23	x	28.07	×	0.45	×	0.7] =	13.66	(75)
Northeast 0.9x	0.77	x	2.43	x	28.07	x	0.45	×	0.7] =	14.89	(75)
Northeast 0.9x	0.77	x	2.43	x	28.07	x	0.45	x	0.7	=	14.89](75)

Northeast 0.9x	0.77	x	5.64	x	28.07	x	0.45	x	0.7	=	34.56	(75)
Northeast 0.9x	0.77	x	2.23	×	14.2	x	0.45	x	0.7	i =	6.91	(75)
Northeast 0.9x	0.77	×	2.43	×	14.2	×	0.45	x	0.7	i =	7.53	(75)
Northeast 0.9x	0.77	x	2.43	×	14.2	×	0.45	x	0.7	i =	7.53	
Northeast 0.9x	0.77	×	5.64	×	14.2	×	0.45	x	0.7	j =	17.48	(75)
Northeast 0.9x	0.77	x	2.23	×	9.21	×	0.45	x	0.7	=	4.49	(75)
Northeast 0.9x	0.77	×	2.43	×	9.21	×	0.45	x	0.7] =	4.89	(75)
Northeast 0.9x	0.77	x	2.43	x	9.21	x	0.45	x	0.7	=	4.89	(75)
Northeast 0.9x	0.77	x	5.64	x	9.21	x	0.45	x	0.7	=	11.34	(75)
Southeast 0.9x	0.77	x	3.96	×	36.79	x	0.45	x	0.7	=	31.81	(77)
Southeast 0.9x	0.77	x	3.24	×	36.79	x	0.45	x	0.7	=	26.02	(77)
Southeast 0.9x	0.77	x	3.96	×	62.67	x	0.45	x	0.7	=	54.18	(77)
Southeast 0.9x	0.77	x	3.24	×	62.67	x	0.45	x	0.7] =	44.33	(77)
Southeast 0.9x	0.77	x	3.96	×	85.75	x	0.45	x	0.7	=	74.13	(77)
Southeast 0.9x	0.77	×	3.24	×	85.75	×	0.45	x	0.7	=	60.65	(77)
Southeast 0.9x	0.77	x	3.96	×	106.25	x	0.45	x	0.7] =	91.85	(77)
Southeast 0.9x	0.77	x	3.24	x	106.25	x	0.45	x	0.7] =	75.15	(77)
Southeast 0.9x	0.77	×	3.96	X	119.01	x	0.45	х	0.7] =	102.88	(77)
Southeast 0.9x	0.77	x	3.24	x	119.01	x	0.45	x	0.7] =	84.17	(77)
Southeast 0.9x	0.77	x	3.96	x	118.15] ×	0.45	x	0.7] =	102.13	(77)
Southeast 0.9x	0.7 <mark>7</mark>	x	3.24	x	118.15	x	0.45	x	0.7] =	83.56	(77)
Southeast 0.9x	0.77	x	3.96	x	113.9 <mark>1</mark>	x	0.45	x	0.7	=	98.47	(77)
Southeast 0.9x	0.77	x	3.24	x	113.91	x	0.45	x	0.7] =	80.57	(77)
Southeast 0.9x	0.77	×	3.96	×	104.39	×	0.45	x	0.7	=	90.24	(77)
Southeast 0.9x	0.77	×	3.24	x	104.39	×	0.45	x	0.7	=	73.83	(77)
Southeast 0.9x	0.77	×	3.96	x	92.85	×	0.45	x	0.7	=	80.27	(77)
Southeast 0.9x	0.77	×	3.24	×	92.85	×	0.45	x	0.7] =	65.67	(77)
Southeast 0.9x	0.77	x	3.96	x	69.27	x	0.45	x	0.7] =	59.88	(77)
Southeast 0.9x	0.77	×	3.24	x	69.27	×	0.45	x	0.7	=	48.99	(77)
Southeast 0.9x	0.77	x	3.96	×	44.07	x	0.45	x	0.7] =	38.1	(77)
Southeast 0.9x	0.77	x	3.24	x	44.07	x	0.45	x	0.7] =	31.17	(77)
Southeast 0.9x	0.77	x	3.96	x	31.49	x	0.45	x	0.7	=	27.22	(77)
Southeast 0.9x	0.77	x	3.24	x	31.49	x	0.45	x	0.7	=	22.27	(77)
Northwest 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	9.24	x	11.28	x	0.45	x	0.7	=	22.76	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	×	9.24	×	22.97	×	0.45	x	0.7	=	46.32	(81)
Northwest 0.9x	0.77	×	2.43	×	41.38	×	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	×	9.24	×	41.38	×	0.45	x	0.7] =	83.46	(81)
Northwest 0.9x	0.77	×	2.43	×	67.96	×	0.45	x	0.7] =	36.05	(81)
Northwest 0.9x	0.77	×	9.24	×	67.96	×	0.45	x	0.7	=	137.07	(81)

Northwest 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(81)
Northwest 0.9x	0.77	x	9.24	x	91.35	x	0.45	x	0.7] =	184.25	(81)
Northwest 0.9x	0.77	x	2.43	x	97.38	x	0.45	x	0.7] =	51.66	(81)
Northwest 0.9x	0.77	x	9.24	x	97.38	×	0.45	×	0.7] =	196.43	(81)
Northwest 0.9x	0.77	x	2.43	x	91.1	×	0.45	×	0.7	=	48.33	(81)
Northwest 0.9x	0.77	x	9.24	x	91.1	×	0.45	x	0.7	=	183.76	(81)
Northwest 0.9x	0.77	x	2.43	x	72.63	×	0.45	×	0.7	=	38.53	(81)
Northwest 0.9x	0.77	x	9.24	x	72.63	×	0.45	×	0.7	=	146.49	(81)
Northwest 0.9x	0.77	x	2.43	x	50.42	x	0.45	x	0.7	=	26.75	(81)
Northwest 0.9x	0.77	x	9.24	x	50.42	x	0.45	x	0.7	=	101.7	(81)
Northwest 0.9x	0.77	x	2.43	x	28.07	×	0.45	×	0.7	=	14.89	(81)
Northwest 0.9x	0.77	x	9.24	x	28.07	x	0.45	x	0.7	=	56.61	(81)
Northwest 0.9x	0.77	x	2.43	x	14.2	×	0.45	×	0.7	i =	7.53	(81)
Northwest 0.9x	0.77	x	9.24	x	14.2	×	0.45	x	0.7	=	28.64	(81)
Northwest 0.9x	0.77	x	2.43	x	9.21	x	0.45	x	0.7	=	4.89	(81)
Northwest 0.9x	0.77	x	9.24	x	9.21	x	0.45	x	0.7	=	18.59	 (81)

Solar g	jains in	watts, ca	alculated	for eac	n month			(83)m = <mark>S</mark>	um(74)m .	<mark>(8</mark> 2)m				
(83)m=	117.93	220.84	355.18	528.96	673.6	704.41	664.27	550.91	414.5	258.37	144.88	98.57		(83)
Tota <mark>l g</mark>	ains – ir	nternal a	ind solar	r (84)m =	= (73)m -	<mark>⊦ (8</mark> 3)m	, watts							
(84)m=	<mark>57</mark> 2.58	673.3 <mark>5</mark>	793.2	943.5	1064.17	1071.95	1016.89	909.72	785.39	652.95	566.72	<mark>54</mark> 0.97		(84)
7. Me	an inter	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Util <mark>isa</mark>	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)	·						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.94	0.9	0.8	0.66	0.5	0.38	0.44	0.66	0.86	0.94	0.97		(86)
Mean	interna	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	18.87	19.16	19.63	20.22	20.65	20.89	20.96	20.94	20.75	20.16	19.41	18.82		(87)
Temp	erature	durina h	eating p	eriods ir	rest of	dwellina	from Ta	ble 9 Ti	n2 (°C)					
(88)m=	20.04	20.04	20.04	20.05	20.06	20.07	20.07	20.07	20.06	20.06	20.05	20.05		(88)
Litilion	tion foo	tor for a	oine for	root of d	volling			00)					1	
						12,111 (Se		9a)	0.6	0.94	0.02	0.06		(80)
(89)m=	0.96	0.93	0.88	0.77	0.62	0.44	0.31	0.36	0.6	0.84	0.93	0.96	l	(09)
Mean	interna	temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)	-			
(90)m=	17.18	17.6	18.28	19.1	19.67	19.97	20.04	20.03	19.81	19.04	17.98	17.11		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.33	(91)
Mean	interna	temper	ature (fo	or the wh	ole dwel	ling) = fl	_A × T1	+ (1 – fL	.A) × T2					
(92)m=	17.73	18.11	18.72	19.47	20	20.27	20.35	20.33	20.12	19.41	18.45	17.67		(92)
Apply	adjustn	nent to th	he mear	internal	tempera	ature fro	m Table	4e, whe	re appro	opriate				
(93)m=	17.73	18.11	18.72	19.47	20	20.27	20.35	20.33	20.12	19.41	18.45	17.67		(93)
8. Spa	ace hea	ting requ	uirement	t										
Set Ti	i to the r	nean int	ernal ter	mperatui	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a								1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

Litilisation factor for gains, hm:													
(94)m= 0.94 0.91 0.86 0.75 0.61 0.45 0.33 0.38	0.6	0.82	0.91	0.94		(94)							
Useful gains, hmGm , W = (94) m x (84) m		<u> </u>											
(95)m= 536.76 612.16 678.81 712.06 652.29 485.82 334.97 345.58	3 473.91	532.6	516.79	511.04		(95)							
Monthly average external temperature from Table 8													
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4	14.1	10.6	7.1	4.2		(96)							
Heat loss rate for mean internal temperature, Lm , $W = [(39)m \times [(93)m \times ((93)m \times $	m– (96)m]			I	(07)							
(97)m= 1286.88 1262.12 1164.49 992.99 777.33 523.81 346.06 362.23	3 559.39	825.04	1069.58	1276.6		(97)							
(98)m = 558.09 + 436.77 + 361.35 + 202.27 + 93.03 + 0 = 0 = 0	0	217.57	398.01	569.58									
	otal per year	(kWh/yea	r) = Sum(9	8)15.912 =	2836.67	(98)							
Space heating requirement in kWh/m²/year		(, (-		31.23](99)							
9b. Energy requirements – Community heating scheme													
This part is used for space heating, space cooling or water heating pro-	ovided by	a comm	unity scl	neme.									
Fraction of space heat from secondary/supplementary heating (Table	11) '0' if n	ione	,		0	(301)							
Fraction of space heat from community system $1 - (301) =$					1	(302)							
The community scheme may obtain heat from several sources. The procedure allows for	or CHP and	up to four	other heat	sources; ti	he latter								
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump													
Fraction of heat from Community heat pump													
Fraction of total space heat from Community heat pump		(3	802) x (303	a) =	1	(304a)							
Factor for control and charging method (Table 4c(3)) for community h	eating sys	stem			1	(305)							
Distribution loss factor (Table 12c) for community heating system					1.2	(306)							
Space heating					k <mark>Wh/y</mark> ear	-							
Annual space heating requirement					2836.67								
Space heat from Community heat pump	(98) x (3	04a) x (30	5) x (306)	=	3404.01	(307a)							
Efficiency of secondary/supplementary heating system in % (from Tab	ole 4a or A	Appendix	E)		0	(308							
Space heating requirement from secondary/supplementary system	(98) x (3	01) x 100	÷ (308) =		0	(309)							
Water heating													
Annual water heating requirement					2174.35								
If DHW from community scheme: Water heat from Community heat pump	(64) x (3	03a) x (30	5) x (306)	=	2609.22	(310a)							
Electricity used for heat distribution 0.	01 × [(307a)	(307e) +	⊦ (310a)…	(310e)] =	60.13	(313)							
Cooling System Energy Efficiency Ratio					0	(314)							
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) -	÷ (314) =			0	(315)							
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outsid	е				205.58	_](330a)							
warm air heating system fans					0	(330b)							
pump for solar water heating					0	_](330g)							
Total electricity for the above. kWh/vear	=(330a)	+ (330b) +	· (330a) =		205.58] (331)							
	()	· · · · · · / ·	37										

Energy for lighting (calculated in Appendix L)			378.83	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) +	· (315) + (331) + (332	?)(237b) =	5867.56	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	wo fuels repeat (363) to (3	366) for the second fue	280	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.52	1114.59	(367)
Electrical energy for heat distribution [(3	313) x	0.52	31.21	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372)	=	1145.8	(373)
CO2 associated with space heating (secondary) (3	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneo	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		1145.8	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	106.7	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	196.61	(379)
Energy saving/generation technologies (333) to (334) as applicable ltem 1		0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			1070.2	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			11.78	(384)
El rating (section 14)			89.44	(385)

User Details:												
Assessor Name: Software Name:	Stroma FSAP	Versio	n: 1.0.5.49									
			don TM		DIUCK P	iviia F	1001					
Address :	A, DIOCK A, Hall	TCIOSE, LOIN	uon, 1vv	10								
Ground floor	1010113.		Area	a(m²) 1.62	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 179.05	(3a)		
Total floor area TFA = (1a)+(1b)+(1c)+(1d)	+(1e)+(1r	I) 7	1.62	(4)							
Dwelling volume					(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	179.05	(5)		
2. Ventilation rate:	-								<u> </u>			
Number of chimneys Number of open flues	main heating	secondar heating + 0 + 0	y] + [_] + [0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)		
Number of intermittent far	IS				- F	0	x ′	10 =	0	(7a)		
Number of passive vents					Γ	0	x /	10 =	0	(7b)		
Number of passive vents 0 x 10 = Number of flueless gas fires 0 x 40 =												
Infiltration due to chimney		(8)										
Number of storeys in th Additional infiltration Structural infiltration: 0.3	e dwelling (ns) 25 for steel or tim	ber frame or	0.35 for	masonr	ry constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)		
if both types of wall are pre deducting areas of opening If suspended wooden fl	esent, use the value c gs); if equal user 0.35 oor, enter 0.2 (un	orresponding to sealed) or 0.	the greate	er wall are ed), else	a (after enter 0				0	(12)		
If no draught lobby, ent	er 0.05, else ente	r 0							0	(13)		
Percentage of windows	and doors draug	ht stripped							0	(14)		
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)		
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)		
Air permeability value, o	q50, expressed in	cubic metre	s per ho	our per so	quare m	etre of e	nvelope	area	4	(17)		
If based on air permeabili	ty value, then (18)	$= [(17) \div 20] + (8)$	3), otherwi	se (18) = (16)				0.2	(18)		
Air permeability value applies	if a pressurisation tes	st has been don	ie or a deg	gree air pei	rmeability	is being us	sed		4	7(10)		
Shelter factor	4			(20) = 1 -	[0.075 x (1	9)] =			0.7	(13)		
Infiltration rate incorporati	ng shelter factor			(21) = (18)) x (20) =				0.14	(21)		
Infiltration rate modified for	or monthly wind sp	beed							-			
Jan Feb	Mar Apr M	1ay Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind spe	ed from Table 7											
(22)m= 5.1 5	4.9 4.4 4	.3 3.8	3.8	3.7	4	4.3	4.5	4.7				
Wind Factor (22a)m = (22)m ÷ 4											
(22a)m= 1.27 1.25 1	.23 1.1 1.	08 0.95	0.95	0.92	1	1.08	1.12	1.18				

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate etter	ctive air	change	rate for t	he appli	cable ca	se						0.5	(220)
lf exh	aust air h	eat pump	using App	endix N. (2	3b) = (23a	i) x Fmv (e	equation (I	N5)), othe	rwise (23b) = (23a)			0.5	(23a)
lf bala	anced with	n heat reco	overv: effic	ciencv in %	allowing f	or in-use fa	actor (fron	n Table 4h) =) (200)			0.5	(230)
a) If	halance	d mech	anical ve	antilation	with he	at recove	⊃rv (M\/I	-IR) (24s	$\frac{1}{2}$	2b)m + ('	23h) v [[,]	1 – (23c)	/0.5	(230)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	L Coverv (N	I //V) (24b	m = (22)	1 2b)m + (2	1 23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	i Iouse ex	r tract ver	ntilation of	n positiv	ve input v	ventilatio	n from c	utside			<u> </u>	1	
, i	if (22b)n	n < 0.5 ×	‹ (23b), †	then (24d	c) = (23b); otherv	wise (24	c) = (22k	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural	ventilatio	on or wh	$rac{1}{2}$	e positiv	/e input	ventilatio	on from 1	oft 2b)m ² x	0.51				
(24d)m=	0	0				0	0	0.5 + [(2		0.5	0	0	1	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	or (24)	c) or (24	d) in box	(25)				J	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
			1										1	
3. He	at losse	s and he	eat loss	paramete	er:				-			1 1		
ELEN		area	ss (m²)	Openin	gs I ²	Net Ar	ea n²	W/m2	ue :K	AXU (W/ł	<)	k-value kJ/m²·l	e K	A X K kJ/K
Doo <mark>rs</mark>						1.91	x	1	= [1.91				(26)
Windo	ws Type	e 1				2.43		/[1/(1.2)+	0.04] =	2.78	F			(27)
Windo	ws Type	e 2				5.64	x 1	/[1/(1.2)+	0.04] =	6.46	F			(27)
Windo	ws Type	e 3				3.84		/[1/(1.2)+	0.04] =	4.4				(27)
Window	ws Type	e 4				3.24		/[1/(1.2)+	0.04] =	3.71				(27)
Windo	ws Type	e 5				2.43		/[1/(1.2)+	0.04] =	2.78				(27)
Windo	ws Type	e 6				2.43		/[1/(1.2)+	0.04] =	2.78				(27)
Walls -	Type1	46.6	65	20.0	1	26.64	×	0.16	= [4.26	Ξ r			(29)
Walls -	Туре2	9.0	5	1.91	=	7.14	×	0.15		1.07	= i		\dashv	(29)
Total a	irea of e	elements	, m²	L]	55.7		L	I		L			(31)
Party v	vall					37.72	2 x	0	= [0				(32)
Partv f	loor					71.62			L		L		\dashv	(32a)
Party c	ceilina					71.62	<u> </u>				L L			(32b)
* for win	dows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcula	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	L Is given in	paragraph		(0=20)
** includ	le the area	as on both	sides of ii	nternal wali	ls and part	titions		(26) (20)) + (32) -				a - 1	
Heat o	anacity	55, VV/N : Cm - 9/	- 3 (A X (A v k)	0)				(20)(00)	((28)	(30) ± (33	(2) + (2)	(32e) -	30.16	(33) E (34)
i leat c	apaony	Om = O(((20)	.(00) 1 (02	_) i (02a).	(020) -	7015.0	5 (34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

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

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

100

Indicative Value: Low

(35)

if detail	s of therm	al bridging	are not kr	10wn (36) =	= 0.05 x (3	1)								_
Total f	fabric he	at loss							(33) +	(36) =			36.63	(37)
Ventila	ation he	at loss ca	alculated	monthl	y		-		(38)m	= 0.33 × ((25)m x (5)) 		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.49	17.28	17.08	16.04	15.84	14.8	14.8	14.59	15.21	15.84	16.25	16.66		(38)
Heat t	ransfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	54.12	53.91	53.7	52.67	52.46	51.43	51.43	51.22	51.84	52.46	52.88	53.29]	
								•		Average =	Sum(39)1	12 /12=	52.62	(39)
Heat I	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)		1	
(40)m=	0.76	0.75	0.75	0.74	0.73	0.72	0.72	0.72	0.72	0.73	0.74	0.74		_
Numb	er of dag	ys in mo	nth (Tab	le 1a)	-	-	-	-		Average =	Sum(40)₁	12 /12=	0.73	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31]	(41)
													-	
4. W	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
_		Ū									_		1	
Assun if TF	ned occi =∆	Jpancy, o N – 1	N ⊥176 v				-130	(2)1 + 0(1013 v (⁻	TFA -13	2.	.28		(42)
if TF	-A £ 13.	9, N = 1	1 1.707	τι στρ	(0.0000	,	A 10.5)z)] 10.0		11 A 10.	.5)			
Ann <mark>ua</mark>	al averag	ge hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		88	8.46		(43)
Reduce	e the annu	al average	hot water	usage by a	5% if the a	lwelling is	designed	to achieve	a water us	se target o	f			
notinoi												_	1	
Hotwo	Jan	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
								(43)					1	
(44)m=	97.31	93.77	90.23	86.69	83.16	79.62	79.62	83.16	86.69	90.23	93.77	97.31	1001 57	
Energy	content o	f hot water	used - ca	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	DTm / 3600) kWh/mor	nth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	1061.57	(44)
(45)m=	144.31	126.21	130.24	113.55	108.95	94.02	87.12	99.97	101.17	117.9	128.7	139.76		
										Total = Su	m(45) ₁₁₂ =	=	1391.88	(45)
lf instar	ntaneous v	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46)) to (61)	•		•	1	
(46)m=	21.65	18.93	19.54	17.03	16.34	14.1	13.07	15	15.17	17.68	19.3	20.96		(46)
Storad		1055. Da (litras)	includir	na anv si	alar or M	///HBC	storana	within sa	me ves	دما		0	1	(47)
If com			nd no tr	ng any so		ntor 110	litroc in	(47)		301		0	J	(47)
Other	wise if n	o stored	hot wate	er (this in	ncludes i	nstantar		ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:	not nat		10144001	notanta				0. 0 (,			
a) If n	nanufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temp	erature f	actor fro	m Table	2b								0	j	(49)
Energ	y lost fro	om water	⁻ storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If n	nanufac	turer's d	eclared	cylinder l	loss fact	or is not	known:						1	. ,
Hot wa	ater stor	age loss	factor f	rom Tabl	le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If com	munity h	neating s	ee secti	on 4.3									1	
Temp	erature f	actor fro	uie ∠a m Tahl≏	2h								.03		(52) (53)
Energ					oor			(17) - (54)	V (EQ) ~ (52) -		0.0] 1	(53)
Energ	y 1051 110 (50) or	(54) in (4	55)	, r.vvii/ye	Jai			(+/) X (01)	7 × (32) × (3	55) =		.03		(54) (55)
	(00)01		/								L .]	(00)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylind	er contain	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 Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Prima	ry circuit	loss (an	inual) fro	om Table	93							0		(58)
Prima	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	199.59	176.14	185.52	167.04	164.23	147.51	142.4	155.25	154.66	173.18	182.19	195.03		(62)
Solar D	HW input	calculated	using App	endix G o	Appendix	t 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 \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter								-			
(64)m=	199.59	176.14	185.52	167.04	164.23	147.51	142.4	155.25	154.66	173.18	182.19	195.03		_
								Outp	out from w	ater heate	r (annual)₁	12	2042.72	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	, kWh/m	onth 0.2	5	× (45)m	n + (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	92.2	81.91	<mark>8</mark> 7.53	80.55	80.45	74.06	73.19	77.46	76.43	8 <mark>3.42</mark>	85.59	90.69		(65)
inclu	ude (57)	m in calc	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	Table 5	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	114.24	114.24	114.24	114.24	114.24	114.24	114.24	114.24	114.24	114.24	114.24	114.24		(66)
Lightir	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				1	
(67)m=	17.92	15.92	12.95	9.8	7.33	6.19	6.68	8.69	11.66	14.81	17.28	18.42		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	201.05	203.13	197.88	186.68	172.56	159.28	150.41	148.32	153.58	164.77	178.9	192.18		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a)), also se	e Table	5				
(69)m=	34.42	34.42	34.42	34.42	34.42	34.42	34.42	34.42	34.42	34.42	34.42	34.42		(69)
Pumps	s and fa	ns gains	(Table \$	5a)	-				-					
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)	-	-	-	-	-	-		
(71)m=	-91.39	-91.39	-91.39	-91.39	-91.39	-91.39	-91.39	-91.39	-91.39	-91.39	-91.39	-91.39		(71)
Water	heating	gains (T	able 5)											
(72)m-	100.00	121.90	117.64	111 07	108.13	102.85	98.37	104.12	106.16	112.13	118.87	121.9		(72)
(12)11=	123.93	121.09	117.04	111.07										
Total i	internal	gains =	117.04	111.07		(66)	m + (67)m	n + (68)m -	⊦ (69)m +	(70)m + (7	1)m + (72)	im	1	
Total i (73)m=	123.93 internal 400.17	gains = 398.21	385.74	365.63	345.28	(66) 325.59	m + (67)m 312.74	n + (68)m - 318.4	+ (69)m + 328.67	(70)m + (7 348.98	1)m + (72) 372.32	m 389.77		(73)

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	3.84	x	36.79	×	0.45	x	0.7] =	30.84	(77)
Southeast 0.9x	0.77	x	3.24	x	36.79	x	0.45	x	0.7	j =	26.02	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	×	0.45	x	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	×	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	3.84	x	62.67	×	0.45	x	0.7] =	52.54	(77)
Southeast 0.9x	0.77	x	3.24	x	62.67	x	0.45	x	0.7] =	44.33	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	3.84	x	85.75	×	0.45	x	0.7] =	71.88	(77)
Southeast 0.9x	0.77	x	3.24	x	85.75	×	0.45	x	0.7] =	60.65	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7] =	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7] =	45.49	(77)
Southeast 0.9x	0.77	x	3.84	x	106.25	×	0.45	x	0.7] =	89.07	(77)
Southeast 0.9x	0.77	x	3.24	x	106.25	×	0.45	x	0.7] =	75.15	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	×	0.45	x	0.7] =	56.36	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	x	0.45	х	0.7		56.36	(77)
Southeast 0.9x	0.77	x	3.84	x	119.01	х	0.45	x	0.7] -	99.76	(77)
Southeast 0.9x	0.77	x	3.24	x	119.01	×	0.45	x	0.7] =	84.17	– (77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7] =	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7] =	63.13	(77)
Southeast 0.9x	0.77	x	3.84	x	118.15	×	0.45	x	0.7] =	99.04	(77)
Southeast 0.9x	0.77	x	3.24	x	118.15	×	0.45	x	0.7] =	83.56	(77)
Southeast 0.9x	0.77	x	2.43	×	118.15	×	0.45	x	0.7] =	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7] =	62.67	(77)
Southeast 0.9x	0.77	x	3.84	x	113.91	x	0.45	x	0.7] =	95.48	(77)
Southeast 0.9x	0.77	x	3.24	x	113.91	x	0.45	x	0.7	=	80.57	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	×	0.45	x	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	3.84	x	104.39	x	0.45	x	0.7	=	87.51	(77)
Southeast 0.9x	0.77	x	3.24	x	104.39	x	0.45	x	0.7] =	73.83	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7] =	55.37	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	×	0.45	x	0.7] =	55.37	(77)
Southeast 0.9x	0.77	x	3.84	x	92.85	×	0.45	x	0.7] =	77.83	(77)
Southeast 0.9x	0.77	x	3.24	x	92.85	x	0.45	x	0.7] =	65.67	(77)
Southeast 0.9x	0.77	x	2.43	x	92.85	x	0.45	x	0.7] =	49.25	(77)
Southeast 0.9x	0.77	x	2.43	x	92.85	×	0.45	×	0.7] =	49.25	(77)
Southeast 0.9x	0.77	x	3.84	x	69.27	×	0.45	×	0.7] =	58.06	(77)
Southeast 0.9x	0.77	x	3.24	x	69.27	x	0.45	x	0.7	=	48.99	(77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7] =	36.74	(77)

Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	=	36.74	(77)
Southeast 0.9x	0.77	x	3.84	×	44.07	×	0.45	x	0.7	=	36.94	(77)
Southeast 0.9x	0.77	x	3.24	×	44.07	×	0.45	x	0.7	=	31.17	(77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	=	23.38	(77)
Southeast 0.9x	0.77	x	2.43	×	44.07	×	0.45	x	0.7	=	23.38	(77)
Southeast 0.9x	0.77	x	3.84	×	31.49	×	0.45	x	0.7] =	26.39	(77)
Southeast 0.9x	0.77	x	3.24	×	31.49	×	0.45	x	0.7] =	22.27	(77)
Southeast 0.9x	0.77	x	2.43	x	31.49	×	0.45	x	0.7	=	16.7	(77)
Southeast 0.9x	0.77	x	2.43	x	31.49	x	0.45	x	0.7	=	16.7	(77)
Southwest0.9x	0.77	x	2.43	x	36.79]	0.45	x	0.7	=	19.52	(79)
Southwest0.9x	0.77	x	5.64	x	36.79]	0.45	x	0.7	=	45.3	(79)
Southwest0.9x	0.77	x	2.43	x	62.67]	0.45	x	0.7	=	33.25	(79)
Southwest0.9x	0.77	x	5.64	×	62.67]	0.45	x	0.7] =	77.16	(79)
Southwest0.9x	0.77	x	2.43	x	85.75]	0.45	x	0.7	=	45.49	(79)
Southwest0.9x	0.77	x	5.64	x	85.75]	0.45	x	0.7	=	105.58	(79)
Southwest0.9x	0.77	x	2.43	×	106.25]	0.45	x	0.7] =	56.36	(79)
Southwest0.9x	0.77	x	5.64	x	106.25]	0.45	x	0.7	=	130.82	(79)
Southwest0.9x	0.77	x	2.43	×	119.01		0.45	х	0.7	=	63.13	(79)
Southwest0.9x	0.77	x	5.64	x	119.01		0.45	x	0.7] =	146.52	(79)
Southwest0.9x	0.77	x	2.43	x	118.15		0.45	x	0.7	=	62.67	(79)
Southwest0.9x	0.7 <mark>7</mark>	x	5.64	x	118.15		0.45	x	0.7	=	145.46	(79)
Southwest0.9x	0.77	x	2.43	x	113. <mark>91</mark>]	0.45	x	0.7	=	60.42	(79)
Southwest0.9x	0.77	x	5.64	x	113.91		0.45	x	0.7	=	140.24	(79)
Southwest0.9x	0.77	x	2.43	x	104.39]	0.45	x	0.7	=	55.37	(79)
Southwest0.9x	0.77	x	5.64	x	104.39]	0.45	x	0.7	=	128.52	(79)
Southwest0.9x	0.77	x	2.43	x	92.85]	0.45	x	0.7	=	49.25	(79)
Southwest0.9x	0.77	x	5.64	x	92.85]	0.45	x	0.7	=	114.32	(79)
Southwest0.9x	0.77	x	2.43	x	69.27]	0.45	x	0.7	=	36.74	(79)
Southwest0.9x	0.77	x	5.64	x	69.27]	0.45	x	0.7	=	85.28	(79)
Southwest0.9x	0.77	x	2.43	x	44.07]	0.45	x	0.7	=	23.38	(79)
Southwest0.9x	0.77	x	5.64	x	44.07]	0.45	x	0.7	=	54.26	(79)
Southwest0.9x	0.77	×	2.43	×	31.49]	0.45	x	0.7	=	16.7	(79)
Southwest0.9x	0.77	x	5.64	x	31.49	1	0.45	x	0.7	=	38.77	(79)

Solar g	r gains in Watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m=	160.72	273.76	374.57	464.12	519.85	516.09	497.56	455.99	405.58	302.57	192.5	137.54		(83)
Total g	al gains – internal and solar (84)m = (73)m + (83)m , watts													
(84)m=	560.89	671.98	760.31	829.75	865.13	841.68	810.3	774.38	734.25	651.54	564.83	527.31		(84)
7. Me	an inter	nal temp	erature	(heating	season)								
Temp	emperature during heating periods in the living area from Table 9, Th1 (°C)													(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(86)m=	0.92	0.86	0.79	0.67	0.53	0.38	0.28	0.3	0.47	0.71	0.87	0.93	I	(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	19.87	20.17	20.47	20.76	20.91	20.98	21	20.99	20.96	20.75	20.29	19.82		(87)
Temp	erature	durina h	neating p	beriods ir	n rest of	dwelling	from Ta	able 9. Tl	h2 (°C)					
(88)m=	20.29	20.29	20.3	20.31	20.31	20.32	20.32	20.33	20.32	20.31	20.31	20.3		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.91	0.85	0.77	0.64	0.5	0.34	0.24	0.26	0.43	0.68	0.85	0.92	I	(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.78	19.2	19.63	20.01	20.21	20.31	20.32	20.32	20.28	20.02	19.38	18.72		(90)
									1	iLA = Livin	g area ÷ (4	l) =	0.29	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.1	19.48	19.87	20.23	20.42	20.5	20.52	20.52	20.47	20.23	19.64	19.04		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.1	19.48	19.87	20.23	20.42	20.5	20.52	20.52	20.47	20.23	19.64	19.04		(93)
8. Spa	ace hea	ting requ	uirement	t										
Set Ti	to the r	nean int	ernal ter	mperatui	re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	lisation		or gains		ible 9a	lun	1.1	Aug	San	Oct	Nov	Dee		
 Itilies	Jan tion fac	tor for a	ains hm	Apr	iviay	Jun	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m=	0.89	0.83	0.75	0.64	0.5	0.35	0.25	0.27	0.44	0.67	0.84	0.9		(94)
Usefu	l gains.	hmGm	W = (9	4)m x (84	4)m	0.00						0.0		
(95)m=	499.06	559.26	572.95	528.83	433.17	298.36	200.36	209.41	319.54	437.52	472.26	476.29		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	800.91	785.89	718.04	596.64	457.23	303.45	201.4	210.85	330.43	505.09	663.31	790.67		(97)
Space	e heatin	g require	ement fo	or each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m=	224.58	152.3	107.95	48.82	17.91	0	0	0	0	50.27	137.56	233.9		
								Tota	l per year	(kWh/year) = Sum(9	B) _{15,912} =	973.28	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								13.59	(99)
9b. En	ergy rec	uiremer	nts – Coi	mmunity	heating	scheme)							
This pa	art is use	ed for sp	ace hea	ating, spa	ace cool	ing or wa	ater heat	ting prov	ided by	a comm	unity sch	eme.		
Fractio	n of spa	ace heat	from se	condary,	/suppler	nentary	heating	(Table 1	1) '0' if n	one	·		0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sou	rces. The _f	orocedure	allows for	CHP and	up to four o	other heat	sources; ti	ne latter	
includes Eractio	boilers, h	eat pumps	s, geotheri	mal and wa	aste heat f	from powe	r stations.	See Appel	ndix C.				1	(3032)
Fractio			boot fro	m Comn	punip subity b		2			(2)	02) v (202	a) -	1	(303a)
Fractio			neat iro		Table	at pump	,	unitu da na n		(3	02) X (303)	a) =	1	(304a)
			(Toble (40(3)) 10		miny nea	ung sys	lelli			1	
		s ractor	(Table	120) 101 (Johnmun	ity neatil	ng syste	111					1.2	(306)
Space	heating) hooting	roquiros	aant								I	kWh/y	ear
Annual	space	nealing	requiren	IEIII									973.28	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1167.94	(307a)
Efficiency of secondary/supplementary heating system in % (from	n Table 4a or Appen	idix E)	0	(308
Space heating requirement from secondary/supplementary syste	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2042.72	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2451.27	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	36.19	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from c	outside		162.08	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	162.08	(331)
Energy for lighting (calculated in Appendix L)			316.54	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(333)
Tota <mark>l deliv</mark> ered energy for all u <mark>ses (</mark> 307) + (309) + (310) + (312) -	+ (315) + (331) + (<mark>3</mark> 3	32)(237b) =	3 <mark>367.7</mark> 5	(338)
12b. CO2 Emissions – Community heating scheme				
CO2 from other sources of space and water heating (not CHP)	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source 1 (%) If there is CHP using	two fuels repeat (363) to	(366) for the second fue	280	(367a)
CO2 associated with heat source 1 [(307b)+(3	310b)] x 100 ÷ (367b) x	0.52 =	670.85	(367)
Electrical energy for heat distribution [(313) x	0.52 =	* 18.78	(372)
Total CO2 associated with community systems (3	363)(366) + (368)(372	2) =	689.63	(373)
CO2 associated with space heating (secondary) (3	309) x	0 =	. 0	(374)
CO2 associated with water from immersion heater or instantaneo	ous heater (312) x	0.52 =	. 0	(375)
Total CO2 associated with space and water heating (3	373) + (374) + (375) =		689.63	(376)
CO2 associated with electricity for pumps and fans within dwellin	g (331)) x	0.52 =	84.12	(378)
CO2 associated with electricity for lighting (3	332))) x	0.52 =	164.28	(379)
Energy saving/generation technologies (333) to (334) as applicate Item 1	ble	0.52 x 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			559.12	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			7.81	(384)
El rating (section 14)			93.58	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num are Ver	ber: sion:		Versio	on: 1.0.5.49	
A daha a a	P. Pleak P. Ham C	P Iooo Loo	roperty /	Address:	Block B	s - Grou	nd Floor			
Address : 1 Overall dwelling dimer	B, BIOCK B, Ham C	lose, Lon	don, Tvv	10						
Ground floor			Area	a(m²) 0.34	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 175.85	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	I) 7	0.34	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	175.85	(5)
2. Ventilation rate:				_						
Number of chimneys Number of open flues	main s heating • 0 + 0 +	secondar heating 0 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	S					0	X .	10 =	0	(7a)
Number of passive vents						0	x	10 =	0	(7b)
Number of flueless gas fire	es				Ľ	0	X 4	40 =	0	(7c)
Infiltration due to chimney	s, flues and fans =	(6a)+(6b)+(7	(a)+(7b)+(7	7c) =	Г	0		Air ch		ır 7(8)
If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	en carried out or is inten e dwelling (ns) 25 for steel or timbe esent, use the value corre gs); if equal user 0.35	ded, proceed r frame or esponding to	d to (17), c 0.35 for the greate	therwise of masonr er wall are	continue fro ry constr a (after	om (9) to (uction	(16) [(9)	-1]x0.1 =	0 0 0	(9) (10) (11)
If suspended wooden flo	oor, enter 0.2 (unse	aled) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)
Air permeability value, c	150, expressed in cu	ibic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)
If based on air permeabilit	y value, then $(18) = [$	$(17) \div 20]+(8)$	s), otherwi	se(18) = (16) rmoobility	is hoing u	sod		0.2	(18)
Number of sides sheltered		as been don	le ol a deg	nee an pei	meaning	is being u	seu		Δ] (19)
Shelter factor	-			(20) = 1 -	[0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)) x (20) =				0.14	(21)
Infiltration rate modified fo	r monthly wind spee	ed								4
Jan Feb M	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed)	= (21a)	x (22	a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0	.14	0.15	0.16	0.16		
Calcula	ate effec	tive air	change i	rate for t	he appli	cable ca	ise	-	-						
	oust air ba		ulion.	andix N (2	3h) - (23a		equation	(N5)) o	honwise) (23h	(232)			0.5	(23a)
If bala	aust all fie	boot roce		ionov in %	(23a) = (23a)	or in uso f	equation	(NS)), U	4b) -	5 (230) = (23a)			0.5	(23b)
									411) -	(0)	Ωh.\		1 (00 a)	76.5	(23c)
a) ir			anical ve					VHR) (2	4a)m	= (22)	2D)m + (a)	23D) × [1 - (23C)	÷ 100] I	(24a)
(24a)III=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	() () ()		.20		0.27	0.20		(240)
D) IT			anical ve	ntilation	without	neat red		(IVIV) (∠ 	40)m	= (22	20)m + (2	230)		1	(24b)
(240)m=		0	0		0	. ,				0 · .	0	0	0		(240)
C) If v	whole ho f (22b)m	Duse ex	tract ven	itilation (bop (24)	or positiv	ve input v	ventilat	4c) = ('	n outs 22b) m	ide	5 v (23h	<u>،</u>			
(24c)m =	0	0.57	0		0			$\frac{1+0}{0} = \frac{1}{2}$	20) 11	$\frac{1+0}{0}$	0	0	0	1	(24c)
d) If	naturals	ontilati	n or wh				Ventila	tion from		•	Ŭ	0	Ů	l	
u) n i	f (22b)m	= 1, th	en (24d)	m = (22)	b)m othe	erwise (2	24d)m =	= 0.5 +	[(22b)	m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0		0	0	0	0		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (2	24d) in b	ox (2	5)				1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0	.26	0.27	0.27	0.28		(25)
2 40		and he	ot loop r	oromot	or:		•							-	
			eat 1055		ас С	Not Ar	202		مباد		ΔΥΠ		k-value		AXk
		area	(m²)	m	93 ²	A,r	m²	W/I	n2K		(W/ł	<)	kJ/m ² ·l	K	kJ/K
Doo <mark>rs</mark>						1.91	,	<	1	=	1.91				(26)
Windo	ws Type	1				2.43		(1/[1/(1.2	:)+ 0.04	4] = [2.78	Ē			(27)
Windo	ws Type	2				2.43		د1/[1/(1.2	:)+ 0.04	4] = [2.78	F			(27)
Windo	ws Type	3				9.24	, , , , , , , , , , , , , , , , , , ,	(1/[1/(1.2	:)+ 0.04	H] = [10.58	5			(27)
Windov	vs Tvpe	4				3.72	,	(1/[1/(1.2	:)+ 0.04	י אן = 1	4 26	=			(27)
Window	ws Type	5				2.43		.1/[1/(1.2	´ :)+ 0.04	- I H - [2 78	\exists			(27)
Floor		•				70.2			1	- 1 _ [7.024				(28)
		40		00.0	- 1	70.32	+ ′		1] – I	7.034	╡╏			(20)
	Гурод	46.	9	20.2	<u>></u>	26.65	<u> </u>		16	=	4.26	╡╏		\dashv	(29)
	iypez	28.6	52 	1.91		26.72	2、	0.	15	=	4.02				(29)
Total a	rea or er	ements	, m²			145.8	6			r		r			(31)
Party w	vall					18.5	;,	()	=	0			\dashv \vdash	(32)
Party c	eiling					70.34	4								(32b)
* for wind	dows and e the area	roof wind s on both	ows, use e sides of in	ffective wi	ndow U-va Is and part	alue calcul titions	lated usi	ng formul	a 1/[(1/l	J-valı	ıe)+0.04] a	s given in	paragraph	1 3.2	
Fabric	heat los	s. W/K :	= S (A x	U)	o una pun			(26)(30) + (3	82) =				40.41	(33)
Heat ca	apacity (Cm = S(Άxk)	-,						((28)	(30) + (32	2) + (32a).	(32e) =	11160 1	38 (34)
Therma	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K				Indica	tive Value:	Low	· · /	100	(35)
For desig	gn assessi	ments wh	ere the de	tails of the	construct	ion are no	t known	precisely	the indi	cative	e values of	TMP in Ta	able 1f		(00)
can be u	sed instea	nd of a de	tailed calc	ulation.											
Therma	al bridge	s : S (L	x Y) cal	culated u	using Ap	pendix l	K							11.25	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	1)									

Total fa	abric hea	at loss							(33) +	(36) =			51.66	(37)
Ventila	tion hea	it loss ca	alculated	I monthly	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.18	16.97	16.77	15.76	15.55	14.54	14.54	14.33	14.94	15.55	15.96	16.36		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	68.84	68.64	68.43	67.42	67.21	66.2	66.2	66	66.6	67.21	67.62	68.03]	
Heat lo	oss nara	meter (H	HP) W	′m²K					/ (40)m	Average = = (39)m ÷	Sum(39) _{1.}	12 /12=	67.37	(39)
(40)m=	0.98	0.98	0.97	0.96	0.96	0.94	0.94	0.94	0.95	0.96	0.96	0.97	1	
									,	Average =	Sum(40)1.	₁₂ /12=	0.96	(40)
Numbe	er of day	s in mor	nth (Tab	le 1a)	N.4 -				0			Des	1	
(11)m-	Jan	Feb	Mar 21	Apr 20	May 21	Jun	21	Aug 21	Sep	21	1NOV	21		(41)
(41)11=	31	20	31	30	31	30	31	51	30	31	30	31]	(41)
4 3 8 4														
4. VVa	iter heat	ing ener	gy requ	rement:								KVVh/y	ear:	
Assum	ed occu	pancy, I	N			· · · · · · · · · · · · · · · · · · ·					2.	25]	(42)
if TF if TF	A > 13.9 A £ 13.9	9, N = 1 9 N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.0)013 x (FFA -13.	9)			
Ann <mark>ua</mark>	averag	e hot wa	ter usa	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		87	.74		(43)
Reduce	the annua	l average litres per r	hot water	usage by { day (all w	5% if the a	lwelling is t	designed Id)	to achieve	a water us	se target o	f		·	
normore	, unat 125		berson per		aler use, r								1	
Hot wate	Jan Jan ir	Feb	Mar day for ea	Apr ach month	May Vd m – fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(11)	06.51	02.01	20 F	95 00	00.40	79.07	79.07	02.40	95.00	90 F	02.01	06.51	1	
(44)11=	90.51	93.01	69.5	00.99	02.40	10.91	10.97	02.40	00.99	o9.0 Total – Su	93.01	90.01	1052.89	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600	kWh/mor	oth (see Ta	bles 1b, 1	c, 1d)	1052.05	
(45)m=	143.13	125.18	129.18	112.62	108.06	93.25	86.41	99.15	100.34	116.93	127.64	138.61		
lf instan	aneous w	ater heatir	na at point	of use (no	hot water	r storage).	enter 0 in	boxes (46)	-) to (61)	Total = Su	m(45) ₁₁₂ =	=	1380.5	(45)
(46)m-	21 47	18 78	19 38	16.89	16.21	13.99	12.96	14.87	15.05	17 54	19 15	20.79	1	(46)
Water	storage	loss:	10.00	10.00	10.21	10.00	12.00	14.07	10.00	17.04	10.10	20.70]	(/
Storag	e volum	e (litres)	includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0]	(47)
If comr	nunity h	eating a	nd no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherw	ise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
a) If m	storage anufacti	ioss: urer's de	clared I	oss facto	or is kno	wn (kWł	n/dav).					0	1	(48)
Tempe	erature fa	actor fro	m Table	2h		(" day /.					0]	(40)
Energy	lost fro	m water	storage	_~ . kWh/ve	ear			(48) x (49)	=		1	10]	(50)
b) If m	anufact	urer's de	eclared of	ylinder l	oss fact	or is not	known:	(,,			'	10]	(00)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)				0.	02]	(51)
	nunity h	eating s	ee secti	on 4.3									1	
Tempe	erature fa	actor from	ne ∠a m Table	2b							1.	6	4	(52) (53)
Enero	lost fro	m water	storage	kWh/v	ar			(47) x (51)	x (52) x (53) =]	(54)
Enter	(50) or (54) in (5	5) 5)	,ye				() x (01)		, -	1.	03	4	(55)
	. , (, (⁻	,									-	J	

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylind	er contain	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 Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	om Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	198.41	175.11	184.45	166.11	163.34	146.74	141.68	154.43	153.83	172.21	181.14	193.89		(62)
Solar DI	HW input	calculated	using App	endix G o	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 \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter	-	-	-	-		-	-	-	-		
(64)m=	198.41	175.11	184.45	166.11	163.34	146.74	141.68	154.43	153.83	172.21	181.14	193.89		_
								Outp	out from w	ater heate	r (annual)₁	12	2031.34	(64)
Hea <mark>t g</mark>	jains fro	m water	heating	kWh/m	onth 0.2	5 ^ [0.85	× (45)m	n + (61)n	n] + 0.8 x	<mark>د [(46)</mark> m	+ (57)m	+ (59)m]	
(65)m=	91.81	81.56	87.17	80.24	80.15	73.8	72.95	77.19	76.16	<mark>8</mark> 3.1	85.24	90.31		(65)
inclu	ude (57)	m in calo	ulation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	Table 5	5 and 5a):									
Metab	olic gair	ns (Table	5), Wat	ts				•		_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72		(66)
Lightin	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	17.66	15.69	12.76	9.66	7.22	6.09	6.59	8.56	11.49	14.59	17.03	18.15		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	198.09	200.14	194.96	183.94	170.02	156.93	148.19	146.14	151.32	162.35	176.27	189.35		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	ee Table	5	-	-		
(69)m=	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27		(69)
Pumps	s and fa	ns gains	(Table 8	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse		· · · · · · · · · · · · · · · · · · ·												
	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)		_						
(71)m=	s e.g. ev -90.17	aporatic -90.17	n (nega -90.17	tive valu -90.17	es) (Tab -90.17	le 5) -90.17	-90.17	-90.17	-90.17	-90.17	-90.17	-90.17		(71)
(71)m= Water	s e.g. ev -90.17 heating	/aporatic -90.17 gains (T	n (nega -90.17 able 5)	tive valu -90.17	es) (Tab -90.17	le 5) -90.17	-90.17	-90.17	-90.17	-90.17	-90.17	-90.17		(71)
(71)m= Water (72)m=	s e.g. ev -90.17 heating 123.4	/aporatic -90.17 gains (T 121.38	n (nega -90.17 able 5) 117.17	tive valu -90.17 111.45	es) (Tab -90.17 107.73	le 5) -90.17 102.5	-90.17 98.05	-90.17 103.75	-90.17 105.77	-90.17 111.7	-90.17 118.38	-90.17 121.38		(71)
(71)m= Water (72)m= Total i	s e.g. ev -90.17 heating 123.4	/aporatic -90.17 gains (T 121.38 gains =	n (nega -90.17 able 5) 117.17	tive valu -90.17 111.45	es) (Tab -90.17 107.73	le 5) -90.17 102.5 (66)	-90.17 98.05 m + (67)m	-90.17 103.75 n + (68)m -	-90.17 105.77 + (69)m +	-90.17 111.7 (70)m + (7	-90.17 118.38 1)m + (72)	-90.17 121.38		(71) (72)
(71)m= Water (72)m= Total i (73)m=	s e.g. ev -90.17 heating 123.4 internal 395.97	vaporatio -90.17 gains (T 121.38 gains = 394.02	n (nega -90.17 able 5) 117.17 381.7	tive valu -90.17 111.45 361.86	es) (Tab -90.17 107.73 341.78	le 5) -90.17 102.5 (66) 322.34	-90.17 98.05 m + (67)m 309.65	-90.17 103.75 n + (68)m - 315.26	-90.17 105.77 + (69)m + 325.4	-90.17 111.7 (70)m + (7 345.45	-90.17 118.38 1)m + (72) 368.49	-90.17 121.38 m 385.7		(71) (72) (73)

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

Orientation:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7] =	5.99	(75)
Northeast 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(75)
Northeast 0.9x	0.77	x	9.24	x	11.28	x	0.45	x	0.7] =	22.76	(75)
Northeast 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7] =	12.18	(75)
Northeast 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(75)
Northeast 0.9x	0.77	x	9.24	x	22.97	x	0.45	x	0.7	=	46.32	(75)
Northeast 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(75)
Northeast 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(75)
Northeast 0.9x	0.77	x	9.24	x	41.38	x	0.45	x	0.7	=	83.46	(75)
Northeast 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(75)
Northeast 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(75)
Northeast 0.9x	0.77	x	9.24	x	67.96	x	0.45	x	0.7	=	137.07	(75)
Northeast 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(75)
Northeast 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(75)
Northeast 0.9x	0.77	x	9.24	x	91.35	x	0.45	x	0.7] =	184.25	(75)
Northeast 0.9x	0.77	x	2.43	×	97.38	х	0.45	х	0.7	=	51.66	(75)
Northeast 0.9x	0.77	x	2.43	x	97.38	x	0.45	x	0.7] =	51.66	(75)
Northeast 0.9x	0.77	x	9.24	x	97.38] ×	0.45	x	0.7] =	196.43	(75)
Northeast 0.9x	0.77	x	2.43	x	91.1	x	0.45	x	0.7	=	48.33	(75)
Northeast 0.9x	0.77	x	2.43	x	91.1	x	0.45	x	0.7] =	48.33	(75)
Northeast 0.9x	0.77	x	9.24	x	91.1	×	0.45	x	0.7	=	183.76	(75)
Northeast 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	x	9.24	x	72.63	x	0.45	x	0.7	=	146.49	(75)
Northeast 0.9x	0.77	x	2.43	x	50.42	x	0.45	x	0.7	=	26.75	(75)
Northeast 0.9x	0.77	x	2.43	x	50.42	x	0.45	x	0.7	=	26.75	(75)
Northeast 0.9x	0.77	x	9.24	x	50.42	x	0.45	x	0.7	=	101.7	(75)
Northeast 0.9x	0.77	x	2.43	x	28.07	x	0.45	x	0.7	=	14.89	(75)
Northeast 0.9x	0.77	x	2.43	x	28.07	x	0.45	x	0.7] =	14.89	(75)
Northeast 0.9x	0.77	x	9.24	x	28.07	x	0.45	x	0.7] =	56.61	(75)
Northeast 0.9x	0.77	x	2.43	x	14.2	x	0.45	x	0.7] =	7.53	(75)
Northeast 0.9x	0.77	x	2.43	x	14.2	x	0.45	x	0.7] =	7.53	(75)
Northeast 0.9x	0.77	x	9.24	x	14.2	x	0.45	x	0.7	=	28.64	(75)
Northeast 0.9x	0.77	x	2.43	x	9.21	x	0.45	x	0.7] =	4.89	(75)
Northeast 0.9x	0.77	x	2.43	x	9.21	x	0.45	x	0.7	=	4.89	(75)
Northeast 0.9x	0.77	x	9.24	x	9.21	x	0.45	x	0.7	=	18.59	(75)
Southeast 0.9x	0.77	x	3.72	x	36.79	x	0.45	x	0.7	=	29.88	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	3.72	x	62.67	x	0.45	x	0.7] =	50.89	(77)

Southeast 0.9x	0.77	x	2.4	3	x	6	2.67	x	0.45		×	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	3.7	2	x	8	5.75	×	0.45		× [0.7	=	69.64	(77)
Southeast 0.9x	0.77	x	2.4	3	x	8	5.75	×	0.45		× [0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	3.7	2	x	10	6.25	×	0.45		× [0.7	=	86.28	(77)
Southeast 0.9x	0.77	x	2.4	3	x	10	6.25	x	0.45		× [0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	3.7	2	x	11	9.01	x	0.45		× [0.7	=	96.64	(77)
Southeast 0.9x	0.77	x	2.4	3	x	11	9.01	×	0.45		× [0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	3.7	2	x	11	8.15	×	0.45		× [0.7	=	95.94	(77)
Southeast 0.9x	0.77	x	2.4	3	x	11	8.15	x	0.45		×	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	3.7	2	x	11	3.91	x	0.45		× [0.7	=	92.5	(77)
Southeast 0.9x	0.77	x	2.4	3	x	11	3.91	×	0.45		× [0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	3.7	2	x	10	4.39	x	0.45		× [0.7	=	84.77	(77)
Southeast 0.9x	0.77	x	2.4	3	x	10	4.39	×	0.45		× [0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	3.7	2	x	92	2.85	×	0.45		× [0.7	=	75.4	(77)
Southeast 0.9x	0.77	x	2.4	3	x	92	2.85	×	0.45		× [0.7	=	49.25	(77)
Southeast 0.9x	0.77	x	3.7	2	x	6	9.27	×	0.45		× [0.7	=	56.25	(77)
Southeast 0.9x	0.77	x	2.4	3	x	6	9.27	x	0.45		× [0.7	=	36.74	(77)
Southeast 0.9x	0.77	x	3.7	2	x	4	4.07	x	0.45		x	0.7	=	35.79	(77)
Southeast 0.9x	0.77	x	2.4	3	x	4	4.07	x	0.45		× [0.7	=	23.38	(77)
Southeast 0.9x	0.77	x	3.7	2	x	3	1.49	×	0.45		× [0.7	=	25.57	(77)
Southeast 0.9x	0.7 <mark>7</mark>	x	2.4	3	x	3	1.49	x	0.45		x [0.7	=	16.7	(77)
Sola <mark>r gains in</mark>	watts, cal	culated	for eac	n month				(83)m	n = Sum(74))m(8	82)m			-	
(83)m= 84.12	154.83	242.49	351.81	440.93	4	58.36	433.33	363	.69 279.8	85 1	79.38	102.86	70.63		(83)
Total gains –	internal an	d solar	r (84)m = I	= (73)m	+ (8	, 83)m 1	watts	i				- <u>i</u>		-	(2.1)
(84)m= 480.09	548.85	624.19	713.66	782.71	7	80.71	742.98	678	.95 605.2	24 5	24.83	471.35	456.33		(84)
7. Mean inte	rnal tempe	erature	(heating	seasor	า)									_	
Temperature	e during he	ating p	eriods ir	n the livi	ng	area f	rom Tab	ole 9	, Th1 (°C)				21	(85)
Utilisation fa	ctor for gai	ins for l	living are	ea, h1,m	<u>ו (s</u>	ee Ta	ble 9a)							-	
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug Se	эр	Oct	Nov	Dec		
(86)m= 0.95	0.93	0.88	0.79	0.66		0.5	0.38	0.4	0.64	4	0.84	0.93	0.96		(86)
Mean interna	al temperat	ture in	living are	ea T1 (f	ollo	w step	os 3 to 7	7 in T	able 9c)				-	_	
(87)m= 19.13	19.39	19.81	20.32	20.7	2	20.91	20.97	20.	96 20.8	B :	20.3	19.64	19.09		(87)
Temperature	e during he	ating p	eriods ir	n rest of	dw	velling	from Ta	able 9	9, Th2 (° (C)					
(88)m= 20.1	20.1	20.11	20.12	20.12	2	20.13	20.13	20.	14 20.1	3 2	20.12	20.12	20.11	7	(88)
Utilisation fa	ctor for gai	ins for	rest of d	vellina.	h2.	m (se	e Table	9a)		-		•		-	
(89)m= 0.95	0.92	0.87	0.77	0.62		0.44	0.31	0.3	35 0.58	8	0.81	0.92	0.95	7	(89)
Mean interna	al temperat	ture in	the rest	of dwall	ing	T2 (fc	llow etc		to 7 in T	ahle (<u> </u>	I	4	
(90)m= 17.59	17.97	18.57	19.29	19.79	2	20.05	20.11	20	.1 19.9		9.27	18.34	17.54	7	(90)
. ,		-				-				fLA	= Liv	ing area ÷ (4	(<u> </u>	0.42	(91)
															. ,

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

(92)m=	18.24	18.57	19.09	19.72	20.17	20.41	20.47	20.46	20.29	19.7	18.88	18.19]	(92)
Apply	adjustm	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate			1	
(93)m=	18.24	18.57	19.09	19.72	20.17	20.41	20.47	20.46	20.29	19.7	18.88	18.19		(93)
8. Spa	ace heat	ting requ	uirement											
Set Ti the ut	to the r ilisation	nean int factor fo	ternal ter or gains	mperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calo	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilisa	tion fac	tor for g	ains, hm	<u> </u>									1	
(94)m=	0.93	0.9	0.85	0.75	0.62	0.46	0.34	0.38	0.59	0.8	0.9	0.94]	(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m								-	
(95)m=	445.37	493.86	529.91	537.95	484.01	359.03	249.05	257.55	358.29	419.96	423.87	426.78		(95)
Month	ly avera	age exte	ernal tem	perature	e from Ta	able 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 I	oss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m : I	x [(93)m I	– (96)m]	1	1	1	(07)
(97)m=	959.51	938.05	861.42	729.44	569.24	384.38	256.29	268.03	412.48	611.9	796.64	951.48		(97)
Space	e heating	g require	ement fo	r each m		/Vh/moni	th = 0.02	24 x [(97])m – (95)m] x (4	1)m	200.07	1	
(98)m=	382.52	298.49	246.64	137.88	63.41	0	0	0	0	142.8	268.4	390.37	4000 54	
0								lota	l per year	(kvvh/yeai	r) = Sum(9)	8)15,912 =	1930.51	
Space	e neating	g require	ement in	KVVN/M ²	/year								27.45	(99)
9b. Ene	ergy req	uiremer	nts – Cor	nmunity	heating	scheme	;							
This pa Fractio	art is use n of spa	ed for sp ice heat	bace hea from se	iting, spa condary/	ace cooli /supplen	ng or wa nentary l	ater heat heating (ting prov Table 1 ⁻	ided by a 1) '0' if n	a c <mark>omm</mark> one	unity sch	neme.	0	(301)
Fractio	n of spa	ce heat	from co	mmunity	svstem	$1 - (30^{\circ})$	1) =		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		_		1	 (302)
The com	munity sc	heme ma	v obtain h	at from se	veral sour	res The r	procedure	allows for	CHP and u	in to four	other heat	sources. t	he latter	
includes	boilers, h	eat pumps	s, geothern	nal and wa	aste heat f	rom powel	r stations.	See Appel	ndix C.		other near	300/003, 1		
Frac <mark>tio</mark>	n of hea	t from C	Commun	<mark>ity h</mark> eat	oump								1	(303a)
Fractio	n of tota	I space	heat fro	m Comn	nunity he	eat pump	C			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting syst	tem			1	(305)
Distribu	ution los	s factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.2	(306)
Space	heating	9											kWh/yea	•
Annual	space l	neating	requiren	nent									1930.51	
Space	heat fro	m Comr	munity h	eat pum	р				(98) x (30)4a) x (30	5) x (306) :	=	2316.62	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/sup	plemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annual	heating water h	eating r	equirem	ent									2031.34	7
If DHW	from co	ommuni	tv schem	ne:										
Water	heat froi	m Comr	nunity he	eat pump)				(64) x (30)3a) x (30	5) x (306) :	=	2437.61	(310a)
Electric	city used	l for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)…((310e)] =	47.54	(313)
Cooling	g Syster	n Energ	y Efficie	ncy Ratio	C								0	(314)
Space	cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)

Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fr	om outside		159.19	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	159.19	(331)
Energy for lighting (calculated in Appendix L)			311.88	(332)
Electricity generated by PVs (Appendix M) (negative quantity	y)		-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (3	12) + (315) + (331) + (33	32)(237b) =	4495.22	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	[•] Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	I P) using two fuels repeat (363) to	(366) for the second fu	el 280	(367a)
CO2 associated with heat source 1 [(307	7b)+(310b)] x 100 ÷ (367b) x	0.52	= 881.23	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 24.67	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37)	2)	= 905.9	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instant	aneous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		905.9	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	= 82.62	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= 161.86	(379)
Ene <mark>rgy saving/gener</mark> ation tech <mark>nolo</mark> gies (333) to (334) as app Item 1	blicable	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			771.48	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			10.97	(384)
El rating (section 14)			91.04	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12	roporty	Stroma Softwa	a Num are Ver	ber: sion:	loor	Versio	n: 1.0.5.49	
	R Block R Ham C			4001855.	DIUCK D	- IVIIU F	1001			
Address : 1 Overall dwelling dimen	B, DIUCK D, Halli C	iose, Lond	JON, TVV	10						
Ground floor	5013.		Area	a(m²) 0.34	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 175.85	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n) 7	0.34	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	175.85	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	$\begin{array}{c} main \\ heating \\ \hline 0 \\ \hline 0 \\ \hline 0 \\ \end{array} + \begin{bmatrix} \\ \\ \\ \\ \\ \\ \end{array}$	beating 0 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	s				- Ē	0	x ′	10 =	0	(7a)
Number of passive vents						0	× ^	10 =	0	(7b)
Number of flueless gas fire	es				Ē	0	X 4	40 =	0	(7c)
Infiltration due to chimneys	s, flues and fans = (en carried out or is intend	6a)+(6b)+(7 led, proceed	a)+(7b)+(7 d to (17), c	7c) = otherwise c	ontinue fro	0 om (9) to ((16)	Air cn ÷ (5) =	0	ur (8)
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dw <mark>elling</mark> (ns) 25 for steel or timber	frame or	0.35 for	masonr	y constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)
if both types of wall are pre deducting areas of opening If suspended wooden flo	sent, use the value corre as); if equal user 0.35 oor, enter 0.2 (unsea	sponding to aled) or 0.	the greate	er wall area d), else	a <i>(after</i> enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, c	50, expressed in cu	bic metre	s per ho	ur per so	quare m	etre of e	nvelope	area	4	(17)
If based on air permeabilit	y value, then (18) = [(17) ÷ 20]+(8	3), otherwis	se (18) = (16)				0.2	(18)
Air permeability value applies	if a pressurisation test ha	as been don	e or a deg	iree air pei	meability i	is being us	sed		4	
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			4	(19)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)	x (20) =				0 14](21)
Infiltration rate modified fo	r monthly wind spee	d							0.14	
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltra	tion rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16]	
Calcul	ate etteci	tive air Lventila	change i ition:	rate for t	he appli	cable ca	se						0.5	(220)
lf exh	aust air he	at pump i	using Appe	endix N. (2	3b) = (23a) × Fmv (e	equation (1	N5)), othe	rwise (23b) = (23a)			0.5	(23a)
If bala	anced with	heat reco	overv: effici	encv in %	allowing f	or in-use f	actor (fron	n Table 4h) =	(=04)			0.5	(230)
a) If	balancer		anical ve	ntilation	with bo	at recove	any (M)/I		-) 	2h)m ⊥ (23b) v [·	1 _ (23c)	/6.5 · 1001	(230)
(24a)m=		0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	1 - (230)]	(24a)
(2 la)				ntilation	without	heat rec		11/1) (241	1 = (2)	$2b$ $m \pm ($	23b)	0.20	J	
(24b)m=		0		0	0						0	0	1	(24b)
c) If	whole ho		tract ven	tilation o	or positiv	e input v	ventilatio	n from (Jutside				J	
i c) ii	if (22b)m	< 0.5 ×	(23b), t	hen (24c	c) = (23b); other	vise (24	c) = (22	b) m + 0	.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural v	entilatio	on or wh	ole hous	e positiv	e input	ventilatio	on from	loft	<u>ا</u>		1		
i	if (22b)m	= 1, th	en (24d)	m = (22t	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			,	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air o	change	rate - en	iter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)				,	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	at l <mark>osses</mark>	and he	eat loss p	paramete	er:									
ELEN		Gros	ss	Openin	gs	Net Ar	ea	U-val	ue	AXU		k-value	Э	AXk
_		area	(m²)	m	2	A ,r	n²	W/m2	2K	(W/I	K)	kJ/m²·l	К	kJ/K
Doors	_					1.91	×	1	=	1.91				(26)
Windo	ws Type	1				2.43	x1	/[1/(1.2)+	• 0.04] =	2.78				(27)
Windo	ws Type	2				2.43	x1	/[1/(1.2)+	0.04] =	2.78				(27)
Windo	ws Type	3				9.24	x1	/[1/(1.2)+	0.04] =	10.58				(27)
Windo	ws Type	4				3.72	x1	/[1/(1.2)+	0.04] =	4.26				(27)
Windo	ws Type	5				2.43	x1	/[1/(1.2)+	0.04] =	2.78				(27)
Walls 7	Type1	46.9	9	20.25	5	26.65	5 x	0.16	=	4.26				(29)
Walls ⁻	Type2	28.6	62	1.91		26.72	<u>x</u>	0.15	=	4.02				(29)
Total a	area of el	ements	, m²			75.53	3							(31)
Party v	wall					18.5	x	0	=	0				(32)
Party f	loor					70.34					ī		$\neg \square$	(32a)
Party o	ceiling					70.34	 ↓ _]				Ī		\exists	(32b)
* for win ** inclua	dows and i le the areas	roof winde s on both	ows, use e sides of in	ffective wil ternal wall	ndow U-va Is and part	alue calcul itions	ated using	formula 1	l/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	n 3.2	
Fabric	heat loss	s, W/K =	= S (A x	U)				(26)(30) + (32) =				33.38	(33)
Heat c	apacity C	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	6236.5	8 (34)
Therm	al mass	parame	ter (TMF	? = Cm ÷	- TFA) ir	ı kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be ι	ign assessr Jsed instea	nents wh d of a de	ere the de tailed calcu	tails of the ılation.	constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	s : S (L	x Y) cale	culated u	using Ap	pendix I	<						7.34	(36)

if details of thermal bridging are not known $(36) = 0.05 \times (31)$

Total fa	abric hea	at loss							(33) +	(36) =			40.72	(37)
Ventila	tion hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.18	16.97	16.77	15.76	15.55	14.54	14.54	14.33	14.94	15.55	15.96	16.36		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m=	57.9	57.7	57.49	56.48	56.28	55.26	55.26	55.06	55.67	56.28	56.68	57.09		
Heat lo	ss para	meter (H	HLP), W/	′m²K					ر (40)m	Average = = (39)m ÷	Sum(39) _{1.} (4)	12 /12=	56.43	(39)
(40)m=	0.82	0.82	0.82	0.8	0.8	0.79	0.79	0.78	0.79	0.8	0.81	0.81		
Numbe	er of dav	s in mor	oth (Tab	le 1a)		I			,	Average =	Sum(40)1.	12 /12=	0.8	(40)
- Turnbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
Δεειισ	ed occu	nancy I	N									05	1	(42)
if TF.	A > 13.9), N = 1	ъ + 1.76 х	[1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.0)013 x (⁻	TFA -13.	9)	25	J	(42)
if TF	A £ 13.9	9, N = 1												
Annual Reduce	average	e hot wa I average	ater usac	ge in litre usage by :	es per da 5% if the a	ay Vd,av Iwelling is	erage = designed	(25 x N) to achieve	+ 36 a water us	se target o	87	.74		(43)
not more	e that 125	litres per p	person per	day (all w	rater use, l	hot and co	ld)			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	n litres p <mark>er</mark>	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					,	
(44)m=	9 <mark>6.51</mark>	93.01	89.5	85. <mark>9</mark> 9	82.48	78.97	78.97	82.48	85.99	89.5	93.01	96.51		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)))))))))))))))))))	kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = bles 1b, 1	c, 1d)	1052.89	(44)
(45)m=	143.13	125.18	129.18	112.62	108.06	93.25	86.41	99.15	100.34	116.93	127.64	138.61]	
								1 1	-	Total = Su	m(45) ₁₁₂ =		1380.5	(45)
lf instant	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)				•	
(46)m=	21.47	18.78	19.38	16.89	16.21	13.99	12.96	14.87	15.05	17.54	19.15	20.79		(46)
Storage	storage e volum	ioss: e (litres)	includir	na anv so	olar or M	/WHRS	storage	within sa	me ves	sel		0	1	(47)
If comr	nunity h	eating a	nd no ta	nk in dw	vellina e	nter 110	litres in	(47)		001		0]	(-1)
Otherw	ise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boile	ers) ente	er '0' in (47)			
Water	storage	loss:											_	
a) If m	anufacti	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear		1	(48) x (49)	=		1	10		(50)
b) If m Hot wa	anutacti ter stora	urer's de age loss	eclared of factor fr	om Tabl	oss fact e 2 (kW	or is not h/litre/da	known: v)				0	02	1	(51)
If comr	nunity h	eating s	ee secti	on 4.3	• = (.,	.,,				0.	02]	(01)
Volume	e factor	from Tal	ble 2a								1.	03]	(52)
Tempe	rature fa	actor fro	m Table	2b							0	.6]	(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	03		(54)
Enter	(50) or (54) in (5	5)								1.	03	J	(55)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylind	er contain	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 Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	om Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	198.41	175.11	184.45	166.11	163.34	146.74	141.68	154.43	153.83	172.21	181.14	193.89		(62)
Solar DI	HW input	calculated	using App	endix G o	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 \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter	-	-	-	-		-	-	-	-		
(64)m=	198.41	175.11	184.45	166.11	163.34	146.74	141.68	154.43	153.83	172.21	181.14	193.89		_
								Outp	out from w	ater heate	r (annual)₁	12	2031.34	(64)
Hea <mark>t g</mark>	jains fro	m water	heating	kWh/m	onth 0.2	5 ^ [0.85	× (45)m	n + (61)n	n] + 0.8 x	<mark>د [(46)</mark> m	+ (57)m	+ (59)m]	
(65)m=	91.81	81.56	87.17	80.24	80.15	73.8	72.95	77.19	76.16	<mark>8</mark> 3.1	85.24	90.31		(65)
inclu	ude (57)	m in calo	ulation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	Table 5	5 and 5a):									
Metab	olic gair	ns (Table	5), Wat	ts				•		_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72	112.72		(66)
Lightin	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	17.66	15.69	12.76	9.66	7.22	6.09	6.59	8.56	11.49	14.59	17.03	18.15		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	198.09	200.14	194.96	183.94	170.02	156.93	148.19	146.14	151.32	162.35	176.27	189.35		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	ee Table	5	-	-		
(69)m=	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27		(69)
Pumps	s and fa	ns gains	(Table 8	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse		· · · · · · · · · · · · · · · · · · ·												
	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)		_						
(71)m=	s e.g. ev -90.17	aporatic -90.17	n (nega -90.17	tive valu -90.17	es) (Tab -90.17	le 5) -90.17	-90.17	-90.17	-90.17	-90.17	-90.17	-90.17		(71)
(71)m= Water	s e.g. ev -90.17 heating	/aporatic -90.17 gains (T	n (nega -90.17 able 5)	tive valu -90.17	es) (Tab -90.17	le 5) -90.17	-90.17	-90.17	-90.17	-90.17	-90.17	-90.17		(71)
(71)m= Water (72)m=	s e.g. ev -90.17 heating 123.4	/aporatic -90.17 gains (T 121.38	n (nega -90.17 able 5) 117.17	tive valu -90.17 111.45	es) (Tab -90.17 107.73	le 5) -90.17 102.5	-90.17 98.05	-90.17 103.75	-90.17 105.77	-90.17 111.7	-90.17 118.38	-90.17 121.38		(71)
(71)m= Water (72)m= Total i	s e.g. ev -90.17 heating 123.4	/aporatic -90.17 gains (T 121.38 gains =	n (nega -90.17 able 5) 117.17	tive valu -90.17 111.45	es) (Tab -90.17 107.73	le 5) -90.17 102.5 (66)	-90.17 98.05 m + (67)m	-90.17 103.75 n + (68)m -	-90.17 105.77 + (69)m +	-90.17 111.7 (70)m + (7	-90.17 118.38 1)m + (72)	-90.17 121.38		(71) (72)
(71)m= Water (72)m= Total i (73)m=	s e.g. ev -90.17 heating 123.4 internal 395.97	vaporatio -90.17 gains (T 121.38 gains = 394.02	n (nega -90.17 able 5) 117.17 381.7	tive valu -90.17 111.45 361.86	es) (Tab -90.17 107.73 341.78	le 5) -90.17 102.5 (66) 322.34	-90.17 98.05 m + (67)m 309.65	-90.17 103.75 n + (68)m - 315.26	-90.17 105.77 + (69)m + 325.4	-90.17 111.7 (70)m + (7 345.45	-90.17 118.38 1)m + (72) 368.49	-90.17 121.38 m 385.7		(71) (72) (73)

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

Orientation:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7] =	5.99	(75)
Northeast 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(75)
Northeast 0.9x	0.77	x	9.24	x	11.28	x	0.45	x	0.7] =	22.76	(75)
Northeast 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7] =	12.18	(75)
Northeast 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(75)
Northeast 0.9x	0.77	x	9.24	x	22.97	x	0.45	x	0.7	=	46.32	(75)
Northeast 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(75)
Northeast 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(75)
Northeast 0.9x	0.77	x	9.24	x	41.38	x	0.45	x	0.7	=	83.46	(75)
Northeast 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(75)
Northeast 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(75)
Northeast 0.9x	0.77	x	9.24	x	67.96	x	0.45	x	0.7	=	137.07	(75)
Northeast 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(75)
Northeast 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(75)
Northeast 0.9x	0.77	x	9.24	x	91.35	x	0.45	x	0.7] =	184.25	(75)
Northeast 0.9x	0.77	x	2.43	×	97.38	х	0.45	х	0.7	=	51.66	(75)
Northeast 0.9x	0.77	x	2.43	x	97.38	x	0.45	x	0.7] =	51.66	(75)
Northeast 0.9x	0.77	x	9.24	x	97.38] ×	0.45	x	0.7] =	196.43	(75)
Northeast 0.9x	0.77	x	2.43	x	91.1	x	0.45	x	0.7	=	48.33	(75)
Northeast 0.9x	0.77	x	2.43	x	91.1	x	0.45	x	0.7] =	48.33	(75)
Northeast 0.9x	0.77	x	9.24	x	91.1	×	0.45	x	0.7	=	183.76	(75)
Northeast 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	x	9.24	x	72.63	x	0.45	x	0.7	=	146.49	(75)
Northeast 0.9x	0.77	x	2.43	x	50.42	x	0.45	x	0.7	=	26.75	(75)
Northeast 0.9x	0.77	x	2.43	x	50.42	x	0.45	x	0.7	=	26.75	(75)
Northeast 0.9x	0.77	x	9.24	x	50.42	x	0.45	x	0.7	=	101.7	(75)
Northeast 0.9x	0.77	x	2.43	x	28.07	x	0.45	x	0.7	=	14.89	(75)
Northeast 0.9x	0.77	x	2.43	x	28.07	x	0.45	x	0.7] =	14.89	(75)
Northeast 0.9x	0.77	x	9.24	x	28.07	x	0.45	x	0.7] =	56.61	(75)
Northeast 0.9x	0.77	x	2.43	x	14.2	x	0.45	x	0.7] =	7.53	(75)
Northeast 0.9x	0.77	x	2.43	x	14.2	x	0.45	x	0.7] =	7.53	(75)
Northeast 0.9x	0.77	x	9.24	x	14.2	x	0.45	x	0.7	=	28.64	(75)
Northeast 0.9x	0.77	x	2.43	x	9.21	x	0.45	x	0.7] =	4.89	(75)
Northeast 0.9x	0.77	x	2.43	x	9.21	x	0.45	x	0.7	=	4.89	(75)
Northeast 0.9x	0.77	x	9.24	x	9.21	x	0.45	x	0.7	=	18.59	(75)
Southeast 0.9x	0.77	x	3.72	x	36.79	x	0.45	x	0.7	=	29.88	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	3.72	x	62.67	x	0.45	x	0.7] =	50.89	(77)

Southeast 0.9x	0.77	x	2.43	3	x	62.67	×	0.45	x	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	3.72	2	x	85.75	×	0.45	x	0.7	=	69.64	(77)
Southeast 0.9x	0.77	x	2.43	3	x	85.75	×	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	3.72	2	x	106.25	×	0.45	x	0.7	=	86.28	(77)
Southeast 0.9x	0.77	x	2.43	3	x	106.25	۲ × آ	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	3.72	2	x	119.01	×	0.45	x	0.7	=	96.64	(77)
Southeast 0.9x	0.77	x	2.43	3	x	119.01	×	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	3.72	2	x	118.15	۲ × آ	0.45	x	0.7	=	95.94	(77)
Southeast 0.9x	0.77	x	2.43	3	x	118.15	×	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	3.72	2	x	113.91	×	0.45	x	0.7	=	92.5	(77)
Southeast 0.9x	0.77	x	2.43	3	x	113.91	×	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	3.72	2	x	104.39	×	0.45	x	0.7	=	84.77	(77)
Southeast 0.9x	0.77	x	2.43	3	x	104.39	×	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	3.72	2	x	92.85	×	0.45	x	0.7	=	75.4	(77)
Southeast 0.9x	0.77	x	2.43	3	x	92.85	×	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	x	3.72	2	x	69.27	×	0.45	x	0.7	=	56.25	(77)
Southeast 0.9x	0.77	x	2.43	3	x	69.27	x	0.45	x	0.7	=	36.74	(77)
Southeast 0.9x	0.77	x	3.72	2	x	44.07	×	0.45	x	0.7	=	35.79	(77)
Southeast 0.9x	0.77	x	2.43	3	x	44.07	x	0.45	x	0.7	=	23.38	(77)
Southeast 0.9x	0.77	×	3.72	2	x	31.49] ×	0.45	x	0.7	=	25.57	(77)
Southeast 0.9x	0.7 <mark>7</mark>	×	2.43	3	x	31.49	×	0.45	x	0.7	=	16.7	(77)
Sola <mark>r gain</mark> s in	watts, calc	ulated	for each	month			(83)m	n = Sum(74)m	(82)m				
(83)m= 84.12	154.83 2	42.49	351.81	440.93	4	58.36 433.33	363	.69 279.85	179.38	102.86	70.63		(83)
Total gains – i	internal and	l solar	(84)m =	(73)m ·	+ (8	B3)m, watts						1	(2.1)
(84)m= 480.09	548.85 6	24.19	713.66	782.71	78	80.71 742.98	678	.95 605.24	524.83	3 471.35	456.33		(84)
7. Mean inte	rnal temper	ature (heating	season)								
Temperature	e during hea	ating pe	eriods in	the livi	ng	area from Ta	able 9	, Th1 (°C)				21	(85)
Utilisation fac	ctor for gair	ns for li	ving are	a, h1,m	(S	ee Table 9a))		-			1	
Jan	Feb	Mar	Apr	May		Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.95	0.92	0.86	0.75	0.6	(0.44 0.32	0.3	0.58	0.81	0.92	0.95		(86)
Mean interna	al temperatu	ure in li	iving are	a T1 (fo	ollo	w steps 3 to	7 in T	able 9c)					
(87)m= 19.53	19.78 2	20.15	20.57	20.84	2	0.96 20.99	20.	98 20.9	20.53	19.97	19.49		(87)
Temperature	e during hea	ating pe	eriods in	rest of	dw	elling from T	able 9	9, Th2 (°C)					
(88)m= 20.23	20.24 2	20.24	20.25	20.25	2	0.27 20.27	20.	27 20.26	20.25	20.25	20.24		(88)
Utilisation fac	ctor for aair	ns for r	est of dv	vellina.	h2.	m (see Tabl	e 9a)						
(89)m= 0.94	0.91	0.85	0.73	0.56		0.39 0.27	0.3	0.53	0.78	0.91	0.95		(89)
Mean interna	al temperatu	ure in t	he rest o	of dwell	ina	T2 (follow st	teps 3	to 7 in Tab	le 9c)			ı	
(90)m= 18.25	18.61 1	19.14	19.73	20.07	2	0.23 20.26	20.	26 20.16	19.69	18.9	18.2		(90)
L		I				Į	-	I	fLA = Liv	ring area ÷ (4	4) =	0.42	(91)

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

(92)m=	18.79	19.1	19.56	20.08	20.4	20.53	20.56	20.56	20.47	20.04	19.35	18.74		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.79	19.1	19.56	20.08	20.4	20.53	20.56	20.56	20.47	20.04	19.35	18.74		(93)
8. Spa	ace hea	ting req	uirement	1										
Set Ti the ut	to the r ilisation	mean int factor fo	ternal ter or gains	mperatur using Ta	re obtain Ible 9a	ied at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calo	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:				•						
(94)m=	0.92	0.89	0.83	0.72	0.57	0.41	0.29	0.33	0.54	0.77	0.89	0.93		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	443.17	488.84	518.63	513.05	444.83	317.38	216.51	225.13	327.19	405.71	419.35	425.1		(95)
Month	nly aver	age exte	ernal tem	perature	e from Ta	able 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	oss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]			1	
(97)m=	838.95	819.44	751.1	631.6	489.36	327.96	219.08	229.09	354.45	531.46	694.52	830.26		(97)
Space	e heatin	g requir	ement fo	r each m	honth, k\	Nh/moni	th = 0.02	24 x [(97])m – (95)m] x (4	1)m		I	
(98)m=	294.46	222.16	172.95	85.36	33.13	0	0	0	0	93.56	198.13	301.44		-
-					.,			Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	1401.19	(98)
Space	e heatin	g requir	ement in	kWh/m ²	/year								19.92	(99)
9b. En	ergy rec	uiremer	nts – Cor	mmunity	heating	scheme			\		_			
This pa	art is use	ed for sp	bace hea	iting, spa	ace co <mark>ol</mark> i	ing or wa	ater heat	ting prov	ided by	a c <mark>omm</mark>	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary/	supplen	nentary I	neating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace he <mark>at</mark>	from co	mmunity	system	1 – (301	1) =						1	(302)
The com	imunity so	cheme ma	y obtain he	eat fro <mark>m se</mark>	everal sour	ces. The p	procedure	allows for	CHP and u	up to four	other heat	sources; t	he latter	
Fractio	n of hea	eat pump. at from (s, geotheri Commun	itv heat i	aste heat f	rom powei	r stations.	See Appei	ndıx C.				1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	method	(Table	4c(3)) fo	r commı	unity hea	ating syst	tem			1	(305)
Distribu	ution los	s factor	(Table 1	I2c) for c	commun	ity heatii	ng syste	m					1.2	(306)
Space	heating	a											kWh/vea	 r
Annual	space	heating	requiren	nent									1401.19	
Space	heat fro	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) =	=	1681.43	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/sup	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annual	heating water h	j neating i	equirem	ent									2031.34	٦
If DHW Water	/ from controls heat from	ommuni m Comr	ty schen nunity he	ne: eat oumr)				(64) x (30)3a) x (30	5) x (306) :	=	2437 61	(310a)
Electric	city used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)((310e)] =	41.19	(313)
Cooline	g Syster	n Enera	y Efficie	ncy Ratio	0				- /	· · · /		. /4	0	(314)
Space	coolina	(if there	is a fixe	d cooline	a svsten	n, if not e	enter 0)		= (107) ÷	(314) =			0	`´´ (315)
	200mg	,				.,			().	x y			, v	(0.0)

Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside			159.19	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b)) + (330g) =	159.19	(331)
Energy for lighting (calculated in Appendix L)			311.88	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315)	+ (331) + (332	2)(237b) =	3860.03	(338)
12b. CO2 Emissions – Community heating scheme				
Ene kW	∍rgy h/year	Emission facto kg CO2/kWh	r Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels	s repeat (363) to (;	366) for the second fu	uel 280	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 1	100 ÷ (367b) x	0.52	= 763.49	(367)
Electrical energy for heat distribution [(313) x		0.52	= 21.38	(372)
Total CO2 associated with community systems (363)(36	56) + (368)(372)		= 784.87	(373)
CO2 associated with space heating (secondary) (309) x		0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous hea	ter (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (373) + (373)	74) + (375) =		784.87	(376)
CO2 associated with electricity for pumps and fans within dwelling (331)) ×	0.52	= 82.62	(378)
CO2 associated with electricity for lighting (332))) x		0.52	= 161.86	(379)
Ene <mark>rgy saving/gener</mark> ation tech <mark>nolo</mark> gies (333) to (334) as applicable Item 1		0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			650.45	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			9.25	(384)
El rating (section 14)			92.44	(385)

User Details:														
Assessor Name: Software Name:	Stroma FSAP 20		Stroma Softwa	a Num are Ver	on: 1.0.5.49									
	Property Address: Block C - Ground Floor													
Address :	Address : C, Block C, Ham Close, London, TW10													
Ground floor	Volume(m ³) 250.05 (3a)													
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 100.02 (4)														
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$														
2. Ventilation rate:														
Number of chimneys Number of open flues	main s heating • 0 + 0 +	secondar heating 0 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)				
Number of intermittent fan	S					0	X .	10 =	0	(7a)				
Number of passive vents					Γ	0	x	10 =	0	(7b)				
Number of flueless gas fire	0	(7c)												
Infiltration due to chimneys](8)												
Number of storeys in the Additional infiltration Structural infiltration: 0.2	0	(9) (10) (11)												
if both types of wall are pre deducting areas of opening If suspended wooden flo	sent, use the value corre s); if equal user 0.35 oor, enter 0.2 (unsea	esponding to aled) or 0.	the greate	er wall area d), else	a (after enter 0				0	⊐](12)				
If no draught lobby, ente	r 0.05, else enter 0								0	(13)				
Percentage of windows	and doors draught	stripped							0	(14)				
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)				
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)				
Air permeability value, q	50, expressed in cu	bic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)				
If based on air permeability	y value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)				
Air permeability value applies	if a pressurisation test h	as been don	ie or a deg	ree air pei	rmeability	is being u	sed							
Shelter factor		0.7	(19)											
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$](21)				
Infiltration rate modified for	monthly wind spee	ed												
Jan Feb M	/ar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind spe	ed 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 = (22)	m ÷ 4								•					
(22a)m= 1.27 1.25 1.	23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]					

Adjuste	d infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_		
_ [0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16			
Calcula	ite effec	tive air (change i tion:	rate for t	he appli	cable ca	se							(00-)	
	ust air be			andix N (2	(23b) - (23a	a) x Emv (e	auation (I	N5)) othe	nwisa (23h	(232)			0.5	(23a)	
in exhaust an meat pump using Appendix IN, $(250) = (230) \times \text{FINV}$ (equation (IN5)), otherwise (230) = (23a)											0.5	(23D)			
) -)		00h) [1 (00 a)	76.5	(23C)	
a) II (TR) (248	a)m = (22)	$\frac{20}{1000}$ m + (2	23D) × [1 - (230)) ÷ 100]]	(242)	
(24a)111=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.20	0.27	0.27	0.20	J	(240)	
		d mecha	anicai ve			neat rec		VIV) (240 T	m = (22)	2b)m + (2	23b)		1	(24b)	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(240)	
C) If V	vhole ho		tract ven	itilation (or positiv	/e input \	ventilatio	on from (outside	5 v (22h					
(24c)m-	0	0.5 ×	(230), t		J = (23L)			C = (ZZ)	$\frac{1}{1}$			0	ו	(24c)	
		ontilatio					vontiloti	n from		0	0	0	J	()	
u) if	(22b)m	n = 1, the	en (24d)	m = (22)	o)m othe	erwise (2	(4d)m =	0.5 + [(2	2b)m ² x	0.5]					
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)	
Effec	tive air	change	rate - er	nter (24a) or (24t) or (24	c) or (24	d) in box	x (25)				1		
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)	
														_	
3. Hea		s and ne	at loss		er:							1			
ELEIVI	ENI	area	(m²)	Openin		A,r	ea n²	W/m2	ue 2K	AXU (W/ł	<)	kJ/m ² ·l	κ K	kJ/K	
Doo <mark>rs</mark>			Ì			1.91	x	1	=	1.91	<i>·</i>			(26)	
Windov	vs Type	1				3.24	x1	L/[1/(1.2)+	0.04] =	3.71	F			(27)	
Windov	vs Type	2				3.24		/[1/(1.2)+	0.041 =	3 71	Ħ			(27)	
Windov	vs Type	3				$6 \times 1/[1/(12) + 0.04] = 6.97$								(27)	
Window	ve Type	1				0	(2.24) $\times 1/(1/(1.2) + 0.04) = (2.74)$							(27)	
Windows Type 4					3.24		/[//(1.2))		3.71				(27)		
vvindov	vs type	5				3.24	X	/[1/(1.2)+	0.04] =	3.71				(27)	
vvindov	vs Type	6				3.24	x1	/[1/(1.2)+	0.04] =	3.71	╡,			(27)	
Floor						100.0	2 X	0.1	=	10.002				(28)	
Walls T	ype1	59.6	7	22.2	2	37.47	x	0.16	=	6				(29)	
Walls T	ype2	35.5	3	1.91		33.62	<u>x</u>	0.15	=	5.05				(29)	
Total a	ea of e	lements	, m²			195.2	2							(31)	
Party w	all					24.23	3 X	0	=	0				(32)	
Party c	eiling					100.0	2				Ī		$\exists \square$	(32b)	
* for wind	lows and	roof winde s on both	ows, use e sides of in	effective wi	ndow U-va Is and par	alue calcul	ated using	formula 1	/[(1/U-valı	ıe)+0.04] a	ns given in	paragraph	1 3.2		
Fabric heat loss $W/K = S(A \times II)$ (26)(30) + (32) =										18 28	(33)				
Heat capacity $Cm = S(A \times k)$										(30) + (32) + (32a) $(32a) - (32a) - (32a)$					
Heat ca	apacity (Cm = S(Axk)	-,					((28)	(30) + (32	2) + (32a).	(32e) =	15732 7	3 (34)	
Heat ca Therma	apacity (al mass	Cm = S(parame	A x k) ter (TMF	-, P = Cm ÷	- TFA) ir	ו kJ/m²K			((28) Indica	(30) + (32 itive Value:	2) + (32a). : Low	(32e) =	15732.7	3 (34)	

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

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

if details	of therma	al bridging	are not kr	own (36) =	= 0.05 x (3	1)								
Total fabric heat loss									(33) +	62.35	(37)			
Ventila	tion hea	at loss ca	alculated	monthl	у		-		(38)m	= 0.33 × (25)m x (5)	-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	24.42	24.14	23.85	22.4	22.11	20.67	20.67	20.38	21.25	22.11	22.69	23.27		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	86.77	86.48	86.2	84.75	84.46	83.02	83.02	82.73	83.6	84.46	85.04	85.62		
Average = Sum(39) ₁₁₂ /12=												12 /12=	84.68	(39)
Heat lo	ss para	meter (H	HLP), W/	/m²K			r		(40)m	= (39)m ÷	· (4)		I	
(40)m=	0.87	0.86	0.86	0.85	0.84	0.83	0.83	0.83	0.84	0.84	0.85	0.86		
Average = Sum(40)112 /12= Number of days in month (Table 1a)												0.85	(40)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
													I	
Assum if TF	ed occu A > 13 (וף או Pancy, I א N – 1	N + 1 76 x	[1 - exp	(-0 0003	249 x (TF	-13 9)2)] + 0 ()013 x (⁻	TFA -13	2.	74		(42)
if TF.	A £ 13.9	9, N = 1			(0.0000		10.0	/2/] • 0.0			.0)			
Annual	averag	e hot wa	ater usag	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36		99	.27		(43)
Reduce	the annua that 125	al average litres per l	hot water person pe	usage by a r day (all w	5% if the a vater use, l	welling is	designed i Id)	to achieve	a water us	se target o	t			
									0					
Hot wate	Jan Prusage in	Feb	IVIar	Apr	Vd m – fa	JUN	JUI Table 1c x	(43)	Sep	Oct	INOV	Dec		
(14)	100.10	105.22	101.05	07.00	02.24	20.24		02.21	07.20	101.25	105.00	100.10		
(44)11=	109.19	105.22	101.25	97.28	93.31	69.34	69.34	93.31	97.20	Totol - Su	105.22	109.19	1101.22	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	1191.22	
(45)m=	161.93	141.63	146.15	127.41	122.26	105.5	97.76	112.18	113.52	132.3	144.41	156.82		_
If instant		otor hooti	na ot point	fund (no	hot wata	torogo	ontor 0 in	haven (16	-) to (61)	Total = Su	m(45) ₁₁₂ =	=	1561.87	(45)
n mstant	aneous w		ng at point I	l or use (no		storage),) (0 (0 1)				I	(12)
(46)m= Water	24.29 storage	21.24	21.92	19.11	18.34	15.82	14.66	16.83	17.03	19.84	21.66	23.52		(46)
Storag	e volum	e (litres)	includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunitv h	eating a	ind no ta	ink in dw	vellina. e	nter 110) litres in	(47)				•		()
Otherw	ise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '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 (4								(48) x (49) =			110			(50)
b) If manufacturer's declared cylinder loss factor is not known:														
Hot wa	ter stora	age loss	Tactor II	om 1 abi	ie ∠ (kvvi	n/litre/da	iy)				0.	.02		(51)
Volume	e factor	from Ta	ble 2a	0.1-1.0							1	03		(52)
Tempe	rature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost from water storage, kWh/year								(47) x (51)	x (52) x (53) =	1	03		(54)
Enter (50) or (54) in (55)											1.	.03		(55)
Water	storage	loss cal	culated ⁺	for each	month			((56)m = (55) × (41)	m				
--	---	---	---	---	---	--	--	--	--	--	---	---	---------------	--
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)r	n
(62)m=	217.21	191.56	201.42	180.91	177.53	158.99	153.04	167.46	167.01	187.57	197.91	212.1		(62)
Solar DI	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	-	
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (<u>3)</u>		-			
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter		-		-	-				-		
(64)m=	217.21	191.56	201.42	180.91	177.53	158.99	153.04	167.46	167.01	187.57	197.91	212.1		_
								Outp	out from w	ater heate	r (annual)₁	12	2212.71	(64)
Hea <mark>t</mark> g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	98.06	87.03	92.82	85.16	84.87	77.87	76.73	81.52	80.54	88.21	90.81	96.37		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in t <mark>he</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity ł	neating	
5. Int	ternal ga	ains (see	Table 5	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	tts				i		_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Son	Oct	Nov	.		
(66)m=	136.99	136.99	136.00	1 400 00				-	Sep	Oci	1107	Dec		
Lightin			130.33	136.99	136.99	136.99	136.99	136.99	136.99	136.99	136.99	Dec 136.99		(66)
(67)m=	ig gains	(calcula	ted in Ap	ppendix	^{136.99} L, equat	136.99 ion L9 o	136.99 r L9a), a	136.99 Iso see	136.99 Table 5	136.99	136.99	Dec 136.99		(66)
	g gains 22.86	(calcula 20.3	ted in A ₁	136.99 opendix 12.5	136.99 L, equat 9.34	136.99 ion L9 o 7.89	136.99 r L9a), a 8.52	136.99 Iso see 11.08	136.99 Table 5 14.87	136.99 18.88	136.99 22.04	Dec 136.99 23.49		(66) (67)
Applia	ng gains 22.86 nces ga	(calcula ^{20.3} ins (calc	ted in Ap 16.51 ulated ir	ppendix 12.5 Append	136.99 L, equat 9.34 dix L, eq	136.99 ion L9 o 7.89 uation L	136.99 r L9a), a 8.52 13 or L1	136.99 Iso see 11.08 3a), also	136.99 Table 5 14.87 see Ta	136.99 18.88 ble 5	136.99 22.04	Dec 136.99 23.49		(66) (67)
Applia (68)m=	ng gains 22.86 nces ga 256.36	(calcula 20.3 ins (calc 259.02	ted in A _I 16.51 ulated ir 252.32	136.99 opendix 12.5 Append 238.05	136.99 L, equat 9.34 dix L, eq 220.03	136.99 ion L9 of 7.89 uation L 203.1	136.99 r L9a), a 8.52 13 or L1 191.79	136.99 Iso see 11.08 3a), also 189.13	136.99 Table 5 14.87 see Ta 195.83	136.99 18.88 ble 5 210.1	136.99 22.04 228.12	Dec 136.99 23.49 245.05]	(66) (67) (68)
Applia (68)m= Cookir	ng gains 22.86 nces ga 256.36 ng gains	(calcula 20.3 ins (calc 259.02 (calcula	ted in A _I 16.51 ulated ir 252.32 ted in A	136.99 opendix 12.5 Append 238.05 ppendix	136.99 L, equat 9.34 dix L, eq 220.03 L, equat	136.99 ion L9 of 7.89 uation L 203.1 tion L15	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a)	136.99 Iso see 11.08 3a), also 189.13), also se	136.99 Table 5 14.87 9 see Ta 195.83 ee Table	136.99 18.88 ble 5 210.1 5	136.99 22.04 228.12	Dec 136.99 23.49 245.05		(66) (67) (68)
Applia (68)m= Cookir (69)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7	(calcula 20.3 ins (calc 259.02 (calcula 36.7	ted in A ₁ 16.51 ulated ir 252.32 ited in A 36.7	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7	136.99 Iso see 11.08 3a), also 189.13), also se 36.7	136.99 Table 5 14.87 9 see Ta 195.83 9 Table 36.7	136.99 18.88 ble 5 210.1 5 36.7	136.99 22.04 228.12 36.7	Dec 136.99 23.49 245.05 36.7		(66) (67) (68) (69)
Applia (68)m= Cookir (69)m= Pumps	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains	ted in A _l 16.51 ulated ir 252.32 ited in A 36.7 (Table \$	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a)	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7	136.99 Iso see 11.08 3a), also 189.13), also se 36.7	136.99 Table 5 14.87 9 see Ta 195.83 9 Table 36.7	136.99 18.88 ble 5 210.1 5 36.7	136.99 22.04 228.12 36.7	Dec 136.99 23.49 245.05 36.7		(66) (67) (68) (69)
Applia (68)m= Cookir (69)m= Pumps (70)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0	ted in A _l 16.51 ulated ir 252.32 ited in A 36.7 (Table \$	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7	136.99 ion L9 of 7.89 uation L 203.1 tion L15 36.7	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7	136.99 Iso see 11.08 3a), also 189.13 0, also se 36.7	136.99 Table 5 14.87 9 see Ta 195.83 ee Table 36.7	136.99 18.88 ble 5 210.1 5 36.7	136.99 22.04 228.12 36.7	Dec 136.99 23.49 245.05 36.7		(66) (67) (68) (69) (70)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai 0 s e.g. ev	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic	ted in A _l 16.51 16.51 10.100 in 252.32 10.100 in A 36.7 (Table \$ 0 in (nega	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0 tive valu	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 0	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0	136.99 Iso see 11.08 3a), also 189.13), also se 36.7	136.99 Table 5 14.87 0 see Ta 195.83 ee Table 36.7	136.99 18.88 ble 5 210.1 5 36.7 0	136.99 22.04 228.12 36.7 0	Dec 136.99 23.49 245.05 36.7 0		(66)(67)(68)(69)(70)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai 0 s e.g. ev -109.59	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic -109.59	ted in A 16.51 16.51 252.32 1ted in A 36.7 (Table 5 0 n (nega -109.59	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0 tive valu -109.59	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 ele 5) -109.59	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0	136.99 Iso see 11.08 3a), also 189.13), also se 36.7 0	136.99 Table 5 14.87 9 see Ta 195.83 9 Table 36.7 0	136.99 18.88 ble 5 210.1 5 36.7 0	136.99 22.04 228.12 36.7 0	Dec 136.99 23.49 245.05 36.7 0 -109.59		 (66) (67) (68) (69) (70) (71)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai 0 s e.g. ev -109.59 heating	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic -109.59 gains (T	ted in A ₁ 16.51 16.51 10.111	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0 tive valu -109.59	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 le 5) -109.59	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0	136.99 Iso see 11.08 3a), also 189.13 0, also se 36.7 0	136.99 Table 5 14.87 9 see Ta 195.83 9 ee Table 36.7 0 -109.59	136.99 18.88 ble 5 210.1 5 36.7 0 -109.59	136.99 22.04 228.12 36.7 0 -109.59	Dec 136.99 23.49 245.05 36.7 0 -109.59		 (66) (67) (68) (69) (70) (71)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fat 0 s e.g. ev -109.59 heating 131.81	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic -109.59 gains (T 129.51	ted in A ₁ 16.51 16.51 10.101 for the second secon	136.99 opendix 12.5 Appendi 238.05 ppendix 36.7 5a) 0 tive valu -109.59	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 le 5) -109.59	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0 -109.59	136.99 Iso see 11.08 3a), also 189.13), also se 36.7 0 -109.59	136.99 Table 5 14.87 0 see Ta 195.83 20 Table 36.7 0 -109.59 111.86	136.99 18.88 ble 5 210.1 5 36.7 0 -109.59 118.56	136.99 22.04 228.12 36.7 0 -109.59	Dec 136.99 23.49 245.05 36.7 0 -109.59 129.52		 (66) (67) (68) (69) (70) (71) (72)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and far 0 s e.g. ev -109.59 heating 131.81	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 -109.59 gains (T 129.51 gains =	ted in A ₁ 16.51 16.51 10.11 16.51 12.52.32 10.12 10 10.12 10 10.12 10 10.12 10 10.12 10 10.12 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10 10 10 10 10 10 10 10 10 10 10	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0 tive valu -109.59 118.28	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 ele 5) -109.59 108.16 (66)	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0 -109.59 103.13 m + (67)m	136.99 Iso see 11.08 3a), also 189.13), also se 36.7 0 -109.59 109.57 1 + (68)m -	136.99 Table 5 14.87 9 see Ta 195.83 9e Table 36.7 0 -109.59 111.86 + (69)m + 1	136.99 18.88 ble 5 210.1 5 36.7 0 -109.59 118.56 (70)m + (7)	136.99 22.04 228.12 36.7 0 -109.59 126.13 1)m + (72)	Dec 136.99 23.49 245.05 36.7 0 -109.59 129.52 m		 (66) (67) (68) (69) (70) (71) (72)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai 0 s e.g. ev -109.59 heating 131.81 internal 475.12	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic -109.59 gains (T 129.51 gains = 472.93	ted in A ₁ 16.51 16.51 10.1252.32 10.1252.32 10.1252.32 10.1252.32 10.1252.32 10.1252.32 10.1252 10.1	136.99 opendix 12.5 Appendi 238.05 ppendix 36.7 5a) 0 tive valu -109.59 118.28	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59 114.08	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 le 5) -109.59 108.16 (66) 383.24	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0 -109.59 103.13 m + (67)m 367.53	136.99 Iso see 11.08 3a), also 189.13), also se 36.7 0 -109.59 109.57 n + (68)m - 373.87	136.99 Table 5 14.87 9 see Ta 195.83 9 e Table 36.7 0 -109.59 111.86 + (69)m + 0 386.66	136.99 18.88 ble 5 210.1 5 36.7 0 -109.59 118.56 (70)m + (7 411.64	136.99 22.04 228.12 36.7 0 -109.59 126.13 1)m + (72) 440.38	Dec 136.99 23.49 245.05 36.7 0 -109.59 129.52 m 462.16		 (66) (67) (68) (69) (70) (71) (72) (73)

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

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest0.9x	0.77	x	3.24	x	36.79]	0.45	x	0.7] =	26.02	(79)
Southwest0.9x	0.77	x	3.24	x	36.79	İ	0.45	x	0.7	i =	26.02	– (79)
Southwest0.9x	0.77	x	3.24	x	36.79	İ	0.45	x	0.7	=	26.02	(79)
Southwest0.9x	0.77	x	3.24	x	62.67	İ	0.45	x	0.7	j =	44.33	– (79)
Southwest0.9x	0.77	x	3.24	x	62.67	j	0.45	x	0.7] =	44.33	(79)
Southwest0.9x	0.77	x	3.24	×	62.67]	0.45	x	0.7] =	44.33	(79)
Southwest0.9x	0.77	x	3.24	x	85.75]	0.45	x	0.7] =	60.65	(79)
Southwest0.9x	0.77	x	3.24	x	85.75]	0.45	x	0.7	=	60.65	(79)
Southwest0.9x	0.77	x	3.24	x	85.75]	0.45	x	0.7] =	60.65	(79)
Southwest0.9x	0.77	x	3.24	x	106.25]	0.45	x	0.7] =	75.15	(79)
Southwest0.9x	0.77	x	3.24	x	106.25]	0.45	x	0.7	=	75.15	(79)
Southwest0.9x	0.77	x	3.24	x	106.25]	0.45	x	0.7] =	75.15	(79)
Southwest0.9x	0.77	x	3.24	x	119.01]	0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	3.24	x	119.01]	0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	3.24	x	119.01]	0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	3.24	×	118.15		0.45	Х	0.7		83.56	(79)
Southwest0.9x	0.77	x	3.24	x	118.15]	0.45	x	0.7] =	83.56	(79)
Southwest0.9x	0.77	x	3.24	х	118.15		0.45	x	0.7] =	83.56	(79)
Southwest0.9x	0.77	x	3.24	x	113.91		0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	3.24	×	113.91		0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	3.24	x	113.91		0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	3.24	x	104.39]	0.45	x	0.7] =	73.83	(79)
Southwest0.9x	0.77	x	3.24	x	104.39]	0.45	x	0.7	=	73.83	(79)
Southwest0.9x	0.77	x	3.24	x	104.39]	0.45	x	0.7	=	73.83	(79)
Southwest0.9x	0.77	x	3.24	x	92.85]	0.45	x	0.7	=	65.67	(79)
Southwest0.9x	0.77	x	3.24	x	92.85]	0.45	x	0.7	=	65.67	(79)
Southwest0.9x	0.77	x	3.24	x	92.85]	0.45	x	0.7	=	65.67	(79)
Southwest0.9x	0.77	x	3.24	x	69.27]	0.45	x	0.7	=	48.99	(79)
Southwest0.9x	0.77	x	3.24	x	69.27]	0.45	x	0.7] =	48.99	(79)
Southwest0.9x	0.77	x	3.24	x	69.27]	0.45	x	0.7	=	48.99	(79)
Southwest0.9x	0.77	x	3.24	x	44.07]	0.45	x	0.7	=	31.17	(79)
Southwest0.9x	0.77	x	3.24	x	44.07]	0.45	x	0.7] =	31.17	(79)
Southwest0.9x	0.77	x	3.24	x	44.07]	0.45	x	0.7	=	31.17	(79)
Southwest0.9x	0.77	x	3.24	x	31.49]	0.45	x	0.7	=	22.27	(79)
Southwest0.9x	0.77	x	3.24	x	31.49]	0.45	x	0.7	=	22.27	(79)
Southwest0.9x	0.77	x	3.24	x	31.49]	0.45	x	0.7	=	22.27	(79)
Northwest 0.9x	0.77	x	3.24	x	11.28	×	0.45	x	0.7	=	7.98	(81)
Northwest 0.9x	0.77	x	3.24	×	11.28	×	0.45	x	0.7] =	7.98	(81)
Northwest 0.9x	0.77	x	6	x	11.28	x	0.45	x	0.7	=	14.78	(81)

Northwest 0.9x	0.77	x	3.24	x	22.97	x	0.45	x	0.7	=	16.24	(81)
Northwest 0.9x	0.77	x	3.24	x	22.97	x	0.45	x	0.7	i =	16.24	(81)
Northwest 0.9x	0.77	x	6	x	22.97	x	0.45	x	0.7	=	30.08	(81)
Northwest 0.9x	0.77	x	3.24	x	41.38	x	0.45	x	0.7	i =	29.27	(81)
Northwest 0.9x	0.77	x	3.24	x	41.38] x	0.45	x	0.7	i =	29.27	(81)
Northwest 0.9x	0.77	x	6	x	41.38	x	0.45	x	0.7	=	54.2	(81)
Northwest 0.9x	0.77	x	3.24	×	67.96	x	0.45	x	0.7	=	48.06	(81)
Northwest 0.9x	0.77	x	3.24	×	67.96	×	0.45	x	0.7	=	48.06	(81)
Northwest 0.9x	0.77	x	6	x	67.96	x	0.45	x	0.7	 =	89.01	(81)
Northwest 0.9x	0.77	x	3.24	x	91.35	x	0.45	x	0.7	=	64.61	(81)
Northwest 0.9x	0.77	x	3.24	x	91.35	x	0.45	x	0.7	=	64.61	(81)
Northwest 0.9x	0.77	x	6	×	91.35	x	0.45	x	0.7	=	119.64	(81)
Northwest 0.9x	0.77	x	3.24	×	97.38	x	0.45	x	0.7	=	68.88	(81)
Northwest 0.9x	0.77	x	3.24	×	97.38	x	0.45	x	0.7	=	68.88	(81)
Northwest 0.9x	0.77	x	6	×	97.38	x	0.45	x	0.7	=	127.55	(81)
Northwest 0.9x	0.77	x	3.24	x	91.1	x	0.45	x	0.7	=	64.43	(81)
Northwest 0.9x	0.77	x	3.24	x	91.1	x	0.45	x	0.7	=	64.43	(81)
Northwest 0.9x	0.77	x	6	X	91.1	x	0.45	х	0.7	=	119.32	(81)
Northwest 0.9x	0.77) x	3.24	x	72.63	x	0.45	x	0.7	=	51.37	(81)
Northwest 0.9x	0.77	x	3.24	x	72.63] ×	0.45	x	0.7	=	51.37	(81)
Northwest 0.9x	0.7 <mark>7</mark>] x	6	x	72.63	x	0.45	x	0.7	=	95.12	(81)
Northwest 0.9x	0.77] x	3.24	x	50.4 <mark>2</mark>	x	0.45	x	0.7	=	35.66	(81)
Northwest 0.9x	0.77] x	3.24	x	50.42] x	0.45	x	0.7	=	35.66	(81)
Northwest 0.9x	0.77	x	6	x	50.42	x	0.45	x	0.7	=	66.04	(81)
Northwest 0.9x	0.77	x	3.24	x	28.07	x	0.45	x	0.7	=	19.85	(81)
Northwest 0.9x	0.77	x	3.24	x	28.07	x	0.45	x	0.7	=	19.85	(81)
Northwest 0.9x	0.77	x	6	x	28.07	x	0.45	x	0.7	=	36.76	(81)
Northwest 0.9x	0.77	x	3.24	x	14.2	x	0.45	x	0.7	=	10.04	(81)
Northwest 0.9x	0.77	x	3.24	x	14.2	x	0.45	x	0.7	=	10.04	(81)
Northwest 0.9x	0.77	x	6	x	14.2) x	0.45	x	0.7	=	18.59	(81)
Northwest 0.9x	0.77	x	3.24	×	9.21	x	0.45	x	0.7	=	6.52	(81)
Northwest 0.9x	0.77	x	3.24	×	9.21	x	0.45	x	0.7	=	6.52	(81)
Northwest 0.9x	0.77	x	6	x	9.21	x	0.45	x	0.7	=	12.07	(81)

Solar g	ains in	watts, ca	alculated	for eacl	n month			(83)m = 5	um(74)m .	(82)m				
(83)m=	108.81	195.55	294.68	410.58	501.38	516	489.88	419.36	334.38	223.44	132.19	91.91		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	583.93	668.48	752.36	843.5	908.92	899.24	857.42	793.23	721.04	635.08	572.56	554.07		(84)
7. Me	an inter	nal temp	erature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(86)m=	0.96	0.95	0.91	0.83	0.7	0.54	0.41	0.46	0.67	0.87	0.95	0.97		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	19.25	19.49	19.88	20.35	20.71	20.91	20.97	20.96	20.81	20.35	19.72	19.21		(87)
Temp	erature	durina h	eating n	eriods ir	n rest of	dwelling	from Ta	ble 9 Tl	n2 (°C)					
(88)m=	20.2	20.2	20.2	20.21	20.21	20.23	20.23	20.23	20.22	20.21	20.21	20.21		(88)
Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.96	0.94	0.9	0.81	0.67	0.49	0.34	0.39	0.62	0.85	0.94	0.97		(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=	17.82	18.18	18.73	19.4	19.88	20.14	20.21	20.2	20.03	19.41	18.52	17.77		(90)
						-	-		f	LA = Livin	g area ÷ (4	+) =	0.32	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	A x T1	+ (1 – fl	A) x T2			•		
(92)m=	18.27	18.59	19.09	19.7	20.14	20.39	20.45	20.44	20.28	19.71	18.9	18.23		(92)
vlaaA	adiustn	nent to t	he mear	internal	temper	L ature fro	n Table	4e. whe	ere appro	opriate				
(93)m=	, 18.27	18.59	19.09	19.7	20.14	20.39	20.45	20.44	20.28	19.71	18.9	18.23		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the r	nean int	ernal ter	mperatur	re obtair	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	1:										
(94)m=	0.94	0.92	0.88	0.79	0.66	0.5	0.36	0.41	0.62	0.83	0.92	0.95		(94)
Us <mark>efu</mark>	l gains,	hmGm	W = (9	4)m x (84	4)m									
(95)m=	551.71	615.22	659.18	667.42	602.27	448.61	311.24	322.28	450.24	526.3	526.88	527.17		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m : L ava aa	x [(93)m∙	– (96)m]				(07)
(97)m=	1212.45	1184.39	1085.36	915.46	713.21	480.35	319.63	334.38	516.7	769.18	1003.76	1200.94		(97)
Space	heatin	g require		r each m			h = 0.02	24 x [(97))m – (95)m] x (4'	1)m	501.00		
(90)11=	491.59	302.49	317.00	178.59	02.04	0	0	U 	0	100.7	343.35	501.20	0.477.00	
								Tota	i per year	(kwn/year) = Sum(98	5)15,912 =	2477.62	(90)
Space	e heatin	g require	ement in	kWh/m ²	/year								24.77	(99)
9b. Ene	ergy rec	luiremer	nts – Cor	mmunity	heating	scheme								
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ing or wa	ater heat	ting prov	ided by a	a comm	unity sch	ieme.		
Fractio	n of spa	ace heat	from se	condary	/supplen	nentary l	neating ((Table 1	1) '0' if no	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sour	rces. The p	procedure	allows for	CHP and u	up to four o	other heat	sources; tl	he latter	
Fractio	n of hea	at from C	ommun	ity heat	pump	rom powei	stations.	See Apper	iaix C.			[1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump)			(3)	02) x (303a	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commı	unity hea	iting syst	tem			1	(305)
Distribu	ution los	s factor	(Table 1	I2c) for c	commun	ity heatii	ng syste	m	-			 	1.2	(306)
Space	heating	a										I	kWh/ve	ear
Annual	space	, heating	requirem	nent									2477.62	
												I		

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	2973.15	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2212.71]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2655.26	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307	7e) + (310a)(310e)] =	56.28	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from ou	ıtside		226.36	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	226.36	(331)
Energy for lighting (calculated in Appendix L)	_		403.66	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) +	(<mark>315) +</mark> (331) + (<mark>33</mark>	32)(237b) =	5 <mark>528.3</mark> 5	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor	Emiss <mark>ions</mark> kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	vo fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(31	0b)] x 100 ÷ (367b) x	0.52	= 1404.4	(367)
Electrical energy for heat distribution [(31	13) x	0.52	= 29.21	(372)
Total CO2 associated with community systems (36	3)(366) + (368)(37)	2) =	1433.61	(373)
CO2 associated with space heating (secondary) (30	9) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (37	3) + (374) + (375) =		1433.61	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	117.48	(378)
CO2 associated with electricity for lighting (33	2))) x	0.52	= 209.5	(379)
Energy saving/generation technologies (333) to (334) as applicabl Item 1	e	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			1381.68	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			13.81	(384)
El rating (section 14)			87.23	(385)

		Use	er Details:						
Assessor Name:			Stroma	a Num	ber:				
Software Name:	Stroma FSAP 2012		Softwa	are Ver	sion:		Versio	n: 1.0.5.49	
	Q. Diagle Q. Liage Class	Prope	rty Address:	Block C	: - Mid F	loor			
Address :	C, BIOCK C, Ham Clos	se, London,	10010						
	1510115.		rea(m²)		Δ.ν. Ηρί	aht(m)		Volume(m ³)	
Ground floor			100.02	(1a) x	2	.5	(2a) =	250.05	(3a)
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)+(1e)-	+(1n)	100.02	(4)					
Dwelling volume				(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	250.05	(5)
2. Ventilation rate:									
	main sec heating he	condary ating	other		total			m ³ per hou	•
Number of chimneys		0 +	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	IS			Γ	0	x ′	10 =	0	(7a)
Number of passive vents				Ē	0	x	10 =	0	(7b)
Number of flueless gas fir	es				0	X 4	40 =	0	(7c)
							Air ch	ange <mark>s per</mark> ho	ur
Infiltration due to chimney	s, flues and fans = (6a)	+(6b)+(7a)+(7	b)+(7c) =		0		÷ (5) =	0	(8)
Number of storeys in th	e dwelling (ns)	, proceed to (1	7), otnerwise c	continue fre	om (9) to (16)		0	
Additional infiltration	o un o					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber fra	ame or 0.35	for masonr	y constr	uction		-	0	(11)
if both types of wall are pre	esent, use the value correspo	onding to the g	reater wall area	a (after					
deducting areas of opening	gs); if equal user 0.35 oor_enter 0.2 (unseale	d) or 0 1 (se	aled) else	enter 0				0	7(12)
If no draught lobby, enter	er 0.05. else enter 0							0	(12)
Percentage of windows	and doors draught stri	pped						0	(14)
Window infiltration	_		0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate			(8) + (10) ·	+ (11) + (1	2) + (13) +	- (15) =		0	(16)
Air permeability value, o	q50, expressed in cubic	c metres pe	r hour per so	quare m	etre of e	nvelope	area	4	(17)
If based on air permeabilit	ty value, then (18) = [(17)	÷ 20]+(8), oth	erwise (18) = (16)				0.2	(18)
Air permeability value applies	s if a pressurisation test has b	been done or a	i degree air pei	rmeability i	is being us	sed			
Shelter factor	L		(20) = 1 - [0.075 x (1	9)] =			4	(19)
Infiltration rate incorporati	ng shelter factor		(21) = (18)) x (20) =				0.14](20)](21)
Infiltration rate modified for	or monthly wind speed						I	0.14	
Jan Feb I	Mar Apr May	Jun Ju	ıl Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7	•							
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3 3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22a)m $		I	I					1	
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95 0.9	5 0.92	1	1.08	1.12	1.18		
		•	•					I	

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	elter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate etter	ctive air (al ventila	change	rate for t	he appli	cable ca	se						0.5	(220)
lf exh	aust air h	eat pump i	using App	endix N. (2	3b) = (23a	i) x Fmv (e	equation (I	N5)), othe	rwise (23b) = (23a)			0.5	(23a)
lf bala	anced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use fa	actor (fron	n Table 4h) =	(200)			0.5	(230)
a) If	halance	d mech	anical ve	ntilation	with he	at recove	∍rv (M\/I	HR) (24s	n' = (22)	h = (23h) 🗸 [′	1 – (23c)		(230)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	balance	d mecha	I anical ve	entilation	without	heat rec	coverv (N	I MV) (24b)m = (22	2b)m + (2	23b)		I	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	ract ver	ntilation c	or positiv	ve input v	ventilatio	n from c	utside				1	
, i	if (22b)n	n < 0.5 ×	(23b), t	then (24d	c) = (23b); otherv	vise (24	c) = (22k	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft 2b)m² x	0.51				
ا =(24d)m	0	0	0		0		40/11 <u>–</u>	$\frac{0.3 + [(2)]}{0}$		0.5]	0	0]	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in box	(25)				I	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
									I					_
3. He	at losse	s and ne	eat loss		er:	Not An								
ELEN		area	ss (m²)	Openin	gs 2	Net Ar	ea n²	W/m2	:K	AXU (W/ł	<)	k-value kJ/m²·l	e K	A X K kJ/K
Doo <mark>rs</mark>						1.91	x	1] = [1.91				(26)
Windo	ws Type	e 1				3.24	x1	/[1/(1.2)+	0.04] =	3.71	Fi i			(27)
Windo	ws Type	2				3.24	x 1	/[1/(1.2)+	0.04] =	3.71	F			(27)
Windo	ws Type	e 3				6		/[1/(1.2)+	0.04] =	6.87	5			(27)
Windov	ws Type	94				3.24		/[1/(1.2)+	0.04] =	3.71	=			(27)
Windo	ws Type	e 5				3.24		/[1/(1.2)+	0.04] =	3.71	=			(27)
Window	ws Type	e 6				3.24		/[1/(1.2)+	0.04] =	3.71				(27)
Walls ⁻	Type1	59.6	67	22.2		37.47	' x	0.16] = [6				(29)
Walls ⁻	Гуре2	35.5	53	1.91		33.62	<u>x</u>	0.15		5.05	ה ה		\dashv	(29)
Total a	rea of e	lements	, m²			95.2			เ					(31)
Party v	vall					24.23	3 X	0	= [0				(32)
Party f	loor					100.02	2		L				\dashv	(32a)
Party c	eiling					100.02	2				L L		\dashv	(32b)
* for win	dows and	roof winde	ows, use e	effective wil	ndow U-va	alue calcula	ated using	g formula 1	/[(1/U-valu	e)+0.04] a	L s given in	paragraph		ſ` ´
Fabric	heat loo	as on both ss W/K -	sides of II = S (A v	uernar wall	s and part	MONS		(26)(30)	+ (32) =				20.20	(33)
Heat c	apacity	Cm = S((Axk)	-,					((28)	.(30) + (32	2) + (32a).	(32e) =	8731.3	3 (34)

Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m²K

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

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

100

Indicative Value: Low

(35)

if detail	s of therm	al bridging	are not kr	10wn (36) =	= 0.05 x (3	1)							-	_
Total	fabric he	at loss							(33) +	(36) =			47.38	(37)
Ventila	ation hea	at loss c	alculated	d monthly	у				(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	24.42	24.14	23.85	22.4	22.11	20.67	20.67	20.38	21.25	22.11	22.69	23.27		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	71.8	71.51	71.23	69.78	69.49	68.05	68.05	67.76	68.63	69.49	70.07	70.65		
					•		•	•		Average =	Sum(39)1	12 /12=	69.71	(39)
Heat I	oss para	ameter (H	HLP), W	/m²K				r	(40)m	= (39)m ÷	- (4) T		1	
(40)m=	0.72	0.72	0.71	0.7	0.69	0.68	0.68	0.68	0.69	0.69	0.7	0.71		
Numb	er of day	ys in mo	nth (Tab	ole 1a)	-	-	-	-		Average =	Sum(40)₁.	12 /12=	0.7	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. W	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
													1	
Assun if TI	ned occu FA > 13	upancy, 9 N = 1	N + 1 76 x	([1 - exp	(-0.0003	849 x (TF	- -13 9	(2)1 + 0()013 x (TFA -13	2.	74		(42)
if <mark>T</mark>	FA £ 13.	9, N = 1			(0.0000	/ 10 X (11	10.0	<i>[</i>			.0)			
Ann <mark>ua</mark>	al averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		99	.27		(43)
Reduce	e the annua	al average	hot water	usage by a	5% if the a	lwelling is	designed	to achieve	a water us	se target o	of			
notino													1	
Hot wa	Jan	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
								(43)					1	
(44)m=	109.19	105.22	101.25	97.28	93.31	89.34	89.34	93.31	97.28	101.25	105.22	109.19	4404.00	
Energy	content of	f hot water	used - ca	lculated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	OTm / 3600) kWh/mor	nth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	1191.22	(44)
(45)m=	161.93	141.63	146.15	127.41	122.26	105.5	97.76	112.18	113.52	132.3	144.41	156.82		
										Total = Su	m(45) ₁₁₂ =	=	1561.87	(45)
lf instar	ntaneous v	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46)) to (61)			1	1	
(46)m=	24.29	21.24	21.92	19.11	18.34	15.82	14.66	16.83	17.03	19.84	21.66	23.52		(46)
Stora		1055. Da (litras)) includir		alar or M	///HBC	storana	within sa	amo vos	مما		0	1	(47)
lf com			and no to	ng any so		ntor 110	litroc in	(47)		301		0	J	(47)
Other	wise if n	n stored	hot wate	er (this in	icludes i	nstantar		ombi boil	ers) ente	er '0' in ((47)			
Water	storage	loss:	not nat		10144001	notanta				0. 0 (,			
a) If r	nanufac	turer's d	eclared l	loss facto	or is kno	wn (kWł	n/day):					0]	(48)
Temp	erature f	actor fro	m Table	e 2b								0	j	(49)
Energ	y lost fro	om watei	r storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If r	nanufact	turer's de	eclared	cylinder l	loss fact	or is not	known:							. ,
Hot w	ater stor	age loss	factor f	rom Tabl	le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If com	munity h	neating s	see secti	on 4.3									1	
Temp	ie iacióľ eraturo f	actor fro	ule Za m Tahla	2h								.03		(52)
Energy					oor			(17) ~ (54)	V (EQ) ··· (52)		0.0] 1	(55)
Enter	y iust irc . (50) or	711 watel (54) in <i>(P</i>	55)	; KVV(1/Y6	dl			(47) X (51)) X (22) X (55) =	1.	03		(54) (55)
	(00) 01	(~) (,								¹ .	00]	(00)

Water	storage	loss cal	culated ⁺	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)r	n
(62)m=	217.21	191.56	201.42	180.91	177.53	158.99	153.04	167.46	167.01	187.57	197.91	212.1		(62)
Solar DI	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (<u>3)</u>		-			
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter		-		-	-				-		
(64)m=	217.21	191.56	201.42	180.91	177.53	158.99	153.04	167.46	167.01	187.57	197.91	212.1		_
								Outp	out from w	ater heate	r (annual)₁	12	2212.71	(64)
Hea <mark>t</mark> g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	98.06	87.03	92.82	85.16	84.87	77.87	76.73	81.52	80.54	88.21	90.81	96.37		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in t <mark>he</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity ł	neating	
5. Int	ternal ga	ains (see	Table 5	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	tts				i		_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Son	Oct	Nov	.		
(66)m=	136.99	136.99	136.00	1 400 00				-	Sep	Oci	1107	Dec		
Lightin			130.33	136.99	136.99	136.99	136.99	136.99	136.99	136.99	136.99	Dec 136.99		(66)
(67)m=	ig gains	(calcula	ted in Ap	ppendix	^{136.99} L, equat	136.99 ion L9 o	136.99 r L9a), a	136.99 Iso see	136.99 Table 5	136.99	136.99	Dec 136.99		(66)
	g gains 22.86	(calcula 20.3	ted in A ₁	136.99 opendix 12.5	136.99 L, equat 9.34	136.99 ion L9 o 7.89	136.99 r L9a), a 8.52	136.99 Iso see 11.08	136.99 Table 5 14.87	136.99 18.88	136.99 22.04	Dec 136.99 23.49		(66) (67)
Applia	ng gains 22.86 nces ga	(calcula ^{20.3} ins (calc	ted in Ap 16.51 ulated ir	ppendix 12.5 Append	136.99 L, equat 9.34 dix L, eq	136.99 ion L9 o 7.89 uation L	136.99 r L9a), a 8.52 13 or L1	136.99 Iso see 11.08 3a), also	136.99 Table 5 14.87 see Ta	136.99 18.88 ble 5	136.99 22.04	Dec 136.99 23.49		(66) (67)
Applia (68)m=	ng gains 22.86 nces ga 256.36	(calcula 20.3 ins (calc 259.02	ted in A _I 16.51 ulated ir 252.32	136.99 opendix 12.5 Append 238.05	136.99 L, equat 9.34 dix L, eq 220.03	136.99 ion L9 of 7.89 uation L 203.1	136.99 r L9a), a 8.52 13 or L1 191.79	136.99 Iso see 11.08 3a), also 189.13	136.99 Table 5 14.87 see Ta 195.83	136.99 18.88 ble 5 210.1	136.99 22.04 228.12	Dec 136.99 23.49 245.05]	(66) (67) (68)
Applia (68)m= Cookir	ng gains 22.86 nces ga 256.36 ng gains	(calcula 20.3 ins (calc 259.02 (calcula	ted in A _I 16.51 ulated ir 252.32 ted in A	136.99 opendix 12.5 Append 238.05 ppendix	136.99 L, equat 9.34 dix L, eq 220.03 L, equat	136.99 ion L9 of 7.89 uation L 203.1 tion L15	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a)	136.99 Iso see 11.08 3a), also 189.13), also se	136.99 Table 5 14.87 9 see Ta 195.83 ee Table	136.99 18.88 ble 5 210.1 5	136.99 22.04 228.12	Dec 136.99 23.49 245.05		(66) (67) (68)
Applia (68)m= Cookir (69)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7	(calcula 20.3 ins (calc 259.02 (calcula 36.7	ted in A ₁ 16.51 ulated ir 252.32 ited in A 36.7	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7	136.99 Iso see 11.08 3a), also 189.13), also se 36.7	136.99 Table 5 14.87 9 see Ta 195.83 9 Table 36.7	136.99 18.88 ble 5 210.1 5 36.7	136.99 22.04 228.12 36.7	Dec 136.99 23.49 245.05 36.7		(66) (67) (68) (69)
Applia (68)m= Cookir (69)m= Pumps	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains	ted in A _l 16.51 ulated ir 252.32 ited in A 36.7 (Table \$	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a)	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7	136.99 Iso see 11.08 3a), also 189.13), also se 36.7	136.99 Table 5 14.87 9 see Ta 195.83 9 Table 36.7	136.99 18.88 ble 5 210.1 5 36.7	136.99 22.04 228.12 36.7	Dec 136.99 23.49 245.05 36.7		(66) (67) (68) (69)
Applia (68)m= Cookir (69)m= Pumps (70)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0	ted in A _l 16.51 ulated ir 252.32 ited in A 36.7 (Table \$	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7	136.99 ion L9 of 7.89 uation L 203.1 tion L15 36.7	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7	136.99 Iso see 11.08 3a), also 189.13 0, also se 36.7	136.99 Table 5 14.87 9 see Ta 195.83 ee Table 36.7	136.99 18.88 ble 5 210.1 5 36.7	136.99 22.04 228.12 36.7	Dec 136.99 23.49 245.05 36.7		(66) (67) (68) (69) (70)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai 0 s e.g. ev	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic	ted in A _l 16.51 16.51 10.100 in 252.32 10.100 in A 36.7 (Table \$ 0 in (nega	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0 tive valu	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 0	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0	136.99 Iso see 11.08 3a), also 189.13), also se 36.7	136.99 Table 5 14.87 0 see Ta 195.83 ee Table 36.7	136.99 18.88 ble 5 210.1 5 36.7 0	136.99 22.04 228.12 36.7 0	Dec 136.99 23.49 245.05 36.7 0		(66)(67)(68)(69)(70)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai 0 s e.g. ev -109.59	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic -109.59	ted in A 16.51 16.51 252.32 1ted in A 36.7 (Table 5 0 n (nega -109.59	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0 tive valu -109.59	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 ele 5) -109.59	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0	136.99 Iso see 11.08 3a), also 189.13), also se 36.7 0	136.99 Table 5 14.87 9 see Ta 195.83 9 Table 36.7 0	136.99 18.88 ble 5 210.1 5 36.7 0	136.99 22.04 228.12 36.7 0	Dec 136.99 23.49 245.05 36.7 0 -109.59		 (66) (67) (68) (69) (70) (71)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai 0 s e.g. ev -109.59 heating	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic -109.59 gains (T	ted in A ₁ 16.51 16.51 10.111	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0 tive valu -109.59	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 le 5) -109.59	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0	136.99 Iso see 11.08 3a), also 189.13 0, also se 36.7 0	136.99 Table 5 14.87 9 see Ta 195.83 9 ee Table 36.7 0 -109.59	136.99 18.88 ble 5 210.1 5 36.7 0 -109.59	136.99 22.04 228.12 36.7 0 -109.59	Dec 136.99 23.49 245.05 36.7 0 -109.59		 (66) (67) (68) (69) (70) (71)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fat 0 s e.g. ev -109.59 heating 131.81	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic -109.59 gains (T 129.51	ted in A ₁ 16.51 16.51 10.101 for the second secon	136.99 opendix 12.5 Appendi 238.05 ppendix 36.7 5a) 0 tive valu -109.59	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 le 5) -109.59	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0 -109.59	136.99 Iso see 11.08 3a), also 189.13), also se 36.7 0 -109.59	136.99 Table 5 14.87 0 see Ta 195.83 20 Table 36.7 0 -109.59 111.86	136.99 18.88 ble 5 210.1 5 36.7 0 -109.59 118.56	136.99 22.04 228.12 36.7 0 -109.59	Dec 136.99 23.49 245.05 36.7 0 -109.59 129.52		 (66) (67) (68) (69) (70) (71) (72)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and far 0 s e.g. ev -109.59 heating 131.81	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 -109.59 gains (T 129.51 gains =	ted in A ₁ 16.51 16.51 10.11 16.51 12.52.32 10.12 10 10.12 10 10.12 10 10.12 10 10.12 10 10.12 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10.12 10 10 10 10 10 10 10 10 10 10 10 10 10	136.99 opendix 12.5 Appendix 238.05 ppendix 36.7 5a) 0 tive valu -109.59 118.28	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 ele 5) -109.59 108.16 (66)	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0 -109.59 103.13 m + (67)m	136.99 Iso see 11.08 3a), also 189.13), also se 36.7 0 -109.59 109.57 1 + (68)m -	136.99 Table 5 14.87 9 see Ta 195.83 9e Table 36.7 0 -109.59 111.86 + (69)m + 1	136.99 18.88 ble 5 210.1 5 36.7 0 -109.59 118.56 (70)m + (7)	136.99 22.04 228.12 36.7 0 -109.59 126.13 1)m + (72)	Dec 136.99 23.49 245.05 36.7 0 -109.59 129.52 m		 (66) (67) (68) (69) (70) (71) (72)
Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m= Total i (73)m=	ng gains 22.86 nces ga 256.36 ng gains 36.7 s and fai 0 s e.g. ev -109.59 heating 131.81 internal 475.12	(calcula 20.3 ins (calc 259.02 (calcula 36.7 ns gains 0 raporatic -109.59 gains (T 129.51 gains = 472.93	ted in A ₁ 16.51 16.51 10.1252.32 10.1252.32 10.1252.32 10.1252.32 10.1252.32 10.1252.32 10.1252 10.1	136.99 opendix 12.5 Appendi 238.05 ppendix 36.7 5a) 0 tive valu -109.59 118.28	136.99 L, equat 9.34 dix L, eq 220.03 L, equat 36.7 0 es) (Tab -109.59 114.08	136.99 ion L9 o 7.89 uation L 203.1 tion L15 36.7 0 le 5) -109.59 108.16 (66) 383.24	136.99 r L9a), a 8.52 13 or L1 191.79 or L15a) 36.7 0 -109.59 103.13 m + (67)m 367.53	136.99 Iso see 11.08 3a), also 189.13), also se 36.7 0 -109.59 109.57 n + (68)m - 373.87	136.99 Table 5 14.87 9 see Ta 195.83 9 e Table 36.7 0 -109.59 111.86 + (69)m + 0 386.66	136.99 18.88 ble 5 210.1 5 36.7 0 -109.59 118.56 (70)m + (7 411.64	136.99 22.04 228.12 36.7 0 -109.59 126.13 1)m + (72) 440.38	Dec 136.99 23.49 245.05 36.7 0 -109.59 129.52 m 462.16		 (66) (67) (68) (69) (70) (71) (72) (73)

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

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest0.9x	0.77	x	3.24	x	36.79]	0.45	x	0.7] =	26.02	(79)
Southwest0.9x	0.77	x	3.24	x	36.79	İ	0.45	x	0.7	i =	26.02	– (79)
Southwest0.9x	0.77	x	3.24	x	36.79	İ	0.45	x	0.7	=	26.02	(79)
Southwest0.9x	0.77	x	3.24	x	62.67	İ	0.45	x	0.7	j =	44.33	– (79)
Southwest0.9x	0.77	x	3.24	x	62.67	j	0.45	x	0.7] =	44.33	(79)
Southwest0.9x	0.77	x	3.24	×	62.67]	0.45	x	0.7] =	44.33	(79)
Southwest0.9x	0.77	x	3.24	x	85.75]	0.45	x	0.7] =	60.65	(79)
Southwest0.9x	0.77	x	3.24	x	85.75]	0.45	x	0.7	=	60.65	(79)
Southwest0.9x	0.77	x	3.24	x	85.75]	0.45	x	0.7] =	60.65	(79)
Southwest0.9x	0.77	x	3.24	x	106.25]	0.45	x	0.7] =	75.15	(79)
Southwest0.9x	0.77	x	3.24	x	106.25]	0.45	x	0.7	=	75.15	(79)
Southwest0.9x	0.77	x	3.24	x	106.25]	0.45	x	0.7] =	75.15	(79)
Southwest0.9x	0.77	x	3.24	x	119.01]	0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	3.24	x	119.01]	0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	3.24	x	119.01]	0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	3.24	×	118.15		0.45	Х	0.7		83.56	(79)
Southwest0.9x	0.77	x	3.24	x	118.15]	0.45	x	0.7] =	83.56	(79)
Southwest0.9x	0.77	x	3.24	х	118.15		0.45	x	0.7] =	83.56	(79)
Southwest0.9x	0.77	x	3.24	x	113.91		0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	3.24	×	113.91		0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	3.24	x	113.91		0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	3.24	x	104.39]	0.45	x	0.7] =	73.83	(79)
Southwest0.9x	0.77	x	3.24	x	104.39]	0.45	x	0.7	=	73.83	(79)
Southwest0.9x	0.77	x	3.24	x	104.39]	0.45	x	0.7	=	73.83	(79)
Southwest0.9x	0.77	x	3.24	x	92.85]	0.45	x	0.7	=	65.67	(79)
Southwest0.9x	0.77	x	3.24	x	92.85]	0.45	x	0.7	=	65.67	(79)
Southwest0.9x	0.77	x	3.24	x	92.85]	0.45	x	0.7	=	65.67	(79)
Southwest0.9x	0.77	x	3.24	x	69.27]	0.45	x	0.7	=	48.99	(79)
Southwest0.9x	0.77	x	3.24	x	69.27]	0.45	x	0.7] =	48.99	(79)
Southwest0.9x	0.77	x	3.24	x	69.27]	0.45	x	0.7	=	48.99	(79)
Southwest0.9x	0.77	x	3.24	x	44.07]	0.45	x	0.7	=	31.17	(79)
Southwest0.9x	0.77	x	3.24	x	44.07]	0.45	x	0.7] =	31.17	(79)
Southwest0.9x	0.77	x	3.24	x	44.07]	0.45	x	0.7	=	31.17	(79)
Southwest0.9x	0.77	x	3.24	x	31.49]	0.45	x	0.7	=	22.27	(79)
Southwest0.9x	0.77	x	3.24	x	31.49]	0.45	x	0.7	=	22.27	(79)
Southwest0.9x	0.77	x	3.24	x	31.49]	0.45	x	0.7	=	22.27	(79)
Northwest 0.9x	0.77	x	3.24	x	11.28	×	0.45	x	0.7	=	7.98	(81)
Northwest 0.9x	0.77	x	3.24	×	11.28	×	0.45	x	0.7] =	7.98	(81)
Northwest 0.9x	0.77	x	6	x	11.28	x	0.45	x	0.7	=	14.78	(81)

Northwest 0.9x	0.77	x	3.24	x	22.97	x	0.45	x	0.7	=	16.24	(81)
Northwest 0.9x	0.77	x	3.24	x	22.97	x	0.45	x	0.7	i =	16.24	(81)
Northwest 0.9x	0.77	x	6	x	22.97	x	0.45	x	0.7	=	30.08	(81)
Northwest 0.9x	0.77	x	3.24	x	41.38	x	0.45	x	0.7	i =	29.27	(81)
Northwest 0.9x	0.77	x	3.24	x	41.38] x	0.45	x	0.7	i =	29.27	(81)
Northwest 0.9x	0.77	x	6	x	41.38	x	0.45	x	0.7	=	54.2	(81)
Northwest 0.9x	0.77	x	3.24	×	67.96	x	0.45	x	0.7	=	48.06	(81)
Northwest 0.9x	0.77	x	3.24	×	67.96	×	0.45	x	0.7	=	48.06	(81)
Northwest 0.9x	0.77	x	6	x	67.96	x	0.45	x	0.7	 =	89.01	(81)
Northwest 0.9x	0.77	x	3.24	x	91.35	x	0.45	x	0.7	=	64.61	(81)
Northwest 0.9x	0.77	x	3.24	×	91.35	x	0.45	x	0.7	=	64.61	(81)
Northwest 0.9x	0.77	x	6	×	91.35	x	0.45	x	0.7	=	119.64	(81)
Northwest 0.9x	0.77	x	3.24	×	97.38	x	0.45	x	0.7	=	68.88	(81)
Northwest 0.9x	0.77	x	3.24	×	97.38	x	0.45	x	0.7	=	68.88	(81)
Northwest 0.9x	0.77	x	6	×	97.38	x	0.45	x	0.7	=	127.55	(81)
Northwest 0.9x	0.77	x	3.24	x	91.1	x	0.45	x	0.7	=	64.43	(81)
Northwest 0.9x	0.77	x	3.24	x	91.1	x	0.45	x	0.7	=	64.43	(81)
Northwest 0.9x	0.77	x	6	X	91.1	x	0.45	х	0.7	=	119.32	(81)
Northwest 0.9x	0.77) x	3.24	x	72.63	x	0.45	x	0.7	=	51.37	(81)
Northwest 0.9x	0.77	x	3.24	x	72.63] ×	0.45	x	0.7	=	51.37	(81)
Northwest 0.9x	0.7 <mark>7</mark>] x	6	x	72.63	x	0.45	x	0.7	=	95.12	(81)
Northwest 0.9x	0.77] x	3.24	x	50.4 <mark>2</mark>	x	0.45	x	0.7	=	35.66	(81)
Northwest 0.9x	0.77] x	3.24	x	50.42] x	0.45	x	0.7	=	35.66	(81)
Northwest 0.9x	0.77	x	6	x	50.42	x	0.45	x	0.7	=	66.04	(81)
Northwest 0.9x	0.77	x	3.24	x	28.07	x	0.45	x	0.7	=	19.85	(81)
Northwest 0.9x	0.77	x	3.24	x	28.07	x	0.45	x	0.7	=	19.85	(81)
Northwest 0.9x	0.77	x	6	x	28.07	x	0.45	x	0.7	=	36.76	(81)
Northwest 0.9x	0.77	x	3.24	x	14.2	x	0.45	x	0.7	=	10.04	(81)
Northwest 0.9x	0.77	x	3.24	x	14.2	x	0.45	x	0.7	=	10.04	(81)
Northwest 0.9x	0.77	x	6	x	14.2) x	0.45	x	0.7	=	18.59	(81)
Northwest 0.9x	0.77	x	3.24	×	9.21	x	0.45	x	0.7	=	6.52	(81)
Northwest 0.9x	0.77	x	3.24	×	9.21	x	0.45	x	0.7	=	6.52	(81)
Northwest 0.9x	0.77	x	6	x	9.21	x	0.45	x	0.7	=	12.07	(81)

Solar g	ains in	watts, ca	alculated	for eacl	n month			(83)m = 5	um(74)m .	(82)m				
(83)m=	108.81	195.55	294.68	410.58	501.38	516	489.88	419.36	334.38	223.44	132.19	91.91		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	583.93	S in Watts, calculated for each month (63)II = Sun(74)III(62)III 3.81 195.55 294.68 410.58 501.38 516 489.88 419.36 334.38 223.44 132.19 91.91 s - internal and solar (84)m = (73)m + (83)m , watts 3.93 668.48 752.36 843.5 908.92 899.24 857.42 793.23 721.04 635.08 572.56 554.07 Internal temperature (heating season) curre during heating periods in the living area from Table 9, Th1 (°C) 1 factor for gains for living area, h1,m (see Table 9a) 21 Apr 4 A								(84)				
7. Me	7. Mean internal temperature (heating season)													
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(86)m=	0.96	0.94	0.89	0.79	0.64	0.47	0.34	0.39	0.6	0.83	0.93	0.97		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	19.66	19.89	20.23	20.62	20.86	20.97	20.99	20.99	20.92	20.59	20.07	19.62		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	20.33	20.33	20.33	20.34	20.35	20.36	20.36	20.36	20.35	20.35	20.34	20.34		(88)
Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)		-				
(89)m=	0.95	0.93	0.87	0.76	0.6	0.42	0.3	0.33	0.56	0.81	0.93	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.5	18.84	19.32	19.86	20.18	20.33	20.35	20.35	20.27	19.84	19.11	18.46		(90)
-						-	-	-	f	iLA = Livin	g area ÷ (4	ł) =	0.32	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	LA x T1	+ (1 – fL	A) × T2					
(92)m=	18.87	19.17	19.61	20.1	20.4	20.53	20.55	20.55	, 20.47	20.08	19.41	18.83		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.87	19.17	19.61	20.1	20.4	20.53	20.55	20.55	20.47	20.08	19.41	18.83		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the r	mean int	ernal ter	mperatur	re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation factor for gains using Table 9a														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	1:										
(94)m=	0.94	0.91	0.86	0.75	0.61	0.44	0.31	0.35	0.56	0.8	0.91	0.95		(94)
Usefu	l gains,	hmGm .	, W = (9	4)m x (8₄	4)m									
(95)m=	549.53	609.56	645.71	636.24	551.05	391.95	266.63	277.57	407.37	507.88	521.77	525.59		(95)
Month	ily avera	age exte	rnal tem	perature	e from Ta	able 8								(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for mea	an interr	al tempe	erature,	Lm , VV =	=[(39)m : L	x [(93)m·	– (96)m		000.05	4000.07		(07)
(97)m=	1045.95	1020.73	933.67	781.63	604.38	403.48	269.12	281.39	437.28	658.63	862.85	1033.37		(97)
Space	e neatin	g require		r each m	1000000000000000000000000000000000000		$\ln = 0.02$	24 X [(97)m – (95)mj x (4 ⁻	1)m	277 70		
(90)11=	309.33	270.31	214.24	104.00	39.07	0	0	U Tata	0	(1))(1)	240.00	577.79	4700 70	(08)
								Tota	i per year	(kvvn/year) = Sum(9)	5)15,912 =	1739.76	(90)
Space	e heatin	g require	ement in	kWh/m ²	/year								17.39	(99)
9b. Ene	ergy rec	luiremer	nts – Coi	mmunity	heating	scheme)							
This pa	art is use	ed for sp	ace hea	ting, spa	ace cool	ing or wa	ater heat	ting prov	ided by	a comm	unity sch	ieme.		
Fractio	n of spa	ace heat	from se	condary/	/supplen	nentary l	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	' system	1 – (301	1) =						1	(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sou	rces. The p	procedure	allows for	CHP and u	up to four o	other heat	sources; tl	ne latter	
Fractio	boilers, h	eat pumps at from C	s, geotheri Commun	nal and wa ity heat i	aste heat f DUMD	rom powei	r stations.	See Appei	ndıx C.			I	1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pum	C			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ting svs	tem		l	1	(305)
Distribu	ution los	s factor	(Table 1	I2c) for c	commun	ity heatii	ng syste	m				l	1.2	(306)
Snaco	hostin	r		,								l	k\Mb/v	ar
Annual	space	a heating	requiren	nent								I	1739 76	
	59000											l	1100.10	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	2087.72	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Apper	idix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2212.71]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2655.26	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	47.43	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from ou	tside		226.36	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	226.36	(331)
Energy for lighting (calculated in Appendix L)			403.66	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3</mark>)
Total delivered energy for all uses (307) + (309) + (310) + (312) +	(315) + (331) + (33	32)(237b) =	4642.91	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO <mark>2/yea</mark> r	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	ro fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(31)	0b)] x 100 ÷ (367b) x	0.52	1183.46	(367)
Electrical energy for heat distribution [(31	3) x	0.52	24.62	(372)
Total CO2 associated with community systems (36)	3)(366) + (368)(37	2) =	1208.08	(373)
CO2 associated with space heating (secondary) (30	9) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantaneou	s heater (312) x	0.52 =	0	(375)
Total CO2 associated with space and water heating (37	3) + (374) + (375) =		1208.08	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52 =	117.48	(378)
CO2 associated with electricity for lighting (33)	2))) x	0.52 =	209.5	(379)
Energy saving/generation technologies (333) to (334) as applicable Item 1	e	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			1156.15	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			11.56	(384)
El rating (section 14)			89.32	(385)

User Details:													
Assessor Name: Software Name:	Stroma FSAP	2012		Stroma Softwa	a Num Ire Ver	ber: sion:	-1	Versio	n: 1.0.5.49				
A dalaa a a	C. Block C. Llon	P Class Lar	roperty /	Address:	BIOCK C	; - Top F	loor						
Address :	C, BIOCK C, Han	i Close, Lon	don, TW	/10									
Ground floor			Area 5	a(m²) 4.95	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 137.38	(3a)			
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)-	+(1e)+(1r	I) 5	4.95	(4)								
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	137.38	(5)			
2. Ventilation rate:								•		_			
Number of chimneys Number of open flues	main heating 0	secondar heating	y] + [] + [other 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)			
Number of intermittent fai	าร					0	x ′	10 =	0	(7a)			
Number of passive vents					Г	0	x ′	10 =	0	(7b)			
Number of flueless gas fi	0 anges per hor	(7c)											
Infiltration due to chimney If a pressurisation test has be Number of storeys in th	0](8)](9)											
Additional infiltration Structural infiltration: 0.	25 for steel or tim	per frame or	0.35 for	masonr	y constr	uction	[(9)	-1]x0.1 =	0	(10) (11)			
if both types of wall are pr deducting areas of openin If suspended wooden fl	esent, use the value c gs); if equal user 0.35 loor, enter 0.2 (un:	orresponding to sealed) or 0.	the greate	er wall area ed), else	a <i>(after</i> enter 0				0	(12)			
If no draught lobby, ent	er 0.05, else ente	0							0	(13)			
Percentage of windows	and doors draug	nt stripped							0	(14)			
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)			
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)			
Air permeability value,	q50, expressed in	cubic metre	s per ho	our per so	quare m	etre of e	nvelope	area	4	(17)			
If based on air permeabili	ty value, then (18)	$= [(17) \div 20] + (8)$	3), otherwi	se (18) = (16) moobilituu	ia haina w	and		0.2	(18)			
Number of sides sheltere	d	a nas been uun	le ol a deg	liee all pei	ineability i	s being us	seu		1	(19)			
Shelter factor	-			(20) = 1 - [0.075 x (1	9)] =			0.7	(20)			
Infiltration rate incorporati	ing shelter factor			(21) = (18)	x (20) =				0.14	(21)			
Infiltration rate modified for	or monthly wind sp	eed						ľ		-			
Jan Feb	Mar Apr N	lay Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind sp	eed 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	2)m ÷ 4								L				
(22a)m= 1.27 1.25	1.23 1.1 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18					

Adjuste	Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m													
<u> </u>	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate etter	ctive air	change	rate for t	he applic	cable ca	se						0.5	(220)
lf exh	aust air h	eat pump i	using App	endix N (2	3b) = (23a) x Fmv (e	equation (N	(5)) othe	rwise (23h) = (23a)			0.5	(234)
lf bala	anced with	heat reco	overv: effic	iency in %	allowing fo	or in-use f	actor (from	n Table 4h) =) = (20u)			0.5	(230)
		d moob			with hor)- .))))))	00h) [/	1 (22-)	/6.5	(230)
a) II								1K) (248	(24)	$\frac{20}{10.27}$	230) × [1 - (230)) - 100j]	(24a)
(24a)III=	0.5	0.29	0.29		0.27	0.25	0.25	0.25).20		0.27	0.20	J	(2-14)
D) II	balance				without	neat rec		//v) (240	$p_{\rm m} = (22)$	2) + m(a2	230)		1	(24b)
(240)m=		0	0		0	0	0	0		0	0	0	J	(240)
C) If	whole h f (22h)n	ouse ex	tract ver	tilation c	or positiv (23b)	e input \): otherv	vise (24)	on from (c) - (22k	hot the muther hot the muther hot the hot th	5 v (23h))			
(24c)m =	0		0		0 0		0	$\frac{0}{0} = \frac{22x}{2}$,, 0	0	1	(24c)
d) If	notural	vontilati					vontilatio		oft	Ů	Ů	Ů	J	x - y
u) ii	f (22b)n	n = 1, the	en (24d)	m = (22k)	b)m othe	rwise (2	4d)m = 0	0.5 + [(2	2b)m ² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in box	(25)				4	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
									I				1	
3. He	at losse	s and he	eat loss	paramete	er:							1 -1		
ELEN		Gros area	65 (m²)	Openin	gs 2	Net Ar	ea n²	U-valu W/m2	le K	AXU (W/I	K)	k-value	e K	A X K kJ/K
Doors						1.91	T x	1	= [1.91	, 			(26)
Window		e 1				6.72		/[1/(1.2)+	0.041 =	7.69	Ħ			(27)
Window		2				2.42		/[1/(1 2)+	0.041 -	2.70	H			(27)
Window		3				2.43		/[1/(1 2)+		0.70	H			(27)
Windo	wa Tupe	. 1				2.43		/[1/(1.2))	0.041	2.78				(27)
	ws type Eurod	; 4				6.72	×''	/[I/(I.2) +	0.04] =	7.69				(27)
vvalis	i ype i	32.	7	18.3		14.4	×	0.16	= [2.3			\dashv	(29)
Walls	l ype2	32.	7	1.91		30.79) X	0.15	= [4.63				(29)
Roof		54.9	95	0		54.95	j X	0.1	=	5.5				(30)
Total a	rea of e	lements	, m²			120.3	5							(31)
Party v	vall					21.15	j x	0	=	0				(32)
Party f	loor					54.95	;							(32a)
* for win ** includ	dows and e the area	roof wind as on both	ows, use e sides of ir	effective wil nternal wall	ndow U-va 's and parti	lue calcula itions	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	h 3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				35.2	9 (33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	4051.	01 (34)
Therma	al mass	parame	ter (TMF	⁻ = Cm ÷	- TFA) in	kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be u	gn assess ised inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	constructi	on are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						19.6	1 (36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3 ⁻	1)								
Total fa	abric he	at loss							(33) +	(36) =			54.9	1 (37)

Ventila	ation hea	at loss ca	alculated	d monthl	у		(38)m = 0.33 × (25)m × (5)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	13.42	13.26	13.1	12.31	12.15	11.36	11.36	11.2	11.67	12.15	12.47	12.78		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	68.33	68.17	68.01	67.22	67.06	66.26	66.26	66.1	66.58	67.06	67.37	67.69		
Heat l	nss nara	meter (l	HIP) W	/m²K	-				(40)m	Average = = (39)m ÷	Sum(39)₁. · (4)	12 /12=	67.18	(39)
(40)m=	1.24	1.24	1.24	1.22	1.22	1.21	1.21	1.2	1.21	1.22	1.23	1.23		
		I	I	I	I	Į	Į	I	<u>ا</u>	Average =	Sum(40)1	12 /12=	1.22	(40)
Numb	er of day	/s in mo	nth (Tab	le 1a)		-	-		-					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum if TF if TF	ned occu A > 13.9 A £ 13.9	upancy, 9, N = 1 9, N = 1	N + 1.76 ×	([1 - exp	o(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13	.9)	84		(42)
Annua Reduce	I averag	je hot wa a <i>l average</i>	ater usag hot water	ge in litre usage by	es per da 5% if the c	ay Vd,av Iwelling is	erage = designed i	(25 x N) to achieve	+ 36 a water us	se target o	f 77	7.8		(43)
not mor	e that 125	litres per	person pe	r day (all w	ater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er u <mark>sage i</mark>	n litres pei	r day for ea	ach m <mark>onth</mark>	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	<mark>8</mark> 5.58	82.47	79.36	76.25	73.13	70.02	70.02	73.13	76.25	79.36	82.47	<mark>8</mark> 5.58		_
Energy	content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600	- kWh/mor	Tota <mark>l = Su</mark> oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	933.63	(44)
(45)m=	126.92	111	114.54	99.86	95.82	82.69	76.62	87.92	88.97	10 <u>3.69</u>	113.19	122.91		
lf instan	taneous v	vater heati	na at noin:	t of use (no	hot water	r storage)	enter () in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1224.14	(45)
(<u>46</u>)m-		16 65	17 19		14 27	12.4	11 40	12 10	12.25	15 55	16.09	19.44	1	(46)
Water	storage	loss:	17.10	14.90	14.57	12.4	11.49	13.19	15.55	15.55	10.90	10.44		(40)
Storag	je volum	e (litres)) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com Otherv Water	munity h vise if no storage	neating a o stored loss:	and no ta hot wate	ank in dw er (this ir	velling, e ncludes i	nter 110 nstantar) litres in neous co	(47) ombi boil	ers) ente	er '0' in (47)			
a) If n	nanufact	urer's d	eclared l	loss fact	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	e 2b								0		(49)
Energ	y lost fro	om water urer's de	r storage eclared (e, kWh/ye cvlinder	ear loss fact	or is not	known:	(48) x (49)) =		1	10		(50)
Hot wa	ater stor	age loss	factor f	rom Tab	le 2 (kW	h/litre/da	ay)				0.	02		(51)
If com	munity h	neating s	see secti	on 4.3										
Volum	e factor	from Ta	ble 2a	OL							1.	.03		(52)
rempe	erature f	actor tro	In Table						(50)	0	.6		(53)
Energ	y lost fro (50) or $\frac{1}{2}$	m watei (54) in (4	r storage	e, kWh/y	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Wator	storage		culated	for each	month			((56)m - (55) × (41)	m	1.	03		(55)
(56)~		1033 Cal			22.04	20.00	22.04		20, 2, (41)	22.04	20.00	22.04		(56)
(50)11=	32.01	20.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(00)

If cylinde	er contain	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	inual) fro	om Table	93							0		(58)
Primar	y circuit	loss cal	culated f	for each	month (59)m = ((58) ÷ 36	5 × (41)	m				·	
(moc	dified by	/ factor fr	om Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41)	m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	182.19	160.93	169.82	153.36	151.1	136.18	131.9	143.2	142.47	158.97	166.68	178.19		(62)
Solar DH	IW input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	v) (enter '0'	if no sola	r contributi	ion to wate	er heating)	I	
(add ad	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies,	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	182.19	160.93	169.82	153.36	151.1	136.18	131.9	143.2	142.47	158.97	166.68	178.19		_
								Outp	out from wa	ater heate	r (annual)₁	12	1874.98	(64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	86.42	76.85	82.31	76	76.08	70.29	69.7	73.46	72.38	78.7	80.43	85.09		(65)
inclu	de (57)	m in calc	culation of	of (6 <mark>5</mark>)m	only i <mark>f</mark> c	ylinder is	s in th <mark>e</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	91.79	91.79	91.79	91. <mark>7</mark> 9	91.79	91.79	91.79	91.79	91.79	9 <mark>1.79</mark>	91.79	91.79		(66)
Lightin	g gains	(calculat	ted in Ap	pendix	L, equati	on L9 oi	r L9a), a	lso see	Table 5				1	
(67)m=	14.27	12.67	10.31	7.8	5.83	4.92	5.32	6.92	9.28	11.79	13.76	14.67		(67)
Appliar	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5			I	
(68)m=	160.06	161.72	157.53	148.62	137.37	126.8	119.74	118.08	122.27	131.18	142.42	152.99		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5			I	
(69)m=	32.18	32.18	32.18	32.18	32.18	32.18	32.18	32.18	32.18	32.18	32.18	32.18		(69)
Pumps	and fa	ns gains	(Table 5	5a)]	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.a. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)					1		1	
(71)m=	-73.44	-73.44	-73.44	-73.44	-73.44	, -73.44	-73.44	-73.44	-73.44	-73.44	-73.44	-73.44		(71)
Water	heating	dains (T	able 5)										1	
(72)m=	116.16	114.36	110.63	105.55	102.26	97.62	93.68	98.73	100.53	105.78	111.71	114.37	1	(72)
Total i	nternal	gains =				(66)	m + (67)m	+ (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m	ł	
(73)m=	341.02	339.29	329.01	312.52	296.01	279.89	269.28	274.27	282.61	299.28	318.43	332.57		(73)
6. <u>So</u> l	ar gains	S:									I			
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	iated equa	tions to co	nvert to th	e applicab	ole orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	x		a		FF		Gains	

Table 6b

Table 6c

Table 6a

m²

Table 6d

(W)

Couthoost		1		1		1		1		1		– –
Southeast 0.9x	0.77	X	6.72	x	36.79	X	0.45	X	0.7	=	53.97	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	X	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	6.72	x	36.79	x	0.45	x	0.7	=	53.97	(77)
Southeast 0.9x	0.77	x	6.72	x	62.67	x	0.45	x	0.7	=	91.94	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	6.72	x	62.67	x	0.45	x	0.7] =	91.94	(77)
Southeast 0.9x	0.77	x	6.72	x	85.75	x	0.45	x	0.7] =	125.79	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	6.72	x	85.75	x	0.45	x	0.7	=	125.79	(77)
Southeast 0.9x	0.77	x	6.72	x	106.25	x	0.45	x	0.7] =	155.86	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	x	0.45	x	0.7] =	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	x	0.45	x	0.7] =	56.36	(77)
Southeast 0.9x	0.77	x	6.72	x	106.25	x	0.45	x	0.7	=	155.86	(77)
Southeast 0.9x	0.77	x	6.72	x	119.01	x	0.45	x	0.7	=	174.58	(77)
Southeast 0.9x	0.77	x	2.43	X	119.01	х	0.45	х	0.7	=	63.13	(77)
Southeast 0.9x	0.77] x	2.43	x	119.01	x	0.45	x	0.7] =	63.13	(77)
Southeast 0.9x	0.77	x	6.72	x	119.01] ×	0.45	x	0.7	=	174.58	(77)
Southeast 0.9x	0.7 <mark>7</mark>] x	6.72	x	118.15	x	0.45	x	0.7	=	173.32	(77)
Southeast 0.9x	0.77] x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	6.72	x	118.15	x	0.45	x	0.7] =	173.32	(77)
Southeast 0.9x	0.77	x	6.72	x	113.91	x	0.45	x	0.7] =	167.1	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	6.72	x	113.91	x	0.45	x	0.7	=	167.1	(77)
Southeast 0.9x	0.77	x	6.72	x	104.39	x	0.45	x	0.7	=	153.13	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	6.72	x	104.39	x	0.45	x	0.7	=	153.13	(77)
Southeast 0.9x	0.77	x	6.72	x	92.85	x	0.45	x	0.7] =	136.21	(77)
Southeast 0.9x	0.77	x	2.43	x	92.85	x	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	x	2.43	x	92.85	x	0.45	x	0.7] =	49.25	(77)
Southeast 0.9x	0.77	x	6.72	x	92.85	x	0.45	x	0.7] =	136.21	(77)
Southeast 0.9x	0.77	x	6.72	x	69.27	x	0.45	x	0.7	=	101.61	(77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	=	36.74	(77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	=	36.74	(77)
Southeast 0.9x	0.77	x	6.72	x	69.27	x	0.45	x	0.7	=	101.61	(77)
Southeast 0.9x	0.77	x	6.72	×	44.07	x	0.45	x	0.7] =	64.65	(77)

Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	44	4.07	x		0.45	×	0.7		=	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	2.4	43	x	44	4.07	x		0.45	×	0.7		=	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	6.7	72	x	44	4.07	x		0.45	x	0.7		=	64.65	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	6.7	72	x	3	1.49	x		0.45	x	0.7		=	46.19	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	3	1.49	x		0.45	x	0.7		=	16.7	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	3	1.49	x		0.45	x	0.7		=	16.7	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	6.7	72	x	3	1.49	x		0.45	×	0.7		=	46.19	(77)
Solar g	pains in	watts, ca	alculated	d for eac	h month	<u> </u>			(83)m	1 = SL	um(74)m .	(82)m				I	()
(83)m=	146.98	250.37	342.56	424.45	475.42	4	71.99	455.04	417.	.02	370.92	276.7	1 176.05	125.	79		(83)
l otal g	jains – i	nternal a	and sola	r (84)m = I	= (73)m	+ (8	83)m ,	Watts	004	00	050.54	575.0		450	05	I	(0.4)
(84)m=	488.01	589.66	671.57	736.97	771.43		51.87	724.32	691.	.28	653.54	575.9	9 494.48	458.	35		(64)
7. Me	an inter	nal temp	perature	(heating	g seasor	า)										-	_
Temp	erature	during h	neating p	periods in	n the livi	ng	area f	rom Tab	ole 9,	Th1	1 (°C)					21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	า (s T	ee Tal	ble 9a)			-			-		I	
	Jan	Feb	Mar	Apr	May	-	Jun	Jul	Αι	ug	Sep	Oc	Nov	De	ec		(00)
(86)m=	0.93	0.89	0.83	0.75	0.64		0.5	0.38	0.4	.1	0.58	0.78	0.89	0.9	4		(86)
Me <mark>an</mark>	interna	l temper	ature in	living ar	ea T1 (f	ollo	w step	os 3 to 7	in T	able	e 9c)						
(87)m=	18.83	19.19	19.66	20.17	20.58	2	0.84	20.94	20.9	93	20.75	20.21	19.43	18.7	6		(87)
Temp	erature	during h	neating p	periods i	n rest of	dw	elling	from Ta	able S), Th	12 (°C)						
(88)m=	19.89	19.89	19.89	19.9	19.9	1	9.92	19. <mark>92</mark>	19.9	92	19.91	19.9	19.9	19.8	39		(88)
Util <mark>isa</mark>	ation fac	ctor for g	ains for	rest of d	welling,	h2,	,m (se	e Table	9a)								
(89)m=	0.92	0.87	0.81	0.72	0.59		0.43	0.29	0.3	2	0.52	0.74	0.88	0.9	3		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ling	T2 (fc	ollow ste	eps 3	to 7	in Tabl	e 9c)		-			
(90)m=	17.04	17.55	18.2	18.92	19.45		9.78	19.88	19.8	87	19.68	18.99	17.91	16.9	94		(90)
							•			•	f	LA = Li	/ing area ÷ (4) =		0.41	(91)
Mean	interna	l temper	ature (fo	or the wh	nole dwe	ellin	a) = fL	A x T1	+ (1 -	– fL	A) x T2						
(92)m=	17.77	18.22	18.8	19.43	19.91	2	20.21	20.31	20.	.3	20.12	19.49	18.53	17.6	69		(92)
Apply	v adjustr	nent to t	he mear	n interna	l tempe	ratu	ire froi	m Table	e 4e, v	whe	re appro	opriate	I ;			1	
(93)m=	17.77	18.22	18.8	19.43	19.91	2	20.21	20.31	20.	.3	20.12	19.49	18.53	17.6	69		(93)
8. Sp	ace hea	iting requ	uiremen	t													
Set T the ut	i to the ilisation	mean int	ernal ter or gains	mperatu using Ta	re obtaii able 9a	ned	l at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti,m	=(76)m an	d re-	calo	ulate	
	Jan	Feb	Mar	Apr	Мау		Jun	Jul	Αι	ug	Sep	Oct	Nov	De	эс		
Utilisa	ation fac	tor for g	ains, hr	n:		-										1	
(94)m=	0.89	0.85	0.79	0.7	0.59	(0.45	0.32	0.3	5	0.53	0.73	0.85	0.9)		(94)
Usefu	Il gains,	hmGm	, W = (9	4)m x (8	4)m	T -	<u></u> 1									I	
(95)m=	434.96	499.16	528.74	516.54	453.61	3	37.51	235.36	244.	.37	345.88	419.3	420.73	413.	68		(95)
	niy aver	age exte						16.6	16	4	111	10.6	71	1	<u>,</u>		(96)
Heat	loss rate	a for me	an interr	l ^{0.9}			<u>''''' </u>	-[(30)m	x [(0?	 3)m	- (96)m	1	'.'	4.2		l	(30)
(97)m=	920.4	908.1	836.34	707.93	550.76		371.9	246.12	258.	.03	400.58	J 596.3	2 770.27	912.	86		(97)
Space	L heatin	g require	ement fo	r each n	nonth, k	Wh	/mont	h = 0.02	24 x [(97)	m – (95)m] x	 (41)m	L		ł	
(98)m=	361.16	274.81	228.86	137.8	72.28	Τ	0	0	0		0	131.6	8 251.67	371.	39		

	Total per v	ear (kWh/year) = Sum(98)	5.912 =	1829.65	(98)
Space heating requirement in kWh/m ² /year			,012	33.3](99)
9h Energy requirements – Community heating s	heme				
This part is used for space heating, space cooling	or water heating provided	by a community schem	าย.		
Fraction of space heat from secondary/suppleme	ntary heating (Table 11) '0'	if none		0	(301)
Fraction of space heat from community system 1	– (301) =			1	(302)
The community scheme may obtain heat from several source includes boilers, heat pumps, geothermal and waste heat from Eraction of heat from Community heat pump	s. The procedure allows for CHP and the procedure allows for CHP and the procedure of the process of the proces	and up to four other heat sou	rces; the	latter	7(3032)
Fraction of total space heat from Community heat	toumo	(302) x (303a) -		1	$]^{(300a)}$
Factor for control and charging method (Table 4c	(3)) for community beating	(002) × (0000) -		1](0044)](305)
Distribution loss factor (Table 12c) for community		system		1.0	
Space besting	nearing system				
Annual space heating requirement			Г	1829.65	٦
Space heat from Community heat pump	(98)	x (304a) x (305) x (306) =		2195.58	_](307a)
Efficiency of secondary/supplementary heating s	vstem in % (from Table 4a o	or Appendix E)		0	_](308
Space heating requirement from secondary/supp	ementary system (98)	x (301) x 100 ÷ (308) =		0	_ (309)
Water heating Annual water heating requirement				1874.98	
If DHW from community scheme: Water heat from Community heat pump	(64)	x (303a) x (305) x (306) =	Г	2249.97](310a)
Electricity used for heat distribution	0.01 × [(30)7a)(3 <mark>07e) +</mark> (310a)(310	e)] =	44.46	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system,	if not enter 0) = (10	07) ÷ (314) =		0	(315)
Electricity for pumps and fans within dwelling (Ta mechanical ventilation - balanced, extract or posi	ble 4f): tive input from outside			117.32	_ (330a)
warm air heating system fans			Γ	0	_ (330b)
pump for solar water heating			Γ	0	_](330g)
Total electricity for the above, kWh/year	=(33	0a) + (330b) + (330g) =		117.32	_ (331)
Energy for lighting (calculated in Appendix L)				252] (332)
Electricity generated by PVs (Appendix M) (nega	tive quantity)			-730.07	(333)
Total delivered energy for all uses (307) + (309) -	- (310) + (312) + (315) + (3	31) + (332)(237b) =		4084.8	(338)
12b. CO2 Emissions – Community heating scher	ne				
	Energy kWh/ye	Emission fa ar kg CO2/kWh	ctor Er ı kç	nissions J CO2/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	ing (not CHP) there is CHP using two fuels repe	at (363) to (366) for the seco	nd fuel	208	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100÷	(367b) x 0.52] =	1109.25] (367)

Electrical energy for heat distribution

23.07

0.52

(372)

Total CO2 associated with community s	ystems	(363)(366) + (368)(372	2)	=	1132.32	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1132.32	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	60.89	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	130.79	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	cable	0.52 × 0	0.01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				945.09	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				17.2	(384)
El rating (section 14)					87.33	(385)

User Details:													
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49				
			ropeny /	Address: /10	BIOCK L	- Groui	na Fioor						
Address : 1 Overall dwelling dimen	Sions:	JUSE, LUII	uon, i v	/10									
Ground floor			Area 8	a(m²) 9.26	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 223.15](3a)			
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1r	n) 8	9.26	(4)								
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	.(3n) =	223.15	(5)			
2. Ventilation rate:		-		_									
Number of chimneys Number of open flues	main neating 0 + 0 + 0 +	secondar heating 0 0	y] + [] + [0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)			
Number of intermittent fan	S					0	X .	10 =	0	(7a)			
Number of passive vents	0	(7b)											
Number of flueless gas fire	0	(7c)											
Infiltration due to chimneys	0	(8)											
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dwelling (ns) 25 for steel or timbe	r frame or	0.35 for	· masonr	ry constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)			
if both types of wall are pre deducting areas of opening If suspended wooden flo	sent, use the value corre s); if equal user 0.35 oor, enter 0.2 (unse	esponding to aled) or 0.	the great	er wall are ed), else	a (after enter 0				0	⊐](12)			
If no draught lobby, ente	er 0.05, else enter 0								0	(13)			
Percentage of windows	and doors draught	stripped							0	(14)			
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)			
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)			
Air permeability value, q	50, expressed in cu	ubic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)			
If based on air permeabilit	y value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)			
Air permeability value applies	if a pressurisation test h	as been dor	ie or a deg	gree air pei	rmeability	is being u	sed						
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.7	(19)			
Infiltration rate incorporatir	ng shelter factor			(21) = (18)) x (20) =				0.14](21)			
Infiltration rate modified for monthly wind speed													
Jan Feb M	/lar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind spe	ed from Table 7	•											
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7													
Wind Factor (22a)m = (22))m ÷ 4	•											
(22a)m= 1.27 1.25 1.	23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]				

Adjuste	ed infiltr	ation rat	e (allow	ing for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate effe	ctive air	change	rate for t	he appli	cable ca	se						0.5	(22.0)
lf exh	aust air h	eat nump i	using App	endix N (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) othe	rwise (23h	(23a) = (23a)			0.5	(234)
lf bala	inced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use fa	actor (fron	n Table 4h) =	<i>,)</i> = (200)			0.5	(230)
a) If	halance	d mech	anical ve	ntilation	with he	at recove	⊃rv (M\/I	-IR) (24s	/ a)m – (2 [,]	2h)m + ('	23h) 🗙 [[,]	1 – (23c)	76.5 ∸ 1001	(230)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28	÷ 100]	(24a)
b) If	balance	d mech	ı anical ve	I entilation	without	heat rec	L coverv (N	I //V) (24b	m = (2)	1 2b)m + (;	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If y	whole h	u ouse ex	tract ver	ntilation of	n pripositiv	re input v	ı ventilatio	n from c	utside					
i	f (22b)n	n < 0.5 ×	< (23b), t	then (24d	c) = (23b); otherv	wise (24	c) = (22k	o) m + 0	.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	-				
i I	f (22b)n	n = 1, th	en (24d) 1	m = (22l	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		1	I	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24k	o) or (240	c) or (24	d) in box	k (25)			1	I	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. Hea	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		G <mark>ros</mark> are <mark>a</mark>	ss (m²)	Openin m	gs I ²	Net Ar A ,r	ea n²	U-valı W/m2	ue !K	A X U (VV/ł	<)	k-value kJ/m²·l	€ ≺	A X k kJ/K
Doo <mark>rs</mark>						1.91	x	1	=	1.91				(26)
Win <mark>do</mark> v	ws Type	e 1				1.44	x1	/[1/(1.2)+	0.04] =	1.65				(27)
Windov	ws Type	92				3.24	x1	/[1/(1.2)+	0.04] =	3.71				(27)
Window	ws Type	e 3				4.2	x1	/[1/(1.2)+	0.04] =	4.81	5			(27)
Window	ws Type	e 4				6		/[1/(1.2)+	0.04] =	6.87				(27)
Window	ws Type	e 5				2.43		/[1/(1.2)+	0.04] =	2.78				(27)
Window	ws Type	e 6				4.08		/[1/(1.2)+	0.04] =	4.67	_			(27)
Window	ws Type	e 7				2.43		/[1/(1.2)+	0.04] =	2.78	=			(27)
Floor						89.26	3 X	0.1	=	8.92600	1			(28)
Walls 1	Type1	66	3	23.8	2	42.18	3 X	0.16		6.75	-		$\exists \vdash$	(29)
Walls 1	ype2	38.	9	1.91		36.99) x	0.15		5.56	= i		\dashv	(29)
Total a	rea of e	lements	s, m²			194.1	6				L			(31)
Party w	vall					15.85	5 X	0	=	0				(32)
Partv c	eilina					89.26					L		\dashv	(32b)
* for wind	dows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	ı formula 1	/[(1/U-valı	ue)+0.04] a	L s given in	paragraph	L 3.2	(0_0)
Fabric	heat los	s, W/K :	= S (A x	U)	is anu pali			(26)(30)) + (32) =				50.42	(33)

Heat capacity $Cm = S(A \times k)$

Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K

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

(34)

(35)

13922.18

100

((28)...(30) + (32) + (32a)...(32e) =

Indicative Value: Low

can be ι	used inste	ad of a dei	tailed calc	ulation.										
Therm	al bridge	əs : S (L	x Y) cal	culated	using Ap	pendix l	K						14.23	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			64.65	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	21.8	21.54	21.28	19.99	19.74	18.45	18.45	18.19	18.96	19.74	20.25	20.77		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	86.45	86.19	85.93	84.64	84.39	83.1	83.1	82.84	83.61	84.39	84.9	85.42		
										Average =	Sum(39)1.	12 /12=	84.58	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K		-	-	-	(40)m	= (39)m ÷	- (4)			
(40)m=	0.97	0.97	0.96	0.95	0.95	0.93	0.93	0.93	0.94	0.95	0.95	0.96		
Numb	or of dou	in mor	oth (Tab	10 10)			-			Average =	Sum(40)1.	12 /12=	0.95	(40)
Numbe		Eab	Mar		May	lup	1.1	Δυσ	Son	Oct	Nov	Dec		
(11)m-	21	29	21	20	111ay	20	301 21	7.uy	30 30	21	20	21		(41)
(41)11=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ener	rgy requ	irement:								kWh/ye	ear:	
Assum	ned occu	pancy.	N								2	62		(42)
if TF	A > 13.	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0)013 x (TF <mark>A -1</mark> 3.	.9)	02		~ /
if TF	A £ 13.9	9, N = 1												
Annua	l averag	e hot wa	ater usa	ge in litre	s per da 5% if the c	ay Vd,av Welling is	erage =	(25 x N)	+ 36 a water us	se target o	96	.32		(43)
not more	e that 125	litres per p	person pe	r day (all w	ater use, l	hot and co	ld)		a water ac	be larger e				
	lan	Feb	Mar	Apr	May	lun	lul.	Aug	Sen	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	Jep	OCI		Dec		
(44)m-	105.05	102.1	08.24	04.20	00.54	86.60	86.60	00.54	04.30	08.24	102.1	105.05		
(44)111-	105.55	102.1	30.24	94.59	30.34	00.09	00.03	30.34			m(14) -	105.55	1155.9	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E)))))))))))))))))))	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	1155.0	()
(45)m=	157.12	137.42	141.8	123.63	118.62	102.36	94.85	108.85	110.15	128.36	140.12	152.16		
				1						Total = Su	m(45) ₁₁₂ =	=	1515.44	(45)
lf instan	taneous w	ater heatii	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46,) to (61)					
(46)m=	23.57	20.61	21.27	18.54	17.79	15.35	14.23	16.33	16.52	19.25	21.02	22.82		(46)
Water	storage	loss:												
Storag	e volum	e (litres)	includir	ng any so	plar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	ind no ta	ank in dw	elling, e	nter 110) litres in	(47)						
Otherv	vise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
vvater	storage	loss: uror'o de	olorod	ooo foot	or ia kna							-	1	(40)
а) II II т						wii (kvvi	i/uay).					0		(48)
Tempe	erature i	actor Iro	m rable	2D								0		(49)
Energy	y lost fro	m water	storage	e, kWh/y∉ cylinder l	ear oss fact	or is not	known:	(48) x (49)	=		1	10		(50)
Hot wa	ater stor	ade loss	factor fi	rom Tabl	e 2 (kW	h/litre/da	av)				0	02]	(51)
If com	munity h	leating s	ee secti	on 4.3	- (.,					L0.	02	l	(01)
Volum	e factor	from Tal	ble 2a								1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6	1	(53)

Energy Enter	y lost fro (50) or	om water (54) in (5	• storage 55)	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			. ,
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contain	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 Append	l lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	9 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	212.4	187.34	197.08	177.12	173.9	155.86	150.13	164.12	163.64	183.64	193.61	207.44		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	: H (negati	ve quantity	v) (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 (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	212.4	187.34	197.08	177.12	173.9	155.86	150.13	164.12	163.64	18 <mark>3.6</mark> 4	193.61	207.44		_
								Outp	out from wa	ater heate	r (annual)₁	12	2166.28	(64)
Hea <mark>t g</mark>	lains fro	m water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	96.46	85.63	91.37	83.9	83.66	76.83	75.76	80.41	79.42	86.9	89.38	94.82		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77		(66)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				1	
(67)m=	21.19	18.82	15.31	11.59	8.66	7.31	7.9	10.27	13.79	17.51	20.43	21.78		(67)
Applia	nces ga	ins (calc	ulated ir	Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	1	1	
(68)m=	237.71	240.18	233.96	220.73	204.02	188.32	177.83	175.37	181.58	194.82	211.52	227.22		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m=	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08		(69)
Pumps	s and fa	ns gains	(Table \$	5a)	-	-								
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	on (nega	tive valu	es) (Tab	le 5)				-				
(71)m=	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62		(71)
Water	heating	gains (T	able 5)						-					
(72)m=	129.66	127.43	122.81	116.53	112.45	106.71	101.83	108.08	110.3	116.8	124.15	127.44		(72)
Total i	internal	gains =				(66)	m + (67)m	1 + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	450.79	448.66	434.31	411.08	387.37	364.58	349.8	355.95	367.91	391.36	418.33	438.67		(73)
6. So	lar gains	S:												

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

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.44	x	11.28	x	0.45	x	0.7] =	3.55	(75)
Northeast 0.9x	0.77	x	4.08	x	11.28	x	0.45	x	0.7	i =	10.05	(75)
Northeast 0.9x	0.77	x	1.44	x	22.97	x	0.45	x	0.7	i =	7.22	(75)
Northeast 0.9x	0.77	x	4.08	x	22.97	x	0.45	×	0.7	j =	20.46	(75)
Northeast 0.9x	0.77	x	1.44	x	41.38	x	0.45	x	0.7] =	13.01	(75)
Northeast 0.9x	0.77	x	4.08	x	41.38	x	0.45	×	0.7] =	36.85	(75)
Northeast 0.9x	0.77	x	1.44	x	67.96	x	0.45	×	0.7] =	21.36	(75)
Northeast 0.9x	0.77	x	4.08	x	67.96	x	0.45	×	0.7] =	60.52	(75)
Northeast 0.9x	0.77	x	1.44	x	91.35	x	0.45	×	0.7	=	28.71	(75)
Northeast 0.9x	0.77	x	4.08	x	91.35	x	0.45	×	0.7	=	81.36	(75)
Northeast 0.9x	0.77	x	1.44	x	97.38	x	0.45	×	0.7] =	30.61	(75)
Northeast 0.9x	0.77	x	4.08	x	97.38	×	0.45	×	0.7	=	86.73	(75)
Northeast 0.9x	0.77	x	1.44	x	91.1	x	0.45	x	0.7	=	28.64	(75)
Northeast 0.9x	0.77	x	4.08	x	91.1	x	0.45	x	0.7	=	81.14	(75)
Northeast 0.9x	0.77	x	1.44	x	72.63	x	0.45	×	0.7	j =	22.83	(75)
Northeast 0.9x	0.77	x	4.08	x	72.63	x	0.45	x	0.7	=	64.68	(75)
Northeast 0.9x	0.77	x	1.44	x	50.42	x	0.45	x	0.7	i -	15.85	(75)
Northeast 0.9x	0.77	x	4.08	x	50.42	İ 🖈	0.45	x	0.7] =	44.91	(75)
Northeast 0.9x	0.77	x	1.44	x	28.07	x	0.45	x	0.7	j =	8.82	(75)
Northeast 0.9x	0.77	x	4.08	×	28.07	x	0.45	x	0.7	i =	25	(75)
Northeast 0.9x	0.77	x	1.44	x	14.2	×	0.45	x	0.7	i =	4.46	(75)
Northeast 0.9x	0.77	x	4.08	x	14.2	x	0.45	x	0.7	i =	12.64	(75)
Northeast 0.9x	0.77	x	1.44	×	9.21	x	0.45	×	0.7	=	2.9	(75)
Northeast 0.9x	0.77	x	4.08	x	9.21	x	0.45	×	0.7	=	8.21	(75)
Southeast 0.9x	0.77	x	3.24	x	36.79	x	0.45	×	0.7] =	26.02	(77)
Southeast 0.9x	0.77	x	6	x	36.79	x	0.45	x	0.7] =	48.19	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	– (77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	×	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	3.24	x	62.67	x	0.45	x	0.7] =	44.33	(77)
Southeast 0.9x	0.77	x	6	x	62.67	x	0.45	x	0.7] =	82.09	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	3.24	x	85.75	x	0.45	x	0.7] =	60.65	(77)
Southeast 0.9x	0.77	x	6	x	85.75	x	0.45	x	0.7] =	112.32	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	×	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7] =	45.49	(77)
Southeast 0.9x	0.77	x	3.24	×	106.25	×	0.45	×	0.7] =	75.15	(77)
Southeast 0.9x	0.77	x	6	×	106.25	×	0.45	×	0.7] =	139.17	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	x	0.45	x	0.7] =	56.36	(77)

		1		1	r	1				1		٦
Southeast 0.9x	0.77	X	2.43	X	106.25	X	0.45	х	0.7	=	56.36	_(77)
Southeast 0.9x	0.77	x	3.24	x	119.01	x	0.45	x	0.7	=	84.17	(77)
Southeast 0.9x	0.77	x	6	x	119.01	x	0.45	x	0.7	=	155.88	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	3.24	x	118.15	x	0.45	x	0.7	=	83.56	(77)
Southeast 0.9x	0.77	x	6	x	118.15	x	0.45	x	0.7	=	154.75	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	3.24	x	113.91	x	0.45	x	0.7	=	80.57	(77)
Southeast 0.9x	0.77	x	6	x	113.91	x	0.45	x	0.7] =	149.19	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	3.24	x	104.39	x	0.45	x	0.7	=	73.83	(77)
Southeast 0.9x	0.77	x	6	x	104.39	x	0.45	x	0.7	=	136.73	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7] =	55.37	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7] =	55.37	(77)
Southeast 0.9x	0.77	x	3.24	X	92.85	х	0.45	х	0.7] =	65.67	(77)
Southeast 0.9x	0.77	x	6	x	92.85	x	0.45	x	0.7] =	121.61	(77)
Sout <mark>heast</mark> 0.9x	0.77	x	2.43	х	92.85] ×	0.45	x	0.7] =	49.25	(77)
Sout <mark>heast</mark> 0.9x	0.77	x	2.43	x	92.85	x	0.45	x	0.7] =	49.25	(77)
Sout <mark>heast _{0.9x}</mark>	0.77	x	3.24	x	69.27	x	0.45	x	0.7	=	48.99	(77)
Sout <mark>heast _{0.9x}</mark>	0.77	x	6	x	69.27	x	0.45	x	0.7	=	90.72	(77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	=	36.74	(77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	=	36.74	(77)
Southeast 0.9x	0.77	x	3.24	x	44.07	x	0.45	x	0.7	=	31.17	(77)
Southeast 0.9x	0.77	x	6	x	44.07	x	0.45	x	0.7	=	57.72	(77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	=	23.38	(77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	=	23.38	(77)
Southeast 0.9x	0.77	x	3.24	x	31.49	x	0.45	x	0.7	=	22.27	(77)
Southeast 0.9x	0.77	x	6	x	31.49	x	0.45	x	0.7	=	41.24	(77)
Southeast 0.9x	0.77	x	2.43	x	31.49	x	0.45	x	0.7	=	16.7	(77)
Southeast 0.9x	0.77	x	2.43	x	31.49	x	0.45	x	0.7] =	16.7	(77)
Southwest _{0.9x}	0.77	x	4.2	x	36.79]	0.45	x	0.7	=	33.73	(79)
Southwest _{0.9x}	0.77	x	4.2	x	62.67]	0.45	x	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	x	4.2	x	85.75]	0.45	x	0.7	=	78.62	(79)
Southwest _{0.9x}	0.77	x	4.2	x	106.25]	0.45	x	0.7	=	97.42	(79)
Southwest <mark>0.9</mark> x	0.77	×	4.2	×	119.01]	0.45	x	0.7	=	109.11	(79)
Southwest _{0.9x}	0.77	×	4.2	×	118.15]	0.45	x	0.7] =	108.32	(79)
Southwest <mark>0.9</mark> x	0.77	×	4.2	×	113.91]	0.45	×	0.7] =	104.44	(79)
Southwest <mark>0.9</mark> x	0.77	×	4.2	×	104.39]	0.45	x	0.7	=	95.71	(79)
-												

Southw	/est <mark>0.9x</mark>	0.77	>	. 4	.2	x	9	2.85]		0.45	x	0.7	=	85.13	(79)
Southw	/est <mark>0.9x</mark>	0.77	,	. 4	.2	x	6	9.27	1		0.45		0.7	=	63.51	(79)
Southw	/est <mark>0.9x</mark>	0.77	>	. 4	.2	x	4	4.07	i		0.45		0.7	=	40.41	(79)
Southw	/est _{0.9x}	0.77	,		.2	x	3	31.49	i		0.45	Ξ×Ϊ	0.7	=	28.87	(79)
	L								4							
Solar g	gains in	watts, ca	alculate	d for ea	ch month	ı			(83)m	n = S	um(74)m .	(82)m				
(83)m=	160.58	278.04	392.43	506.34	585.49	5	89.33	564.82	504	.53	431.68	310.53	193.16	136.89		(83)
Total g	gains – i	nternal a	nd sola	ır (84)m	= (73)m	+ (83)m	, watts							-	
(84)m=	611.37	726.7	826.74	917.42	972.86	9	53.91	914.62	860	.49	799.59	701.89	611.49	575.56		(84)
7. Me	an inter	nal temp	erature	(heatin	g seasor	ר)										
Temp	oerature	during h	eating	periods	in the livi	ing	area	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living a	ea, h1,m	า (ร	ее Та	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	0.95	0.92	0.87	0.79	0.66		0.51	0.38	0.4	42	0.62	0.82	0.92	0.96		(86)
Mean	interna	l temper	ature in	living a			w ste	ns 3 to 7	r 7 in T	[abl			-			
(87)m=	19.16	19.46	19.88	20.35	20.7	T	20.9	20.97	20.	.96	20.82	20.36	19.68	19.1	1	(87)
–								(<u> </u>					1	. ,
I emp		during h	eating	periods	in rest of	dv T	velling	from 1a	able 9	9, 11	h2 (°C)	00.40	00.40	00.40		(00)
(88)m=	20.11	20.11	20.11	20.13	20.13		20.14	20.14	20.	.14	20.14	20.13	20.12	20.12		(00)
Utilisa	ation fac	tor for g	ains for	rest of o	dwelling,	h2	,m (se	e Table	9a)						1	
(89)m=	0.94	0.91	0.86	0.76	0.62		0.45	0.31	0.3	35	0.56	0.8	0.91	0.95		(89)
Me <mark>an</mark>	<mark>in</mark> terna	l temp <mark>er</mark>	<mark>atur</mark> e in	the res	t of dwell	ling) T2 (f	ollow ste	ps 3	8 to 7	7 in Tabl	e 9 <mark>c)</mark>				
(90)m=	17.64	18.08	18.67	19.33	19.79	2	20.05	20.12	20.	.11	19.96	19.35	18.4	17.57		(90)
											f	LA = Liv	ing area ÷ (4) =	0.33	(91)
Mean	n interna	l tempera	ature (f	or the w	hole dwe	ellin	(a) = f	LA × T1	+ (1	— fL	A) × T2					
(92)m=	18.15	18.54	19.07	19.67	20.1		20.34	20.4	20	.4	, 20.25	19.69	18.83	18.08]	(92)
Apply	/ adjustr	nent to th	ne mea	n interna	al tempe	ratu	ure fro	m Table	4e,	whe	ere appro	priate			1	
(93)m=	18.15	18.54	19.07	19.67	20.1	2	20.34	20.4	20	.4	20.25	19.69	18.83	18.08		(93)
8. Sp	ace hea	iting requ	uiremer	it											-	
Set T	i to the	mean int	ernal te	mperati	ire obtaii	nec	d at st	ep 11 of	Tab	le 9t	o, so tha	t Ti,m=	(76)m an	d re-calo	culate	
the ut	tilisation	factor fo	or gains	using T	able 9a	-								1	1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hr	n:		-	0.47	0.04			0.57	0.70		0.00	1	(04)
(94)m=	0.93	0.89	0.83	0.74	0.62		0.47	0.34	0.3	37	0.57	0.78	0.89	0.93		(94)
Useru	JI gains,	nmGm ,	$VV = (S_{00})$	$\frac{1}{1} \frac{1}{692} \frac{1}{17}$	$\frac{1}{1}$ 602 14		11 61	207.24	210	16	151 12	547 15	515 91	527.99	1	(95)
(95)m=	bly over	040.30	rpal tor	noorotuu	1003.14	- <u>-</u>	44.04	307.34	519	.10	434.42	547.15	345.64	557.00	J	(00)
(96)m=	4.3		6.5	8.9			14.6	16.6	16	4	14 1	10.6	71	42	1	(96)
Heat	loss rate	e for mea	an inter	nal temr	erature	l m	- W =	=[(39)m	x [(9)	3)m	(96)m	1	1		J	()
(97)m=	1197.23	1176.02	1080.49	911.68	708.51		76.62	316.11	331	.07	513.93	, 767.03	995.87	1185.88]	(97)
Space	e heatin	a reauire	ement f	or each	month. k	W	n/mon	۱ th = 0.02	24 x	[(97])m – (95)ml x (4	1 11)m		1	
(98)m=	469.77	355.93	290.38	164.53	78.4	Τ	0	0)	0	163.59	, 324.02	482.11]	
	L							I		Tota	l per year	(kWh/ye	ar) = Sum(9	8)15,912 =	2328.74	(98)
Snac	e heatin	a require	ement i	ר k\/\/h/m	² /vear										26.09	(99)
Spade		3.240.00			. , ,										1 20.00	(00)

9b. Energy requirements – Community heating scheme	e				
This part is used for space heating, space cooling or w Fraction of space heat from secondary/supplementary	ater heating provided by a co heating (Table 11) '0' if none	ommunity schem	e.	0	(301)
Fraction of space heat from community system 1 - (30)1) =			1	(302)
The community scheme may obtain heat from several sources. The includes boilers, heat pumps, geothermal and waste heat from power Fraction of heat from Community heat pump	procedure allows for CHP and up to er stations. See Appendix C.	o four other heat sour	rces; the	latter 1	-](303a)
Fraction of total space heat from Community heat pump	D	(302) x (303a) =		1](304a)
Factor for control and charging method (Table 4c(3)) for	' or community heating system			1] (305)
Distribution loss factor (Table 12c) for community heat	ing system			1.2] (306)
Space heating				kWh/year].
Annual space heating requirement				2328.74]
Space heat from Community heat pump	(98) x (304a)	x (305) x (306) =		2794.48	(307a)
Efficiency of secondary/supplementary heating system	i in % (from Table 4a or Appe	endix E)		0	(308
Space heating requirement from secondary/supplement	ntary system (98) x (301) x	(100 ÷ (308) =		0	(309)
Water heating Annual water heating requirement				2166.28	1
If DHW from community scheme: Wat <mark>er he</mark> at from Community heat pump	(64) x (303a)	x (305) x (306) =		2599.54	(310a)
Electricity used for heat distribution	0.01 × [(307a)(3	07e) + (310a)(310e	e)] =	53.94	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = (107) ÷ (31	4) =		0	(315)
Electricity for pumps and fans within dwelling (Table 4f mechanical ventilation - balanced, extract or positive in	i): nput from outside			202	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	30b) + (330g) =		202	(331)
Energy for lighting (calculated in Appendix L)				374.26	(332)
Electricity generated by PVs (Appendix M) (negative q	uantity)			-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310	0) + (312) + (315) + (331) + (3	332)(237b) =		5240.21	(338)
12b. CO2 Emissions – Community heating scheme			_		
	Energy kWh/year	Emission fac kg CO2/kWh	tor Er kg	nissions J CO2/year	
CO2 from other sources of space and water heating (n Efficiency of heat source 1 (%)	not CHP) s CHP using two fuels repeat (363) t	to (366) for the secor	nd fuel	280	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	999.82	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	27.99	(372)
Total CO2 associated with community systems	(363)(366) + (368)(3	72)	=	1027.82	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)

CO2 associated with water from immers	sion heater or instant	aneous heater	(312) x	0.52		=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) +	(375) =				1027.82	(376)
CO2 associated with electricity for pump	os and fans within dw	elling (331)) x		0.52		=	104.84	(378)
CO2 associated with electricity for lighti	ng	(332))) x		0.52		=	194.24	(379)
Energy saving/generation technologies Item 1	(333) to (334) as app	licable		0.52	x 0.01 =		-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =						947.99	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =						10.62	(384)
El rating (section 14)							90.54	(385)



			User D	etails:						
Assessor Name: Software Name: S	troma FSAP 2012	2		Stroma Softwa	a Num Ire Ver	ber: sion:	-	Versic	on: 1.0.5.49	
	Plack D. Hom Clar	Pr Pr	roperty /	Address:	BIOCK L) - Mid F	loor			
1 Overall dwelling dimension	, BIOCK D, HAITI CIUS	se, Lone	uon, i vv	10						
Ground floor			Area	1(m²) 9.26	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m³) 223.15	(3a)
Total floor area $TFA = (1a)+($	1b)+(1c)+(1d)+(1e)	+(1n) 89	9.26	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	223.15	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	main see heating he 0 + 0 + 0 +	condary eating 0 0	y	0 0] = [total 0 0	x -	40 = 20 =	m³ per hour 0 0	(6a) (6b)
Number of intermittent fans						0	X 1	10 =	0	(7a)
Number of passive vents					Γ	0	x	10 =	0	(7b)
Number of flueless gas fires					Ē	0	X	40 = Air ch	0 anges per hou	(7c)
Infiltration due to chimneys, f	lues and fans = (6a) carried out or is intended)+(6b)+(7; d, proceed	a)+(7b)+(7 d to (17), o	7c) = otherwise c	ontinue fro	0 om (9) to ((16)	÷ (5) =	0	(8)
Number of storeys in the d Additional infiltration Structural infiltration: 0.25 t	welling (ns) for steel or timber fr	ame or	0.35 for	masonr	y constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)
if both types of wall are preser deducting areas of openings); If suspended wooden floor	t, use the value correspo if equal user 0.35 . enter 0.2 (unseale	onding to ed) or 0.	the greate	er wall area	a <i>(after</i> enter 0				0](12)
If no draught lobby, enter 0	0.05. else enter 0	a) e. e.	. (000.0	.,					0](12)
Percentage of windows an	d doors draught stri	ipped							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 cubic	c metres	s per ho	ur per so	quare m	etre of e	nvelope	area	4	(17)
If based on air permeability v	alue, then (18) = [(17)) ÷ 20]+(8	B), otherwis	se (18) = (16)				0.2	(18)
Air permeability value applies if a	pressurisation test has l	been don	e or a deg	ree air per	meability i	is being us	sed			٦
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			4	(19)
Infiltration rate incorporating	shelter factor			(21) = (18)	x (20) =	/-			0.7	$]^{(20)}$
Infiltration rate modified for m	onthly wind speed			. , . ,					0.14](21)
Jan Feb Mai	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind speed	from Table 7						•			
(22)m= 5.1 5 4.9	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m	÷4							-		
(22a)m= 1.27 1.25 1.23	1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

	ed infiltr	ation rat	e (allow	ing for sr	neiter an	a wina s	peea) =	(21a) x	(22a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula If me	ate etter	ctive air	change	rate for t	he appli	cable ca	se						0.5	(232)
lf exha	aust air he	eat pump	usina App	endix N. (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
lf bala	nced with	heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (from	n Table 4h) =	, (,			76.5	(23c)
a) If I	balance	d mech	, anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	a)m = (2)	2b)m + (;	23b) x [1	l – (23c)	- 1001	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If I	balance	d mech	ı anical ve	entilation	without	heat rec	: overv (N	и ЛV) (24b)m = (22	1 2b)m + (2	23b)			
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If v	whole h	ouse ex	tract ver	ntilation of	or positiv	ve input v	/entilatic	n from c	outside					
í	f (22b)n	n < 0.5 >	< (23b), t	then (24o	c) = (23b); otherv	vise (24	c) = (22b	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If i	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft					
	f (22b)n	n = 1, th	en (24d)	m = (22k)	o)m othe	erwise (2	4d)m = 0	0.5 + [(2	2b)m² x	0.5]		0	l	(244)
(24d)m=	0	0	0				0			0	0	0		(240)
Effec	ctive air		rate - er	1 ter (24a)) or (24t	o) or (240	c) or (24		(25)	0.07	0.07	0.00	l	(25)
(25)11=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(23)
3. Hea	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEM	IENT	Gros are <mark>a</mark>	ss (m²)	Openin m	gs 2	Net Ar A ,r	ea n²	U-valı W/m2	ue K	A X U (W/ł	K)	k-value kJ/m²·ł	e K	A X k kJ/K
ELEM Doors	IENT	Gros area	ss (m²)	Openin m	gs 2	Net Ar A ,r 1.91	ea n² X	U-valı W/m2	ue :K =	A X U (W/ł 1.91	K)	k-value kJ/m²·ł	↔ <	A X k kJ/K (26)
ELEM Doors Windov	IENT	Gros area	ss (m²)	Openin m	gs ,²	Net Ar A ,r 1.91	ea n ² x x	U-valı W/m2 1 /[1/(1.2)+	UR K 0.04] = [A X U (W/ł 1.91 1.65	K)	k-value kJ/m²·ł	2 <	A X k kJ/K (26) (27)
ELEM Doors Window Window	IENT vs Type vs Type	Gros area e 1 e 2	ss (m²)	Openin m	gs 2	Net Arr A ,r 1.91 1.44 3.24	ea n ² x x x ¹ /x ¹ /x ¹ /	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+	ue !K 0.04] = [0.04] = [A X U (W/ł 1.91 1.65 3.71	<)	k-value kJ/m²·ł	÷ ≺	A X k kJ/K (26) (27) (27)
ELEM Doors Window Window Window	IENT vs Type vs Type vs Type	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs ²	Net Arr A , n 1.91 1.44 3.24 4.2	ea n ² x x x ¹ x ¹ x ¹	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+	ue K 0.04] = [0.04] = [0.04] =	A X U (W/) 1.91 1.65 3.71 4.81	<)	k-value	÷ ≺	A X k kJ/K (26) (27) (27) (27)
ELEM Doors Window Window Window	IENT vs Type vs Type vs Type vs Type	Gros area e 1 e 2 e 3 e 4	ss (m²)	Openin m	gs 2	Net Arr A ,r 1.91 1.44 3.24 4.2 6	ea n ² x x ¹ x ¹ x ¹ x ¹ x ¹	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	ue K = [0.04] = [0.04] = [0.04] = [A X U (W/ł 1.91 1.65 3.71 4.81 6.87	<)	k-value kJ/m²-ł	e K	A X k kJ/K (26) (27) (27) (27) (27)
ELEM Doors Window Window Window Window	IENT vs Type vs Type vs Type vs Type vs Type	Gros area e 1 e 2 e 3 e 4 e 5	ss (m²)	Openin m	gs 2	Net Arr A , n 1.91 1.44 3.24 4.2 6 2.43	ea n ² x x11 x11 x11 x11 x11 x11 x11 x	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	UE K = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/ł 1.91 1.65 3.71 4.81 6.87 2.78		k-value		A X k kJ/K (26) (27) (27) (27) (27) (27)
ELEM Doors Window Window Window Window Window	IENT ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6	5S (m²)	Openin m	gs 2	Net Arr A , n 1.91 1.44 3.24 4.2 6 2.43 4.08	ea n ² x x x x x x x x x x x x x x x x x x x	U-valu W/m2 1 (1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	ue K = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/I 1.91 1.65 3.71 4.81 6.87 2.78 4.67		k-value		A X k kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEM Doors Window Window Window Window Window Window	IENT vs Type vs Type vs Type vs Type vs Type vs Type vs Type	Gros area 2 1 2 2 2 3 2 4 2 5 2 6 2 6 2 7	ss (m²)	Openin m	gs 2	Net Arr A , n 1.91 1.44 3.24 4.2 6 2.43 4.08 2.43	ea n ² x x1, x1, x1, x1, x1, x1, x1, x1,	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	UE 0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/I 1.91 1.65 3.71 4.81 6.87 2.78 4.67 2.78		k-value		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEM Doors Window Window Window Window Window Window Window	IENT ws Type ws Type ws Type ws Type ws Type ws Type vs Type	Gros area 9 1 9 2 9 3 9 4 9 5 9 6 9 7 66	SS (m ²)	Openin m	gs 2 2	Net Ar, A, n 1.91 1.44 3.24 4.2 6 2.43 4.08 2.43 42.18	ea n ² x x11 x11 x11 x11 x11 x11 x11 x	U-valu W/m2 1 (1/(1.2)+ (1/(1.2)+	Le K = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/ł 1.91 1.65 3.71 4.81 6.87 2.78 4.67 2.78 6.75		k-value		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29)
ELEM Doors Window Window Window Window Window Window Walls T Walls T	IENT vs Type vs Type vs Type vs Type vs Type vs Type ⁻ ype1 ⁻ ype2	Gros area 2 1 2 2 2 3 2 4 2 5 2 6 2 7 2 6 6 7 6 6 7 38.	55 (m ²) 5 9	Openin m 23.82	gs 2 2	Net Arr A, n 1.91 1.44 3.24 4.2 6 2.43 4.08 2.43 4.08 2.43 42.18 36.99	ea n ² x x11 x11 x11 x11 x11 x11 x11 x	U-valu W/m2 1 (1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	LIE 	A X U (W/I 1.91 1.65 3.71 4.81 6.87 2.78 4.67 2.78 6.75 5.56		k-value		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29) (29)
ELEM Doors Window Window Window Window Window Window Window Walls T Walls T Total a	IENT vs Type vs Type vs Type vs Type vs Type vs Type ⁻ ype1 ⁻ ype2 rea of e	Gros area 2 3 4 2 3 4 2 3 4 2 5 6 6 7 66 38. Idements	5 (m ²) 9 9	Openin m 23.8/ 1.91	gs 2 2	Net Arr A , n 1.91 1.44 3.24 4.2 6 2.43 4.08 2.43 42.18 36.99	ea n ² x x ¹¹ x ¹¹ x ¹¹ x ¹¹ x ¹¹ x ¹¹ x ¹¹ x ¹¹ x ¹² x ¹² x ¹²	U-valu W/m2 1 (1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ (1/(1.2)+ 0.16 0.15	$\begin{array}{c} \text{ue} \\ \text{K} \\ = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ = \\ \end{array}$	A X U (W/I 1.91 1.65 3.71 4.81 6.87 2.78 4.67 2.78 6.75 5.56		k-value kJ/m²-ł		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEM Doors Window Window Window Window Window Window Walls T Walls T Total a Party w	IENT vs Type vs Typ	Gros area 2 2 3 4 2 3 4 2 5 6 2 7 6 38 lements	5 (m ²) 9 5, m ²	Openin m 23.8/ 1.91	gs 2 2	Net Ar, A, n 1.91 1.44 3.24 4.2 6 2.43 4.08 2.43 4.08 2.43 4.08 2.43 4.08 2.43 104.9 104.9	ea n ² x x1, x1, x1, x1, x1, x1, x1, x1,	U-value W/m2 (1/(1.2)+) (1/	$ \begin{array}{c} Ue \\ $	A X U (W/ł 1.91 1.65 3.71 4.81 6.87 2.78 4.67 2.78 6.75 5.56		k-value kJ/m²-ł		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEM Doors Window Window Window Window Window Window Walls T Walls T Total a Party w Party fl	IENT vs Type vs Type vs Type vs Type vs Type vs Type ⁻ ype1 ⁻ ype2 rea of e vall oor	Gros area 2 2 3 4 2 3 4 2 5 6 6 7 66 38. Ilements	ss (m²) 9 5, m²	Openin m 23.8/ 1.91	gs 2 2	Net Ar, A, n 1.91 1.44 3.24 4.2 6 2.43 4.08 2.43 4.08 2.43 42.18 36.99 104.9 15.85 89.26	ea n ² x x1 x1 x1 x1 x1 x1 x1 x1 x1 x1	U-valu W/m2 1 (1/(1.2)+ (1/(1.2)+)))))))))))))))))))))))))))))))))))	$ \begin{array}{c} $	A X U (W/ł 1.91 1.65 3.71 4.81 6.87 2.78 4.67 2.78 6.75 5.56 0		k-value kJ/m²-ŀ		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (29) (29) (31) (32)
ELEM Doors Window Window Window Window Window Window Walls T Walls T Total a Party w Party fl Party c	IENT vs Type vs Type vs Type vs Type vs Type vs Type vs Type vs Type vs Type vall oor eiling	Gros area 2 3 4 2 3 4 2 5 6 6 7 66 38 and 38 and ss (m ²) 9 9, m ²	Openin m 23.8/ 1.91	gs 2 2	Net Arr A, r 1.91 1.44 3.24 4.2 6 2.43 4.08 2.43 4.08 2.43 4.08 2.43 4.08 2.43 104.9 104.9 104.9 104.9 89.26 89.26	ea n ² x x ¹¹ x ¹	U-valu W/m2 1 (1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$ \begin{array}{c} $	A X U (W/I 1.91 1.65 3.71 4.81 6.87 2.78 4.67 2.78 6.75 5.56 0		k-value kJ/m²-ł		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (29) (29) (29) (31) (32) (32a)	

 Fabric heat loss, W/K = S (A x U)
 (26)...(30) + (32) = 41.5 (33)

 Heat capacity Cm = S(A x k)
 ((28)...(30) + (32) + (32a)...(32e) = 7673.98 (34)

 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K
 Indicative Value: Low
 100 (35)

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

can be ι	ised inste	ad of a dei	ailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						9.44	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			50.94	(37)
Ventila	tion hea	at loss ca	alculated	monthly	ý				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	21.8	21.54	21.28	19.99	19.74	18.45	18.45	18.19	18.96	19.74	20.25	20.77		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	72.74	72.48	72.22	70.93	70.67	69.39	69.39	69.13	69.9	70.67	71.19	71.7		
Heat In	oss nara	meter (F		/m²K					/ (40)m	Average = = (39)m ÷	Sum(39) _{1.}	.12 /12=	70.87	(39)
(40)m=	0.81	0.81	0.81	0.79	0.79	0.78	0.78	0.77	0.78	0.79	0.8	0.8		
(10)	0.01	0.01	0.01	0.10	0.10	0.10	0.10	0.17	0.10	Average =	Sum(40)	12/12=	0 79	(40)
Numbe	er of day	/s in moi	nth (Tab	le 1a)						weruge –		.12712-	0.70	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ener	gy requ	irement:								kWh/ye	ear:	
													1	
ASSUM	ed occu	ipancy, i 9 N = 1	N + 1 76 x	[1 - exp	(-0.0003	349 x (TF	- A -13 9	(2)1 + 0)013 x (⁻	TFA -13	2.	62		(42)
if TF	A £ 13.9	9, N = 1			(0.0000			/_/] · 0.0	,		,			
Annua	l averag	e hot wa	ater usag	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		96	.32		(43)
Reduce	the annua that 125	al average litres per l	hot water person ne	usage by : r day (all w	5% if the a ater use. I	welling is hot and co	designed (Id)	to achieve	a water us	se target o	t			
						iot and co						6		
Hot wate	Jan Prusage i	Feb	Mar day for e	Apr	May Vd m – fa	Jun	JUI JUI	Aug (43)	Sep	Oct	Nov	Dec		
(10)	105 05				00.54				04.00		400.4	405.05		
(44)m=	105.95	102.1	98.24	94.39	90.54	86.69	86.69	90.54	94.39	98.24	102.1	105.95		
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600	kWh/mor	total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	1155.8	(44)
(45)m=	157.12	137.42	141.8	123.63	118.62	102.36	94.85	108.85	110.15	128.36	140.12	152.16		
									-	Total = Su	m(45) ₁₁₂ =		1515.44	(45)
lf instant	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)	-	-			
(46)m=	23.57	20.61	21.27	18.54	17.79	15.35	14.23	16.33	16.52	19.25	21.02	22.82		(46)
Water	storage	IOSS:	الم ماريما							aal			1	
Storag	e volum	e (ittres)	Includir	ig any so			storage		ime ves	sei	(0		(47)
If comr	nunity r viso if po	eating a	na no ta hot wate	INK IN AW	elling, e Indes i	nter 110	Iltres in	(47) mbi boili	are) onto	ar 'O' in (47)			
Water	storage	loss.	not wate		iciuues i	nstantai					<i>H()</i>			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):)		(48)
Tempe	erature f	actor fro	m Table	2b		,	• •					<u>ີ</u>		(49)
Energy	lost fro	m water	storage	kWh/ve	ar			(48) x (49)	=			10		(50)
b) If m	anufact	urer's de	eclared of	cylinder l	oss fact	or is not	known:	()			I	10		(00)
Hot wa	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	iy)				0.	02		(51)
If comr	munity h	leating s	ee secti	on 4.3										
Volum	e factor	from Tal	ble 2a	0							1.	03		(52)
Iempe	erature f	actor fro	m Table	2b							0	.6		(53)

Energy Enter	y lost fro (50) or	om water (54) in (5	• storage 55)	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			. ,
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contain	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 Append	l lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	9 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	212.4	187.34	197.08	177.12	173.9	155.86	150.13	164.12	163.64	183.64	193.61	207.44		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	: H (negati	ve quantity	v) (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 (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	212.4	187.34	197.08	177.12	173.9	155.86	150.13	164.12	163.64	18 <mark>3.6</mark> 4	193.61	207.44		_
								Outp	out from wa	ater heate	r (annual)₁	12	2166.28	(64)
Hea <mark>t g</mark>	lains fro	m water	heating.	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	96.46	85.63	91.37	83.9	83.66	76.83	75.76	80.41	79.42	86.9	89.38	94.82		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77	130.77		(66)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				1	
(67)m=	21.19	18.82	15.31	11.59	8.66	7.31	7.9	10.27	13.79	17.51	20.43	21.78		(67)
Applia	nces ga	ins (calc	ulated ir	Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	1	1	
(68)m=	237.71	240.18	233.96	220.73	204.02	188.32	177.83	175.37	181.58	194.82	211.52	227.22		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5			I	
(69)m=	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08	36.08		(69)
Pumps	s and fa	ns gains	(Table \$	5a)	-	-								
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	on (nega	tive valu	es) (Tab	le 5)				-				
(71)m=	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62	-104.62		(71)
Water	heating	gains (T	able 5)						-					
(72)m=	129.66	127.43	122.81	116.53	112.45	106.71	101.83	108.08	110.3	116.8	124.15	127.44		(72)
Total i	internal	gains =				(66)	m + (67)m	1 + (68)m +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	450.79	448.66	434.31	411.08	387.37	364.58	349.8	355.95	367.91	391.36	418.33	438.67		(73)
6. So	lar gains	S:												

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

Orientation:	: Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b	FF Table 6c		Gains (W)		
Northeast 0.9x	0.77	x	1.44	x	11.28	x	0.45	x	0.7] =	3.55	(75)
Northeast 0.9x	0.77	x	4.08	x	11.28	x	0.45	x	0.7	j =	10.05	(75)
Northeast 0.9x	0.77	x	1.44	x	22.97	x	0.45	x	0.7	i =	7.22	(75)
Northeast 0.9x	0.77	x	4.08	x	22.97	x	0.45	x	0.7	j =	20.46	(75)
Northeast 0.9x	0.77	x	1.44	x	41.38	x	0.45	x	0.7	=	13.01	(75)
Northeast 0.9x	0.77	x	4.08	x	41.38	x	0.45	x	0.7] =	36.85	(75)
Northeast 0.9x	0.77	x	1.44	x	67.96	x	0.45	x	0.7] =	21.36	(75)
Northeast 0.9x	0.77	x	4.08	x	67.96	x	0.45	x	0.7] =	60.52	(75)
Northeast 0.9x	0.77	x	1.44	x	91.35	x	0.45	x	0.7	=	28.71	(75)
Northeast 0.9x	0.77	x	4.08	x	91.35	x	0.45	x	0.7	=	81.36	(75)
Northeast 0.9x	0.77	x	1.44	x	97.38	x	0.45	x	0.7] =	30.61	(75)
Northeast 0.9x	0.77	x	4.08	x	97.38	×	0.45	x	0.7	=	86.73	(75)
Northeast 0.9x	0.77	x	1.44	x	91.1	x	0.45	x	0.7	=	28.64	(75)
Northeast 0.9x	0.77	x	4.08	x	91.1	x	0.45	x	0.7	=	81.14	(75)
Northeast 0.9x	0.77	x	1.44	x	72.63	x	0.45	x	0.7	j =	22.83	(75)
Northeast 0.9x	0.77	x	4.08	x	72.63	x	0.45	х	0.7	=	64.68	(75)
Northeast 0.9x	0.77	x	1.44	x	50.42	x	0.45	x	0.7	i -	15.85	(75)
Northeast 0.9x	0.77	x	4.08	x	50.42	İ 🖈	0.45	x	0.7] =	44.91	(75)
Northeast 0.9x	0.77	x	1.44	x	28.07	x	0.45	x	0.7	j =	8.82	(75)
Northeast 0.9x	0.77	x	4.08	×	28.07	x	0.45	x	0.7	i =	25	(75)
Northeast 0.9x	0.77	x	1.44	x	14.2	×	0.45	x	0.7	i =	4.46	(75)
Northeast 0.9x	0.77	x	4.08	x	14.2	x	0.45	x	0.7	j =	12.64	(75)
Northeast 0.9x	0.77	x	1.44	×	9.21	x	0.45	x	0.7] =	2.9	(75)
Northeast 0.9x	0.77	x	4.08	x	9.21	x	0.45	x	0.7	=	8.21	(75)
Southeast 0.9x	0.77	x	3.24	x	36.79	x	0.45	x	0.7] =	26.02	(77)
Southeast 0.9x	0.77	x	6	x	36.79	x	0.45	x	0.7] =	48.19	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	– (77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	3.24	x	62.67	x	0.45	x	0.7] =	44.33	(77)
Southeast 0.9x	0.77	x	6	x	62.67	x	0.45	x	0.7] =	82.09	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	3.24	x	85.75	x	0.45	x	0.7] =	60.65	(77)
Southeast 0.9x	0.77	x	6	x	85.75	x	0.45	x	0.7] =	112.32	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	3.24	×	106.25	×	0.45	x	0.7] =	75.15	(77)
Southeast 0.9x	0.77	x	6	×	106.25	×	0.45	x	0.7] =	139.17	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	x	0.45	x	0.7] =	56.36	(77)

		1		1		1				1		٦					
Southeast 0.9x	0.77	X	2.43	X	106.25	X	0.45	х	0.7	=	56.36	_(77) _					
Southeast 0.9x	0.77	x	3.24	x	119.01	x	0.45	x	0.7	=	84.17	(77)					
Southeast 0.9x	0.77	x	6	x	119.01	x	0.45	x	0.7	=	155.88	(77)					
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)					
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)					
Southeast 0.9x	0.77	x	3.24	x	118.15	x	0.45	x	0.7	=	83.56	(77)					
Southeast 0.9x	0.77	x	6	x	118.15	x	0.45	x	0.7	=	154.75	(77)					
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)					
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)					
Southeast 0.9x	0.77	x	3.24	x	113.91	×	0.45	x	0.7	=	80.57	(77)					
Southeast 0.9x	0.77	x	6	x	113.91	x	0.45	x	0.7] =	149.19	(77)					
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7] =	60.42	(77)					
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7] =	60.42	(77)					
Southeast 0.9x	0.77	x	3.24	x	104.39	x	0.45	x	0.7	=	73.83	(77)					
Southeast 0.9x	0.77	x	6	x	104.39	x	0.45	x	0.7	=	136.73	(77)					
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7] =	55.37	(77)					
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7] =	55.37	(77)					
Southeast 0.9x	0.77	x	3.24	X	92.85	х	0.45	х	0.7] =	65.67	(77)					
Southeast 0.9x	0.77	x	6	x	92.85	x	0.45	x	0.7] =	121.61	(77)					
Sout <mark>heast</mark> 0.9x	0.77	x	2.43	х	92.85	x	0.45	x	0.7] =	49.25	(77)					
Sout <mark>heast</mark> 0.9x	0.77	x	2.43	x	92.85	x	0.45	x	0.7] =	49.25	(77)					
Sout <mark>heast _{0.9x}</mark>	0.77	x	3.24	x	69.27	x	0.45	x	0.7	=	48.99	(77)					
Sout <mark>heast _{0.9x}</mark>	0.77	x	6	x	69.27	×	0.45	x	0.7	=	90.72	(77)					
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	=	36.74	(77)					
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	=	36.74	(77)					
Southeast 0.9x	0.77	x	3.24	x	44.07	x	0.45	x	0.7	=	31.17	(77)					
Southeast 0.9x	0.77	x	6	x	44.07	x	0.45	x	0.7	=	57.72	(77)					
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	=	23.38	(77)					
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	=	23.38	(77)					
Southeast 0.9x	0.77	x	3.24	x	31.49	x	0.45	x	0.7	=	22.27	(77)					
Southeast 0.9x	0.77	x	6	x	31.49	x	0.45	x	0.7	=	41.24	(77)					
Southeast 0.9x	0.77	x	2.43	x	31.49	x	0.45	x	0.7	=	16.7	(77)					
Southeast 0.9x	0.77	x	2.43	x	31.49	x	0.45	x	0.7] =	16.7	(77)					
Southwest _{0.9x}	0.77	x	4.2	x	36.79]	0.45	x	0.7	=	33.73	(79)					
Southwest _{0.9x}	0.77	x	4.2	x	62.67]	0.45	x	0.7	=	57.46	(79)					
Southwest _{0.9x}	0.77	x	4.2	x	85.75]	0.45	x	0.7	=	78.62	(79)					
Southwest _{0.9x}	0.77	x	4.2	x	106.25]	0.45	x	0.7	=	97.42	(79)					
Southwest <mark>0.9</mark> x	0.77	×	4.2	×	119.01]	0.45	x	0.7	=	109.11	(79)					
Southwest _{0.9x}	0.77	×	4.2	×	118.15]	0.45	x	0.7] =	108.32	(79)					
Southwest _{0.9x}	0.77	×	4.2	×	113.91]	0.45	x	0.7	=	104.44	(79)					
Southwest <mark>0.9</mark> x	0.77	×	4.2	×	104.39]	0.45	x	0.7	=	95.71	(79)					
-																	
Coutbu				_		_	г			1							()
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Couthu		0.77		` ل_	4.2		×L	9	2.85]		0.45	_ ×	0.7	=	85.13	(79)
Southw	est <mark>0.9x</mark>	0.77		`	4.2		×	6	9.27	ļ		0.45	_ ×	0.7	=	63.51	(79)
Southw	est <mark>0.9x</mark>	0.77		` <u></u>	4.2		×	4	4.07	ļ		0.45	×	0.7	=	40.41	(79)
Southw	est <mark>0.9x</mark>	0.77	:	(4.2		x	3	31.49			0.45	x	0.7	=	28.87	(79)
Solar g	pains in	watts, ca	alculate	d for	each m	onth	r			(83)m	ו = S	um(74)m .	(82)m			7	
(83)m=	160.58	278.04	392.43	506	6.34 58	5.49	58	9.33	564.82	504	.53	431.68	310.53	193.16	136.89		(83)
Total g	jains – i	nternal a	ind sola	ar (84	l)m = (7	3)m -	+ (8	33)m	, watts							,	
(84)m=	611.37	726.7	826.74	917	7.42 97	2.86	95	3.91	914.62	860	.49	799.59	701.89	611.49	575.56		(84)
7. Me	an inter	nal temp	erature	e (hea	ating sea	ason))										
Temp	erature	during h	eating	perio	ds in the	e livir	ng a	area f	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	livin	g area, l	h1,m	(se	e Ta	ble 9a)								
	Jan	Feb	Mar		Apr 1	Mav	Ì,	Jun	Jul	A	ua	Sep	Oct	Nov	Dec]	
(86)m=	0.94	0.91	0.85	0.	.74 ().6	0	.45	0.33	0.3	36	0.55	0.79	0.91	0.95	1	(86)
						.				· · ·						1	
Mean		I temper	ature ir	1 livin	g area	11 (fc		w ste	ps 3 to 1	/ in I	able	e 9c)	00.50		1.0.54	1	(07)
(87)m=	19.56	19.85	20.21	20	5.6 20	J.84	20	0.96	20.99	20.	98	20.91	20.58	20.02	19.51	J	(07)
Temp	erature	during h	eating	perio	ds in re	st of	dw	elling	from Ta	able 9	9, TI	n2 (°C)				-	
(88)m=	20.24	20.24	20.25	20	.26 20	0.26	20	0.27	20.27	20.	28	20.27	2 <mark>0.26</mark>	20.26	20.25		(88)
Utilisa	ation fac	tor for a	ains for	rest	of dwel	lina. I	h2.	m (se	e Table	9a)							
(89)m=	0.94	0.9	0.83	0.	72 0	0.57	().4	0.28	0.3	31	0.51	0.76	0.9	0.95	1	(89)
Magin	linterne.		oturo ir		reat of a	du ce lli		TO /4								1	
							ng	12 (IC		ps 3	26		e 9C)	18.07	10.22	1	(00)
(90)11=	10.5	10.72	19.23	19	.70 2	5.08	20	0.23	20.20	20.	20	20.18	19.70	ing area \div (4) -	0.00	
															-) -	0.33	(31)
Mear	interna	l temper	ature (or the	e whole	dwel	lling	g) = fl	LA × T1	+ (1	– fL	A <mark>) × T2</mark>					
(92)m=	18.72	19.1	19.56	20	0.04 20	0.33	20	0.48	20.51	20	.5	20.42	20.03	19.32	18.66		(92)
Apply	adjustr	nent to t	he mea	n inte	ernal ter	mpera	atu	re fro	m Table	e 4e,	whe	re appro	priate	_		۹.	
(93)m=	18.72	19.1	19.56	20	0.04 20	0.33	20	0.48	20.51	20	.5	20.42	20.03	19.32	18.66		(93)
8. Sp	ace hea	ting requ	uiremer	nt													
Set T	i to the I	mean int	ernal te	empe	rature o	btain	ed	at ste	ep 11 of	Tabl	le 9k	o, so tha	t Ti,m=	:(76)m an	d re-cal	culate	
the u	ilisation	factor to	or gains			9a							0.1			1	
1.1411.4	Jan	Feb	Mar	<u> </u>	Apr I	vlay		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisa		tor for g	ains, ni	n:	71 0	57		44	0.20		22	0.50	0.75	0.00	0.02	1	(04)
(94)m=	0.92	0.88	0.81	0.		.57	0	.41	0.29	0.3	32	0.52	0.75	0.88	0.93		(94)
User	li gains,	nmGm ,	VV = (3)	94)m	x (84)m	5.02	20	04.2	267.07	270	24	412.02	E2E 00	520.44	E2E 0	1	(05)
(95)m=	002.94	030.02	073.47		0.27 55	5.02		94.Z	207.97	219	.51	412.95	525.90	5 559.44	555.6		(33)
WONT	niy aver			npera				38 46	16.6	10	4	444	10.6	74	4.2	1	(06)
	4.3	4.9	0.0			1.7		4.0	0.01		.4	(00)	10.0	1.1	4.2	J	(90)
	1055 rate				emperat		∟m Г∡∩	, VV =	=[(39)m	x [(9;	3)m	– (96)m	666.75	000 70	1006 75	1	(07)
(97)III=	040.70	0.020.93	943.22	1 /90	0.34 01	0.20 th: ⊡		/m.o.9	2/1.1 hb 0.00	203	./0	442.02	1000.75	41)	1030.75	J	(31)
Spac						ui, KV	/vn/	nioni	$u_1 = 0.02$	24 X [(97))111 – (95) I I] X (+ 1)[[]	270 74	1	
(90)11=	301.43	202.29	200.09		0.00 4	1.1		U	0		, T - :	U	104.73	237.62	0)	4004.00	
											rota	i per year	(KVVN/ye	ar) = Sum(9)	o) _{15,912} =	1681.63	(96)
Spac	e heatin	g require	ement i	n kW	h/m²/ye	ar										18.84	(99)

9b. Energy requirements – Community heating scheme					
This part is used for space heating, space cooling or water he Fraction of space heat from secondary/supplementary heating	eating provided by a com ng (Table 11) '0' if none	munity scheme	e.	0	(301)
Fraction of space heat from community system $1 - (301) =$				1	(302)
The community scheme may obtain heat from several sources. The procedu includes boilers, heat pumps, geothermal and waste heat from power station Fraction of heat from Community heat pump	ure allows for CHP and up to fo ns. See Appendix C.	ur other heat sourd	ces; the	latter	-](303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =		1	(304a)
Factor for control and charging method (Table 4c(3)) for com	munity heating system	· / · /		1] (305)
Distribution loss factor (Table 12c) for community heating sys	stem			1.2	(306)
Space heating				kWh/year]
Annual space heating requirement				1681.63]
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =		2017.95	(307a)
Efficiency of secondary/supplementary heating system in %	(from Table 4a or Append	lix E)		0	(308
Space heating requirement from secondary/supplementary s	ystem (98) x (301) x 10	00 ÷ (308) =		0	(309)
Water heating Annual water heating requirement				2166.28]
If DHW from community scheme: Wat <mark>er he</mark> at from Community h <mark>eat p</mark> ump	(64) x (303a) x (305) x (306) =	Г	2599.54	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e	e)] =	46.17	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system, if not enter (0) = (107) ÷ (314) =	=		0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fro	om outside			202	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =		202	(331)
Energy for lighting (calculated in Appendix L)				374.26	(332)
Electricity generated by PVs (Appendix M) (negative quantity	()			-730.07	(333)
Total delivered energy for all uses $(307) + (309) + (310) + (310)$	12) + (315) + (331) + (332	2)(237b) =		4463.68	(338)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fac kg CO2/kWh	tor Er kg	nissions CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%) If there is CHP u	P) ising two fuels repeat (363) to (366) for the secon	d fuel	280	(367a)
CO2 associated with heat source 1 [(307	′b)+(310b)] x 100 ÷ (367b) x	0.52	=	855.89	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	23.96	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)		=	879.85	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)

CO2 associated with water from immers	sion heater or instant	aneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) +	(375) =			879.85	(376)
CO2 associated with electricity for pump	os and fans within dw	velling (331)) x		0.52	=	104.84	(378)
CO2 associated with electricity for lighti	ng	(332))) x		0.52	=	194.24	(379)
Energy saving/generation technologies Item 1	(333) to (334) as ap	olicable		0.52	x 0.01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				Γ	800.02	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				Γ	8.96	(384)
El rating (section 14)					[92.02	(385)



			User D	etails:									
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49				
		P	roperty /	Address:	: Block E	- Grou	nd Floor						
Address :	E, BIOCK E, Ham C	lose, Lon	don, Tvv	/10									
Ground floor	510115.		Area 5	a(m²) 0.48	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 126.2](3a)			
Total floor area TFA = (1a)	+(1b)+(1c)+(1d)+(1	e)+(1r	I) 5	0.48	(4)								
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	126.2	(5)			
2. Ventilation rate:													
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} \\ \text{heating} \\ \hline 0 \\ \hline 0 \\ \hline 0 \\ + \end{array} $	secondar heating 0 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)			
Number of intermittent fans	S					0	x .	10 =	0	(7a)			
Number of passive vents						0	x '	10 =	0	(7b)			
Number of flueless gas fire	es				Ľ	0	X 4	40 =	0	(7c)			
Infiltration due to chimneys	Air chan infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0 \div (5) = 0$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)												
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dw <mark>elling</mark> (ns) 25 for steel or timber	frame or	0.35 for	. masonr	ry constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)			
if both types of wall are pre- deducting areas of opening If suspended wooden flo	sent, use the value corre s); if equal user 0.35 oor, enter 0.2 (unsea	esponding to aled) or 0.	the greate	er wall are ed), else	a (after enter 0				0](12)			
If no draught lobby, ente	r 0.05, else enter 0								0	(13)			
Percentage of windows	and doors draught	stripped							0	(14)			
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)			
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)			
Air permeability value, q	50, expressed in cu	bic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)			
If based on air permeability	y value, then (18) = [((17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)			
Air permeability value applies	if a pressurisation test ha	as been don	ie or a deg	gree air pei	rmeability	is being u	sed						
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.7	(19)			
Infiltration rate incorporatir	ig shelter factor			(21) = (18)) x (20) =				0.14](21)			
Infiltration rate modified for	monthly wind spee	ed											
Jan Feb M	lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind spe	ed 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 = (22)	m ÷ 4												
(22a)m= 1.27 1.25 1.	23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]				

Adjuste	ed infiltra	ation rat	e (allow	ing for sh	elter an	d wind s	speed) =	(21a) x	(22a)m					
<u> </u>	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula If me	ate effec echanica	ctive air	change	rate for ti	he applie	cable ca	se						0.5	(23a)
lf exh	aust air he	eat pump	using App	endix N, (2	3b) = (23a) × Fmv (e	equation (N	√5)) , othe	rwise (23b) = (23a)			0.5	(23b)
lf bala	anced with	heat reco	overy: effic	iency in %	allowing for	or in-use f	actor (from	n Table 4h) =	, , ,			76.5	(23c)
a) If	balance	d mech	, anical ve	entilation	with her	at recove	erv (MVI	HR) (24a	a)m = (2)	2h)m + (23b) x [′	1 – (23c)	- 1001	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28	. 100]	(24a)
b) If	balance	d mech	ı anical ve	entilation	without	heat rec	L Coverv (N	и ЛV) (24b	m = (22)	1 2b)m + ()	1 23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ver	ntilation c	or positiv	e input v	ventilatic	n from o	outside	Į	Į			
í	if (22b)n	n < 0.5 >	‹ (23b), †	then (24c	c) = (23b); other\	wise (24	c) = (22k	o) m + 0.	.5 × (23t)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft		-			
i	if (22b)n	n = 1, th	en (24d) 1	m = (22b	o)m othe	rwise (2	24d)m = 0	0.5 + [(2	2b)m² x I	0.5]			I	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				l	(05)
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN	IE NT	Gros	ss	Openin	gs	Net Ar	ea	U-val	ue	AXU		k-value		AXk
Deero		area	(m²)	m	2	A,r	n²	VV/m2	:K	(VV/	K)	KJ/m²•ł		KJ/K
Doors						1.91			=	1.91				(26)
vvindo	ws Type					5.4		/[1/(1.2)+	0.04] =	6.18				(27)
Windo	ws Type	92				3.6	x ^{1/}	/[1/(1.2)+	0.04] =	4.12	4			(27)
Windo	ws Type	93				3.36	X1/	/[1/(1.2)+	0.04] =	3.85				(27)
Floor						50.48	3 X	0.1	=	5.048				(28)
Walls 7	Гуре1	25.9	92	12.36	6	13.56	3 X	0.16	=	2.17				(29)
Walls 7	Type2	38.1	15	1.91		36.24	1 X	0.15	=	5.45				(29)
Total a	rea of e	lements	s, m²			114.5	6							(31)
Party v	vall					12.32	<u>2</u> x	0	=	0				(32)
Party c	eiling					50.48	3							(32b)
* for win ** includ	dows and le the area	roof wind as on both	ows, use e sides of ii	effective wil nternal wall	ndow U-va Is and part	alue calcul itions	ated using	ı formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				28.73	(33)
Heat c	apacity	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	8070.0	7 (34)
Therm	al mass	parame	eter (TMI	⊃ = Cm ÷	- TFA) in	ı kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be ι	gn assess ised inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	f TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						8.73	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			37.46	(37)
Ventila	tion hea	at loss ca	alculated	d monthly	/	-	-	-	(38)m	= 0.33 × ((25)m x (5)	_	I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m=	12.33	12.18	12.04	11.31	11.16	10.43	10.43	10.29	10.72	11.16	11.45	11.74		(38)
Heat tr	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	49.78	49.64	49.49	48.76	48.62	47.89	47.89	47.74	48.18	48.62	48.91	49.2		
Heat lo	oss para	meter (H	HLP). W/	/m²K					(40)m	Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	48.73	(39)
(40)m=	0.99	0.98	0.98	0.97	0.96	0.95	0.95	0.95	0.95	0.96	0.97	0.97		
										Average =	Sum(40)1.	12 /12=	0.97	(40)
Numbe	er of day	vs in moi	nth (Tab	le 1a)										
(11)-	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
1 \\/a	tor hoat	ing ono	rav roqui	iromont:								k\//b/v/	ar:	
4. Wa	iter neai	ing ener	igy iequ	nement.								KVVII/ye	al.	
Assum if TF	ed occu A > 13.9	ipancy, l 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.(0013 x (⁻	TFA -13.	1 9)	.7		(42)
Annual	l averag	e hot wa	ater usag	ge in litre	es per da	iy Vd,av	erage =	(25 x N)	+ 36		74	.68		(43)
Reduce	the annua	al average litros por	hot water	usage by	5% if the a	welling is	designed t	to achieve	a water us	se target o	ſ			
notmore					Aler use, i			A	0.00	Ort	New			
Hot wate	Jan er usage in	n litres per	Mar day for ea	Apr ach month	Vd,m = fa	ctor from T	JUI Table 1c x	(43)	Sep	Oct	NOV	Dec		
(44)m=	82.14	79.16	76.17	73.18	70.2	67.21	67.21	70.2	73.18	76.17	79.16	82.14		
						-				Total = Su	m(44) ₁₁₂ =		8 <mark>96.11</mark>	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)		
(45)m=	121.82	106.54	109.94	95.85	91.97	79.36	73.54	84.39	85.4	99.52	108.64	117.97		
lf instant	aneous w	ater heatii	ng at point	t of use (no	o hot water	· storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1174.94	(45)
(46)m=	18.27	15.98	16.49	14.38	13.8	11.9	11.03	12.66	12.81	14.93	16.3	17.7		(46)
Water	storage	loss:	1	1	1		1	Į	1	1		<u>.</u>		
Storag	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr Otherw	nunity h /ise if no	eating a	ind no ta hot wate	ink in dw er (this ir	/elling, e Includes i	nter 110 nstantar) litres in	(47) mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:	not mate			notantai					,			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	e, kWh/ye	ear	or ic not	known:	(48) x (49)) =		1	10		(50)
Hot wa	iter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	NIOWII. IY)				0.	02		(51)
If comr	nunity h	eating s	ee secti	on 4.3										
Volume	e factor	from Ta	ble 2a m Tabla	0h							1.	03		(52)
Tempe			m rabie					(47) (54)	···· (EQ) ··· (50)	0	.6		(53)
Energy	(50) or (m water 54) in (5	storage	e, KVVN/ye	ear			(47) X (51)) x (52) x (53) =	1.	03 03		(54)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m	L			(00)
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	l d solar sto	rage, (57)	m = (56)m	x [(50) – (L H11)] ÷ (5	0), else (5	I 7)m = (56)	n where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	ı cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m			-			
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	177.09	156.47	165.22	149.34	147.25	132.86	128.82	139.67	138.89	154.8	162.13	173.25		(62)
Solar DI	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)		-			
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	177.09	156.47	165.22	149.34	147.25	132.86	128.82	139.67	138.89	154.8	162.13	173.25		
								Outp	out from wa	ater heate	r (annual)₁	12	1825.78	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	84.73	75.37	80.78	74.66	74.8	69.18	68.67	72.28	71.19	77.31	78.92	83.45		(65)
in <mark>clu</mark>	ıde (57)ı	m in cald	culation	of (65)m	only if c	ylinder i	s in the o	welling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	Table 5	5 and 5a):								_	
Metab	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	<mark>8</mark> 5.21	85.21	<mark>85</mark> .21	85.21	85.21	85.21	8 <mark>5.2</mark> 1	85.21	85.21	8 <mark>5.2</mark> 1	85.21	85.21		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equati	on L9 o	r L9a), a	lso see ⁻	Table 5					
(67)m=	13.24	11.76	9.56	7.24	5.41	4.57	4.94	6.42	8.61	10.93	12.76	13.61		(67)
Applia	nces gai	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	148.48	150.02	146.14	137.87	127.44	117.63	111.08	109.54	113.42	121.69	132.12	141.93		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5			I	
(69)m=	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52		(69)
Pumps	and far	ns gains	(Table {	5a)									I	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.a. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-68.17	-68.17	-68.17	-68.17	-68.17	, -68.17	-68.17	-68.17	-68.17	-68.17	-68.17	-68.17		(71)
Water	heating	aains (T	able 5)										I	
(72)m=	113.88	112.15	, 108.57	103.7	100.54	96.09	92.3	97.15	98.87	103.91	109.61	112.16		(72)
Total i	nternal	gains =				(66)	um + (67)m	l 1 + (68)m +	⊦ (69)m + ((70)m + (7	1)m + (72)	l Im		
(73)m=	324.16	322.5	312.83	297.38	281.95	266.85	256.88	261.67	269.47	285.1	303.05	316.26		(73)
6. So	lar <u>gains</u>	S:												
Solar g	ains are o	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	e applicab	le orientat	ion.		
. .													- ·	

Orientation:	Table 6d		Area m²		Flux Table 6a		g_ Table 6b		Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	3.36	x	11.28	x	0.45	x	0.7	=	8.28	(75)
Northeast 0.9x	0.77	x	3.36	x	22.97	×	0.45	×	0.7	=	16.85	(75)

Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	4	1.38	x	0.45		×	0.7		=	30.35	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	6	57.96	x	0.45		×	0.7		=	49.84	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	g	1.35	×	0.45		×	0.7		=	67	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	9	7.38	x	0.45		×	0.7		=	71.43	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x		91.1	x	0.45		×	0.7		=	66.82	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	7	2.63	x	0.45		×	0.7		=	53.27	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	5	0.42	X	0.45		×	0.7		=	36.98	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	2	8.07	x	0.45		×	0.7		=	20.59	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x		14.2	x	0.45		×	0.7		=	10.41	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x		9.21	x	0.45		×	0.7		=	6.76	(75)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	3	6.79	x	0.45		×	0.7		=	43.37	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	3	6.79	x	0.45		×	0.7		=	28.91	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4		x	6	2.67	x	0.45		×	0.7		=	73.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	6	2.67	x	0.45		×	0.7		=	49.25	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	8	5.75	x	0.45		×	0.7		=	101.08	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	8	5.75	x	0.45		×	0.7		=	67.39	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	1	06.25	x	0.45		×	0.7		=	125.25	(77)
Southea	ast 0.9x	0.77		x	3.6	5	x	1	06.25	x	0.45		х	0.7		=	83.5	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	-	x	1	19.01	x	0.45		×	0.7		=	140.29	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	х	1	19.01] ×	0.45		×	0.7		=	93.53	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	1	18.15	x	0.45		×	0.7		=	139.27	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	1	18.15	x	0.45		× [0.7		=	92.85	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	+	x	1	13.91	x	0.45		× [0.7		=	134.28	(77)
Southea	ast 0.9x	0.77		x	3.6	;	x	1	13.91	x	0.45		x [0.7		=	89.52	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	1	04.39	x	0.45		× [0.7		=	123.05	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	5	x	1	04.39	x	0.45		×	0.7		=	82.04	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	ļ	x	g	2.85	x	0.45		×	0.7		=	109.45	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	5	x	g	2.85	x	0.45		×	0.7		=	72.97	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	ļ	x	6	9.27	x	0.45		×	0.7		=	81.65	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	5	x	6	9.27	x	0.45		×	0.7		=	54.43	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	4	4.07	x	0.45		×	0.7		=	51.95	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	5	x	4	4.07	x	0.45		× [0.7		=	34.63	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	ļ	x	3	31.49	x	0.45		×	0.7		=	37.12	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	3	31.49	x	0.45		× [0.7		=	24.75	(77)
Solar g	pains in	watts, ca	alculat	ted	for each	n mont	h			(83)m	= Sum(74)	m(8	2)m					(00)
(83)m=	80.56	139.98	198.8	32 Jor	258.59	300.81		$\frac{303.55}{(92)m}$	290.61	258	.36 219.4	4 1	56.67	97	68.6	62		(83)
	ans – 1				(04)III =	(73)11	, + ((03)III 570.4		500	02 400 0		44 70	400.05	204			(84)
(04)111=	404.72	402.47	511.0		555.97	562.11		570.4	547.5	520	.03 400.8	¹⁰ 4 ²	+1./0	400.05	304.	.00		(10)
7. Me	an inter	rnal temp	eratu	re (heating	seaso	n)				TL 4 (00)					-		الاست
i emp	erature	e auring h	eating	g pe	eriods in	the liv	/ing	area	rom lat	ole 9,	in1 (°C)						21	(85)
Utilisa	ation fac	ctor for g	ains fo	or li	ving are	a, h1,r	n (s , T	see Ta		•		_	0-+	NI				
	Jan	гер	ivia	1 I	Apr	iviay	′	Jun	Jui		uy Sel	РI	UCI		ים ו	ec		

(86)m=	0.93	0.9	0.85	0.77	0.64	0.49	0.37	0.4	0.59	0.79	0.9	0.94	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)						
(87)m=	19.29	19.56	19.94	20.38	20.71	20.91	20.97	20.96	20.83	20.41	19.79	19.25			(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)						
(88)m=	20.09	20.1	20.1	20.11	20.11	20.13	20.13	20.13	20.12	20.11	20.11	20.1			(88)
Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)							
(89)m=	0.92	0.89	0.83	0.74	0.6	0.44	0.3	0.33	0.53	0.76	0.89	0.93			(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=	17.83	18.21	18.74	19.36	19.79	20.04	20.11	20.1	19.96	19.42	18.55	17.76			(90)
			-		_	-	-	-	f	iLA = Livin	g area ÷ (4	ł) =	0.48		(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2						
(92)m=	18.54	18.86	19.32	19.85	20.24	20.46	20.52	20.52	20.38	19.9	19.15	18.48			(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate					
(93)m=	18.54	18.86	19.32	19.85	20.24	20.46	20.52	20.52	20.38	19.9	19.15	18.48			(93)
8. Spa	ace hea	ting requ	uirement	t											
Set Ti	to the r	nean int	ernal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate		
the ut	lisation		or gains		ible 9a	lun	Int	A.u.a.	Son	Oct	Nov	Dee		_	
 Itilisa	Jan tion fac	tor for a	ains hm	Apr	iviay	Jun	Jui	Aug	Sep	Oct	INOV	Dec			
(94)m=	0.9	0.87	0.82	0.73	0.61	0.46	0.33	0.36	0.55	0.75	0.87	0.91			(94)
Usefu	l gains.	hmGm	W = (9)	4)m x (84	4)m	0110			0.00						
(95)m=	365.65	401.98	417.85	405.61	354.86	261.89	182.58	189.53	269.51	332.91	346.74	351.28			(95)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 8									
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2			(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	- =[(39)m :	x [(93)m·	– (96)m]					
(97)m=	708.71	693.15	634.64	534.07	415.06	280.57	187.91	196.56	302.68	452.04	589.35	702.61	1		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mon	th = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m				
(98)m=	255.23	195.67	161.3	92.49	44.79	0	0	0	0	88.63	174.67	261.39			
								Tota	l per year	(kWh/year) = Sum(9	B) _{15,912} =	1274.1	7	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								25.24		(99)
9b. Ene	ergy rec	uiremer	nts – Coi	mmunity	heating	scheme						•			
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ing or wa	ater heat	ting prov	ided by	a comm	unity sch	ieme.			
Fractio	n of spa	ice heat	from se	condary,	/supplen	nentary I	neating (Table 1	1) '0' if n	one	·		0		(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1		(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sour	rces. The p	orocedure	allows for	CHP and ι	up to four o	other heat	sources; tl	ne latter		
includes Fractio	boilers, h n of hea	eat pumps at from C	s, geotheri Commun	<i>nal and wa</i> ity heat i	aste heat f numn	rom powei	r stations.	See Apper	ndix C.			[1		(303a)
Fractio	n of tota	al snace	heat fro	m Comn	nunity he	eat num	h			(3	02) x (303	a) =	1		(304a)
Factor	for cont	rol and <i>i</i>	charging	method	(Table)	4c(3)) fo	r commi	initv hea	itina svst	tem	, (000	· /	i		(305)
Distrib		s factor	(Table 1	(2c) for c	commun	itv heati	ng svste	m				l	12		(306)
Snaac	hostin	n										l	L\\/		()
Annual	space	s heating	requiren	nent								I	1274 1	year 7	
	59000											l	1217.1		

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1529	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Apper	idix E)	0	(308
Space heating requirement from secondary/supplementary syster	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1825.78	1
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2190.94](310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	37.2	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	utside		114.24	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	114.24	(331)
Energy for lighting (calculated in Appendix L)			233.77	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3</mark>)
Tota <mark>l delivered energy for all uses (</mark> 307) + (309) + (310) + (312) +	(315) + (331) + (33	32)(237b) =	3 <mark>337.8</mark> 8	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	wo fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(37	10b)] x 100 ÷ (367b) x	0.52	928.2	(367)
Electrical energy for heat distribution [(3	813) x	0.52	= 19.31	(372)
Total CO2 associated with community systems (36	63)(366) + (368)(372	2) =	947.5	(373)
CO2 associated with space heating (secondary) (30	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (33)	73) + (374) + (375) =		947.5	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	59.29	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	121.33	(379)
Energy saving/generation technologies (333) to (334) as applicab Item 1	le	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			749.21	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			14.84	(384)
El rating (section 14)			89.49	(385)

			User D	etails:								
Assessor Name: Software Name:	Stroma FSAP 201	12 Dr	oportu /	Stroma Softwa	a Num are Ver	ber: sion:	loor	Versio	on: 1.0.5.49			
Addross J	E Block E Ham Cl		lon TW	4001855. 40	DIUCK E	- IVIIU F	1001					
Address : 1 Overall dwelling dimension		ose, Lond	JON, TVV	10								
Ground floor	10115.		Area 50	1(m²) 0.48	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m³) 126.2	(3a)		
Total floor area $TFA = (1a)$	+(1b)+(1c)+(1d)+(1e	e)+(1n) 50	0.48	(4)							
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	126.2	(5)		
2. Ventilation rate:				_		_						
Number of chimneys Number of open flues	$\begin{array}{c c} main & s \\ heating & l \\ \hline 0 & + \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	econdary neating 0	/ · · · · · · · · · · · · · · · · · · ·	0 0] = [total 0		40 = 20 =	m ³ per hour	(6a)		
Number of intermittent fans		-		-			x /	10 =]` ′] ₍₇₀)		
Number of meeting weater						0		10 -	0			
Number of passive vents					Ľ	0	×	10 =	0	(7b)		
Number of flueless gas fires 0 x 40 = Air chan												
If a pressurisation test has bee	n carried out or is intend	ed. proceed	to (17), o	otherwise c	ontinue fro	0 om (9) to ((16)	÷ (0) =	0	(8)		
Number of storeys in the Additional infiltration Structural infiltration: 0.29	dwelling (ns) 5 for steel or timber	frame or	0.35 for	masonr	y constr	uction	[(9)	-1]x0.1 =	0 0 0	(9) (10) (11)		
if both types of wall are pres deducting areas of openings	ent, use the value corres); if equal user 0.35	sponding to	the greate	er wall area	a (after					_		
If suspended wooden flo	or, enter 0.2 (unsea	led) or 0.	1 (seale	d), else	enter 0				0	(12)		
If no draught lobby, enter	0.05, else enter 0								0	(13)		
Percentage of windows a	ind doors draught s	tripped		0.25 [0.2	v (14) · 1	001 -			0	(14)		
				(8) ± (10) .	× (14) ÷ 1	00] = 2) <u>+ (13)</u> -	± (15) –		0	(15)		
Air permeability value of	0 expressed in cul	nic motros	e nor ho			2) (13)		area	0	(10)		
If based on air permeability	value then $(18) = [(1)]$	17) ÷ 20]+(8), otherwis	se (18) = (16)		invelope	area	4	(17)		
Air permeability value applies in	a pressurisation test ha	s been done	e or a deg	ree air per	meability i	is being u	sed		0.2			
Number of sides sheltered									4	(19)		
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.7	(20)		
Infiltration rate incorporating	g shelter factor			(21) = (18)	x (20) =				0.14	(21)		
Infiltration rate modified for	monthly wind spee	d							L			
Jan Feb M	ar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind spee	d from Table 7	. <u> </u>										
(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)	n ÷ 4											
(22a)m= 1.27 1.25 1.2	3 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18				

Adjust	ed infiltr	ation rat	e (allow	ing for s	helter an	d wind s	speed) =	(21a) x	(22a)m				-	
~	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul If m	ate etter	<i>Ctive air</i> al ventila	change	rate for	the appli	cable ca	se						0.5	(232)
lf exh	aust air h	eat pump	usina App	endix N. (2	23b) = (23a	a) x Fmv (e	equation (N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
If bala	anced with	n heat reco	overv: effic	ciency in %	allowing f	or in-use f	actor (from	n Table 4h) =	, (,			0.5	(230)
a) If	halance	n mech	anical ve	entilation	with he	at recove	≏rv (M\/ł	HR) (24a) m = (22	2h)m + (23h) x [[,]	1 – (23c)	10.3	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	balance	l d mech	I anical ve	L entilation	L without	L heat rec	L coverv (N	I /IV) (24b	l = (22)	I 2b)m + ()	L 23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If	whole h	i ouse ex	r tract ver	ntilation	or positiv	i ve input v	ventilatio	n from c	utside				1	
-,	if (22b)n	n < 0.5 >	(23b), †	then (24	c) = (23b); other	wise (24	c) = (22b	o) m + 0.	.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	nole hous	se positiv	/e input	ventilatio	on from I	oft	-	-	-	•	
	if (22b)n	n = 1, th	en (24d) I)m = (22 T	b)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effe	ctive air	change	rate - ei	nter (24a	a) or (24b	o) or (24)	c) or (24	d) in boy	(25)				1	(05)
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	-0.25	0.26	0.27	0.27	0.28	J	(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	para me t	er:									
ELEN		Gros area	ss (m²)	Openir n	ngs 1²	Net Ar A ,r	rea m²	U-valı W/m2	ue K	A X U (W/I	K)	k-value kJ/m²·l	∍ K	A X k kJ/K
Doo <mark>rs</mark>						1.91	x	1	=	1.91				(26)
Windo	<mark>ws</mark> Type	e 1				5.4	x1.	/[1/(1.2)+	0.04] =	6.18	F			(27)
Windo	ws Type	e 2				3.6	x1.	/[1/(1.2)+	0.04] =	4.12	F			(27)
Windo	ws Type	e 3				3.36		/[1/(1.2)+	0.04] =	3.85	5			(27)
Walls	Type1	25.9	92	12.3	6	13.56	3 X	0.16		2.17	Ξ r			(29)
Walls ⁻	Type2	38.1	15	1.9	1	36.24	+ x	0.15		5.45	- i			(29)
Total a	area of e	elements	, m²			64.08	3		I					(31)
Party v	wall					12.32	2 x	0	= [0				(32)
Party f	loor					50.48	3	L	เ				\dashv	(32a)
Party of	ceiling					50.48	3				ſ		\dashv	(32b)
* for win	dows and le the area	l roof wind as on both	ows, use e sides of ii	effective w nternal wa	indow U-va Ils and part	alue calcul titions	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	paragraph	 1 3.2	(````
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				23.68	(33)
Heat c	apacity	Cm = S	(Axk)	,					((28)	(30) + (32	2) + (32a).	(32e) =	4536.4	47 (34)
Therm	al mass	parame	eter (TMI	P = Cm ·	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be ı	ign assess used inste	sments wh ad of a de	ere the de tailed calc	etails of the culation.	e constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	lculated	using Ap	pendix I	<						5.64	(36)
if details	s of therma	al bridging	are not kr	nown (36)	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			29.32	(37)
Ventila	ation hea	at loss ca	alculated	d monthl	y	i			(38)m	= 0.33 × (25)m x (5))	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

(38)m=	12.33	12.18	12.04	11.31	11.16	10.43	10.43	10.29	10.72	11.16	11.45	11.74		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	41.65	41.5	41.35	40.63	40.48	39.75	39.75	39.61	40.04	40.48	40.77	41.06		
Heat lo	oss para	meter (H	HLP), W/	/m²K				-	(40)m	Average = = (39)m ÷	Sum(39) ₁ (4)	12 /12=	40.59	(39)
(40)m=	0.82	0.82	0.82	0.8	0.8	0.79	0.79	0.78	0.79	0.8	0.81	0.81		
Numbe	er of day	/s in mo	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	0.8	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum if TF if TF	ed occu A > 13.9 A £ 13.9	upancy, 9, N = 1 9, N = 1	N + 1.76 x	:[1 - exp	(-0.0003	849 x (TF	-13.9)2)] + 0.(0013 x (⁻	TFA -13.	1 9)	.7		(42)
Annua	laverag	e hot wa	ater usag	ge in litre	es per da	iy Vd,av	erage =	(25 x N)	+ 36		74	.68		(43)
Reduce	the annua e that 125	al average litres per l	hot water berson per	usage by : r dav (all w	5% if the a ater use. I	lwelling is not and co	designed t ld)	to achieve	a water us	se target o	f			
	lan	Eob	Mar		May	lup		Δυσ	Son	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	Sep	Oci	INUV	Dec		
(44)m=	<mark>8</mark> 2.14	79.16	76.17	73.18	70.2	67.21	67.21	70.2	73.18	76.17	79.16	82.14		
										Tota <mark>l = Su</mark>	m(44) ₁₁₂ =	-	8 <mark>96.11</mark>	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E)Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	bles 1b, 1	c, 1d)		
(45)m=	121.82	106.54	109.94	95.85	91.97	79.36	73.54	84.39	85.4	99.52	108.64	117.97		
lf instant	aneous w	vater heati	ng at point	of use (no	o hot water	storage).	enter 0 in	boxes (46) to (61)	Tota <mark>l = S</mark> u	m(45) ₁₁₂ =	-	1174.94	(45)
(46)m=	18.27	15.98	16.49	14.38	13.8	11.9	11.03	12.66	12.81	14.93	16.3	17.7		(46)
Water	storage	loss:												
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	ind no ta	nk in dw	velling, e	nter 110	litres in	(47)	\	(0) : (4 >			
Water	/ISE If ht storage	o stored	hot wate	er (this ir	ICIUDES I	nstantar	ieous co	indi idmo	ers) ente	er '0' in (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	· storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	anufact	urer's de	eclared o	cylinder l	oss fact	or is not	known:							
Hot wa	iter stora nunity h	age loss leating s	factor fr	om I abl	e 2 (kvv	n/litre/da	iy)				0.	02		(51)
Volume	e factor	from Ta	ble 2a	011 4.0							1.	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
Energy	v lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated I	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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	хH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	ı cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m			-			
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	177.09	156.47	165.22	149.34	147.25	132.86	128.82	139.67	138.89	154.8	162.13	173.25		(62)
Solar DI	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)		-			
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	177.09	156.47	165.22	149.34	147.25	132.86	128.82	139.67	138.89	154.8	162.13	173.25		
								Outp	out from wa	ater heate	r (annual)₁	12	1825.78	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	84.73	75.37	80.78	74.66	74.8	69.18	68.67	72.28	71.19	77.31	78.92	83.45		(65)
in <mark>clu</mark>	ıde (57)ı	m in cald	culation	of (65)m	only if c	ylinder i	s in the o	welling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	Table 5	5 and 5a):								_	
Metab	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	<mark>8</mark> 5.21	85.21	<mark>85</mark> .21	85.21	85.21	85.21	8 <mark>5.2</mark> 1	85.21	85.21	8 <mark>5.2</mark> 1	85.21	85.21		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equati	on L9 o	r L9a), a	lso see ⁻	Table 5					
(67)m=	13.24	11.76	9.56	7.24	5.41	4.57	4.94	6.42	8.61	10.93	12.76	13.61		(67)
Applia	nces gai	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	148.48	150.02	146.14	137.87	127.44	117.63	111.08	109.54	113.42	121.69	132.12	141.93		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5			I	
(69)m=	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52	31.52		(69)
Pumps	and far	ns gains	(Table {	5a)									I	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.a. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-68.17	-68.17	-68.17	-68.17	-68.17	, -68.17	-68.17	-68.17	-68.17	-68.17	-68.17	-68.17		(71)
Water	heating	aains (T	able 5)										I	
(72)m=	113.88	112.15	, 108.57	103.7	100.54	96.09	92.3	97.15	98.87	103.91	109.61	112.16		(72)
Total i	nternal	gains =				(66)	um + (67)m	l 1 + (68)m +	⊦ (69)m + ((70)m + (7	1)m + (72)	l Im		
(73)m=	324.16	322.5	312.83	297.38	281.95	266.85	256.88	261.67	269.47	285.1	303.05	316.26		(73)
6. So	lar <u>gains</u>	S:												
Solar g	ains are o	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to co	onvert to th	e applicab	le orientat	ion.		
. .													- ·	

Orientation:	Table 6d		Area m²		Flux Table 6a		g_ Table 6b		Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	3.36	x	11.28	x	0.45	x	0.7	=	8.28	(75)
Northeast 0.9x	0.77	x	3.36	x	22.97	×	0.45	×	0.7	=	16.85	(75)

Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	4	1.38	x	0.45		×	0.7		=	30.35	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	6	57.96	x	0.45		×	0.7		=	49.84	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	g	1.35	×	0.45		×	0.7		=	67	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	9	7.38	x	0.45		×	0.7		=	71.43	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x		91.1	x	0.45		×	0.7		=	66.82	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	7	2.63	x	0.45		×	0.7		=	53.27	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	5	0.42	X	0.45		×	0.7		=	36.98	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x	2	8.07	x	0.45		×	0.7		=	20.59	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x		14.2	x	0.45		×	0.7		=	10.41	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	3.3	6	x		9.21	x	0.45		×	0.7		=	6.76	(75)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	3	6.79	x	0.45		×	0.7		=	43.37	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	3	6.79	x	0.45		×	0.7		=	28.91	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4		x	6	2.67	x	0.45		×	0.7		=	73.88	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	6	2.67	x	0.45		×	0.7		=	49.25	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	8	5.75	x	0.45		×	0.7		=	101.08	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	8	5.75	x	0.45		×	0.7		=	67.39	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	1	06.25	x	0.45		×	0.7		=	125.25	(77)
Southea	ast 0.9x	0.77		x	3.6	5	x	1	06.25	x	0.45		х	0.7		=	83.5	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	-	x	1	19.01	x	0.45		×	0.7		=	140.29	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	х	1	19.01] ×	0.45		×	0.7		=	93.53	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	1	18.15	x	0.45		×	0.7		=	139.27	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	1	18.15	x	0.45		× [0.7		=	92.85	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	+	x	1	13.91	x	0.45		× [0.7		=	134.28	(77)
Southea	ast 0.9x	0.77		x	3.6	;	x	1	13.91	x	0.45		x [0.7		=	89.52	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	1	04.39	x	0.45		× [0.7		=	123.05	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	5	x	1	04.39	x	0.45		×	0.7		=	82.04	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	ļ	x	g	2.85	x	0.45		×	0.7		=	109.45	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	5	x	g	2.85	x	0.45		×	0.7		=	72.97	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	6	9.27	x	0.45		×	0.7		=	81.65	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	5	x	6	9.27	x	0.45		×	0.7		=	54.43	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	Ļ	x	4	4.07	x	0.45		×	0.7		=	51.95	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	5	x	4	4.07	x	0.45		× [0.7		=	34.63	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	5.4	ļ	x	3	31.49	x	0.45		×	0.7		=	37.12	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	3.6	;	x	3	31.49	x	0.45		× [0.7		=	24.75	(77)
Solar g	pains in	watts, ca	alculat	ted	for each	n mont	h			(83)m	= Sum(74)	m(8	2)m					(00)
(83)m=	80.56	139.98	198.8	32 Jor	258.59	300.81		$\frac{303.55}{(92)m}$	290.61	258	.36 219.4	4 1	56.67	97	68.6	62		(83)
					(04)III =	(73)11	, + ((03)III 570.4		500	02 400 0		44 70	400.05	204			(84)
(04)111=	404.72	402.47	511.0		555.97	562.11		570.4	547.5	520	.03 400.8	¹⁰ 4 ²	+1./0	400.05	304.	.00		(10)
7. Me	an inter	rnal temp	eratu	re (heating	seaso	n)				TL 4 (00)					-		الاست
i emp	erature	e auring h	eating	g pe	eriods in	the liv	/ing	area	rom Ial	ole 9,	in1 (°C)						21	(85)
Utilisa	ation fac	ctor for g	ains fo	or li	ving are	a, h1,r	n (s , T	see Ta		•		_	0-+	NI				
	Jan	rep	ivia	1 I	Apr	iviay	′	Jun	Jui		uy Sel	РI	UCI		ים ו	ec		

(86)m=	0.92	0.88	0.82	0.72	0.58	0.43	0.31	0.34	0.53	0.75	0.88	0.93		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	r in Table	e 9c)					
(87)m=	19.71	19.96	20.28	20.63	20.85	20.96	20.99	20.99	20.92	20.64	20.14	19.67	1	(87)
Temp	erature	durina h	eating p	eriods ir	n rest of	dwellina	from Ta	ble 9. Ti	h2 (°C)					
(88)m=	20.23	20.23	20.24	20.25	20.25	20.26	20.26	20.27	20.26	20.25	20.25	20.24		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2.m (se	e Table	9a)						
(89)m=	0.91	0.87	0.8	0.69	0.55	0.38	0.26	0.29	0.48	0.72	0.86	0.92	1	(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.51	18.86	19.32	19.8	20.09	20.23	20.26	20.26	20.18	, 19.82	19.13	18.46	1	(90)
									f	LA = Livin	g area ÷ (4	l) =	0.48	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	.A) × T2			•		
(92)m=	19.09	19.4	19.79	20.2	20.46	20.58	20.61	20.61	20.54	20.22	19.62	19.04		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.09	19.4	19.79	20.2	20.46	20.58	20.61	20.61	20.54	20.22	19.62	19.04		(93)
8. Spa	ace hea	ting requ	uirement	1										
Set Ti	to the r	nean int	ernal ter	mperatui	re obtair	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	lon	Tactor IC	Mor		Ible 9a	lup	Lut .	Δυσ	Son	Oct	Nov	Dec		
Utilisa	tion fac	tor for a	ains hm	<u>.</u> Арі	Iviay	Jun	Jui	Aug	Sep	Oci	INUV	Dec		
(94)m=	0.89	0.85	0.79	0.69	0.56	0.4	0.29	0.32	0.5	0.72	0.85	0.9		(94)
Us <mark>efu</mark>	l gains,	hmGm .	, W = (9	4)m x (84	4)m									
(95)m=	362.01	394.93	405.11	383.3	324.1	230.25	157.63	164.21	242.45	316.84	340.24	348.3		(95)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	615.95	601.56	549.41	459.06	354.45	237.8	159.45	166.7	257.84	389.24	510.32	609.46	I	(97)
Space	e heatin	g require	ement fo	r each n	honth, k	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4′	1)m			
(98)m=	188.93	138.86	107.36	54.55	22.58	0	0	0	0	53.87	122.46	194.3		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	882.9	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								17.49	(99)
9b. En	ergy rec	luiremer	nts – Coi	mmunity	heating	scheme	;							
This pa	art is use	ed for sp	ace hea	ting, spa		ing or wa	ater heat	ting prov	ided by	a comm	unity sch	ieme.		(201)
Fractio	n or spa	ice neat	from se	condary	supplen	nentary i	neating	Table T	1) U II N	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (30′	1) =						1	(302)
The com	munity so	heme mag	y obtain he	eat from se	everal soul	rces. The p	procedure	allows for	CHP and u	up to four o	other heat	sources; tl	ne latter	
Fractio	n of hea	at from C	commun	ity heat	pump	rom power	r stations.	See Appel	iuix C.			[1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunitv he	eat pum	C			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commi	unitv hea	atina svs	tem		´	1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heati	ng svste	m	5-70			 	1.2	(306)
Snace	heating	n		, -			J , - · ·					l	kWh/w	`´´
Annual	space	, heating	requiren	nent								[882.9	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1059.48	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary syster	n (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1825.78	1
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2190.94	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	32.5	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from or	utside		114.24	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	114.24	(331)
Energy for lighting (calculated in Appendix L)			233.77	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3</mark>)
Tota <mark>l delivered energy for</mark> all uses (307) + (309) + (310) + (312) +	(315) + (331) + (33	32)(237b) =	2 <mark>868.3</mark> 6	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	wo fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(37	10b)] x 100 ÷ (367b) x	0.52	811.04	(367)
Electrical energy for heat distribution [(3	13) x	0.52	- 16.87	(372)
Total CO2 associated with community systems (36	63)(366) + (368)(372	2) =	827.91	(373)
CO2 associated with space heating (secondary) (30	09) x	0 =	= 0	(374)
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (37	73) + (374) + (375) =		827.91	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	59.29	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	121.33	(379)
Energy saving/generation technologies (333) to (334) as applicab Item 1	le	0.52 x 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			629.62	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			12.47	(384)
El rating (section 14)			91.16	(385)

Assessor Name: Software Name:Stroma FSAP 2012Stroma Number: Software Version:Version: 1.0.5.49Mathematical Solution SolutionProperty Address: Block E - Top FloorAddress: Block E - Top FloorAddress:E, Block E, Ham Close, London, TW101.0 versall dwelling dimensions:Av. Height(m)Volume(m ²)Ground floor52.5(1a) x2.5(2a) =Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)52.5(4)Volume(m ²)Dwelling volume(3a)+(2b)+(3c)+(3d)+(3e)+(3n) =131.25(5)C-ventilation rate:Imaging Beecondary Phasing
Hoperty Address: Diock C + Top FloorAddress :E, Block E, Ham Close, London, TW101. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Ground floor 52.5 $(1a) \times 2.5$ $(2a) =$ 131.25 $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.5 (4) $(3a)+(3c)+(3d)+(3c)+(3d)+(3e)+(3n) =$ 131.25 (5) Ventilation rate:Number of chimneys 0 + 0 = 0 $x40 =$ 0 $(6a)$ Number of open flues 0 + 0 = 0 $x10 =$ 0 $(6a)$ Number of passive vents 0 $x10 =$ 0 $x10 =$ 0 $(7a)$ Number of flueless gas fires 0 $x40 =$ 0 (c) Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $x40 =$ 0 (c) Number of storeys in the dwelling (ns)Additional infiltration $(g)-1yc0.1 =$ 0 (g)
In the end of t
Area(m²)Av. Height(m)Volume(m³)Ground floor 52.5 $(1a) \times 2.5$ $(2a) = 131.25$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.5 (4) $(3a)+(3c)+(3d)+(3e)+(3n) = 131.25$ (5) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.25$ (5) (5) (5) (5) 2. Ventilation rate: $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.25$ $(6a)$ $(6a)$ Number of chimneys 0 $+$ 0 $=$ 0 $x40 = 0$ $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $x40 = 0$ $(6a)$ Number of passive vents 0 $x10 = 0$ $(7a)$ Number of flueless gas fires 0 $x40 = 0$ $(7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $+(5) = 0$ (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) (9) Number of storeys in the dwelling (ns) 0 (9) (40) Additional infiltration $(9)-1pc.0.1 = 0$ (10)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 52.5 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.25$ (5) 2. Ventilation rate: Number of chimneys 0 + 0 + 0 = 0 × 40 = 0 (6a) Number of open flues 0 + 0 + 0 = 0 × 20 = 0 (6b) Number of intermittent fans 0 × 10 = 0 (7a) Number of passive vents 0 × 10 = 0 (7b) Number of flueless gas fires 0 × 40 = 0 (7c) Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)= 0 × 40 = 0 (8) <i>If a pressurisation test has been carried out or is intended, proceed to</i> (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration $([9)-1]x0.1 = 0$ (10)
Dwelling volume $(3a)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c$
2. Ventilation rate:Number of chimneys 0 + 0 + 0 = 0 $x40 =$ 0 (6a)Number of open flues 0 + 0 + 0 = 0 $x40 =$ 0 (6b)Number of open flues 0 + 0 + 0 = 0 $x20 =$ 0 (6b)Number of intermittent fans 0 $x10 =$ 0 $(7a)$ 0 $x10 =$ 0 $(7b)$ Number of passive vents 0 $x10 =$ 0 $(7b)$ 0 $x40 =$ 0 $(7c)$ Number of flueless gas fires 0 $x40 =$ 0 $(7c)$ 0 $x40 =$ 0 $(7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $+(5) =$ 0 (6) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9) Number of storeys in the dwelling (ns) 0 (9) (9) (9) Additional infiltration (9) (10) (10)
main heatingsecondary heatingothertotalm³ per hourNumber 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 fans $0 + 0 + 0 = 0$ $x 10 = 0$ (7a)Number of passive vents $0 + 0 = 0$ $x 10 = 0$ (7b)Number of flueless gas fires $0 + 10 = 0$ (7c)Air changes per hourInfiltration due to chimneys, flues and fans = (6e)+(6b)+(7a)+(7c) = 0 $i < 5) = 0$ Infiltration test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns) Additional infiltration 0 (9) (10)
Number of intermittent fans 0 $x 10 =$ 0 $(7a)$ Number of passive vents 0 $x 10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ 0 (8) Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ 0 (8) Number of storeys in the dwelling (ns)Additional infiltration $[(9)-1]x0.1 =$ 0 (10)
Number of passive vents 0 $x 10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 0 $\div (5) =$ 0 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) 0 (9) Number of storeys in the dwelling (ns) 0 (9) (10)
Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 0 \div (5) = 0 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)Number of storeys in the dwelling (ns) 0 0 0 Additional infiltration $[(9)-1]x0.1 =$ 0 (10)
Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 0 \div (5) =0(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(9)(10)Additional infiltration(10)0(10)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 \div (5) =0(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)Number of storeys in the dwelling (ns)0(9)Additional infiltration[(9)-1]x0.1 =0(10)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9) Number of storeys in the dwelling (ns) 0 (9) (10) Additional infiltration 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 deducting areas of openings); if equal user 0.35
If no draught lobby enter 0.05 else else else else else else else els
Percentage of windows and doors draught stripped
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 4 (17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ 0.2 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used
Number of sides sheltered $4 (19)$ Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.77 (20)$
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = $
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Eactor (22a)m = (22)m $\div 4$
(22a)m = 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

Adjuste	ed infiltr	ation rat	e (allowi	ing for sh	elter and	d wind s	peed) =	(21a) x	(22a)m	-			-	
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate effe	ctive air	change	rate for t	he applic	cable ca	se						0.5	(220)
lf exh	aust air h	eat nump i	using App	endix N (2	3b) = (23a) x Emv (e	equation (I	N5)) othe	rwise (23h) = (23a)			0.5	(23a)
lf bala	anced with	heat reco	overv: effic	viency in %	allowing fo	or in-use f	actor (fron	n Table 4h) =) = (20u)			0.5	(230)
		d moob			with hor)- .)m (0)	26) m i (1	226) [·	1 (000)	76.5	(230)
a) II								⊓R) (24a	a) = (2)	$\frac{20}{10.27}$	230) × [1 - (230)	- 100j]	(24a)
(24a)III=	0.3	0.29	0.29		0.27	0.25	0.25	0.25	0.20		0.27	0.20	J	(244)
D) II					without	neat rec		VIV) (240 1	$p_{\rm m} = (22)$	2) + m(a2	230)		1	(24b)
(240)m=		0			0	0		0		0	0	0	J	(240)
c) If	whole h f (22b)r		tract ver	tilation c	or positiv	e input v	ventilatio	on from (outside $n + 0$	5 v (23h	N)			
(24c)m-					0 - (200		0	$\frac{(22)}{0}$) iii + 0.			0	1	(24c)
d) If	notural	vontilati					vontilativ		oft	Ů			l	()
u) ii	f (22b)r	n = 1, the	en (24d)	m = (22k)	b)m othe	rwise (2	(4d)m =	0.5 + [(2	2b)m ² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in box	x (25)				1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28	1	(25)
									1					
3. He	at losse	s and he	eat loss	paramete	er:									• • •
ELEN		Gros	SS (m²)	Openin	gs 2	Net Ar	ea n²	U-val W/m2	ue K	A X U (W/I	K)	k-value	K 3	A X k kJ/K
Doors			()			1.91	x	1	=	1.91				(26)
Window		e 1				6		L/[1/(1.2)+	0.041 –	6.87	Ħ			(27)
Window		2				0 42		/[1/(1 2)+	0.041 -	0.07	H			(27)
Windo		. 2				2.43		/[1/(1.2))	0.041	2.76	E.			(27)
Windo	wa Tura	. 4				2.43		/[1/(1.2)+	0.04] =	2.78	\dashv			(27)
	ws type -	; 4 				2.43	X 1	/[1/(1.2)+	0.04] =	2.78	╡,			(27)
walls	l ype1	47.	5	13.29)	34.21	x	0.16	= [5.47			_	(29)
Walls 7	Гуре2	8		1.91		6.09	x	0.15	=	0.92				(29)
Roof		52.	5	0		52.5	x	0.1	=	5.25				(30)
Total a	rea of e	elements	s, m²			108								(31)
Party v	vall					34.28	3 X	0	=	0				(32)
Party f	loor					52.5					[$\neg $	(32a)
* for win ** includ	dows and le the area	l roof wind as on both	ows, use e sides of ir	effective wil nternal wall	ndow U-va Is and parti	lue calcul itions	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				28.7	7 (33)
Heat c	apacity	Cm = S((A x k)						((28).	.(30) + (32	2) + (32a).	(32e) =	4477.	58 (34)
Therma	al mass	parame	eter (TMI	⁻ = Cm ÷	- TFA) in	kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be u	gn asses: ised inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	constructi	on are not	t known pr	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Therma	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						16.9	3 (36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3 ⁻	1)								
Total fa	abric he	at loss							(33) +	(36) =			45.7	, (37)

Ventila	ation hea	at loss ca	alculated	monthl	у				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.82	12.67	12.52	11.76	11.61	10.85	10.85	10.7	11.15	11.61	11.91	12.21		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	58.52	58.37	58.22	57.46	57.31	56.55	56.55	56.4	56.85	57.31	57.61	57.91		
									(10)	Average =	Sum(39)1	12 /12=	57.42	(39)
Heat l	oss para		HLP), W/	/m²K	1.00	1.00	1.00	1.07	(40)m	= (39)m ÷	• (4)	1.1		
(40)11=	1.11	1.11	1.11	1.09	1.09	1.00	1.00	1.07	1.00	Average -	Sum(40),	1.1 /12=	1 09	(40)
Numb	er of day	vs in mo	nth (Tab	le 1a)						Worugo –			1.00	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			-		-	-			-	-	-	-		
4. Wa	ater heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
A			NI										1	(10)
if TF	FA > 13.9	ipancy, 9, N = 1	in + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.()013 x (TFA -13.	1. .9)	.76		(42)
if TF	A £ 13.9	9, N = 1				,		, ,.	,		,			
Annua	I averag	e hot wa	ater usag	ge in litre usage by	es per da 5% if the o	ay Vd,av Iwelling is	erage = designed t	(25 x N) to achieve	+ 36 a water us	se target o	76	5.09		(43)
not mor	e that 125	litres per	person pe	r day (all w	vater use, l	hot and co	ld)			la got o				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot w <mark>at</mark>	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1 <mark>c x</mark>	(43)				<u>.</u>		
(44)m=	83.7	80.66	77.61	74.57	71.53	68.48	68.48	71.53	74.57	77.61	80.66	<mark>8</mark> 3.7		
										Total = Su	m(44) ₁₁₂ =	=	913.09	(44)
Energy	content of	hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	124.12	108.56	112.02	97. <mark>67</mark>	93.71	80.87	74. <mark>9</mark> 3	85.99	87.02	10 <mark>1.41</mark>	110.7	120.21		_
lf instan	ntaneous w	ater heati	na at point	t of use (no	o hot water	^r storaae).	enter 0 in	boxes (46	-) to (61)	Total = Su	m(45) ₁₁₂ =	-	1197.2	(45)
(46)m-	18.62	16.28	16.8	14 65	14.06	12.13	11 24	12.9	13.05	15 21	16.6	18.03		(46)
Water	storage	loss:	10.0	14.00	14.00	12.10	11.24	12.0	10.00	10.21	10.0	10.00		()
Storag	ge volum	e (litres)) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Other	wise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
vvater a) If n	storage	ioss: urer's di	eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
Temp	erature f	actor fro	m Table	2h			"aay).					0		(40)
Energ	v lost fro	m watei	r storage	kWh/v	ear			(48) x (49)) =			10		(50)
b) If n	nanufact	urer's de	eclared of	cylinder	loss fact	or is not	known:	()()			I	10		(00)
Hot wa	ater stora	age loss	factor fi	rom Tab	le 2 (kW	h/litre/da	ıy)				0.	02		(51)
If com	munity h	eating s	see secti	on 4.3									1	(50)
Tempe	e racior erature f	actor fro	bie ∠a m Table	2b							1.	.03		(52) (53)
Energ	v lost fro	m water	storage	_~ k\//h///	ear			(47) x (51)) x (52) x (53) =		02		(54)
Enter	(50) or (54) in (5	55)	, it v v i i/ y v	Jui			(11) X (01)	, , (02) ^ (1.	.03		(54)
Water	storage	loss cal	, culated	for each	month			((56)m = (55) × (41)ı	m	L'		l	. /
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
x 97.11														

If cylinde	er contains	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)i	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinder	thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61	I)m
(62)m=	179.4	158.49	167.3	151.16	148.99	134.36	130.21	141.27	140.51	156.69	164.19	175.48		(62)
Solar DH	IW input o	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no solai	r contributi	on to wate	r heating)		
(add ad	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies,	, see Ap	pendix G	S)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter	-										
(64)m=	179.4	158.49	167.3	151.16	148.99	134.36	130.21	141.27	140.51	156.69	164.19	175.48		
								Outp	out from wa	ater heatei	r (annual)	12	1848.04	(64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m) + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	85.49	76.04	81.47	75.27	75.38	<mark>6</mark> 9.68	69.14	72.81	71.73	77.94	79.6	84.19		(65)
inclu	de (57)	m in calc	culation	of (65)m	only if c	ylinder is	s in th <mark>e</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	88.19	88.19	88.19	88. <mark>1</mark> 9	88.19	88.19	88.19	88.19	88.19	88.19	88.19	88.19		(66)
Lightin	g gains	(calculat	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso see	Fable 5					
(67)m=	13.7	12.17	9.9	7.49	5.6	4.73	5.11	6.64	8.92	11.32	13.21	14.09		(67)
Appliar	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L'	13 or L1	3a), also	see Tal	ole 5				
(68)m=	153.72	155.32	151.3	142.74	131.94	121.79	115	113.41	117.43	125.98	136.79	146.94		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82		(69)
Pumps	and fai	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-70.55	-70.55	-70.55	-70.55	-70.55	, -70.55	-70.55	-70.55	-70.55	-70.55	-70.55	-70.55		(71)
Water	heating	gains (T	able 5)											
(72)m=	114.91	113.15	109.5	104.54	101.32	96.78	92.93	97.87	99.62	104.76	110.56	113.16		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (70)m + (7	1)m + (72)	m		
(73)m=	331.79	330.1	320.16	304.23	288.32	272.75	262.5	267.37	275.42	291.52	310.01	323.64		(73)
6. Sol	ar gains	S:												
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	х		g_		FF		Gains	
	٦	Table 6d		m²		Tab	ole 6a	Т	able 6b	Та	able 6c		(W)	

Northeast 0.9x	0.77	x	6	x	11.28	x	0.45	x	0.7	=	14.78	(75)
Northeast 0.9x	0.77] x	6	x	22.97	x	0.45	x	0.7	=	30.08](75)
Northeast 0.9x	0.77	x	6	x	41.38	x	0.45	x	0.7	1 =	54.2	– (75)
Northeast 0.9x	0.77	x	6	x	67.96	x	0.45	x	0.7	1 =	89.01	 (75)
Northeast 0.9x	0.77	x	6	x	91.35	×	0.45	x	0.7	i =	119.64	– (75)
Northeast 0.9x	0.77	x	6	x	97.38	x	0.45	x	0.7	i =	127.55	(75)
Northeast 0.9x	0.77	x	6	x	91.1	×	0.45	x	0.7	i =	119.32	(75)
Northeast 0.9x	0.77	x	6	x	72.63	×	0.45	x	0.7	=	95.12	(75)
Northeast 0.9x	0.77	x	6	x	50.42	×	0.45	x	0.7] =	66.04	(75)
Northeast 0.9x	0.77	x	6	×	28.07	×	0.45	x	0.7] =	36.76	(75)
Northeast 0.9x	0.77	x	6	x	14.2	x	0.45	x	0.7	=	18.59	(75)
Northeast 0.9x	0.77	x	6	x	9.21	x	0.45	x	0.7	=	12.07	(75)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	×	0.45	x	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	×	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	×	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	2.43	X	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77] x	2.43	x	85.75	x	0.45	x	0.7] =	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75] ×	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77] ×	2.43	x	106.25	х	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	×	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	×	0.45	x	0.7	=	<mark>5</mark> 6.36	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	×	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	×	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	×	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	×	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	×	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	×	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	×	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	×	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	×	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	×	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	2.43	×	92.85	×	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	×	2.43	×	92.85	×	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	x	2.43	×	92.85	×	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	x	2.43	×	69.27	×	0.45	x	0.7	=	36.74	(77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	=	36.74	(77)

Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	6	69.27) x [0.45	×	Г	0.7		=	36.74	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	2.4	43	x	4	4.07] × [0.45	ے × آ	F	0.7		=	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	4	4.07] × [0.45	×	Γ	0.7		=	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	4	14.07] × [0.45	×	Ē	0.7		=	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	3	31.49	İ x İ		0.45	_ × ٦	Γ	0.7		=	16.7	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	3	31.49] × [0.45	×	Γ	0.7		=	16.7	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	43	x	3	31.49] × [0.45	×	Ē	0.7		=	16.7	(77)
									-									
Solar g	gains in	watts, ca	alculate	d for eac	h month	<u>ו</u>		-	(83)m	= Su	ım(74)m .	(82)	m	-				
(83)m=	73.33	129.82	190.66	258.09	309.03	3	15.57	300.59	261.	25	213.8	146	99	88.73	62	.18		(83)
Total g	gains – i	nternal a	and sola	r (84)m =	= (73)m	+ (83)m	, watts										
(84)m=	405.12	459.92	510.82	562.32	597.35	5	88.33	563.09	528.	62	489.22	438	51	398.74	385	5.82		(84)
7. Me	an inter	rnal temp	perature	(heating	g seasor	า)												
Temp	perature	during h	neating p	periods i	n the liv	ing	area	from Tab	ble 9,	Th1	1 (°C)						21	(85)
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,n	n (s	ee Ta	ble 9a)										
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	0	ct	Nov	D	ec		
(86)m=	0.94	0.92	0.88	0.8	0.69		0.54	0.41	0.4	5	0.65	0.8	3	0.92	0.	95		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in Ta	able	e 9c)				-		•	
(87)m=	18.95	19.22	19.63	20.15	20.57		0.84	20.94	20.9	3	, 20.73	20.	19	19.49	18	8.9		(87)
Temr		during h		Deriods i		f dw	elling	from Ta		Th	2 (°C)							
(88)m=	19.99	19.99	19.99	20.01	20.01		20.02	20.02	20.0	2	20.01	20.0)1	20	2	0		(88)
1.1411:						1		Takla								-		
Utilisa		$\frac{1}{0.01}$	ains for			n2	,m (se		9a)	7	0.58	0.9	<u> </u>	0.0		04		(89)
(03)11-	0.33	0.31	0.00	0.77	0.04		0.47	0.00	0.5	<u>'</u>	0.50	0.0	,	0.3	0.	54		(00)
Mear		l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)						(00)
(90)m=	17.26	17.65	18.24	18.97	19.54		19.88	19.98	19.9	97	19.76	19.0)5 iv/in	18.06	1/	.2		(90)
											1			iy area ÷ (•	+) =		0.52	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	ellin	g) = f	LA × T1	+ (1 -	- fL/	A) × T2						I	
(92)m=	18.15	18.47	18.97	19.59	20.08	2	20.39	20.49	20.4	7	20.27	19.0	65	18.81	18	.09		(92)
Apply	adjustr	nent to t	he meai	n interna	I tempe	ratu	ure fro	m Table	e 4e, v	whe	re appro	opria	te			~~		(02)
(93)m=	18.15	18.47	18.97	19.59	20.08		20.39	20.49	20.4	•7	20.27	19.0	55	18.81	18	.09		(93)
8. Sp	ace nea i to tho	aung requ moon int	urremen formal to	(mporatu	ro obtai	n	l at et	on 11 of	Table	- 0h	co tha	+ Tir	o_('	76)m an	d ro	colo	vulato	
the ut	tilisatior	factor fo	or gains	using Ta	able 9a	nec	1 81 51	epiror	Table	5 90	, so ina	L I I,I)=(<i>i</i> 0)111 att	uie	Cal	Julate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	0	ct	Nov	D	ec		
Utilisa	ation fac	tor for g	ains, hn	ייייי	.					-								
(94)m=	0.91	0.89	0.84	0.76	0.65		0.5	0.37	0.4	1	0.6	0.7	9	0.88	0.9	92		(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (8	4)m													
(95)m=	370.36	407.48	429.11	427.63	385.83	2	93.96	209.1	215.	67	293.88	345	27	352.38	355	5.76		(95)
Mont	hly aver	age exte	ernal ten	nperature	e from T	abl	e 8	i			i			i			I	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	4	14.1	10.	6	7.1	4.	.2		(96)
Heat	loss rat	e for mea	an interr	hal temp	erature,	Lm	1,W=	=[(39)m	x [(93	5)m-	- (96)m]		074			l	(07)
(97)m=	810.24	/92.01	/26.05	614.22	480.26	3	27.15	219.8	229.	(12 (07)	350.68	518.	55	6/4.53	804	1.44		(97)
Spac	e neatir	ig require		br each r	10 ntn, k	T	i/mon	n = 0.02	∠4 X [((97) T	rn – (95)m] x	(4) 02	1)M	222	2 0 0		
(30)11=	521.20	200.41	220.92	1 134.34	10.23		U				U	120	JΖ	231.95	333	0.0Z		

т	otal per year (kWł	n/year) = Sum(98) _{15,912} =	1705.89	(98)
Space heating requirement in kWh/m²/year			32.49	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating pr Fraction of space heat from secondary/supplementary heating (Table	ovided by a co 11) '0' if none	ommunity scheme.	0	(301)
Fraction of space heat from community system $1 - (301) =$,		1	(302)
The community scheme may obtain heat from several sources. The procedure allows	for CHP and up to	four other heat sources; t	he latter	J
includes boilers, heat pumps, geothermal and waste heat from power stations. See Ap Fraction of heat from Community heat pump	pendix C.		1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community h	eating system		1	(305)
Distribution loss factor (Table 12c) for community heating system			1.2	(306)
Space heating			kWh/year	_
Annual space heating requirement			1705.89	
Space heat from Community heat pump	(98) x (304a)	x (305) x (306) =	2047.06	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	ble 4a or Appe	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x	100 ÷ (308) =	0	(309)
Water heating				
Annual water heating requirement			1848.04]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a)	x (305) x (306) =	2217.65	(310a)
Electricity used for heat distribution 0	.01 × [(307a)(30	07e) + (310a)(310e)] =	42.65	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	de		100.08	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (33	0b) + (330g) =	100.08	(331)
Energy for lighting (calculated in Appendix L)			242.03	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (31	5) + (331) + (3	332)(237b) =	3876.74	(338)
12b. CO2 Emissions – Community heating scheme				_
E	Energy	Emission factor	Emissions	
	wiivyear	ky 602/kwn	ny CO2/year	
Efficiency of heat source 1 (%) If there is CHP using two fu	uels repeat (363) t	o (366) for the second fue	208	(367a)

Electrical energy for heat distribution

[(307b)+(310b)] x 100 ÷ (367b) x

(367)

(372)

1064.13

22.13

=

0.52

0.52

Total CO2 associated with community s	systems	(363)(366) + (368)(37	72)	=	1086.26	(373)
CO2 associated with space heating (see	condary)	(309) x	0] =	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52] =	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1086.26	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52] =	51.94	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52] =	125.61	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl	icable	0.52 × 0.	01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				884.91	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				16.86	(384)
El rating (section 14)					87.84	(385)

Assessor Name: Stroma Number: Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.49 Property Address: Block I - Ground Floor	
Property Address: Block I - Ground Floor	
Address - I Block I Hom Close London TW/10	
Address : I, Block I, Ham Close, London, TW To	
Area(m²)Av. Height(m)Volume(m³)Ground floor 70.44 (1a) x 2.5 (2a) = 176.1 (3a))
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 70.44 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 176.1$ (5)	
2. Ventilation rate:	
main heatingsecondary heatingothertotal m^3 per hourNumber of chimneys0+0+0=0× 40 =0(6a)Number of open flues0+0+0=0× 20 =0(6b))
Number of intermittent fans 0 x 10 = 0 (7a))
Number of passive vents $0 \times 10 = 0 (7b)$)
Number of flueless gas fires)
Air changes per hour	
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0 \div (5) = 0$ (8)	
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration ((9)-1]x0.1 = 0 (10) (10) (11) (11) (11) (11) (11) (11))
deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0.)
If no draught lobby, enter 0.05 , else enter 0	,)
Percentage of windows and doors draught stripped)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15))
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16))
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.2 (18))
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	
Number of sides sheltered $4 (19)$ Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.77 (20)$)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$) \
Infiltration rate modified for monthly wind speed	,
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	
Wind Factor (22a)m = (22)m \div 4	
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	

Adjust	ed infiltr	ation rat	te (allowi	ing for sh	elter an	d wind s	speed) =	(21a) x	(22a)m	_				
.	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul	ate effe	ctive air	change	rate for t	he applic	cable ca	se						0.5	
lf exh	aust air h	eat numn	using App	endix N (2	3b) = (23a) x Fmv (e	equation (N	(5)) othe	rwise (23h) = (23a)			0.5	(23a)
lf bala	anced with	n heat reco	overv: effic	viency in %	allowing f	or in-use f	actor (from	n Table 4h) –) = (204)			0.5	(230)
a) If		n moob			with hor				y = (2)	2b) m i (226) v [/	1 (220)	/6.5 · 1001	(230)
a) II (24a)m-					0.27	0.25		1K) (24a	$a_{1} = (2)$	$\frac{20}{10.27}$	230) × [1 - (230)	- 100j	(24a)
(24a)III-		0.23			uithout	boot roc	0.20	1) () () 4h)m (2)	$\frac{0.27}{2}$	0.27	0.20		(210)
D) II					without	neatrec		//v) (24L	D = (22)	$\frac{20}{1}$ - 1(02	230)		l	(24b)
(240)11=					0	0		0		0	0	0		(240)
c) If	whole h if (22b)r	iouse ex	(23b) t	tilation c	or positiv	e input v	ventilatio	on from (22)	outside $(n + 0)$	5 v (23)	N)			
(24c)m =					,) = (200 0			$\frac{0}{0} = \frac{221}{2}$,, 0	0		(24c)
d) If		L Ventilati			o positiv		ventilatio	n from		Ů	Ů	Ů		(- · ·
u) ii	if (22b)r	n = 1, th	en (24d)	m = (22b)	b)m othe	rwise (2	(4d)m = 0	0.5 + [(2	2b)m ² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in box	x (25)					
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
			1				1		1					
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN		Gros	ss (m²)	Openin	gs 2	Net Ar A.r	rea m²	U-val W/m2	ue :K	AXU (W/	K)	k-value	e ≺	AXK kJ/K
Doors						1.91	x	1		1.91				(26)
Windo		e 1				243		/[1/(1.2)+	0.04] =	2 78	F			(27)
Windo	ws Type	2				5.88		/[1/(1.2)+	0.041 =	6.73	Ħ			(27)
Windo	ws Type	23				2.42		/[1/(1 2)+	0.041 -	2.79				(27)
Windo		. 1				2.43		/[1/(1 2)]	0.041	2.70				(27)
	wsiype	54				2.43	×''	/[I/(I.2) +	0.04] =	2.78	╡,			(27)
Floor						70.44	4 X	0.1	=	7.044			\dashv \vdash	(28)
Walls	lype1	34.2	17	13.17	7	21	x	0.16	=	3.36			$_$ $_$	(29)
Walls 7	Type2	31.9	98	1.91		30.07	7 X	0.15	=	4.52				(29)
Total a	rea of e	elements	s, m²			136.5	9							(31)
Party v	vall					21.75	5 X	0	=	0				(32)
Party of	ceiling					70.44	1				[(32b)
* for win ** inclua	dows and le the area	l roof wind as on both	lows, use e n sides of ir	effective wil nternal wall	ndow U-va 's and part	ilue calcul itions	ated using	formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	n 3.2	
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				31.92	(33)
Heat c	apacity	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	11299.9	98 (34)
Therm	al mass	parame	eter (TMF	⊃ = Cm ÷	TFA) in	⊨kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be ι	ign asses: Ised inste	sments wh ad of a de	nere the de stailed calc	etails of the ulation.	constructi	on are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	. x Y) cal	culated u	using Ap	pendix I	<						10	(36)
if details	of therma	al bridging	are not kn	nown (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			41.91	(37)

Ventila	ation hea	at loss ca	alculated	monthl	у	-			(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.2	17	16.79	15.78	15.57	14.56	14.56	14.35	14.96	15.57	15.98	16.39		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	59.12	58.91	58.71	57.69	57.49	56.47	56.47	56.27	56.88	57.49	57.9	58.3		
								-	-	Average =	Sum(39)1.	12 /12=	57.64	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	• (4)			
(40)m=	0.84	0.84	0.83	0.82	0.82	0.8	0.8	0.8	0.81	0.82	0.82	0.83	0.00	
Numbe	er of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12/12=	0.82	(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	Į	!		!	ļ				I		
4 Wa	ater heat	tina ener	rav reau	irement [.]								kWh/ve	ar.	
		ing ono	igy ioqu											
		ipancy, l	N 1 76 y	[1 ovp	(0 0003		- 120) 2)] + 0 (1012 v (*	TEA 12	2.	26		(42)
if TF	A £ 13.9	9, N = 1 9, N = 1	+ 1.70 X	. [1 - exp	(-0.0003	949 X (11	-A -13.9)2)] + 0.0	JU13 X (IFA - 13.	.9)			
Annua	l averag	e hot wa	ater usa	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		87	7.8		(43)
Reduce	the annua e that 125	l average	hot water person pe	usage by r day (all w	5% if the a	lwelling is	designed i Id)	to achieve	a water us	se target o	f			
									0.00	Ort	Neu	Dea		
Hot wat	er usage i	n litres per	day for ea	Apr ach month	Vd.m = fa	ctor from 7	JUI Table 1c x	(43)	Sep	Oct	INOV	Dec		
(44)m-	96.58	93.07	89.55	86.04	82.53	79.02	79.02	82.53	86.04	89.55	93.07	96.58		
(++)11-	30.30	35.07	09.00	00.04	02.35	19.02	19.02	02.00		Total = Su	m(44)1 42 =	30.30	1053 58	(44)
Energy	content of	hot water	used - ca	lculated me	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600	kWh/mor	oth (see Ta	bles 1b, 1	c, 1d)	1000.00	
(45)m=	143.22	125.26	129.26	112.69	108.13	93.31	86.46	99.22	100.4	117.01	127.73	138.7		
										Total = Su	m(45) ₁₁₂ =	-	1381.41	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)		-			
(46)m=	21.48	18.79	19.39	16.9	16.22	14	12.97	14.88	15.06	17.55	19.16	20.81		(46)
Storag	storage	IUSS:	includir		alar ar M		storada	within sa	me ves	ما		0		(47)
If com	munity h	e (illies)	and no to	ng any su ank in du	velling e	ntor 110	litros in	(17)		501		0		(47)
Otherv	vise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		,					,	,				
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	y lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	nanufact	urer's de	eclared (cylinder com Tabl	loss fact	or is not b/litro/da	known:					00		(54)
If com	munity h	eating s	ee secti	on 4.3			iy)				0.	02		(51)
Volum	e factor	from Ta	ble 2a								1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energy	y lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)

If cylinde	er contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)i	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	inual) fro	om Table	93							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinder	thermo	stat)		_	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	Iculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat reg	uired for	water he	eating ca	alculated	l for eacl	h month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	ı (59)m + (61)m
(62)m=	198.5	175.19	184.54	166.19	163.41	146.8	141.74	154.5	153.9	, 172.29	181.22	193.98		(62)
Solar DH	IW input	calculated	using App	endix G or	r Appendix	H (negativ	ve quantity	/) (enter '0'	if no sola	r contributi	ion to wate	er heating)		
(add ad	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix C	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	198.5	175.19	184.54	166.19	163.41	146.8	141.74	154.5	153.9	172.29	181.22	193.98		
l								Outp	out from wa	ater heatei	r (annual)₁	12	2032.24	(64)
Heat g	ains fro	m water	heating	_kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	ı] + 0.8 x	[(46)m	+ (57)m	+ (59)m		
(65)m=	91.84	81.59	87.2	80.27	80.17	73.82	72.97	77.21	76.18	83.13	85.26	90.34		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	vlinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	5 and 5a):							, ,	3	
Motabo		s (Table	5) Wat	te										
Melabi	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(66)m=	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84		(66)
Liahtin	a aains	(calcula	ted in Ar	opendix	L. equat	ion L9 o	r L9a), a	lso see ⁻	Table 5		<u> </u>			
(67)m=	17.95	15.95	12.97	9.82	7.34	6.2	6.7	8.7	11.68	14.83	17.31	18.45		(67)
Appliar	nces da	ins (calc	ulated ir	Append	l lixlea	L Lation L	L 13 or I 1	(Ja) also	see Tal	ole 5				
(68)m=	198.32	200.38	195.19	184.15	170.22	157.12	148.37	146.31	151.5	162.54	176.47	189.57		(68)
Cookin		(calcula	ted in A	nnendix		ion 15	or 15a		a Tahla	5				
(69)m=	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28		(69)
Dumps	and fa		(Table P	52)					•					
(70)m=					0	0	0	0	0	0	0	0		(70)
				tivo valu	es) (Tab		Ů	Ŭ	Ů	Ū	Ů	Ŭ		(- /
(71)m-	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27		(71)
(/ I)III-	hooting		-30.27	-50.27	-50.21	-30.27	-50.21	-30.21	-30.21	-30.21	-50.21	-30.21		()
vvater		gains (1		111 10	107.70	102.52	00.00	102 70	105.0	444 70	110.40	101 40	l	(72)
(72)11=	123.44	121.42	117.2	111.40	107.70	102.00	90.00	103.76	105.6	70) m + (7	110.42	121.42		(12)
I Otal I	nternal	gains =	202.22	262.2	242.47	(00)		245.64	- (09)11 + (70)m + (7)	1)(1) + (72)	206.2	l	(72)
(13)III= 6_Sal	390.57	394.59	302.22	302.3	342.17	322.09	309.99	315.04	323.83	545.95	309.06	300.3		(13)
Solar o	ains are d	s.	using sola	r flux from	Table 6a	and associ	iated equa	tions to co	nvert to th	e applicat	le orientat	ion.		
Orients	ation:	Access F	actor	Area		Flu	X		a	- 5661000	FF		Gains	
5.15110	-	Table 6d		m²		Tal	ole 6a	Т	able 6b	Та	able 6c		(W)	

0.77	x	2.43	x	36.79]	0.45	x	0.7	=	19.52	(79)
0.77	x	2.43	x	62.67	i	0.45	x	0.7	i =	33.25	- (79)
0.77	x	2.43	x	85.75	i	0.45	x	0.7	i =	45.49	 (79)
0.77	x	2.43	x	106.25	i	0.45	x	0.7	i =	56.36	- (79)
0.77	x	2.43	x	119.01	i	0.45	x	0.7	i =	63.13] (79)
0.77	x	2.43	x	118.15	i	0.45	x	0.7	i =	62.67	- (79)
0.77	x	2.43	x	113.91	İ	0.45	x	0.7	=	60.42	_ (79)
0.77	x	2.43	x	104.39	Ī	0.45	x	0.7	=	55.37	- (79)
0.77	x	2.43	x	92.85]	0.45	x	0.7] =	49.25	(79)
0.77	x	2.43	x	69.27]	0.45	x	0.7	=	36.74	(79)
0.77	x	2.43	x	44.07]	0.45	x	0.7	=	23.38	(79)
0.77	x	2.43	x	31.49]	0.45	x	0.7	=	16.7	(79)
0.77	x	5.88	x	11.28	×	0.45	x	0.7] =	14.48	(81)
0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
0.77	x	5.88	x	22.97	×	0.45	x	0.7] =	29.48	(81)
0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(81)
0.77	x	2.43	X	22.97	x	0.45	х	0.7	=	12.18	(81)
0.77] x	5.88	x	41.38	x	0.45	x	0.7] =	53.11	(81)
0.77	x	2.43	x	41.38	×	0.45	x	0.7	=	21.95	(81)
0.7 <mark>7</mark>	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(81)
0.77	x	5.88	x	67.9 <mark>6</mark>	x	0.45	x	0.7	=	87.23	(81)
0.77] x	2.43	x	67.96	×	0.45	x	0.7	=	<mark>3</mark> 6.05	(81)
0.77	x	2.43	x	67.96	x	0.45	x	0.7] =	36.05	(81)
0.77	x	5.88	x	91.35	x	0.45	x	0.7	=	117.25	(81)
0.77	x	2.43	x	91.35	x	0.45	x	0.7] =	48.46	(81)
0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(81)
0.77	x	5.88	x	97.38	x	0.45	x	0.7	=	125	(81)
0.77	x	2.43	x	97.38	x	0.45	x	0.7] =	51.66	(81)
0.77	x	2.43	×	97.38	×	0.45	x	0.7	=	51.66	(81)
0.77	x	5.88	x	91.1	x	0.45	x	0.7] =	116.94	(81)
0.77	x	2.43	x	91.1	×	0.45	x	0.7	=	48.33	(81)
0.77	x	2.43	x	91.1	x	0.45	x	0.7] =	48.33	(81)
0.77	x	5.88	x	72.63	x	0.45	x	0.7	=	93.22	(81)
0.77	x	2.43	x	72.63	x	0.45	x	0.7] =	38.53	(81)
0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(81)
0.77	x	5.88	x	50.42	x	0.45	x	0.7	=	64.72	(81)
0.77	x	2.43	×	50.42	×	0.45	x	0.7	=	26.75	(81)
0.77	x	2.43	×	50.42	×	0.45	x	0.7] =	26.75	(81)
0.77	x	5.88	×	28.07	×	0.45	x	0.7] =	36.03	(81)
0.77	x	2.43	×	28.07	×	0.45	x	0.7	=	14.89	(81)
	0.77 0.77	0.77 × 0.77 ×	0.77 × 2.43 0.77 × 2.43	0.77 × 2.43 × 0.7	0.77 × 2.43 × 36.79 0.77 × 2.43 × 62.67 0.77 × 2.43 × 85.75 0.77 × 2.43 × 106.25 0.77 × 2.43 × 119.01 0.77 × 2.43 × 113.91 0.77 × 2.43 × 114.99 0.77 × 2.43 × 104.39 0.77 × 2.43 × 92.85 0.77 × 2.43 × 44.07 0.77 × 2.43 × 11.28 0.77 × 2.43 × 11.28 0.77 × 2.43 × 11.28 0.77 × 2.43 × 11.28 0.77 × 2.43 × 12.97 0.77 × 2.43 × 13.5 0.77 ×	0.77 × 2.43 × 36.79 0.77 × 2.43 × 62.67 0.77 × 2.43 × 106.25 0.77 × 2.43 × 119.01 0.77 × 2.43 × 119.01 0.77 × 2.43 × 113.91 0.77 × 2.43 × 104.39 0.77 × 2.43 × 104.39 0.77 × 2.43 × 104.39 0.77 × 2.43 × 104.39 0.77 × 2.43 × 11.28 × 0.77 × 2.43 × 11.28 × 0.77 × 2.43 × 11.28 × 0.77 × 2.43 × 2.97 × 0.77 × 2.43 × 2.97 × 0.77 × 2.43 × 11.28 × 0.77 × 2.43 × 11.38 <td>0.77 × 2.43 × 36.79 0.45 0.77 × 2.43 × 62.67 0.45 0.77 × 2.43 × 106.25 0.45 0.77 × 2.43 × 106.25 0.45 0.77 × 2.43 × 119.01 0.45 0.77 × 2.43 × 113.91 0.45 0.77 × 2.43 × 104.39 0.45 0.77 × 2.43 × 92.85 0.45 0.77 × 2.43 × 44.07 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 22.97 × 0.45 0.77 × 2.43 × 21.33</td> <td>0.77 × 2.43 × 36.79 0.45 × 0.77 × 2.43 × 62.67 0.45 × 0.77 × 2.43 × 106.25 0.45 × 0.77 × 2.43 × 119.01 0.45 × 0.77 × 2.43 × 119.01 0.45 × 0.77 × 2.43 × 113.91 0.45 × 0.77 × 2.43 × 104.39 0.45 × 0.77 × 2.43 × 92.85 0.45 × 0.77 × 2.43 × 69.27 0.45 × 0.77 × 2.43 × 11.28 × 0.45 × 0.77 × 2.43 × 11.28 × 0.45 × 0.77 × 2.43 × 22.97 × 0.45 × 0.77 × 2.43 × 67.96 × 0.45 × <td>0.77 × 2.43 × 36.79 0.45 × 0.7 0.77 × 2.43 × 62.67 0.45 × 0.7 0.77 × 2.43 × 106.25 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 113.91 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 12.97 × 0.45 × 0.7 0.77</td><td>0.77 × 2.43 × 36.79 0.45 × 0.77 0.77 × 2.43 × 62.67 0.45 × 0.77 = 0.77 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0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 22.97 × 0.45 0.77 × 2.43 × 21.33	0.77 × 2.43 × 36.79 0.45 × 0.77 × 2.43 × 62.67 0.45 × 0.77 × 2.43 × 106.25 0.45 × 0.77 × 2.43 × 119.01 0.45 × 0.77 × 2.43 × 119.01 0.45 × 0.77 × 2.43 × 113.91 0.45 × 0.77 × 2.43 × 104.39 0.45 × 0.77 × 2.43 × 92.85 0.45 × 0.77 × 2.43 × 69.27 0.45 × 0.77 × 2.43 × 11.28 × 0.45 × 0.77 × 2.43 × 11.28 × 0.45 × 0.77 × 2.43 × 22.97 × 0.45 × 0.77 × 2.43 × 67.96 × 0.45 × <td>0.77 × 2.43 × 36.79 0.45 × 0.7 0.77 × 2.43 × 62.67 0.45 × 0.7 0.77 × 2.43 × 106.25 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 113.91 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 12.97 × 0.45 × 0.7 0.77</td> <td>0.77 × 2.43 × 36.79 0.45 × 0.77 0.77 × 2.43 × 62.67 0.45 × 0.77 = 0.77 × 2.43 × 106.25 0.45 × 0.77 = 0.77 × 2.43 × 118.15 0.45 × 0.77 = 0.77 × 2.43 × 118.15 0.45 × 0.77 = 0.77 × 2.43 × 113.91 0.45 × 0.77 = 0.77 × 2.43 × 192.25 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.45 ×<td>0.77 × 2.43 × 38.79 0.46 × 0.77 = 19.52 0.77 × 2.43 × 62.67 0.45 × 0.77 = 45.43 0.77 × 2.43 × 105.25 0.45 × 0.77 = 65.38 0.77 × 2.43 × 118.01 0.46 × 0.77 = 63.13 0.77 × 2.43 × 113.91 0.46 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.74 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 63.64 0.77 × 2.43 × 44.07 0.45 × 0.77 = 16.7 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 5.99</td></td>	0.77 × 2.43 × 36.79 0.45 × 0.7 0.77 × 2.43 × 62.67 0.45 × 0.7 0.77 × 2.43 × 106.25 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 113.91 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 12.97 × 0.45 × 0.7 0.77	0.77 × 2.43 × 36.79 0.45 × 0.77 0.77 × 2.43 × 62.67 0.45 × 0.77 = 0.77 × 2.43 × 106.25 0.45 × 0.77 = 0.77 × 2.43 × 118.15 0.45 × 0.77 = 0.77 × 2.43 × 118.15 0.45 × 0.77 = 0.77 × 2.43 × 113.91 0.45 × 0.77 = 0.77 × 2.43 × 192.25 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × <td>0.77 × 2.43 × 38.79 0.46 × 0.77 = 19.52 0.77 × 2.43 × 62.67 0.45 × 0.77 = 45.43 0.77 × 2.43 × 105.25 0.45 × 0.77 = 65.38 0.77 × 2.43 × 118.01 0.46 × 0.77 = 63.13 0.77 × 2.43 × 113.91 0.46 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.74 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 63.64 0.77 × 2.43 × 44.07 0.45 × 0.77 = 16.7 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 5.99</td>	0.77 × 2.43 × 38.79 0.46 × 0.77 = 19.52 0.77 × 2.43 × 62.67 0.45 × 0.77 = 45.43 0.77 × 2.43 × 105.25 0.45 × 0.77 = 65.38 0.77 × 2.43 × 118.01 0.46 × 0.77 = 63.13 0.77 × 2.43 × 113.91 0.46 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.74 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 63.64 0.77 × 2.43 × 44.07 0.45 × 0.77 = 16.7 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 5.99

Northw	est <mark>0.9x</mark>	0.77	x	2.4	43	x	2	28.07	x		0.45	×	Γ	0.7		=	14.89	(81)
Northw	est 0.9x	0.77	×	5.8	38	x		14.2] x [0.45	×	Ē	0.7		=	18.22	(81)
Northw	est 0.9x	0.77	×	2.4	43	x		14.2] x [0.45	×	Ē	0.7		=	7.53	(81)
Northw	est 0.9x	0.77	×	2.4	43	x		14.2] x [0.45	×	Ē	0.7		=	7.53	(81)
Northw	est 0.9x	0.77	x	5.8	38	x		9.21] x [0.45	۲×	F	0.7		=	11.83	(81)
Northw	est 0.9x	0.77	×	2.4	43	x		9.21] x [0.45	۲×	F	0.7		=	4.89	(81)
Northw	est 0.9x	0.77	×	2.4	43	x		9.21] x [0.45	×	Ē	0.7		=	4.89	(81)
	L						L		J 1									
Solar g	gains in	watts, ca	alculate	d for eac	h montł	n			(83)m	= St	um(74)m .	(82)	m					
(83)m=	45.97	87.09	142.5	215.68	277.29	2	90.99	274.01	225.	.65	167.46	102	55	56.66	38.	31		(83)
Total g	gains – i	nternal a	and sola	r (84)m =	= (73)m	+ (83)m	, watts									-	
(84)m=	442.54	481.69	524.72	577.99	619.46	6	13.68	584	541.	29	493.3	448	.5	425.72	424	.61		(84)
7. Me	ean inter	nal temp	perature	(heating	seasor	n)												
Temp	perature	during h	neating	periods i	n the liv	ing	area	from Tak	ole 9,	Th	1 (°C)						21	(85)
Utilis	ation fac	ctor for g	ains for	living are	ea, h1,n	n (s	ee Ta	able 9a)			. ,							
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Αι	Jg	Sep	0	ct	Nov	D	ec		
(86)m=	0.96	0.94	0.91	0.83	0.71		0.54	0.41	0.4	6	0.67	0.8	6	0.94	0.9	96		(86)
Moar		tompor	ı ature in	living ar	00 T1 /f	أمالد	w eto	$\frac{1}{2}$	I 7 in T						L]	
(87)m=	19.4	19.59	19.93	20.38	20.72		0.92	20.98	20.9	26	20.83	20.3	39	19.84	19	37		(87)
-								/			- (0 0)						i	. ,
l emp		during h	eating		n rest of	t dw	elling	from Ta	able 9), Ir	12 (°C)			00.00	20	00		(99)
(00)11=	20.22	20.22	20.22	20.24	20.24	4	20.25	20.25	20.2	25	20.25	20	24	20.23	20.	23	j	(00)
Utilis	ation fac	tor for g	ains for	rest of d	welling,	h2	,m (se	e Table	9a)									()
(89)m=	0.95	0.93	0.9	0.81	0.67		0.49	0.35	0.3	9	0.62	8.0	4	0.93	0.9	96		(89)
Mear	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9 <mark>c</mark>						
(90)m=	18.05	18.33	18.82	19.46	19.92	2	20.17	20.23	20.2	23	20.07	19.	19	18.7	18.	02		(90)
											f	LA =	_ivin	ig area ÷ (4	4) =		0.36	(91)
Mear	n interna	l temper	ature (f	or the wh	ole dwe	əllin	g) = f	LA x T1	+ (1 -	– fL	A) × T2							
(92)m=	18.54	18.79	19.22	19.79	20.21	2	20.44	20.5	20.4	49	20.34	19.	32	19.11	18.	51		(92)
Apply	/ adjustr	nent to t	he mea	n interna	l tempe	ratu	ure fro	m Table	4e, v	whe	re appro	opria	te				-	
(93)m=	18.54	18.79	19.22	19.79	20.21	2	20.44	20.5	20.4	49	20.34	19.	32	19.11	18.	51		(93)
8. Sp	ace hea	ting requ	uiremen	t														
Set T the ut	i to the tilisation	mean int	ernal te or gains	mperatu using Ta	re obtai able 9a	nec	l at st	ep 11 of	Table	e 9b	o, so tha	t Ti,r	∩=([*]	76)m an	d re-	calc	ulate	
	Jan	Feb	Mar	Apr	May	Τ	Jun	Jul	Αι	д	Sep	0	ct	Nov	D	ес		
Utilisa	ation fac	tor for g	ains, hn	n:		-		•		-							I	
(94)m=	0.94	0.92	0.88	0.8	0.67		0.5	0.37	0.4	1	0.63	0.8	3	0.91	0.9	94		(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (8	4)m												•	
(95)m=	413.92	441.25	460.13	460.16	414.34	3	08.87	214.76	222.	35	310.47	370	08	387.52	399	.75		(95)
Mont	hly aver	age exte	ernal ten	nperature	e 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	loss rat	e for mea	an inter	nal temp	erature,	Lm	1,W=	=[(39)m	x [(93	3)m-	- (96)m]					1	
(97)m=	841.67	818.09	746.9	628.21	489.23	3	29.86	220.29	230.	.31	354.99	529	91	695.39	834	.03		(97)
Spac	e heatin	g require	ement fo	or each r	nonth, k	(Wh	n/mon	th = 0.02	24 x [(97)	m – (95)m]	(4	1)m			I	
(98)m=	318.25	253.24	213.36	121	55.72		0	0	0		0	118	91	221.66	323	3.1		

	То	tal per year (kWh/y	ear) = Sum(98) _{15,912} =	1625.24	(98)
Space heating requirement in kWh/m²/year				23.07	(99)
9b. Energy requirements – Community heating s	cheme				
This part is used for space heating, space coolin Fraction of space heat from secondary/supplement	g or water heating pro	vided by a com	munity scheme.	0	(301)
Fraction of space heat from community system 1	= (301) =			1	$ \begin{bmatrix} (307) \\ (302) \end{bmatrix} $
The community scheme may obtain heat from several source	es. The procedure allows fo	r CHP and up to fo	our other heat sources; t	he latter	
includes boilers, heat pumps, geothermal and waste heat fro Fraction of heat from Community heat pump	n power stations. See App	endix C.		1	(303a)
Fraction of total space heat from Community heat	at pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4	c(3)) for community he	ating system		1	(305)
Distribution loss factor (Table 12c) for community	y heating system			1.2	(306)
Space heating				kWh/yea	 r
Annual space heating requirement				1625.24	
Space heat from Community heat pump		(98) x (304a) x ((305) x (306) =	1950.28	(307a)
Efficiency of secondary/supplementary heating s	system in % (from Tab	le 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supp	plementary system	(98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating					
Annual water heating requirement				2032.24	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x ((305) x (306) =	2438.69	(310a)
Electricity used for heat distribution	0.0	01 × [(307a)(307e	e) + (310a)(310e)] =	43.89	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system,	if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Ta	able 4f): itive input from outside	2		150.44	
warm air baating system fans		5		159.41	
nume for color water besting				0	
		(220a) + (220b	() (220 ~)	0	
For a light for the above, kwh/year		=(330a) + (330b)) + (330g) =	159.41	
Energy for lighting (calculated in Appendix L)				317.09	(332)
Electricity generated by PVs (Appendix M) (nega	ative quantity)			-730.07	(333)
Total delivered energy for all uses (307) + (309)	+ (310) + (312) + (315	5) + (331) + (33	2)(237b) =	4135.4	(338)
12b. CO2 Emissions – Community heating sche	me =-	orav	Emission factor	Emissions	
	Ei kV	Vh/year	kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and water hea	ting (not CHP)				_
Efficiency of heat source 1 (%)	f there is CHP using two fue	els repeat (363) to (366) for the second fue	208	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] >	(100 ÷ (367b) x	0.52 =	1095.13	(367)

22.78

0.52

(372)

Total CO2 associated with community sy	vstems	(363)(366) + (368)(37	72)	=	1117.91	(373)
CO2 associated with space heating (sec	ondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersi	on heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =			1117.91	(376)
CO2 associated with electricity for pump	s and fans within dwe	elling (331)) x	0.52	=	82.74	(378)
CO2 associated with electricity for lightin	g	(332))) x	0.52	=	164.57	(379)
Energy saving/generation technologies (Item 1	333) to (334) as appli	cable	0.52 × 0.01	=	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				986.31	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14	(384)
El rating (section 14)					88.55	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12	conorty /	Stroma Softwa	a Numi ire Ver	ber: sion:	oor	Versio	n: 1.0.5.49	
	I Block I Ham Clo	ri opdo Londo		n n	DIUCK I		001			
Address :	I, DIUCK I, HAIII CIU	se, Londo	11, IVVI	J						
Ground floor			Area	0.44	(1a) x	Av. He i	ight(m) 2.5	(2a) =	Volume(m ³) 176.1	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n) 70	0.44	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	176.1	(5)
2. Ventilation rate:									<u>, , , , , , , , , , , , , , , , , , , </u>	
Number of chimneys Number of open flues	main s heating 0 + [0 + [0 + [secondary heating 0 0	y	0 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent far					' L L	0	x	10 =	0](7a)
Number of passive vents						0	x ^	10 =	0	`_´ □(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
		6 a) 1 (6 b) 1 /7	a) ((7b) ((7					Air ch	anges per ho	ur
Inflitration due to chimney	s, flues and fans = 0	ba)+(bb)+(7a	(17) + (17)	c) =	ontinue fro	0	(16)	÷ (5) =	0	(8)
Number of storeys in th Additional infiltration Structural infiltration: 0.2	e dwelling (ns) 25 for steel or timber	frame or	0.35 for	masonr	y constru	uction	[(9)·	-1]x0.1 =	0 0 0	(9) (10) (11)
if both types of wall are pre deducting areas of opening	esent, use the value corre gs); if equal user 0.35	esponding to	the greate	er wall area	a (after					
If no draught lobby, ent	001, efficient 0.2 (unsequence of 0.5 also optor 0.5		i (Seale	u), eise					0	(12)
Percentage of windows	and doors draught	strinned							0	$ - \left[\begin{pmatrix} 1 & 3 \\ 1 & 4 \end{pmatrix} \right] $
Window infiltration		siippeu		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				- (8) + (10) -	+ (11) + (1	- 2) + (13) +	+ (15) =		0	(16)
Air permeability value, o	50, expressed in cu	bic metres	s per ho	ur per so	uare me	etre of e	nvelope	area	4	(17)
If based on air permeabilit	y value, then (18) = [(17) ÷ 20]+(8), otherwis	se (18) = (16)		•		0.2	(18)
Air permeability value applies	if a pressurisation test h	as been don	e or a deg	ree air per	meability i	is being us	sed			_
Number of sides sheltered	k			(20) 4 [0.075 v (1	0)1			4	(19)
Shelter factor	a a baltar faatar			(20) = 1 - [(21) - (19)	0.075 X (1	9)] =			0.7	(20)
Inflitration rate incorporation	ng shelter lactor	ما		(21) = (10)	x (20) =				0.14	(21)
			lul	Δυσ	Son	Oct	Nov	Dec		
Monthly avorage wind and	ad from Table 7		Jui	лuy	Och	001		Dec		
$(22)m = \begin{bmatrix} 51 \\ 5 \end{bmatrix} \begin{bmatrix} 5 \\ 5 \end{bmatrix}$		38	3.8	37	4	4.3	4.5	47		
			5.0	5.7	·		I	I	l	
Wind Factor (22a)m = (22)m ÷ 4		0.05	0.00	I	4.00	4.40	4.40	l	
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m														
<u> </u>	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula If me	ate ette	<i>ctive air</i> al ventila	change	rate for ti	he applic	cable ca	se						0.5	(23a)
lf exh	ir meonamoar verturation. If exhaust air beat numn using Annendix N (23h) - (23a) x Emv (equation (N5)), otherwise (23h) - (23a)												0.5	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4b) $=$											0.5	(230)		
a) If balanced mechanical ventilation with beat recovery (MV/HR) (24a)m – (22b)m + (23b) \times [1 – (23c)) (230)	
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	halance	d mech	l anical ve	<u>I</u> Intilation	without	heat rec	overv (N	///) (24h	m = (22)	$\frac{1}{2}$	23h)		1	
(24b)m=	0				0	0		0		0	0	0	1	(24b)
c) If	u whole h	L IOUSE EX	I tract ver	tilation c	r positiv	e input v	/entilatio	n from o	L outside			[I	
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)														
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft	L				
i	f (22b)r	n = 1, th	en (24d)	m = (22b)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in box	(25)					
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. Heat losses and heat loss parameter:														
ELEN		Gros	ss	Openin	gs	Net Ar	ea	U-val	ue	AXU		k-value	e	AXk
_		area	(m²)	m	2	A ,n	n²	W/m2	K	(W/I	<)	kJ/m²·l	K	kJ/K
Doors						1.91	X	1	= [1.91				(26)
Windov	Nindows Type 1 2.43 x1/								0.04] =	2.78				(27)
Windov	Windows Type 2 5.88 $x1/[1/(1.2) + 0.04] = 6.73$												(27)	
Window	ws Type	e 3				2.43	x1/	x1/[1/(1.2)+ 0.04] = 2.78						(27)
Window	Windows Type 4						x1/	/[1/(1.2)+	0.04] =	2.78				(27)
Walls 7	Nalls Type1 34.17 13.17					21 × 0.16 = 3.36								(29)
Walls 7	/alls Type2 31.98 1.91					30.07	' x	0.15	= [4.52				(29)
Total a	rea of e	elements	, m²			66.15	5							(31)
Party wall						21.75	5 x	0	= [0				(32)
Party floor						70.44	`				[$\neg \vdash$	(32a)
Party c	eiling					70.44					Γ		- -	(32b)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions														
Fabric heat loss, W/K = S (A x U)								(26)(30) + (32) =					24.8	7 (33)
Heat capacity $Cm = S(A \times k)$								((28)(30) + (32) + (32a)(32e) =					6369.	.18 (34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K								Indicative Value: Low					100	(35)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.														
Thermal bridges : S (L x Y) calculated using Appendix K													6.24	1 (36)
if details of thermal bridging are not known $(36) = 0.05 \times (31)$								Ľ						
Total fabric heat loss								(33) + (36) =					31.1	1 (37)

Ventilation heat loss calculated monthly									(38)m					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	17.2	17	16.79	15.78	15.57	14.56	14.56	14.35	14.96	15.57	15.98	16.39		(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m														
(39)m=	48.31	48.11	47.91	46.89	46.69	45.67	45.67	45.47	46.08	46.69	47.09	47.5		
								-	-	Average =	Sum(39)1.	12 /12=	46.84	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	• (4)		I	
(40)m=	0.69	0.68	0.68	0.67	0.66	0.65	0.65	0.65	0.65	0.66	0.67	0.67	0.00	
Numbe	er of day	s in mo	nth (Tab	le 1a)					,	<pre>Average =</pre>	Sum(40)₁.	12/12=	0.66	(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	Į	!		!	ļ						
4 Wa	ater heat	tina ener	rav reau	irement [.]								kWh/ve	ear:	
		ing ono	igy ioqu											
		ipancy, l	N 1 76 y	[1 ovp	(0 0003		- 120) 2)] + 0 (1012 v (*	FEA 12	2.	26		(42)
if TF	A 2 13.9 A £ 13.9	9, N = 1 9, N = 1	+ 1.70 X	. [1 - exp	(-0.0003	949 X (11	-A -13.9)2)] + 0.0	JU13 X (IFA - 13.	.9)			
Annua	l averag	e hot wa	ater usa	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		87	7.8		(43)
Reduce	the annua e that 125	l average	hot water person pe	usage by r day (all w	5% if the a	lwelling is	designed i Id)	to achieve	a water us	se target o	f			
									0.00	Ort	Neu	Dee		
Hot wat	er usage i	n litres per	day for ea	Apr ach month	Vd.m = fa	ctor from 7	JUI Table 1c x	(43)	Sep	Oct	INOV	Dec		
(44)m-	96.58	93.07	89.55	86.04	82.53	79.02	79.02	82.53	86.04	89 55	93.07	96 58		
(++)11-	30.30	35.07	09.00	00.04	02.35	19.02	19.02	02.00		Total = Su	m(44)1 42 =	30.30	1053 58	(44)
Energy	content of	hot water	used - ca	lculated me	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600	kWh/mor	oth (see Ta	bles 1b, 1	c, 1d)	1000.00	
(45)m=	143.22	125.26	129.26	112.69	108.13	93.31	86.46	99.22	100.4	117.01	127.73	138.7		
										Fotal = Su	m(45) ₁₁₂ =	=	1381.41	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)		-			
(46)m=	21.48	18.79	19.39	16.9	16.22	14	12.97	14.88	15.06	17.55	19.16	20.81		(46)
Storag	storage	IUSS:	includir		alar ar M		storada	within sa	me ves	ما		0	l	(47)
If com	munity h	e (illies)	and no to	ng any su ank in du	velling e	ntor 110	litros in	(17)		501		0		(47)
Otherv	vise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		,					,	,				
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature factor from Table 2b											0		(49)	
Energy lost from water storage, kWh/year (48) x (49) = 110												(50)		
b) If manufacturer's declared cylinder loss factor is not known:												(54)		
If community heating see section 4.3												(51)		
Volume factor from Table 2a 1.03												(52)		
Temperature factor from Table 2b 0.6												(53)		
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 1.03$													(54)	
Enter (50) or (54) in (55)													(55)	
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)i	m where (H11) is fro	m Append	lix H	
-------------------	------------	------------	-------------	-------------	-------------	---------------	----------------	----------------------	--------------	--------------	--------------	-------------	------------------	-------
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	inual) fro	om Table	93							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinder	thermo	stat)		_	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	Iculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat reg	uired for	water he	eating ca	alculated	l for eacl	h month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	ı (59)m + (61)m
(62)m=	198.5	175.19	184.54	166.19	163.41	146.8	141.74	154.5	153.9	, 172.29	181.22	193.98		(62)
Solar DH	IW input	calculated	using App	endix G or	r Appendix	H (negativ	ve quantity	/) (enter '0'	if no sola	r contributi	ion to wate	er heating)		
(add ad	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix C	3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	198.5	175.19	184.54	166.19	163.41	146.8	141.74	154.5	153.9	172.29	181.22	193.98		
l								Outp	out from wa	ater heatei	r (annual)₁	12	2032.24	(64)
Heat g	ains fro	m water	heating	_kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	ı] + 0.8 x	[(46)m	+ (57)m	+ (59)m		
(65)m=	91.84	81.59	87.2	80.27	80.17	73.82	72.97	77.21	76.18	83.13	85.26	90.34		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	vlinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	5 and 5a):							, ,	3	
Motabo		s (Table	5) Wat	te										
Melabi	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(66)m=	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84	112.84		(66)
Liahtin	a aains	(calcula	ted in Ar	opendix	L. equat	ion L9 o	r L9a), a	lso see ⁻	Table 5		<u> </u>			
(67)m=	17.95	15.95	12.97	9.82	7.34	6.2	6.7	8.7	11.68	14.83	17.31	18.45		(67)
Appliar	nces da	ins (calc	ulated ir	Append	l lixlea	L Lation L	L 13 or I 1	(Ja) also	see Tal	ole 5				
(68)m=	198.32	200.38	195.19	184.15	170.22	157.12	148.37	146.31	151.5	162.54	176.47	189.57		(68)
Cookin		(calcula	ted in A	nnendix		ion 15	or 15a		a Tahla	5				
(69)m=	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28	34.28		(69)
Dumps	and fa		(Table P	52)					•					
(70)m=					0	0	0	0	0	0	0	0		(70)
				tivo valu	es) (Tab		Ů	Ŭ	Ů	Ū	Ů	Ŭ		(- /
(71)m-	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27	-90 27		(71)
(/ I)III-	hooting		-30.27	-50.27	-50.21	-30.27	-50.21	-30.21	-30.21	-30.21	-50.21	-30.21		()
vvater		gains (1		111 10	107.70	102.52	00.00	102 70	105.0	444 70	110.40	101 40	l	(72)
(72)11=	123.44	121.42	117.2	111.40	107.70	102.00	90.00	103.76	105.6	70) m + (7	110.42	121.42		(12)
I Otal I	nternal	gains =	202.22	262.2	242.47	(00)		245.64	- (09)11 + (70)m + (7	1)(1) + (72)	206.2	I	(72)
(13)III= 6_Sal	390.57	394.59	302.22	302.3	342.17	322.09	309.99	315.04	323.83	545.95	309.06	300.3		(13)
Solar o	ains are d	s.	using sola	r flux from	Table 6a	and associ	iated equa	tions to co	nvert to th	e applicat	le orientat	ion.		
Orients	ation:	Access F	actor	Area		Flu	X		a	- 5661000	FF		Gains	
5.15110	-	Table 6d	20101	m²		Tal	ole 6a	Т	able 6b	Та	able 6c		(W)	

0.77	x	2.43	x	36.79]	0.45	x	0.7	=	19.52	(79)
0.77	x	2.43	x	62.67	i	0.45	x	0.7	i =	33.25	- (79)
0.77	x	2.43	x	85.75	i	0.45	x	0.7	i =	45.49	 (79)
0.77	x	2.43	x	106.25	i	0.45	x	0.7	i =	56.36	- (79)
0.77	x	2.43	x	119.01	i	0.45	x	0.7	i =	63.13] (79)
0.77	x	2.43	x	118.15	i	0.45	x	0.7	i =	62.67	- (79)
0.77	x	2.43	x	113.91	İ	0.45	x	0.7	=	60.42	_ (79)
0.77	x	2.43	x	104.39	Ī	0.45	x	0.7	=	55.37	- (79)
0.77	x	2.43	x	92.85]	0.45	x	0.7] =	49.25	(79)
0.77	x	2.43	x	69.27]	0.45	x	0.7	=	36.74	(79)
0.77	x	2.43	x	44.07]	0.45	x	0.7	=	23.38	(79)
0.77	x	2.43	x	31.49]	0.45	x	0.7	=	16.7	(79)
0.77	x	5.88	x	11.28	×	0.45	x	0.7] =	14.48	(81)
0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
0.77	x	5.88	x	22.97	×	0.45	x	0.7] =	29.48	(81)
0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(81)
0.77	x	2.43	X	22.97	x	0.45	х	0.7	=	12.18	(81)
0.77] x	5.88	x	41.38	x	0.45	x	0.7	=	53.11	(81)
0.77	x	2.43	x	41.38	×	0.45	x	0.7	=	21.95	(81)
0.7 <mark>7</mark>	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(81)
0.77	x	5.88	x	67.9 <mark>6</mark>	x	0.45	x	0.7	=	87.23	(81)
0.77] x	2.43	x	67.96	×	0.45	x	0.7	=	<mark>3</mark> 6.05	(81)
0.77	x	2.43	x	67.96	x	0.45	x	0.7] =	36.05	(81)
0.77	x	5.88	x	91.35	x	0.45	x	0.7	=	117.25	(81)
0.77	x	2.43	x	91.35	x	0.45	x	0.7] =	48.46	(81)
0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(81)
0.77	x	5.88	x	97.38	x	0.45	x	0.7	=	125	(81)
0.77	x	2.43	x	97.38	x	0.45	x	0.7] =	51.66	(81)
0.77	x	2.43	×	97.38	×	0.45	x	0.7	=	51.66	(81)
0.77	x	5.88	x	91.1	x	0.45	x	0.7] =	116.94	(81)
0.77	x	2.43	x	91.1	×	0.45	x	0.7	=	48.33	(81)
0.77	x	2.43	x	91.1	x	0.45	x	0.7] =	48.33	(81)
0.77	x	5.88	x	72.63	x	0.45	x	0.7	=	93.22	(81)
0.77	x	2.43	x	72.63	x	0.45	x	0.7] =	38.53	(81)
0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(81)
0.77	x	5.88	x	50.42	x	0.45	x	0.7	=	64.72	(81)
0.77	x	2.43	×	50.42	×	0.45	x	0.7	=	26.75	(81)
0.77	x	2.43	×	50.42	×	0.45	x	0.7] =	26.75	(81)
0.77	x	5.88	×	28.07	×	0.45	x	0.7] =	36.03	(81)
0.77	×	2.43	×	28.07	×	0.45	x	0.7	=	14.89	(81)
	0.77 0.77	0.77 × 0.77 × <tr tr=""> 0.77 ×</tr>	0.77 × 2.43 0.77 × 2.43	0.77 × 2.43 × 0.7	0.77 × 2.43 × 36.79 0.77 × 2.43 × 62.67 0.77 × 2.43 × 85.75 0.77 × 2.43 × 106.25 0.77 × 2.43 × 119.01 0.77 × 2.43 × 113.91 0.77 × 2.43 × 114.99 0.77 × 2.43 × 104.39 0.77 × 2.43 × 92.85 0.77 × 2.43 × 44.07 0.77 × 2.43 × 11.28 0.77 × 2.43 × 11.28 0.77 × 2.43 × 11.28 0.77 × 2.43 × 11.28 0.77 × 2.43 × 12.97 0.77 × 2.43 × 13.5 0.77 ×	0.77 × 2.43 × 36.79 0.77 × 2.43 × 62.67 0.77 × 2.43 × 106.25 0.77 × 2.43 × 119.01 0.77 × 2.43 × 119.01 0.77 × 2.43 × 113.91 0.77 × 2.43 × 104.39 0.77 × 2.43 × 104.39 0.77 × 2.43 × 104.39 0.77 × 2.43 × 104.39 0.77 × 2.43 × 11.28 × 0.77 × 2.43 × 11.28 × 0.77 × 2.43 × 11.28 × 0.77 × 2.43 × 2.97 × 0.77 × 2.43 × 2.97 × 0.77 × 2.43 × 11.28 × 0.77 × 2.43 × 11.38 <td>0.77 × 2.43 × 36.79 0.45 0.77 × 2.43 × 62.67 0.45 0.77 × 2.43 × 106.25 0.45 0.77 × 2.43 × 106.25 0.45 0.77 × 2.43 × 119.01 0.45 0.77 × 2.43 × 113.91 0.45 0.77 × 2.43 × 104.39 0.45 0.77 × 2.43 × 92.85 0.45 0.77 × 2.43 × 44.07 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 22.97 × 0.45 0.77 × 2.43 × 13.8</td> <td>0.77 × 2.43 × 36.79 0.45 × 0.77 × 2.43 × 62.67 0.45 × 0.77 × 2.43 × 106.25 0.45 × 0.77 × 2.43 × 119.01 0.45 × 0.77 × 2.43 × 119.01 0.45 × 0.77 × 2.43 × 113.91 0.45 × 0.77 × 2.43 × 104.39 0.45 × 0.77 × 2.43 × 92.85 0.45 × 0.77 × 2.43 × 69.27 0.45 × 0.77 × 2.43 × 11.28 × 0.45 × 0.77 × 2.43 × 11.28 × 0.45 × 0.77 × 2.43 × 22.97 × 0.45 × 0.77 × 2.43 × 67.96 × 0.45 × <td>0.77 × 2.43 × 36.79 0.45 × 0.7 0.77 × 2.43 × 62.67 0.45 × 0.7 0.77 × 2.43 × 106.25 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 12.97 × 0.45 × 0.7 0.77</td><td>0.77 × 2.43 × 36.79 0.45 × 0.77 0.77 × 2.43 × 62.67 0.45 × 0.77 = 0.77 × 2.43 × 106.25 0.45 × 0.77 = 0.77 × 2.43 × 118.15 0.45 × 0.77 = 0.77 × 2.43 × 118.15 0.45 × 0.77 = 0.77 × 2.43 × 113.91 0.45 × 0.77 = 0.77 × 2.43 × 192.25 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.77 × 2.43 × 11.28 ×<!--</td--><td>0.77 × 2.43 × 38.79 0.46 × 0.77 = 19.52 0.77 × 2.43 × 62.67 0.45 × 0.77 = 45.43 0.77 × 2.43 × 105.25 0.45 × 0.77 = 65.38 0.77 × 2.43 × 118.01 0.46 × 0.77 = 63.13 0.77 × 2.43 × 113.91 0.46 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.74 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 16.7 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 5.99</td></td></td>	0.77 × 2.43 × 36.79 0.45 0.77 × 2.43 × 62.67 0.45 0.77 × 2.43 × 106.25 0.45 0.77 × 2.43 × 106.25 0.45 0.77 × 2.43 × 119.01 0.45 0.77 × 2.43 × 113.91 0.45 0.77 × 2.43 × 104.39 0.45 0.77 × 2.43 × 92.85 0.45 0.77 × 2.43 × 44.07 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 11.28 × 0.45 0.77 × 2.43 × 22.97 × 0.45 0.77 × 2.43 × 13.8	0.77 × 2.43 × 36.79 0.45 × 0.77 × 2.43 × 62.67 0.45 × 0.77 × 2.43 × 106.25 0.45 × 0.77 × 2.43 × 119.01 0.45 × 0.77 × 2.43 × 119.01 0.45 × 0.77 × 2.43 × 113.91 0.45 × 0.77 × 2.43 × 104.39 0.45 × 0.77 × 2.43 × 92.85 0.45 × 0.77 × 2.43 × 69.27 0.45 × 0.77 × 2.43 × 11.28 × 0.45 × 0.77 × 2.43 × 11.28 × 0.45 × 0.77 × 2.43 × 22.97 × 0.45 × 0.77 × 2.43 × 67.96 × 0.45 × <td>0.77 × 2.43 × 36.79 0.45 × 0.7 0.77 × 2.43 × 62.67 0.45 × 0.7 0.77 × 2.43 × 106.25 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 119.01 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 12.97 × 0.45 × 0.7 0.77</td> <td>0.77 × 2.43 × 36.79 0.45 × 0.77 0.77 × 2.43 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2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 104.39 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 11.28 × 0.45 × 0.7 0.77 × 2.43 × 12.97 × 0.45 × 0.7 0.77	0.77 × 2.43 × 36.79 0.45 × 0.77 0.77 × 2.43 × 62.67 0.45 × 0.77 = 0.77 × 2.43 × 106.25 0.45 × 0.77 = 0.77 × 2.43 × 118.15 0.45 × 0.77 = 0.77 × 2.43 × 118.15 0.45 × 0.77 = 0.77 × 2.43 × 113.91 0.45 × 0.77 = 0.77 × 2.43 × 192.25 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.45 × 0.77 = 0.77 × 2.43 × 11.28 × </td <td>0.77 × 2.43 × 38.79 0.46 × 0.77 = 19.52 0.77 × 2.43 × 62.67 0.45 × 0.77 = 45.43 0.77 × 2.43 × 105.25 0.45 × 0.77 = 65.38 0.77 × 2.43 × 118.01 0.46 × 0.77 = 63.13 0.77 × 2.43 × 113.91 0.46 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.74 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 16.7 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 5.99</td>	0.77 × 2.43 × 38.79 0.46 × 0.77 = 19.52 0.77 × 2.43 × 62.67 0.45 × 0.77 = 45.43 0.77 × 2.43 × 105.25 0.45 × 0.77 = 65.38 0.77 × 2.43 × 118.01 0.46 × 0.77 = 63.13 0.77 × 2.43 × 113.91 0.46 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.62 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.74 0.77 × 2.43 × 104.39 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 63.64 0.77 × 2.43 × 69.27 0.45 × 0.77 = 16.7 0.77 × 2.43 × 11.28 × 0.45 × 0.77 = 5.99

Northw	vest 0.9x	0.77	×	2.	43	x	2	28.07	x		0.45	x	0.7	=	14.89	(81)
Northw	est 0.9x	0.77	×	5.	88	x		14.2	x		0.45	×	0.7	=	18.22	(81)
Northw	est 0.9x	0.77	×	2.	43	x		14.2	x [0.45	×	0.7	= =	7.53	(81)
Northw	est 0.9x	0.77	×	2.	43	x		14.2	i x [0.45	×	0.7	= =	7.53	(81)
Northw	vest 0.9x	0.77	×	5.	88	x		9.21	i _× ī		0.45	× ٦	0.7	=	11.83	(81)
Northw	est 0.9x	0.77	×	2.	43	x		9.21	x [0.45	×	0.7	=	4.89	(81)
Northw	vest 0.9x	0.77	×	2.	43	x		9.21	, , x [0.45	۲ × آ	0.7	=	4.89	(81)
	L						L		J L							
Solar	gains in	watts, ca	alculate	d for eac	h month	า			(83)m	= Su	ım(74)m .	(82)m				
(83)m=	45.97	87.09	142.5	215.68	277.29	2	90.99	274.01	225.0	65	167.46	102.5	5 56.66	38.31]	(83)
Total g	gains – i	nternal a	and sola	ır (84)m	= (73)m	+ (83)m	, watts							_	
(84)m=	442.54	481.69	524.72	577.99	619.46	6	13.68	584	541.2	29	493.3	448.5	425.72	424.61		(84)
7. Me	ean inter	rnal temp	perature	(heating	g seasor	า)										
Temp	perature	during h	neating	periods i	n the liv	ing	area	from Tab	ole 9,	Th1	1 (°C)				21	(85)
Utilis	ation fac	ctor for g	ains for	living ar	ea, h1,n	n (s	ее Та	ble 9a)								
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec	1	
(86)m=	0.95	0.93	0.88	0.78	0.63		0.46	0.34	0.38	3	0.6	0.82	0.92	0.95	1	(86)
Mear	interna	l temper	ature in	living ar	ea T1 (f		w ste	$rac{1}{1}$	in T:	ahle	9c)				1	
(87)m=	19.83	20.01	20.3	20.65	20.87		0.97	20.99	20.9	9	20.93	20.64	20.2	19.81		(87)
Tama						L		L from To							1	
1 emp					20.37					, IN o	20.38	20.37	20.37	20.36	1	(88)
(00)11-	20.00	20.00	20.00	20.01	20.01	<u> </u>	_0.00	20.00	20.0		20.00	20.07	20.07	20.00]	(00)
Utilis	ation fac	ctor for g	ains for	rest of c	welling,	h2	,m (se	e Table	9a)		0.55		0.04	0.05	1	(00)
(89)m=	0.94	0.92	0.87	0.76	0.6		0.42	0.29	0.3	3	0.55	0.8	0.91	0.95		(69)
Me <mark>ar</mark>	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9 <mark>c)</mark>		1	1	
(90)m=	18.77	19.02	19.44	19.94	20.23	2	20.36	20.38	20.3	8	20.31	19.93	19.31	18.74		(90)
											f	LA = Liv	ving area ÷ (4) =	0.36	(91)
Mear	n interna	l temper	ature (f	or the wh	nole dwe	ellin	g) = f	LA × T1	+ (1 -	- fL/	A) × T2				_	
(92)m=	19.15	19.38	19.75	20.19	20.46	2	20.58	20.6	20.6	6	20.53	20.19	19.63	19.12		(92)
Apply	/ adjustr	ment to t	he mea	n interna	l tempe	ratu	ure fro	m Table	4e, v	vhe	re appro	priate	_	1	-	
(93)m=	19.15	19.38	19.75	20.19	20.46	2	20.58	20.6	20.6	6	20.53	20.19	19.63	19.12	<u> </u>	(93)
8. Sp	ace hea	ating requ	uiremen	it												
Set T	i to the tilisation	mean int	ernal te	mperatu	re obtai able 9a	nec	at st	ep 11 of	Table	9b	, so tha	t Ti,m=	=(76)m an	d re-cal	culate	
	Jan	Feb	Mar	Apr	May	Τ	Jun	Jul	A	IU	Sen	Oct	Nov	Dec	1	
Utilis	ation fac	tor for a	ains. hr	n:	may		Uarr	Uui	/ 10	9	000	000	1101	200]	
(94)m=	0.93	0.9	0.86	0.75	0.61		0.43	0.31	0.3	5	0.56	0.79	0.9	0.94]	(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (8	4)m			!							1	
(95)m=	410.89	435.82	449.2	436.34	375.74	2	66.32	181.34	188.	78	277.92	354.6	3 381.86	397.24]	(95)
Mont	hly aver	age exte	ernal ter	nperatur	e from T	abl	e 8		•						-	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Heat	loss rat	e for me	an inter	nal temp	erature,	Lm	۱, W :	=[(39)m	x [(93)m-	- (96)m]			-	
(97)m=	717.4	696.53	634.67	529.53	409.08	2	73.13	182.77	190.9	99	296.27	447.7	590.16	708.89]	(97)
Spac	e heatin	g require	ement fo	or each r	nonth, k	Wh	n/mon	th = 0.02	24 x [((97)	m – (95))m] x (41)m	1	1	
(98)m=	228.04	175.2	137.99	67.09	24.81		0	0	0		0	69.25	149.98	231.87]	

	Total per year (kW	'h/year) = Sum(98) _{15,912} =	1084.23	(98)
Space heating requirement in kWh/m²/year		[15.39	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating p	provided by a c	ommunity scheme.	0	(301)
Fraction of space heat from community system 1 (201) –		- -	0	
The community scheme may obtain heat from several sources. The procedure allows	s for CHP and un t	o four other heat sources: th		(302)
includes boilers, heat pumps, geothermal and waste heat from power stations. See A	Appendix C.	Г		٦
Fraction of heat from Community heat pump			1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table $4c(3)$) for community	heating system	ו	1	(305)
Distribution loss factor (Table 12c) for community heating system			1.2	(306)
Space heating		г	kWh/year	- -
Annual space heating requirement			1084.23	
Space heat from Community heat pump	(98) x (304a)	x (305) x (306) =	1301.07	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Appe	endix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x	x 100 ÷ (308) =	0	(309)
Water heating				_
Annual water heating requirement			2032.24	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a)	x (305) x (306) =	2 <mark>4</mark> 38.69	(310a)
Electricity used for heat distribution	0.01 × [(307a)(3	07e) + (310a)(310e)] =	37.4	(313)
Cooling System Energy Efficiency Ratio		[0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (31	4) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outs	side	Γ	159.41	(330a)
warm air heating system fans		ſ	0	(330b)
pump for solar water heating		ſ	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (3	30b) + (330g) =	159.41	(331)
Energy for lighting (calculated in Appendix L)		Γ	317.09	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(333)
Total delivered energy for all uses $(307) + (309) + (310) + (312) + $	315) + (331) + (332)(237b) =	3486.19	(338)
12b. CO2 Emissions – Community heating scheme				_
	Energy kWh/year	Emission factor E kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	fuels repeat (363)	to (366) for the second fuel	208	(367a)
	, /		200	

Electrical energy for heat distribution

0.52

0.52

Total CO2 associated with community s	ystems	(363)(366) + (368)(372	2)	=	952.55	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			952.55	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	82.74	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	164.57	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	cable	0.52 ×	0.01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				820.95	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.65	(384)
El rating (section 14)					90.47	(385)

			User D	etails:							
Assessor Name: Software Name:	Stroma FSAP 2	2012	roportv	Stroma Softwa	a Num ire Ver	ber: sion:	oor	Versio	n: 1.0.5.49		
Addross I	I Block I Ham C	Place Londo	1000000000000000000000000000000000000	n n	DIUCK I	- төр гі	001				
Address :	I, DIUCK I, HAIII C	JUSE, LUNAC), 1991	0							
Ground floor			Area 5	a (m²) 52.5	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 131.25	(3a)	
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1d)+	·(1e)+(1n	I) 5	52.5	(4)						
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	131.25	(5)	
2. Ventilation rate:		-		_		_					
Number of chimneys Number of open flues	main heating 0 +	secondar heating 0	y] + [_] + [_	0 0] = [] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)	
Number of intermittent far	IS IS					0	x	10 =	0	_](7a)	
Number of passive vents						0	x ^	10 =	0	_`´´ ⅂(7b)	
Number of flueless gas fir	es					0	X 4	40 =	0	(7c)	
	hanges per hour										
Infiltration due to chimney	0	(8)									
Number of storeys in th Additional infiltration Structural infiltration: 0.	e dwelling (ns) 25 for steel or timb	per frame or	0.35 for	masonr	y constru	uction	[(9)·	-1]x0.1 =	0 0 0	(9) (10) (11)	
if both types of wall are pre deducting areas of opening	esent, use the value co gs); if equal user 0.35	prresponding to	the greate	er wall area	a (after						
If suspended wooden in	001, enter 0.2 (uns		i (seale	u), eise	enter u				0	(12)	
Percentage of windows	and doors draugh	U at stripped							0	$-1^{(13)}_{(14)}$	
Window infiltration	and doors draugh	it stripped		0.25 - [0.2	x (14) ÷ 1	00] =			0	$ \begin{bmatrix} 1^{(14)} \\ 1^{(15)} \end{bmatrix} $	
Infiltration rate				(8) + (10) ·	+ (11) + (1	- 2) + (13) +	+ (15) =		0	(10)	
Air permeability value, o	50, expressed in	cubic metre	s per ho	ur per so	quare m	etre of e	nvelope	area	4		
If based on air permeabili	ty value, then (18) =	= [(17) ÷ 20]+(8	B), otherwi	se (18) = (16)		•		0.2	(18)	
Air permeability value applies	if a pressurisation test	t has been don	e or a deg	ıree air pei	meability i	is being us	sed			_	
Number of sides sheltered	b			(00) 4	0.075	0)1			4	(19)	
Shelter factor				(20) = 1 - [0.075 X (1	9)] =			0.7	(20)	
Inflitration rate incorporati	ng snelter factor			(21) = (18)	x (20) =				0.14	(21)	
Infiltration rate modified to	or monthly wind sp	eed	1.1	A	0.000	01	Neu	Dec			
	war Apr Ma	ay jun	Jul	Aug	Sep	UCT		Dec			
(22)m=	ed from Table 7	2 20	2.0	27	Λ	10	A E	47	l		
	1.0 4.4 4.3	, 3.0	3.0	3.1	4	4.3	4.0	4.7			
Wind Factor (22a)m = (22)m \div 4											
(22a)m= 1.27 1.25 1	.23 1.1 1.0	8 0.95	0.95	0.92	1	1.08	1.12	1.18			

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m														
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate effe	ctive air	change	rate for t	he applic	cable ca	se						0.5	(220)
lf exh	aust air h	eat nump i	using App	endix N (2	3b) = (23a) x Emv (e	equation (I	N5)) othe	rwise (23h) = (23a)			0.5	(23a)
lf bala	anced with	heat reco	overv: effic	viency in %	allowing fo	or in-use f	actor (fron	n Table 4h) –) = (20u)			0.5	(230)
		d moob			with hor)- .)m (0)	26) m i (1	226) [·	1 (000)	76.5	(230)
a) II								⊓R) (24a	a) = (2)	$\frac{20}{10.27}$	230) × [1 - (230)	- 100j]	(24a)
(24a)III=	0.3	0.29	0.29		0.27	0.25	0.25	0.25	0.20		0.27	0.20	J	(244)
D) II					without	neat rec		VIV) (240 1	$p_{\rm m} = (22)$	2) + m(a2	230)		1	(24b)
(240)m=		0			0	0		0		0	0	0	J	(240)
c) If	whole h f (22b)r		tract ver	tilation c	or positiv	e input v	ventilatio	on from (outside $n + 0$	5 v (23h	N			
(24c)m-					0 - (200		0	$\frac{(22)}{0}$) iii + 0.			0	1	(24c)
d) If	notural	vontilati					vontilativ		oft	Ů			l	()
u) ii	f (22b)r	n = 1, the	en (24d)	m = (22k)	b)m othe	rwise (2	(4d)m =	0.5 + [(2	2b)m ² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in box	x (25)				1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28	1	(25)
									1					
3. He	at losse	s and he	eat loss	paramete	er:									• • •
ELEN		Gros	SS (m²)	Openin	gs 2	Net Ar	ea n²	U-val W/m2	ue K	A X U (W/I	K)	k-value	K \$	A X k kJ/K
Doors			()			1.91	x	1	=	1.91				(26)
Window		e 1				6		L/[1/(1.2)+	0.041 –	6.87	Ħ			(27)
Window		2				0 42		/[1/(1 2)+	0.041 -	0.07	H			(27)
Windo		. 2				2.43		/[1/(1.2))	0.041	2.76	E.			(27)
Windo	wa Tura	. 4				2.43		/[1/(1.2)+	0.04] =	2.78	\dashv			(27)
	ws type -	; 4 				2.43	X 1	/[1/(1.2)+	0.04] =	2.78	╡,			(27)
walls	l ype1	47.	5	13.29)	34.21	x	0.16	= [5.47			_	(29)
Walls 7	Гуре2	8		1.91		6.09	x	0.15	=	0.92				(29)
Roof		52.	5	0		52.5	x	0.1	=	5.25				(30)
Total a	rea of e	elements	s, m²			108								(31)
Party v	vall					34.28	3 X	0	=	0				(32)
Party f	loor					52.5					[$\neg $	(32a)
* for win ** includ	dows and le the area	l roof wind as on both	ows, use e sides of ir	effective wil nternal wall	ndow U-va Is and parti	lue calcul itions	ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				28.7	7 (33)
Heat c	apacity	Cm = S((A x k)						((28).	.(30) + (32	2) + (32a).	(32e) =	4477.	58 (34)
Therma	al mass	parame	eter (TMI	⁻ = Cm ÷	- TFA) in	kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be u	gn asses: ised inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	constructi	on are not	t known pr	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Therma	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						16.9	3 (36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3 ⁻	1)								
Total fa	abric he	at loss							(33) +	(36) =			45.7	, (37)

Ventila	ation hea	at loss ca	alculated	monthl	у				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.82	12.67	12.52	11.76	11.61	10.85	10.85	10.7	11.15	11.61	11.91	12.21		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	58.52	58.37	58.22	57.46	57.31	56.55	56.55	56.4	56.85	57.31	57.61	57.91		
									(10)	Average =	Sum(39)1	12 /12=	57.42	(39)
Heat l	oss para		HLP), W/	/m²K	1.00	1.00	1.00	1.07	(40)m	= (39)m ÷	• (4)	1.1		
(40)11=	1.11	1.11	1.11	1.09	1.09	1.00	1.00	1.07	1.00	Average -	Sum(40),	1.1 /12=	1 09	(40)
Numb	er of day	vs in mo	nth (Tab	le 1a)						Worugo –			1.00	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			-		-	-			-	-	-	-		
4. Wa	ater heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
A			NI										1	(10)
if TF	FA > 13.9	ipancy, 9, N = 1	in + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.()013 x (TFA -13.	1. .9)	.76		(42)
if TF	A £ 13.9	9, N = 1				,		, ,.	,		,			
Annua	I averag	e hot wa	ater usag	ge in litre usage by	es per da 5% if the o	ay Vd,av Iwelling is	erage = designed t	(25 x N) to achieve	+ 36 a water us	se target o	76	5.09		(43)
not mor	e that 125	litres per	person pe	r day (all w	vater use, l	hot and co	ld)			io larger e				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot w <mark>at</mark>	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1 <mark>c x</mark>	(43)				<u>.</u>		
(44)m=	83.7	80.66	77.61	74.57	71.53	68.48	68.48	71.53	74.57	77.61	80.66	<mark>8</mark> 3.7		
										Total = Su	m(44) ₁₁₂ =	=	913.09	(44)
Energy	content of	hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	124.12	108.56	112.02	97. <mark>67</mark>	93.71	80.87	74. <mark>9</mark> 3	85.99	87.02	10 <mark>1.41</mark>	110.7	120.21		_
lf instan	ntaneous w	ater heati	na at point	t of use (no	o hot water	^r storaae).	enter 0 in	boxes (46	-) to (61)	Total = Su	m(45) ₁₁₂ =	-	1197.2	(45)
(46)m-	18.62	16.28	16.8	14 65	14.06	12.13	11 24	12.9	13.05	15 21	16.6	18.03		(46)
Water	storage	loss:	10.0	14.00	14.00	12.10	11.24	12.0	10.00	10.21	10.0	10.00		()
Storag	ge volum	e (litres)) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Other	wise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
vvater a) If n	storage	ioss: urer's di	eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
Temp	erature f	actor fro	m Table	2h			"aay).					0		(40)
Energ	v lost fro	m watei	r storage	kWh/v	ear			(48) x (49)) =			10		(50)
b) If n	nanufact	urer's de	eclared of	cylinder	loss fact	or is not	known:	()()			I	10		(00)
Hot wa	ater stora	age loss	factor fi	rom Tab	le 2 (kW	h/litre/da	ıy)				0.	02		(51)
If com	munity h	eating s	see secti	on 4.3									1	(50)
Tempe	e racior erature f	actor fro	bie ∠a m Table	2b							1.	.03		(52)
Energ	v lost fro	m water	storage	_~ k\//h///	ear			(47) x (51)) x (52) x (53) =		02		(54)
Enter	(50) or (54) in (5	55)	, it v v i i/ y v	Jui			(11) X (01)	, , (02) ^ (1.	.03		(54)
Water	storage	loss cal	, culated	for each	month			((56)m = (55) × (41)ı	m	L'		l	. /
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
x 97.11									l					

If cylinde	er contains	s dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)i	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinder	thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61	I)m
(62)m=	179.4	158.49	167.3	151.16	148.99	134.36	130.21	141.27	140.51	156.69	164.19	175.48		(62)
Solar DH	IW input o	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no solai	r contributi	on to wate	r heating)		
(add ad	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies,	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter	-										
(64)m=	179.4	158.49	167.3	151.16	148.99	134.36	130.21	141.27	140.51	156.69	164.19	175.48		
								Outp	out from wa	ater heatei	r (annual)	12	1848.04	(64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m) + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	85.49	76.04	81.47	75.27	75.38	<mark>6</mark> 9.68	69.14	72.81	71.73	77.94	79.6	84.19		(65)
inclu	de (57)	m in calc	culation	of (65)m	only if c	ylinder is	s in th <mark>e</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	88.19	88.19	88.19	88. <mark>1</mark> 9	88.19	88.19	88.19	88.19	88.19	88.19	88.19	88.19		(66)
Lightin	g gains	(calculat	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso see	Fable 5					
(67)m=	13.7	12.17	9.9	7.49	5.6	4.73	5.11	6.64	8.92	11.32	13.21	14.09		(67)
Appliar	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L'	13 or L1	3a), also	see Tal	ole 5				
(68)m=	153.72	155.32	151.3	142.74	131.94	121.79	115	113.41	117.43	125.98	136.79	146.94		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82	31.82		(69)
Pumps	and fai	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-70.55	-70.55	-70.55	-70.55	-70.55	, -70.55	-70.55	-70.55	-70.55	-70.55	-70.55	-70.55		(71)
Water	heating	gains (T	able 5)											
(72)m=	114.91	113.15	109.5	104.54	101.32	96.78	92.93	97.87	99.62	104.76	110.56	113.16		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (70)m + (7	1)m + (72)	m		
(73)m=	331.79	330.1	320.16	304.23	288.32	272.75	262.5	267.37	275.42	291.52	310.01	323.64		(73)
6. Sol	ar gains	S:												
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	х		g_		FF		Gains	
	٦	Table 6d		m²		Tab	ole 6a	Т	able 6b	Та	able 6c		(W)	

Southeastoov	0.77	1 🗸	0.40		00.70		0.45		0.7	1_	40.50	
Southeast o.o.	0.77] ^ 1	2.43		36.79	× 	0.45		0.7] =]	19.52	_('')
Southeast o.o.	0.77] × 1	2.43		36.79	X 	0.45		0.7] = 1	19.52	_(′′)
Southoast o.o.	0.77] × 1	2.43		36.79	X X	0.45	X	0.7] = 1	19.52	
	0.77] X 1	2.43	X	62.67	X I	0.45	X	0.7] =	33.25	
Southeast 0.9x	0.77	X	2.43	X	62.67	X	0.45	X	0.7] =	33.25	
Southeast 0.9x	0.77	X	2.43	X	62.67	X	0.45	X	0.7] =	33.25	_(77)
Southeast 0.9x	0.77	X	2.43	X	85.75	X	0.45	X	0.7	=	45.49	_(77)
Southeast 0.9x	0.77	x	2.43	X	85.75	X	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	×	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	X	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	x	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	X	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	×	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	×	0.45	x	0.7] =	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7] =	62.67	(77)
Southeast 0.9x	0.77	x	2.43	X	118.15	х	0.45	х	0.7] =	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7	- 1	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7	=	60.42	= (77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7	=	60.42	– (77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7	i =	55.37	- (77)
Southeast 0.9x	0.77	x	2.43	x	104.39	×	0.45	x	0.7	i =	55.37	_ (77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	×	2.43	x	92.85	x	0.45	x	0.7	j =	49.25	- (77)
Southeast 0.9x	0.77	x	2.43	x	92.85	x	0.45	x	0.7	i =	49.25	_ (77)
Southeast 0.9x	0.77	x	2.43	x	92.85	x	0.45	x	0.7	i =	49.25	- (77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	i =	36.74	آ (77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	i =	36.74	(77)
Southeast 0.9x	0.77	x	2.43	x	69.27	x	0.45	x	0.7	j =	36.74	(77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	i =	23.38	آ (77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	=	23.38	(77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	i =	23.38	(77)
Southeast 0.9x	0.77	x	2.43	x	31.49	×	0.45	x	0.7	i =	16.7	(77)
Southeast 0.9x	0.77	x	2.43	x	31.49	x	0.45	x	0.7	1 =	16.7	ے (77)
Southeast 0.9x	0.77] x	2.43	x	31.49	x	0.45	x	0.7	1 =	16.7	⊣ (77)
Southwest0.9x	0.77	x	6	x	36.79	ĺ	0.45	x	0.7	1 =	48.19] (79)
Southwest _{0.9x}	0.77	x	6	x	62.67	ĺ	0.45	x	0.7	1 =	82.09	`_´ (79)
Southwest _{0.9x}	0.77	l x	6	x	85.75	ĺ	0.45	x	0.7	1 =	112.32	`_′ (79)
Southwest _{0.9x}	0.77	x	6	x	106.25	1	0.45	x	0.7	1 =	139.17	⊣` ′ (79)
Southwesto 9x	0.77	」 】 x	 6	l x	119.01	1 	0.45	x	0.7	」 】 =	155.88	_``'](79)
	0.11	1 [^]			110.01	I	0.70	`	0.7] _	100.00	

Southv	vest <mark>0.9x</mark>	0.77	x		6	x	1	18.15	1 [0.45	×	0.7		- [154.75	(79)
Southv	vest <mark>0.9x</mark>	0.77	×		3	x	1	13.91	i F	0.45		0.7		- [149.19	(79)
Southv	vest <mark>0.9x</mark>	0.77	×		6	x	1	04.39	i F	0.45	= × [0.7	-	- [136.73	(79)
Southv	vest <mark>0.9x</mark>	0.77	×		6	x	g	2.85	i F	0.45		0.7	-	- [121.61	(79)
Southv	vest <mark>0.9x</mark>	0.77	×		3	x	6	69.27	i F	0.45	Ξ×Γ	0.7	-	- [90.72	(79)
Southv	vest <mark>0.9x</mark>	0.77	×		5	x	4	4.07	i F	0.45	= × [0.7	-	- [57.72	(79)
Southv	vest <mark>0.9x</mark>	0.77	×		3	x	3	31.49	i F	0.45	= × [0.7	-	- [41.24	(79)
	L								J L_					L		
Solar	gains in	watts, ca	alculate	d for eac	h month	n			(83)m =	Sum(74)m .	(82)m					
(83)m=	106.74	181.82	248.78	308.25	345.27	3	42.77	330.47	302.85	269.38	200.95	127.85	91.35	5		(83)
Total g	gains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (8	83)m	, watts	-		-		-			
(84)m=	438.54	511.92	568.94	612.48	633.58	6	15.52	592.96	570.23	544.8	492.48	437.87	414.9	9		(84)
7. Me	ean inter	nal temp	perature	(heating	g seasor	า)										
Temp	perature	during h	eating	periods i	n the livi	ng	area	from Tab	ole 9, T	h1 (°C)				[21	(85)
Utilis	ation fac	tor for g	ains for	living are	ea, h1,m	า (s	ee Ta	ble 9a)						L		
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Deo	С		
(86)m=	0.93	0.9	0.85	0.77	0.66	(0.52	0.4	0.42	0.6	0.79	0.9	0.94			(86)
Mear	interna	temper	ature in	living ar	ea T1 (f	مالم	w ste	ns 3 to 7	, 7 in Tat	ble 9c)		•				
(87)m=	19.04	19.35	19.76	20.23	20.61		0.86	20.95	20.94	20.78	20.29	19.59	18.98	3		(87)
Tom		during b		l poriodo i	n root of	du	alling	from To								
(88)m-		19 99	19 99	20.01	20.01		ening	20.02		20.01	20.01	20	20			(88)
(00)11-	10.00	10.00	10.00	20.01	20.01		, ,		20.02	20.01	20.01	20				()
Utilis	ation fac	tor for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)	1 0.54	0.70	0.00	0.00	_		(90)
(89)m=	0.92	0.89	0.83	0.74	0.62		J.46	0.32	0.34	0.54	0.76	0.88	0.93			(69)
Mear	interna	l temper	ature in	the rest	of dwell	ling	T 2 (f	ollow ste	eps 3 to	7 in Tabl	le 9 <mark>c)</mark>	_		_		
(90)m=	17.4	17.83	18.42	19.08	19.58	1	9.89	19.99	19.98	19.8	19.17	18.2	17.32	2		(90)
										1	ILA = LIVI	ng area ÷ (·	4) =		0.52	(91)
Mear	n interna	l temper	ature (f	or the wh	nole dwe	llin	g) = fl	LA x T1	+ (1 –	fLA) × T2		-				
(92)m=	18.26	18.63	19.12	19.68	20.12		20.4	20.49	20.48	20.31	19.76	18.93	18.19)		(92)
Apply	/ adjustr	nent to t	he mea	n interna	l tempei	ratu	re fro	m Table	e 4e, wł	nere appro	opriate	1		_		
(93)m=	18.26	18.63	19.12	19.68	20.12		20.4	20.49	20.48	20.31	19.76	18.93	18.19)		(93)
8. Sp	ace hea	iting requ	uiremen	it .					-	01 41	· . .	(70)				
the u	i to the tilisation	factor fo	ernal te pr gains	mperatu using Ta	re obtail able 9a	ned	at ste	ep 11 of	lable	9b, so tha	it II,m=	(76)m an	d re-ca		ulate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Deo	С		
Utilis	ation fac	tor for g	ains, hn	n:	r			i	1		1		1			
(94)m=	0.9	0.86	0.81	0.73	0.62	(0.48	0.35	0.38	0.56	0.75	0.86	0.91			(94)
Usefu	ul gains,	hmGm ,	, W = (9	94)m x (8 T	4)m	-				-		1		_		(07)
(95)m=	395.3	442.46	462.38	449.14	395.54	2	97.28	210.5	218.21	305.2	370.45	378.57	378.1	2		(95)
Mont	nly aver	age exte	ernal ten	nperature	e trom T	abl	e 8	16.0	10.4	111	10.0	74	4.0			(06)
(90)m=	4.3	4.9	6.5		11./		14.0	-10.0	16.4	$\frac{14.1}{2}$	1 10.6	/.1	4.2			(90)
	816 75			619 52		LW 2	1, VV =	=[(39)m]	x [(93)]	11- (90)M	524.81	681 20	810.2	2		(97)
Snac	e heatin			l each r	nonth k	1 <u>,</u> W/P	/mon	h = 0.02	1 200.20 24 x [(0	7)m _ (95	$1^{024.01}$	11)m	1 010.2	-		(~,)
(98)m=	313.56	241.02	202.54	122.68	64.7		0	0		0	114.84	217.96	321.4	8		
1.1	L	1		1	L	1		1	L		L	1	I			

			_
	Total per year (kWh/year) = Sum(98) _{15,912} =	1598.78	(98)
Space heating requirement in kWh/m²/year		30.45	(99)
9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or wa Fraction of space heat from secondary/supplementary h	ater heating provided by a community scheme. heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301	l) =	1	(302)
The community scheme may obtain heat from several sources. The p	procedure allows for CHP and up to four other heat sources; the	e latter	
Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for	r community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating	ng system	1.2	(306)
Space heating		kWh/year	- -
Annual space heating requirement		1598.78	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	1918.54	(307a)
Efficiency of secondary/supplementary heating system	in % (from Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplement	tary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			_
Annual water heating requirement		1848.04	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2217.65	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	41.36	(313)
Cooling System Energy Efficiency Ratio	Ē	0	(314)
Space cooling (if there is a fixed cooling system, if not e	enter 0) $= (107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f) mechanical ventilation - balanced, extract or positive in	: out from outside	100.08	(330a)
warm air heating system fans		0	(330b)
nump for solar water beating	L	0	_(0000) _(330a)
Total electricity for the above kW/b/year	-(330a) + (330b) + (330a) -	100.08	_(331)
Energy for lighting (calculated in Appendix L)	_(3302) + (3302) + (3302) =	242.02	
Electricity generated by PVs (Appendix M) (pegative gu		720.07	
Total delivered energy for all uses $(307) \pm (300) \pm (310)$	$L_{(3101,y)} = \frac{1}{(315) + (331) + (332)} = \frac{1}{(337b)} = \frac{1}{(332)}$	3748.22	
$\frac{1}{100}$	(312) + (313) + (331) + (332)(2370) =	5740.22	(338)
T2b. CO2 Emissions – Community heating scheme	Energy Emission factor E	missions	
	kWh/year kg CO2/kWh k	g CO2/year	
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	ot CHP) CHP using two fuels repeat (363) to (366) for the second fuel	208	(3672)
CO2 associated with heat source 1	$[(307b)+(310b)] \times 100 \div (367b) \times 0.52 =$	1032.06](367)

[(307b)+(310b)] x 100 ÷ (367b) x

(367)

(372)

1032.06

21.47

0.52

0.52

Total CO2 associated with community s	systems	(363)(366) + (368)(37	2)	=	1053.53	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	vater heating	(373) + (374) + (375) =			1053.53	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	51.94	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	125.61	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl	icable	0.52	x 0.01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				852.17	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				16.23	(384)
El rating (section 14)					88.29	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 207	12		Stroma Softwa	a Num are Ver	ber: sion:		Versio	on: 1.0.5.49	
	M Block M Hom C	Pl loso Lor	roperty A	Address:	BIOCK IV	I - Grou	nd Floor			
1 Overall dwelling dimer		iose, Loi	idon, iv	VIO						
Ground floor			Area	a (m²) 0.09	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 125.23](3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n) 5	0.09	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	125.23	(5)
2. Ventilation rate:									-	
Number of chimneys Number of open flues	main s heating I 0 + 0 +	econdar neating 0	y +] +	other 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	IS				L	0	X ?	10 =	0	(7a)
Number of passive vents						0	× ′	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	X 4	40 = Air ch	0 nange <mark>s per</mark> hou	(7c) ur
Infiltration due to chimney If a pressurisation test has be Number of storeys in the Additional infiltration	s, flues and fans = (6 en carried out or is intend e dwelling (ns)	a)+(6b)+(7 ed, proceed	a)+(7b)+(7 d to (17), c	7c) = otherwise c	ontinue fre	0 om (9) to ((16) [(9)·	÷ (5) = -1]x0.1 =	0 0 0	(8) (9) (10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening If suspended wooden flo	25 for steel or timber esent, use the value corres gs); if equal user 0.35 por, enter 0.2 (unsea	frame or sponding to led) or 0.	0.35 for the greate 1 (seale	masonr er wall area d), else	y constr a <i>(after</i> enter 0	uction			0](11)](12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Vindow infiltration	and doors draught s	trippea		0 25 - [0 2	$\mathbf{x}(14) \div 1$	001 -			0	
				(8) + (10) -	× (14) ÷ 1	2) + (13) -	+ (15) =		0	(15)
Air permeability value	150 expressed in cul	oic metre	s ner ho	ur per so	uare m	etre of e	nvelone	area	0	(10)
If based on air permeabilit	x value, then $(18) = [(2)$	17) ÷ 20]+(8	B), otherwis	se (18) = (16)		involopo	aioa	0.2](17)](18)
Air permeability value applies	if a pressurisation test ha	s been don	e or a deg	ıree air pei	meability	is being u	sed			
Number of sides sheltered	ł								4	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified fo	r monthly wind spee	d 11					1	1	1	
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7	,						i	1	
(22)m= 5.1 5 4	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-				
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul	ate effe	ctive air	change	rate for t	he appli	cable ca	se						0.5	
lf exh	aust air h	eat pump i	using App	endix N (2	3b) = (23a	a) x Fmv (e	equation (1	N5)) other	wise (23h) = (23a)			0.5	(238)
lf bala	anced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use fa	actor (fron	n Table 4h) =) = (204)			0.5	(230)
a) If		nd moch			with hor	ot rocov			y = (2)	2b)m i (22b) v [·	1 (22a)	· 1001	(230)
a) II					0.27			1K) (248	0.26	$\frac{20}{10.27}$		1 - (230)	÷ 100]	(24a)
(2-τα)=					without	boot roo		1) () () ()	m = (2)	$\frac{0.27}{2}$	22h)	0.20		(2.00)
0) II (24b)m-					without			0 (240 0	0 $11 = (22)$	$\frac{20}{1}$	230)	0		(24b)
(240)III-			tractiver		o no oitiu		un tilatia			0	0	0		(210)
C) II	if (22b)r	00seex	(23b) 1	then (24)	r positiv c) = (23b). otherv	ventilatio vise (24	c) = (22h	m + 0	5 x (23h))			
(24c)m=	0	0	0		0		0		0	0	0	0		(24c)
d) If	natural	ventilatio	n or wh		e nositiv		ventilatio	n from l	oft					
i an	if (22b)r	n = 1, the	en (24d)	m = (22b)	b)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (240	c) or (24	d) in box	(25)			-		
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
2 40	ot loopo	e end he	ot loop i	ooromot	or:									
		S and he			ae	Not Ar	02	ll-vali		ΔΧΠ		k-value		AXK
CLCN		area	(m²)	m	93 ²	A ,r	n²	W/m2	K	(W/I	K)	kJ/m ² ·ł	, <	kJ/K
Doo <mark>rs</mark>						1.91	x	1	=	1.91				(26)
Windo	ws Type	e 1				2.43	x1	/[1/(1.2)+	0.04] =	2.78	F			(27)
Windo	ws Type	2				7.56	x 1	/[1/(1.2)+	0.04] =	8.66	F			(27)
Floor						50.09		0.1		5 009				(28)
Walls ⁻	Tvne1	22/	5	0.00		12.46		0.16	≓ _ ¦	1.00	╡╏		\dashv	(29)
Walls		22.4		9.95		12.40		0.10		1.99	╡╏		\dashv	
Totol	roo of c		m ²	1.91		20.72		0.15	= [4.02				(29)
Dente		ements	, 111-			101.1	/				—			(31)
Party v	wali					30.58	3 X	0	=	0			\dashv	(32)
Party o	ceiling					50.09)				L			(32b)
* for win	dows and le the are:	l roof wind as on both	ows, use e sides of ir	effective wi nternal wal	ndow U-va Is and part	alue calcula titions	ated using	formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	ss. W/K :	= S (A x	U)	e una part			(26)(30)	+ (32) =				24.37	(33)
Heat c	apacity	Cm = S(Axk)	-,					((28)	(30) + (32	2) + (32a).	(32e) =	8741.05	(34)
Therm	al mass	parame	ter (TMI	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low	````	100	(35)
For desi	ign asses	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f	100	
can be ι	used inste	ad of a de	tailed calc	ulation.				Ē						
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix k	<						8.51	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
l otal fa	abric he	at loss							(33) +	(36) =			32.88	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	/	. I			(38)m	= 0.33 × (25)m x (5))	l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m=	12.23	12.09	11.94	11.22	11.07	10.35	10.35	10.21	10.64	11.07	11.36	11.65		(38)
Heat tr	ransfer o	coefficie	nt, W/K	r	· · · · · ·				(39)m	= (37) + (3	38)m		I	
(39)m=	45.11	44.97	44.82	44.1	43.96	43.23	43.23	43.09	43.52	43.96	44.25	44.53		—].
Stroma I	FSAP 201	2 Version	1.0.5.49	(SAP 9.92)	- http://ww	ww.stroma	.com			Average =	Sum(39)1	12 /12=	44.0pa	<u>ge 2 </u> (3 9)

Heat lo	ss para	meter (H	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.9	0.9	0.89	0.88	0.88	0.86	0.86	0.86	0.87	0.88	0.88	0.89		
L	r of dou		L						,	Average =	Sum(40)1.	12 /12=	0.88	(40)
	lan	Feb	Mar		May	lun	6.1	Διια	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wat	ter heat	ting ener	gy requ	irement:								kWh/ye	ear:	
Assume if TF/ if TF/	ed occu A > 13.9 A £ 13.9	ıpancy, l 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	ΓFA -13.	1. .9)	69		(42)
Annual Reduce t not more	averag the annua that 125	e hot wa al average litres per p	ater usag hot water person pel	ge in litre usage by day (all w	es per da 5% if the a vater use, l	ay Vd,av Iwelling is hot and co	erage = designed : ld)	(25 x N) to achieve	+ 36 a water us	se target o	74 f	1.4		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					L	
(44)m=	81.84	78.87	75.89	72.91	69.94	66.96	66.96	69.94	72.91	75.89	78.87	81.84		-
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	892.83	(44)
(45)m=	121.37	106.15	109.54	95.5	91.63	79.07	73.27	84.08	85.09	99.16	108.24	117.54		_
lf instanta	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	•	1170.65	(45)
(46)m=	18.21	15.92	16.43	14. <mark>32</mark>	13.75	11.86	10.99	12.61	12.76	14.87	16.24	17.63		(46)
Water s	storage	loss:												
Storage	e volum	e (litres)	Includir	ig any so	Diar or V	WHRS	storage		ame ves	sei		0		(47)
Otherw	nunity n ise if no	eating a	na no ta hot wate	ink in aw er (this ir	/elling, e icludes i	nter 110 nstantar	neous co	(47) mbi boil	ers) ente	er '0' in <i>(</i>	47)			
Water s	storage	loss:							,		,			
a) If ma	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If ma	anufact	urer's de	eclared (cylinder l	oss fact	or is not	known:							(54)
If comm	nunitv h	eating s	ee secti	on 4.3		1/11110/02	iy)				0.	02		(51)
Volume	factor	from Tal	ble 2a								1.	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter ((50) or ((54) in (5	55)								1.	03		(55)
Water s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	r 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 Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary	/ circuit	loss (an	inual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m		_			
mod) ۲	lified by	factor fi	om Tab	le H5 if t I	here is s	solar wat	ter heati	ng and a	ı cylinde	r thermo	stat)	-	I	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for each	n month	(61)m =	(60)	÷ 365 × (41)m						
(61)m=	0	0	0	0	0	(0 0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for	each month	(62)m	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	176.65	156.08	164.82	148.99	146.91	132	2.57 128.55	139.36	138.58	154.44	161.73	172.82		(62)
Solar DI	-IW input	calculated	using App	oendix G o	r Appendix	H (n	egative quantit	y) (enter	0' if no sola	r contribu	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	app	olies, see Ap	pendix	G)			-		
(63)m=	0	0	0	0	0	(0 0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	176.65	156.08	164.82	148.99	146.91	132	2.57 128.55	139.36	138.58	154.44	161.73	172.82		_
								Ou	tput from w	ater heate	er (annual)	112	1821.49	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [().85 × (45)n	า + (61)	m] + 0.8 :	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	84.58	75.24	80.64	74.55	74.69	69	.09 68.58	72.18	71.09	77.19	78.78	83.3		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylind	der is in the	dwelling	g or hot w	ater is f	rom com	imunity h	neating	
5. In	ternal g	ains (see	e Table (5 and 5a):									
Metab	olic gai	ns (Table	e 5). Wa	tts	, 									
	Jan	Feb	Mar	Apr	May	J	un Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	84.64	84.64	84.64	84.64	84.64	84	.64 84.64	84.64	84.64	8 <mark>4.64</mark>	84.64	84.64		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L	_9 or L9a), /	also see	Table 5					
(67)m=	13.24	11.76	9.57	7.24	5.41	4.	57 4.94	6.42	8.62	10.94	12.77	13.61		(67)
Applia	nces da	ains (calc	ulated in	n Appen	dix L. ea	uatio	on L13 or L1	3a), als	o see Ta	ble 5	1			
(68)m=	147.47	149	145.14	136.93	126.57	116	5.83 110.32	108.79	112.65	120.86	131.22	140.96		(68)
Cookir	a dains	s (calcula	ted in A	ppendix	L. equat	ion	L15 or L15a), also s	see Table	1 9 5				
(69)m=	31.46	31.46	31.46	31.46	31.46	31	46 31.46	31.46	31.46	31.46	31.46	31.46	1	(69)
Pumps	and fa	ns gains	(Table)	5a)				1			-			
(70)m=					0		0 0	0	0	0	0	0	1	(70)
		Vaporatio	n (nega	tive valu	es) (Tab	L Je 5')							
(71)m=	-67.71	-67.71	-67.71	-67.71	-67.71	-67	,	-67.71	-67.71	-67.71	-67.71	-67.71]	(71)
Water	heating		able 5)			•						•		. ,
(72)m=	113.68	111 96	108.39	103 54	100.39	95	95 92 18	97.01	98 73	103 75	109.42	111 97]	(72)
Total i	ntorna			100.01	100.00		(66)m + (67)r	1 + (68)m	+ (69)m +	(70)m + (7)m +	(72))m		(/
(73)m-	322 78	321 11	311 40	206 11	280.76	265	75 255 84	260.62	268.39	283.04	301.8	314.93	1	(73)
(13)III-	lar gain	<	011.40	200.11	200.10	200	200.04	200.02	200.00	200.04	301.0	014.00		()
Solar o	ains are	calculated	using sola	ar flux from	Table 6a	and a	ssociated equa	ations to d	convert to th	ne applical	ble orienta	tion.		
Orient	ation:	Access F	actor	Area			Flux		a		FF		Gains	
		Table 6d		m²			Table 6a		Table 6b	Т	able 6c		(VV)	
Southe	ast <mark>0.9x</mark>	0.77	x	7.5	56	×Г	36.79] x [0.45	x	0.7	=	60.72	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	7.5	56	×Г	62.67	i x F	0.45		0.7	=	103.43](77)
Southe	ast <mark>0.9x</mark>	0.77	×	7 !	56	×Г	85.75	i . ⊢	0.45		0.7		141.52](77)
Southe	ast <mark>0.9x</mark>	0.77	x	7 !	56	хГ	106.25	╡╻┝	0.45	╡╷┝	0.7		175.35](77)
Southe	ast <mark>0.9x</mark>	0.77	×	71	56	хГ	119.01	i " ⊢	0.45	╡╷┝	0.7		196.4](77)
		0.11		1.			110.01	┛└	0.10	L	0.1		10011	· /

Southe	ast <mark>0.9x</mark>	0.77	x	. [7.56];	x	118.15	x	0.45	x	0.7	=	194.98	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	ן י	7.56	- ,	x	113.91	x	0.45	x	0.7	=	187.99	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	ן י	7.56	;	x	104.39	x	0.45	x	0.7	=	172.28	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	[7.56	;	x	92.85	x	0.45	x	0.7	=	153.23	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	[7.56	;	x	69.27	x	0.45	x	0.7	=	114.31	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	Ē	7.56	;	x	44.07	×	0.45	x	0.7	=	72.73	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	Ē	7.56	; [x	31.49	x	0.45	x	0.7	=	51.96	(77)
Northw	est <mark>0.9x</mark>	0.77	×	Ē	2.43];	x	11.28	×	0.45	x	0.7	=	5.99	(81)
Northw	est <mark>0.9x</mark>	0.77	×	[2.43	;	x	22.97	x	0.45	x	0.7	=	12.18	(81)
Northw	est <mark>0.9x</mark>	0.77	×	: [2.43	;	x	41.38	x	0.45	x	0.7	=	21.95	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	[2.43	;	x	67.96	x	0.45	x	0.7	=	36.05	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	: [2.43	;	x	91.35	x	0.45	x	0.7	=	48.46	(81)
Northw	est <mark>0.9x</mark>	0.77	×	· [2.43	;	×	97.38	x	0.45	x	0.7	=	51.66	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	[2.43	;	x	91.1	x	0.45	x	0.7	=	48.33	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	[2.43	;	x	72.63	x	0.45	x	0.7	=	38.53	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	· [2.43	;	x	50.42	x	0.45	x	0.7	=	26.75	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	: [2.43	;	x	28.07	x	0.45	x	0.7	=	14.89	(81)
Northwe	est 0.9x	0.77	x		2.43		x	14.2	x	0.45	x	0.7	=	7.53	(81)
Northwe	est <mark>0.9x</mark>	0.77	×		2.43];	x	9.21	x	0.45	x	0.7	- 1	4.89	(81)
Sola <mark>r g</mark>	<mark>jain</mark> s in	watts, <mark>ca</mark>	lculate	d f	for each mo	nth			(83)m	n = Sum(74)m	<mark>(8</mark> 2)m	1	_		
(83)m=	66.71	115.61	163.47		211.4 244	.86	24	46.64 236.31	210	0.8 179.98	129.:	2 80.26	56.85		(83)
l otal g	ains – i	nternal a	nd sola	ir ((84)m = (73)m +	- (8	33)m, watts	1				1	,	(0.4)
(84)m=	389.49	436.73	474.96		507.5 525	.62	5	12.39 492.15	4/1	.42 448.37	413.1	4 382.06	3/1./8		(84)
7. Me	an inter	nal temp	erature	e (ł	neating sea	son)									
Temp	erature	during he	eating	pe	riods in the	livin	g	area from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa	ation fac	tor for ga	ains for	liv	/ing area, h	1,m	(s	ee Table 9a)			1 -		1 _	1	
	Jan	Feb	Mar	╀	Apr M	ay		Jun Jul	A	ug Sep	Oc	t Nov	Dec		(00)
(86)m=	0.93	0.9	0.86		0.77 0.6	5		0.5 0.37	0.	4 0.59	0.79	0.9	0.94]	(86)
Mean	interna	l tempera	ature in	liv	ving area T	1 (fo	llo	w steps 3 to 7	7 in T	able 9c)			-	-	
(87)m=	19.47	19.71	20.05		20.45 20.	75	2	0.92 20.98	20.	97 20.86	20.4	9 19.93	19.43		(87)
Temp	erature	during he	eating	pe	riods in res	t of c	dw	elling from Ta	able	9, Th2 (°C)			2	_	
(88)m=	20.17	20.17	20.17		20.18 20.	19	2	20.2 20.2	20	.2 20.19	20.1	9 20.18	20.18		(88)
Utilisa	ation fac	tor for ga	ains for	re	est of dwellin	ng, h	۱2,	m (see Table	9a)						
(89)m=	0.92	0.89	0.84	Τ	0.75 0.6	52	(0.45 0.31	0.3	34 0.54	0.76	0.89	0.93]	(89)
Mean	interna	l tempera	ature in	th	ne rest of dv	vellir	าต	T2 (follow ste	eps 3	to 7 in Tab	le 9c)	•		-	
(90)m=	18.13	18.47	18.95	Ť	19.51 19	.9	2	0.13 20.18	20.	18 20.06	19.5	8 18.8	18.08]	(90)
		ı – – I		-	I	1		I		I	fLA = Li	iving area ÷ ((4) =	0.44	(91)
Mean	interna	l tempera	ature (f	٥r	the whole c	well	lin	n) = fl A x T1	+ (1	– fl A) x T2	,			L	
(92)m=	18.72	19.02	19.44	Ť	19.92 20.	28	2	0.48 20.53	20.	53 20.41	19.9	8 19.3	18.68	1	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.72	19.02	19.44	19.92	20.28	20.48	20.53	20.53	20.41	19.98	19.3	18.68		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	nean int factor fo	ernal ter or gains	nperatur using Ta	e obtain Ible 9a	ied at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.9	0.87	0.82	0.74	0.62	0.47	0.34	0.37	0.55	0.76	0.87	0.91		(94)
Usefu	ıl gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	352.27	381.26	391.21	375.45	326.07	239.2	166.1	172.7	248.32	312.34	331.5	339.55		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m-	– (96)m]				
(97)m=	650.74	634.93	579.86	486.15	376.96	254.13	170.08	177.92	274.79	412.39	539.79	644.79		(97)
Space	e heating	g require	ement fo	r each m	nonth, k\	Nh/mont	th = 0.02	24 x [(97)	m – (95)m] x (4′	1)m			
(98)m=	222.06	170.46	140.35	79.7	37.86	0	0	0	0	74.43	149.97	227.1		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	1101.95	(98)
Space	e heating	g require	ement in	kWh/m ²	/year]	22	(99)
9h En	erav rea	ujiremen	ots – Cor	nmunity	heating	scheme						l]
This of	art is use	d for en	no – Col	ting spa		ing or w	ator boat	ting prov	ided by	a comm	unity sch	omo		
Fractio	on of spa	ice heat	from se	condary/	supplen/	nentary l	neating	Table 1	1) '0' if n	one	unity SCI		0	(301)
Fractio	n of one	an heat	from oo	mmunity	avetom	1 (20)	1) _		, -			 Г		
FIACIO		ice neal	ITOITI CO	minumity	system	1 - (30	() =					[1	(302)
The con	nmunity so	heme may	y obtain he	eat from se	everal sour	ces. The p	procedure	allows for	CHP and u	up to four o	other heat	sources; th	ne latter	
Fractio	on of hea	at from C	commun	ity heat p	oump		stations.	See Apper	idix O.			[1	(303a)
Fractio	on of tota	al space	heat fro	m Comn	nunity he	eat pump				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ting syst	tem		[1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syste	m				[1.2	(306)
Space	heating	3											kWh/year	
Annua	I space	heating i	requirem	nent								[1101.95]
Space	heat fro	m Comr	nunity h	eat pum	р				(98) x (30	04a) x (305	5) x (306) =	- [1322.34	(307a)
Efficier	ncy of se	econdary	/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment fro	m secon	dary/sup	oplemen	tary syst	tem	(98) x (30	01) x 100 ÷	÷ (308) =	[0	(309)
Water Annua	heating I water h	l neating r	equirem	ent								[1821.49	1
If DHW Water	/ from co heat fro	ommunit m Comn	ty schem	ne: eat pump)				(64) x (30)3a) x (30	5) x (306) =	ا = [2185.78] (310a)
Electric	city used	d for hea	t distribu	ution '				0.01	× [(307a).	(307e) +	(310a)(310e)] = [35.08] (313)
Cooline	g Syster	n Enera	y Efficier	ncy Ratio	C				/	. /		·- [0] (314)
Space	cooling	(if there	is a fixe	d cooline	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		l [0	(315)
Electric	city for p	oumps ar	nd fans v	within dw	velling (1	Table 4f)	:					l] ` `
mecha	nical ve	ntilation	- balanc	ed, extra	act or po	sitive in	put from	outside					113.36	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =		113.36	(331)
Energy for lighting (calculated in Appendix L)				233.88	(332)
Electricity generated by PVs (Appendix M) (negative quantity)				-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312)	+ (315) + (331) + (33	2)(237b) =		3125.29	(338)
12b. CO2 Emissions – Community heating scheme					-
	Energy kWh/year	Emission factor kg CO2/kWh	r Emi kg C	ssions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	g two fuels repeat (363) to ((366) for the second fu	Jel	208	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	=	875.34	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	18.21	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	=	893.55	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantane	ous heater (312) x	0.52	- [0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			893.55	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	- T	58.83	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	- [121.38	(379)
Energy saving/generation technologies (333) to (334) as applica	able				_
Item 1		0.52 × 0.01 =	=	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =				694.86	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				13.87	(384)

Dwelling CO2 Emission Rate (383) ÷ (4) = El rating (section 14)

(385)

90.21

			User De	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012	2 Dro	anorty A	Stroma Softwa	a Numi ire Ver	ber: sion:	loor	Versio	n: 1.0.5.49	
Addross	A Block M Ham Clo		hop TM	110	DIUCK IV	1 - IVIIU F	1001			
1 Overall dwelling dimens	ions:	ose, Lonc	JON, TV	/10						
Ground floor	0113.		Area	0.09	(1a) x	Av. He i	ight(m) 2.5	(2a) =	Volume(m ³) 125.23	(3a)
Total floor area TFA = $(1a)$ +	(1b)+(1c)+(1d)+(1e)	+(1n)	50	0.09	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	125.23	(5)
2. Ventilation rate:									<u>,</u> ,	
Number of chimneys Number of open flues	main see heating he 0 + 0 +	condary eating 0 0	+	0 0] = [total 0 0		40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fans						0	x ′	10 =	0	(7a)
Number of passive vents					Г	0	x ·	10 =	0	(7b)
Number of flueless gas fires					Ē	0	X 4	40 = Air ch	0 anges per hou	(7c)
Infiltration due to chimneys, If a pressurisation test has been	flues and fans = (6a))+(6b)+(7a) d, proceed a)+(7b)+(7 to (17), o	(c) = therwise c	ontinue fro	0 om (9) to ((16)	÷ (5) =	0	(8)
Number of storeys in the Additional infiltration Structural infiltration: 0.25	dwelling (ns) for steel or timber fr	ame or C).35 for	masonr	y constru	uction	[(9)	-1]x0.1 =	0 0 0	(9) (10) (11)
if both types of wall are prese deducting areas of openings, If suspended wooden floo	ent, use the value corresp ; if equal user 0.35 or, enter 0.2 (unseale	onding to ti ed) or 0.1	he greate (sealed	er wall area d), else	a <i>(after</i> enter 0				0	_](12)
If no draught lobby, enter	0.05, else enter 0							·	0	(13)
Percentage of windows a	nd doors draught stri	ipped							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, q5	0, expressed in cubi	c metres	per ho	ur per so	quare me	etre of e	nvelope	area	4	(17)
If based on air permeability	value, then (18) = [(17) ÷ 20]+(8),	, otherwis	se (18) = (16)				0.2	(18)
Air permeability value applies if	a pressurisation test has	been done	or a deg	ree air per	meability i	s being us	sed			
Shelter factor			((20) = 1 - [0.075 x (1	9)] =			4	(19)
Infiltration rate incorporating	shelter factor		((21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified for	monthly wind speed								0.14	
Jan Feb Ma	ar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spee	d 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)n	ייייייייייייייייייייייייייייייייייייי					_				
(22a)m= 1.27 1.25 1.23	3 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul	ate effe	ctive air	change	rate for t	he appli	cable ca	se							(00-)
lf ovh	aust air h		using Ann	andix N (2	3h) - (23a) v Emv (e	auation (N	(15)) other	wise (23h) - (23a)			0.5	(238)
If bal	anced with	best reco	worv: offic	iency in %	(200) = (200)	or in-use f	actor (from	n Table 4b) –) – (200)			0.5	(23D)
					allowing in) =			(00 c)	76.5	(23c)
a) If	balance		anical ve		with hea			HR) (24a	m = (22)	2b)m + ()	23b) × [1 - (23c)	÷ 100]	(240)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(24a)
b) If	balance	ed mecha	anical ve	entilation	without	heat rec	covery (N	VV) (24b)m = (22	2b)m + (2 I	23b)			(0.45)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(240)
c) If	whole h	iouse ex	tract ver	tilation c	or positiv	e input v	ventilatio	on from c	outside	E (00k				
(0.1 c) m	if (22b)n	n < 0.5 ×	(23D), 1	nen (240	c) = (230); otnerv		c) = (22c)	b) m + 0.	5 × (230)) 		l	(24c)
(24c)m=				0	0	0	0		0	0	0	0		(240)
d) If	natural if (22b)r	ventilation $= 1$ the	on or wh en (24d)	ole hous $m = (22b)$	e positiv	rwise (2	ventilatio	on from 1 0 5 + [(2)	oft 2b)m² x	0 51				
(24d)m=	0	0	0	0	0	0	0		0	0	0	0		(24d)
Fffe	ctive air	change	rate - er	ter (24a) or (24h	(24)	c) or (24	d) in box	(25)					
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
()	0.0	0.20	0.20	0.11	0.21	0.20	0.20	0.20	0.20	0.2.	0.21			(- /
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN		Gros	ss (m ²)	Openin	gs 2	Net Ar	ea	U-valu	le Ne	A X U	K)	k-value		A X k
Doors		area	(111)					1		1.01		K0/111-1	`	(26)
Windo		. 1				1.91		/[1/(1 2))		1.91	H			(20)
						2.43		/[1/(1.2)+	0.04] =	2.78	H			(27)
vvindo	ws Type	e 2		_		7.56	×1.	/[1/(1.2)+	0.04] =	8.66	Ľ,			(27)
Walls	Type1	22.4	5	9.99		12.46	3 X	0.16	=	1.99				(29)
Walls 7	Type2	28.6	62	1.91		26.72	<u>2</u> X	0.15	=	4.02				(29)
Total a	rea of e	elements	, m²			51.08	3							(31)
Party v	vall					30.58	3 X	0	=	0				(32)
Party f	loor					50.09)				[\neg	(32a)
Party of	ceiling					50.09					Ī		\exists	(32b)
* for win	dows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcula	ated using	formula 1,	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
** inclua	le the area	as on both	sides of ir	nternal wall	s and part	titions								
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				19.36	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	5234.75	(34)
Therm	al mass	parame	ter (TMI	P = Cm ÷	- TFA) in	∩ kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be ι	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix k	<						4.71	(36)
if details	of therma	al bridging	are not kr	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			24.07	(37)
Ventila	tion hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5))	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.23	12.09	11.94	11.22	11.07	10.35	10.35	10.21	10.64	11.07	11.36	11.65		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	36.3	36.16	36.02	35.29	35.15	34.42	34.42	34.28	34.71	35.15	35.44	35.73		
Stroma I	FSAP 201	2 Version	1.0.5.49	(SAP 9.92)	- http://ww	ww.stroma	.com		/	Average =	Sum(39)1	12 /12=	35.2 6 a	ge 2 o <mark>(39</mark>)

Heat lo	ss para	meter (H	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.72	0.72	0.72	0.7	0.7	0.69	0.69	0.68	0.69	0.7	0.71	0.71		
Numbe	r of day	r vs in mor	nth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	0.7	(40)
[.lan	Feb	Mar	Apr	May	Jun	.lul	Αυσ	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
					-		_					_		
4. Wa	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
Assum if TF/ if TF/	ed occu A > 13.9 A £ 13.9	upancy, I 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	ΓFA -13.	1. .9)	69		(42)
Annual Reduce t not more	averag the annua that 125	je hot wa al average litres per j	ater usag hot water person per	ge in litre usage by ^r day (all w	es per da 5% if the a rater use, I	ay Vd,av Iwelling is hot and co	erage = designed i ld)	(25 x N) to achieve	+ 36 a water us	se target o	74 f	1.4		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	81.84	78.87	75.89	72.91	69.94	66.96	66.96	69.94	72.91	75.89	78.87	81.84		-
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	OTm / 3600) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 1	c, 1d)	892.83	(44)
(45)m=	121.37	106.15	109.54	95.5	91.63	79.07	73.27	84.08	85.09	99.16	108.24	117.54		_
lf instanta	aneous w	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,) to (61)	Fotal = Su	m(45) ₁₁₂ =	-	1170.65	(45)
(46)m=	18.21	15.92	16.43	14.32	13.75	11.86	10.99	12.61	12.76	14.87	16.24	17.63		(46)
Water s	storage	loss:	includir	na any se	olar or M		storage	within sa	ame ves	ما		0		(17)
lf com	ounity h	eating a	nd no te	ink in dw	velling e	nter 110	litres in	(47)		501	L	0		(47)
Otherw	ise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water s	storage	loss:												
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	om water	storage	, kWh/ye	ear	on : o mot	lun numu	(48) x (49)) =		1	10		(50)
Hot wa	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	whown: ay)				0.	02		(51)
If comn	nunity h	heating s	ee secti	on 4.3										
Volume	e factor	from Tal	ble 2a m Tabla	2 h							1.	03		(52)
-				20					(50) (0	.6		(53)
Energy	(50) or (m water (54) in (5	storage	, KVVh/ye	ear			(47) X (51)) x (52) x (53) =	1.	03		(54)
Water	storage	loss cal	culated t	for each	month			((56)m = (55) x (41)ı	m	1.	03		(00)
(50)m	22.04		22.04		22.04	20.00	22.04		20.08	22.04	20.00	22.04	l	(56)
(56)m= If cylinde	r contains	28.92 s dedicate	d solar sto	30.98 rage, (57)i	32.01 n = (56)m	30.98 x [(50) – (32.01 H11)] ÷ (5	0), else (5	7)m = (56)	32.01 m where (30.98 H11) is fro	m Append	lix H	(50)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
- Primar	/ circuit	loss (an	nual) fro	om Table	e 3							0		(58)
Primary	/ circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m	r thormo	etat)			
(1100 (59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
(/···				L		L							l	

Combi	loss ca	alculated	for each	n month	(61)m =	(60)	÷ 365 × (41)m						
(61)m=	0	0	0	0	0	(0 0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for	each month	(62)m	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	176.65	156.08	164.82	148.99	146.91	132	2.57 128.55	139.36	138.58	154.44	161.73	172.82		(62)
Solar DI	-IW input	calculated	using App	oendix G o	r Appendix	H (n	egative quantit	y) (enter	0' if no sola	r contribu	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	app	olies, see Ap	pendix	G)			-		
(63)m=	0	0	0	0	0	(0 0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	176.65	156.08	164.82	148.99	146.91	132	2.57 128.55	139.36	138.58	154.44	161.73	172.82		_
								Ou	tput from w	ater heate	er (annual)	112	1821.49	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [().85 × (45)n	า + (61)	m] + 0.8 :	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	84.58	75.24	80.64	74.55	74.69	69	.09 68.58	72.18	71.09	77.19	78.78	83.3		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylind	der is in the	dwelling	g or hot w	ater is f	rom com	imunity h	neating	
5. In	ternal g	ains (see	e Table (5 and 5a):									
Metab	olic gai	ns (Table	e 5). Wa	tts	, 									
	Jan	Feb	Mar	Apr	May	J	un Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	84.64	84.64	84.64	84.64	84.64	84	.64 84.64	84.64	84.64	8 <mark>4.64</mark>	84.64	84.64		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equat	ion L	_9 or L9a), /	also see	Table 5					
(67)m=	13.24	11.76	9.57	7.24	5.41	4.	57 4.94	6.42	8.62	10.94	12.77	13.61		(67)
Applia	nces da	ains (calc	ulated in	n Appen	dix L. ea	uatio	on L13 or L1	3a), als	o see Ta	ble 5	1			
(68)m=	147.47	149	145.14	136.93	126.57	116	5.83 110.32	108.79	112.65	120.86	131.22	140.96		(68)
Cookir	a dains	s (calcula	ted in A	ppendix	L. equat	ion	L15 or L15a), also s	see Table	1 9 5				
(69)m=	31.46	31.46	31.46	31.46	31.46	31	46 31.46	31.46	31.46	31.46	31.46	31.46	1	(69)
Pumps	and fa	ns gains	(Table)	5a)				1			-			
(70)m=					0		0 0	0	0	0	0	0	1	(70)
		Vaporatio	n (nega	tive valu	es) (Tab	L Je 5')							
(71)m=	-67.71	-67.71	-67.71	-67.71	-67.71	-67	,	-67.71	-67.71	-67.71	-67.71	-67.71]	(71)
Water	heating		able 5)			•						•		· · ·
(72)m=	113.68	111 96	108.39	103 54	100.39	95	95 92 18	97.01	98 73	103 75	109.42	111 97]	(72)
Total i	ntorna			100.01	100.00		(66)m + (67)r	1 + (68)m	+ (69)m +	(70)m + (7)m +	(72))m		(/
(73)m-	322 78	321 11	311 40	206 11	280.76	265	75 255 84	260.62	268 39	283.94	301.8	314.93	1	(73)
(13)III-	lar gain	<	011.40	200.11	200.10	200	200.04	200.02	200.00	200.04	301.0	014.00		()
Solar o	ains are	calculated	using sola	ar flux from	Table 6a	and a	ssociated equa	ations to d	convert to th	ne applical	ble orienta	tion.		
Orient	ation:	Access F	actor	Area			Flux		a		FF		Gains	
		Table 6d		m²			Table 6a		Table 6b	Т	able 6c		(VV)	
Southe	ast <mark>0.9x</mark>	0.77	x	7.5	56	×Г	36.79] x [0.45	x	0.7	=	60.72	(77)
Southe	ast <mark>0.9x</mark>	0.77	×	7.5	56	×Г	62.67	i x F	0.45		0.7	=	103.43](77)
Southe	ast <mark>0.9x</mark>	0.77	×	7 !	56	×Г	85.75	i . ⊢	0.45		0.7		141.52](77)
Southe	ast <mark>0.9x</mark>	0.77	x	7 !	56	хГ	106.25	╡╻┝	0.45	╡╷┝	0.7		175.35](77)
Southe	ast <mark>0.9x</mark>	0.77	×	71	56	хГ	119.01	i " ⊢	0.45	╡╷┝	0.7		196.4](77)
		0.11					110.01	┛└	0.10	L	0.1		10011	· /

Southea	ast <mark>0.9x</mark>	0.77	×	(7.56	6	x	1	18.15	x	0.45		x [0.7		= [194.98	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	(7.56	6	x	1	13.91	x	0.45		x [0.7		=	187.99	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	(7.56	6	x	1	04.39	x	0.45		x [0.7		=	172.28	(77)
Southea	ast <mark>0.9x</mark>	0.77	×] ،	7.56	6	x	g	2.85	x	0.45		x [0.7		=	153.23	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	(7.56	5	x	6	9.27	x	0.45		x [0.7		=	114.31	(77)
Southea	ast <mark>0.9x</mark>	0.77	×		7.56	6	x	4	4.07	x	0.45		x [0.7		=	72.73	(77)
Southea	ast <mark>0.9x</mark>	0.77	×		7.56	6	x	3	31.49	x	0.45		x [0.7		=	51.96	(77)
Northwe	est <mark>0.9x</mark>	0.77	×		2.43	3	x	1	1.28	x	0.45		x [0.7		=	5.99	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	(2.43	3	x	2	22.97	x	0.45		x [0.7		=	12.18	(81)
Northwe	est <mark>0.9x</mark>	0.77	×] ،	2.43	3	x	4	1.38	x	0.45		x [0.7		=	21.95	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	(2.43	3	x	6	67.96	x	0.45		x [0.7		=	36.05	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	(2.43	3	x	g	91.35	x	0.45		x [0.7		=	48.46	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	(2.43	3	x	g	97.38	x	0.45		x [0.7		=	51.66	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	(2.43	3	x	9	91.1	x	0.45		x [0.7		=	48.33	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	(2.43	3	x	7	2.63	x	0.45		x [0.7		=	38.53	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	(2.43	3	x	5	50.42	x	0.45		x [0.7		=	26.75	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	(2.43	3	x	2	28.07	x	0.45		x	0.7		= [14.89	(81)
Northwe	est 0.9x	0.77	×		2.43	3	x		14.2	х	0.45		x	0.7		=	7.53	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	۲	2.43	3	x	9	9.21	x	0.45		x [0.7		= [4.89	(81)
Solar gains in watts, calculated for each month $(83)m = Sum(74)m \dots (82)m$																		
(83)m=	<mark>6</mark> 6.71	115.6 <mark>1</mark>	163.47		211.4	244.86	6 2	46.64	23 <mark>6.31</mark>	210	0.8 179.9	98 12	29.2	80.26	56.8	85		(83)
Total g	ains – i	nternal a	nd sola	ar ((84)m =	(7 <mark>3)</mark> n	ו + (83)m	, watts					_				
(84)m=	389.49	436.73	474.96		507.5	525.62	2 5	12.39	492.15	471	.42 448.3	37 41	3.14	382.06	371	.78		(84)
7. Me	an inter	nal temp	erature	e (I	heating	seasc	on)											
Temp	erature	during h	eating	ре	eriods in	the liv	ving	area	from Tab	ole 9	, Th1 (°C))				[21	(85)
Utilisa	ation fac	tor for ga	ains for	liv	ving area	a, h1,	m (s	ee Ta	ble 9a)									
	Jan	Feb	Mar		Apr	May	/	Jun	Jul	A	ug Se	р (Oct	Nov	D	ec		
(86)m=	0.91	0.88	0.82		0.71	0.57		0.42	0.31	0.3	3 0.51	0	.73	0.87	0.9	2		(86)
Mean	interna	l tempera	ature in	ı li	ving are	a T1 ((follo	w ste	ps 3 to 7	7 in T	able 9c)							
(87)m=	19.95	20.17	20.44		20.72	20.9	2	20.98	20.99	20.	99 20.9	5 20).74	20.33	19.9	92		(87)
Temp	erature	during h	eating	ре	eriods in	rest c	of dw	elling	from Ta	able 9	9, Th2 (°C	C)						
(88)m=	20.32	20.32	20.32		20.34	20.34	2	20.35	20.35	20.	35 20.3	5 20	0.34	20.33	20.3	33		(88)
Utilisa	ation fac	tor for g	ains for	re	est of dw	/elling	, h2	.m (se	e Table	9a)		-						
(89)m=	0.91	0.87	0.8	T	0.69	0.54		0.38	0.26	0.2	.9 0.47	, 0	.71	0.86	0.9)2		(89)
Mean	interna	l temper:	ature in	th	ne rest o	of dwe	lling	T2 (f	n Now ste	ens 3	to 7 in Ta	able 9	c)	_!				
(90)m=	18.92	19.22	19.6	T	20	20.22		20.33	20.35	20.	35 20.3	3 20	0, 0.02	19.46	18.	88		(90)
·		I		-						I	I	fLA =	= Liv	ing area ÷ (4	4) =		0.44	(91)
Mean	interno	Itomoor	atura (f	or	the who	سه مار	allin	a) – f	ΙΔ 🗸 Τ1	⊥ (1	_ fl ∆) ∽ [¬]	го				l		
(92)m=	19.38	19.64	19.97	T	20.32	20.52		97 - 11 20.62	20.63	20	63 20.59	9 20	0.34	19.84	19.3	34		(92)
V- 4										L _î.		`						

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.38	19.64	19.97	20.32	20.52	20.62	20.63	20.63	20.59	20.34	19.84	19.34		(93)
8. Sp	ace hea	ting requ	uirement											
Set T the ut	i to the r ilisation	nean int factor fo	ernal ter or gains	nperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.89	0.85	0.79	0.69	0.55	0.4	0.28	0.31	0.48	0.71	0.84	0.9		(94)
Usefu	ıl gains,	hmGm ,	W = (94	4)m x (84	4)m									
(95)m=	346.94	371.79	375.05	348.19	289.65	202.68	137.94	143.85	215.86	291.48	322.33	335.04		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m >	x [(93)m-	– (96)m]				
(97)m=	547.32	532.94	485.13	402.97	310.03	207.09	138.88	145.13	225.16	342.35	451.55	540.87		(97)
Space	e heating	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	4 x [(97))m – (95)m] x (4′	1)m			
(98)m=	149.08	108.29	81.9	39.45	15.16	0	0	0	0	37.85	93.04	153.14		-
								Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	677.9	(98)
Space	e heating	g require	ement in	kWh/m²	/year								13.53	(99)
9b. En	erav rea	uiremer	nts – Cor	nmunitv	heating	scheme)							7
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ng or wa	ater heat	ing prov	ided by a	a c <mark>omm</mark>	unity sch	neme.		,
Fractio	n of spa	ace heat	from se	condary/	supplen	nentary h	neating (Table 1	1) '0' if no	one			0	(301)
Fraction of space heat from community system 1 – (301) =														(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter														-
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.														
Fractio	n of hea	at from C	Commun	ity heat p	oump								1	(303a)
Fractio	on of tota	al space	heat fro	m Comn	nunity he	eat pump				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	inity hea	iting syst	tem	•		1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syster	m					1.2	(306)
Space	heating	9											kWh/year	_
Annua	space	heating	requirem	nent									677.9	
Space	heat fro	m Comr	nunity h	eat pum	р				(98) x (30	04a) x (308	5) x (306) :	=	813.49	(307a)
Efficier	ncy of se	econdary	//supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment fro	m secon	dary/sup	plemen	tary syst	em	(98) x (30	01) x 100 ÷	÷ (308) =		0	(309)
Water Annua	heating I water h	l neating r	equirem	ent								I	1821.49	1
If DHW Water	/ from co heat from	ommunit m Comn	ty schem nunity he	ne: eat pump)				(64) x (30)3a) x (305	5) x (306) :	= [2185.78] (310a)
Electric	city used	d for hea	ıt distribu	ution				0.01	× [(307a).	(307e) +	· (310a)…([310e)] =	29.99	(313)
Cooline	g Syster	n Energ	y Efficie	ncy Ratio	C					-			0	(314)
Space	cooling	(if there	is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	(314) =		l	0	(315)
Electric	city for p	oumps ai	nd fans v	vithin dw	- . velling (1	able 4f)	:					l		J .
mecha	nical ve	ntilation	- balanc	ed, extra	act or po	sitive in	put from	outside					113.36	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	113.36	(331)
Energy for lighting (calculated in Appendix L)			233.88	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(333)
Total delivered energy for all uses $(307) + (309) + (310) + (312)$	+ (315) + (331) + (332	2)(237b) =	2616.44	(338)
12b. CO2 Emissions – Community heating scheme				-
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using	g two fuels repeat (363) to (366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	748.38	(367)
Electrical energy for heat distribution	[(313) x	0.52	15.57	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)) =	763.94	(373)
CO2 associated with space heating (secondary)	(309) x	0	0	(374)
CO2 associated with water from immersion heater or instantane	ous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		763.94	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	58.83	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	121.38	(379)
Energy saving/generation technologies (333) to (334) as application	able			_
Item 1		0.52 x 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376) (382) =			565.25	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			11.28	(384)

El rating (section 14)

(385)

92.03

User Details:														
Assessor Name: Software Name:	Stroma FSAP	2012		Stroma Softwa	a Num are Ver	ber: sion:	- I	Versio	n: 1.0.5.49					
	M Block M Ha	P m Close I or	roperty /	Address:	BIOCK IV	1 - 1 op i	-100r							
1 Overall dwelling dimer		III Close, Loi		VIO										
Ground floor			Area 8	a(m²) 5.71	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m³) 214.27	(3a)				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)	+(1e)+(1r	I) 8	5.71	(4)									
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	214.27	(5)				
2. Ventilation rate:														
Number of chimneys Number of open flues	main heating 0	secondar heating + 0 + 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)				
Number of intermittent far	IS					0	Χ.	10 =	0	(7a)				
Number of passive vents	mber of passive vents $0 \times 10 =$													
Number of flueless gas fir	40 = Air ch	o anges per hou	(7c) ur											
Infiltration due to chimney If a pressurisation test has be Number of storeys in th	0](8)](9)												
Additional infiltration							[(9)	-1]x0.1 =	0	(10)				
Structural infiltration: 0. if both types of wall are pre- deducting areas of opening	25 for steel or tim esent, use the value of gs); if equal user 0.35	ber frame or corresponding to	0.35 for	masonr er wall area	ry constr a (after	uction	•		0](11)				
If suspended wooden in	001, enter 0.2 (un	r O	i (seale	u), eise	enter 0				0	(12)				
Percentage of windows	and doors draug	ht strinned							0	(13)				
Window infiltration		in shipped		0.25 - [0.2	x (14) ÷ 1	00] =			0	(17)				
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)				
Air permeability value, o	q50, expressed ir	o cubic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)				
If based on air permeabili	ty value, then (18)	= [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)				
Air permeability value applies	if a pressurisation te	st has been dor	e or a deg	ree air pei	rmeability	is being u	sed			_				
Number of sides sheltered	t de la companya de			(20) - 1	[0 075 v (1	0)1			4	(19)				
Shelter factor	na choltor footor			(20) = 1 - [[0.075 X (1	9)] =		-	0.7	_(20)				
Infiltration rate modified for	ng sheller lactor	nand		(21) = (10))				0.14	(21)				
			lul	Aug	Son	Oct	Nov	Dee						
		lay Juli	Jui	Aug	Sep	001		Dec						
$(22)m = \begin{bmatrix} 51 \\ 51 \end{bmatrix} \begin{bmatrix} 51 \\ 5 \end{bmatrix}$		3 38	3.8	37	Д	<u>4</u> २	45	<u>4</u> 7						
	+ +		0.0	0.1	- T	-7.5	L 7.5							
Wind Factor (22a)m = (22)m ÷ 4			1	[]	.		[]	l					
(22a)m= 1.27 1.25 1	.23 1.1 1.	0.95	0.95	0.92	1	1.08	1.12	1.18						

Adjuste	Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m													
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate ette	Ctive air al ventila	change	rate for ti	he applic	cable ca	se						0.5	(220)
lf exh	aust air h	eat numn i	using App	endix N (2	3h) = (23a) x Fmv (e	equation (N	N5)) othe	rwise (23h) = (23a)			0.5	(23a)
lf bala	anced with	heat reco	overv: effic	iency in %	allowing fo	or in-use f	actor (from	n Table 4h) =) = (20u)			0.5	(230)
a) If	holonor	d moob			with hor) = (2)	2b)m i (22h) v [/	1 (220)	/6.	(23C)
a) II								Π Κ) (24a	(24)	$\frac{20}{10.27}$	230) × [1 - (230)] - 100j	(24a)
(24a)III=	0.3	0.29				0.25	0.25	0.25	0.20	0.27	0.27	0.20	J	(240)
D) II (24b)m						neat rec		VIV) (240 0	p = (22)	2) + m(a2	230)		1	(24b)
(240)11=		0	0		0	0				0	0	0	J	(240)
C) If i	whole h f (22b)n	OUSE EX	tract ver	tilation c	v positiv	e input \): otherw	/entilatio	on from ($22k$	outside	5 v (23h	N)			
(24c)m-	0				,) = (200 0		0	c) = (22)) iii + 0.		/) 	0	1	(24c)
(240)II-	noturol	vontilati					vontilativ		oft	Ŭ	Ů	0	l	()
u) n i	f (22b)n	n = 1, the	en (24d)	m = (22t))m othe	rwise (2	4d)m = 1	0.5 + [(2	2b)m ² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24b) or (240	c) or (24	d) in box	(25)				1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0 <mark>.27</mark>	0.27	0.28		(25)
													1	
3. Hea	at losse	s and he	eat loss	paramete	er:							1 -1		
ELEN		Gros	SS (m²)	Openin	gs 2	Net Ar	ea n²	U-vali W/m2	ue K	A X U (W/I	K)	k-value	e K	A X k kJ/K
Doors						1.91		1	= [1.91	/			(26)
Window		e 1				6		 /[1/(1.2)+	0.041 =	6.87	Ħ			(27)
Window	ws Type	2				2 42		/[1/(1 2)+	0.041 -	2.70	8			(27)
Windo		2				2.43		/[1/(1 2)]		2.70	H			(27)
Windo	wa Tupo	. 1				2.43		/[//(1.2))		2.78				(27)
	ws type	; 4 				2.43	X1/	/[1/(1.2)+	0.04] =	2.78	╡,			(27)
vvalis i	iype1	37.	1	13.29)	23.81	×	0.16	= [3.81			_	(29)
Walls	lype2	16.3	35	1.91		14.44	x	0.15	= [2.17				(29)
Roof		85.7	'1	0		85.71	x	0.1	=	8.57				(30)
Total a	rea of e	elements	, m²			139.10	6							(31)
Party v	vall					47.58	x	0	=	0				(32)
Party fl	loor					85.71								(32a)
* for wind ** includ	dows and le the area	l roof winde as on both	ows, use e sides of ir	effective wil nternal wall	ndow U-va s and part	lue calcula itions	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	ז 3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				31.6	i8 (33)
Heat ca	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6684	.91 (34)
Therma	al mass	parame	ter (TM	⁻ = Cm ÷	TFA) in	kJ/m²K			Indica	tive Value	: Low		100) (35)
For desi can be u	gn assess Ised inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	constructi	on are not	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Therma	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix k	<						12.5	(36)
if details	of therma	al bridging	are not kr	nown (36) =	: 0.05 x (3	1)							·	
Total fa	abric he	at loss							(33) +	(36) =			44.2	2 (37)

Ventila	ation hea	at loss ca	alculated	monthl	у	-			(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	20.93	20.68	20.44	19.2	18.95	17.71	17.71	17.47	18.21	18.95	19.45	19.94		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	65.15	64.9	64.65	63.42	63.17	61.93	61.93	61.68	62.43	63.17	63.66	64.16		
						-			(10)	Average =	Sum(39)1	12 /12=	63.35	(39)
Heat lo	oss para		HLP), W	/m²K	0.74	0.70	0.70	0.70	(40)m	$= (39)m \div$. (4)	0.75		
(40)m=	0.76	0.76	0.75	0.74	0.74	0.72	0.72	0.72	0.73	0.74	0.74 Sum(40).	0.75	0.74	(40)
Numb	er of day	s in mo	nth (Tab	le 1a)					,	-verage -	Ourri(+0)1	12712-	0.74	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			•	•							•			
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
A														
Assum if TF	ied occu A > 13.9	ipancy, i 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.0	0013 x (⁻	TFA -13.	2. .9)	56		(42)
if TF	A £ 13.9	9, N = 1	-		(- (/ /] -	(-				
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36	e tarnet o	95	.06		(43)
not mor	e that 125	litres per	person pe	r day (all w	vater use, l	hot and co	ld)	lo acineve	a water at	se larger o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1 <mark>c x</mark>	(43)						
(44)m=	104.56	100.76	96.96	93.15	89.35	85.55	85.55	89.35	<mark>93</mark> .15	96.96	100.76	104.56		
										Total = Su	m(44) ₁₁₂ =	=	1140.67	(44)
Energy	content of	hot water	used - ca	culated me	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	155.06	135.62	139.94	122.01	117.07	101.02	93. <mark>6</mark> 1	107.42	108.7	12 <mark>6.68</mark>	138.28	150.17		_
lf instan	taneous w	ater heati	na at noin	t of use (no	hot wate	r storage)	enter () in	hoxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1495.59	(45)
(46)~				10.00	47.50	45 45			16.24	10	20.74	22.52		(46)
Water	storage	loss:	20.99	10.3	17.00	15.15	14.04	10.11	10.31	19	20.74	22.53		(40)
Storag	je volum	e (litres)) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherv	vise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:	مامتمطا	a a a fa at			(dov)							(10)
а) II п Татага		urer s de	eciared i	OSS IACI	or is kno	wn (kvvr	vday):					0		(48)
Tempe		actor Iro	m rabie					(40) (40)	\ \			0		(49)
b) If n	y lost fro nanufact	m water urer's de	eclared (e, kvvn/ye cvlinder l	ear loss fact	or is not	known:	(48) X (49)) =		1	10		(50)
Hot wa	ater stora	age loss	factor f	rom Tab	le 2 (kW	h/litre/da	ay)				0.	02		(51)
If com	munity h	eating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a	Oh							1.	03		(52)
rempe	erature fa	actor tro	I I ADIE						(50)		.6		(53)
Energy Enter	y lost fro (50) or (m water (54) in (P	storage	e, KVVh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Water	storage		oulated.	for each	month			((56)m - 4)	55) 🗸 (41)	m	1.	U3		(00)
vvalel		1055 Udl				00.00	00.01				00.00	00.04		
=m(αc)	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(00)

If cylinde	er contair	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (57	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circui	t loss (an	inual) fro	om Table	e 3	-						0		(58)
Primar	y circui	t loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	y factor fi	om Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (6	61)m
(62)m=	210.34	185.54	195.22	175.5	172.35	154.52	148.89	162.7	162.2	181.96	191.78	205.45		(62)
Solar DH	- W input	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0'	if no sola	r contributi	ion to wate	er heating)		
(add ad	dditiona	al lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	210.34	185.54	195.22	175.5	172.35	154.52	148.89	162.7	162.2	181.96	191.78	205.45		
I								Outp	out from wa	ater heate	r (annual)₁	12	2146.4	.3 (64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	9 <mark>5.78</mark>	85.03	90.75	83. <mark>36</mark>	83.15	76.38	75.35	79.94	78.94	86.34	88.77	94.15		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in th <mark>e</mark> o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal g	ains (see	Table 5	and 5a):									
Metabo	olic gai	ns (Table	5) Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	128.12	128.12	128.12	128.12	128.12	128.12	128.12	128.12	128.12	128.12	128.12	128.12		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	21.62	19.2	15.61	11.82	8.84	7.46	8.06	10.48	14.06	17.86	20.84	22.22		(67)
Appliar	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5	•			
(68)m=	230.96	233.36	227.32	214.46	198.23	182.98	172.79	170.39	176.43	189.29	205.52	220.77		(68)
Cookin	ng gains	s (calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	35.81	35.81	35.81	35.81	35.81	35.81	35.81	35.81	35.81	35.81	35.81	35.81		(69)
Pumps	and fa	ns gains	(Table 5										I	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)					•			
(71)m=	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49	-102.49		(71)
Water	heating	gains (T	able 5)											
(72)m=	128.74	126.54	121.98	115.78	111.76	106.09	101.27	107.44	109.64	116.05	123.3	126.55		(72)
Total i	nterna	l gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	442.75	440.53	426.35	403.5	380.26	357.96	343.55	349.75	361.56	384.63	411.09	430.97		(73)
6. Sol	lar gain	s:									•			
Solar g	ains are	calculated	using sola	r flux from	Table 6a a	and assoc	ated equa	tions to co	nvert to th	e applicat	ole orientat	ion.		
Orienta	ation:	Access F	actor	Area		Flu	x		g_		FF		Gains	
		Table 6d		m²		Tal	ole 6a	Т	able 6b	Ta	able 6c		(W)	

Southeast o or	0.77	٦.,	0.40	1	0.0 70	1	0.45		0.7	1	40.50	
	0.77] × 1	2.43	X 	36.79	X 	0.45	X	0.7] =	19.52	
Southeast 0.9x	0.77	X	2.43	X	36.79	X	0.45	X	0.7] =	19.52	_ ⁽⁷⁷⁾
Southeast 0.9x	0.77	×	2.43	×	36.79	X	0.45	X	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	2.43	×	62.67	×	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	2.43	x	62.67	x	0.45	x	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7] =	45.49	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7] =	45.49	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	×	0.45	x	0.7] =	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	x	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	x	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7] =	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7] =	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7] =	62.67	(77)
Southeast 0.9x	0.77	x	2.43	×	118.15	×	0.45	x	0.7	=	62.67	– (77)
Southeast 0.9x	0.77	x	2.43	×	118.15	х	0.45	х	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7	- 1	60.42	= (77)
Southeast 0.9x	0.77	x	2.43	x	113.91	×	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	x	0.45	x	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	2.43	x	104.39	x	0.45	x	0.7] =	55.37	– (77)
Southeast 0.9x	0.77	x	2.43	x	104.39	×	0.45	x	0.7	=	55.37	– (77)
Southeast 0.9x	0.77	x	2.43	x	104.39	×	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	2.43	×	92.85	×	0.45	x	0.7] =	49.25	– (77)
Southeast 0.9x	0.77	x	2.43	×	92.85	×	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	x	2.43	×	92.85	×	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	x	2.43	×	69.27	×	0.45	x	0.7] =	36.74	(77)
Southeast 0.9x	0.77	x	2.43	×	69.27	×	0.45	x	0.7] =	36.74	– (77)
Southeast 0.9x	0.77	x	2.43	x	69.27	×	0.45	x	0.7] =	36.74	(77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7	j =	23.38	(77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7] =	23.38	(77)
Southeast 0.9x	0.77	x	2.43	x	44.07	x	0.45	x	0.7] =	23.38	(77)
Southeast 0.9x	0.77	x	2.43	×	31.49	×	0.45	x	0.7] =	16.7	(77)
Southeast 0.9x	0.77	x	2.43	x	31.49	x	0.45	x	0.7	j =	16.7	(77)
Southeast 0.9x	0.77	x	2.43	x	31.49	x	0.45	x	0.7	1 =	16.7	= (77)
Northwest 0.9x	0.77	x	6	×	11.28	×	0.45	x	0.7] =	14.78	(81)
Northwest 0.9x	0.77	x	6	x	22.97	x	0.45	x	0.7	j =	30.08	(81)
Northwest 0.9x	0.77] x	6	x	41.38	İ x	0.45	x	0.7	j =	54.2	(81)
Northwest 0.9x	0.77	x	6	×	67.96	×	0.45	x	0.7	i =	89.01	(81)
Northwest 0.9x	0.77	x	6	×	91.35	x	0.45	x	0.7	i =	119.64	(81)
1				4								

Northw	est 0.9x	0.77	×		6	x	97	.38	x	0.45	x	0.7	=	127.55	(81)
Northw	est 0.9x	0.77	×	: <u> </u>	6	x	91	1.1	x [0.45	x	0.7	=	119.32	(81)
Northw	est 0.9x	0.77	×		3	x	72	.63	×	0.45	x	0.7	=	95.12	(81)
Northw	est 0.9x	0.77	×		3	x	50	.42	x [0.45	x	0.7	=	66.04	(81)
Northw	est 0.9x	0.77	×		3	x	28	.07	× [0.45	×	0.7	=	36.76	(81)
Northw	est 0.9x	0.77	×		3	x	14	1.2	×	0.45	x	0.7	=	18.59	(81)
Northw	est 0.9x	0.77	×		3	x	9.:	21	x [0.45	x	0.7	=	12.07	(81)
	L			L		I									
Solar g	gains in	watts, ca	alculate	d for eac	h month	1			(83)m =	Sum(74)m	(82)m				
(83)m=	73.33	129.82	190.66	258.09	309.03	3′	15.57	300.59	261.2	5 213.8	146.9	9 88.73	62.18		(83)
Total g	gains – i	nternal a	and sola	ır (84)m =	= (73)m	+ (8	33)m ,	watts						_	
(84)m=	516.08	570.35	617.01	661.59	689.29	67	73.53	644.15	610.9	9 575.37	531.6	2 499.82	493.15]	(84)
7. Me	ean inter	rnal temp	perature	(heating	seasor	າ)								-	
Temp	perature	during h	neating	periods i	n the livi	nga	area fro	om Tab	ole 9, 1	⁻ h1 (°C)				21	(85)
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,m	י ו (se	ee Tab	ole 9a)]
	Jan	Feb	Mar	Apr	May	Ì	Jun	Jul	Aug	g Sep	Oct	Nov	Dec]	
(86)m=	0.96	0.94	0.9	0.83	0.71		0.55	0.41	0.45	0.66	0.85	0.94	0.96	1	(86)
Moan	interna	l temper	aturo in	living ar	ا مع T1 (f		w stop	s 3 to 7	in Ta	hle 9c)		- I		1	
(87)m=	19.57	19.77	20.08	20.47	20.77		0.93	20.98	20.98	20.87	20.5	19.99	19.54	<u> </u>	(87)
_						<u> </u>				TI 2 (20)				1	
l emp			neating	periods II	n rest of	dw L	elling f	rom la	able 9,	Th2 (°C)			00.0	1	(99)
(00)11=	20.29	20.29	20.29	20.31	20.31	2	0.32	20.32	20.32	20.32	20.31	20.3	20.3	J	(00)
Utilisa	ation fac	ctor for g	ains for	rest of d	welling,	h2,	m (see	Table	9a)	_	_	_	1	,	
(89)m=	0.95	0.93	0.89	0.81	0.68		0.5	0.35	0.39	0.61	0.83	0.93	0.96		(89)
Mear	interna	l temper	ature in	the rest	of dwell	ing	T2 (fol	llow ste	eps 3 to	o 7 in Tab	ole 9 <mark>c)</mark>				
(90)m=	18.35	18.64	19.09	19.64	20.04	2	0.26	20.31	20.3	20.18	19.7	18.96	18.31		(90)
											fLA = Liv	ving area ÷ ((4) =	0.32	(91)
Mean	n interna	l temper	ature (f	or the wh	ole dwe	elling	g) = fL/	A × T1	+ (1 –	fLA) × T2	2				
(92)m=	18.74	19.01	19.41	19.91	20.27	2	0.48	20.53	20.52	20.41	19.96	19.3	18.71		(92)
Apply	adjustr	nent to t	he mea	n interna	l temper	ratu	re from	n Table	4e, w	here app	ropriate			_	
(93)m=	18.74	19.01	19.41	19.91	20.27	2	0.48	20.53	20.52	20.41	19.96	19.3	18.71		(93)
8. Sp	ace hea	ating requ	uiremen	it											
Set T	i to the	mean int	ernal te	mperatu	re obtair	ned	at step	o 11 of	Table	9b, so th	at Ti,m:	=(76)m an	nd re-cale	culate	
line u	lan		Mar			Г		hul		Son		Nov	Dec	1	
l Itilis:	ation fac	tor for a	ains hr	n. 1 <u>vhi</u>	Iviay		Jun	Jui					Dec]	
(94)m=	0.94	0.92	0.88	0.8	0.68		0.51	0.37	0.41	0.62	0.82	0.91	0.95]	(94)
Usefu	L gains.	l hmGm	L . W = (9	1)4)m x (8	<u>I</u> 4)m	<u> </u>							1	1	
(95)m=	484.28	522.4	540.44	528.24	466.59	34	44.07	238.39	247.6	3 354.18	434.7	4 455.45	466.06]	(95)
Mont	hly aver	age exte	rnal ter	nperature	e from T	able	e 8			_!				1	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16.4	14.1	10.6	7.1	4.2]	(96)
Heat	loss rat	e for mea	an inter	nal temp	erature,	Lm	, W =[(39)m :	x [(93)		י <u></u> ו]		•		
(97)m=	940.99	915.56	834.72	698.3	541.61	36	63.93	243.15	254.2	5 393.61	591.1	7 776.39	930.96]	(97)
Spac	e heatin	ig require	ement f	or each r	nonth, k	Wh	/month	n = 0.02	24 x [(9	9)m – (9	5)m] x ((41)m		-	
(98)m=	339.79	264.2	218.95	122.45	55.81		0	0	0	0	116.3	8 231.07	345.89		

	Tota	l per year (kWh/y	ear) = Sum(98) _{15,912} =	1694.54	(98)
Space heating requirement in kWh/m²/year			[19.77	(99)
9b. Energy requirements – Community heating scl	neme				_
This part is used for space heating, space cooling	or water heating prov	vided by a com	imunity scheme.		
Fraction of space heat from secondary/supplement		I) U II none	L	0	
The community scheme may obtain best from source acurate	-(301) =	CHD and up to fo		1	(302)
includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community heat pump	power stations. See Appe	ndix C.		1	(303a)
Fraction of total space heat from Community heat	pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community hea	ating system	Γ	1	(305)
Distribution loss factor (Table 12c) for community I	neating system		Γ	1.2	(306)
Space heating			-	kWh/year	_
Annual space heating requirement			[1694.54	
Space heat from Community heat pump		(98) x (304a) x (305) x (306) =	2033.44	(307a)
Efficiency of secondary/supplementary heating sys	stem in % (from Table	e 4a or Append	dix E)	0	(308
Space heating requirement from secondary/supple	ementary system	(98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			[2146.43	
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x (305) x (306) =	2575.72	(310a)
Electricity used for heat distribution	0.01	× [(307a)(307e	e) + (310a)(310e)] =	46.09	(313)
Cooling System Energy Efficiency Ratio			[0	(314)
Space cooling (if there is a fixed cooling system, if	not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Tab mechanical ventilation - balanced, extract or positi	le 4f): ve input from outside		-	173.19	(330a)
warm air heating system fans			Γ	0	(330b)
pump for solar water heating			Γ	0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	173.19	(331)
Energy for lighting (calculated in Appendix L)			Γ	381.77	(332)
Electricity generated by PVs (Appendix M) (negativ	ve quantity)		Γ	-730.07	(333)
Total delivered energy for all uses (307) + (309) +	(310) + (312) + (315)	+ (331) + (33	2)(237b) =	4434.04	(338)
12b. CO2 Emissions – Community heating schem	е				
	En kW	ergy h/year	Emission factor E kg CO2/kWh k	Emissions kg CO2/year	
CO2 from other sources of space and water heatir Efficiency of heat source 1 (%)	ng (not CHP) here is CHP using two fuels	s repeat (363) to (366) for the second fuel	208	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x	0.52 =	1150.07	(367)

23.92

0.52

(372)

Total CO2 associated with community s	ystems	(363)(366) + (368)(372	2)	=	1174	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	ion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1174	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	89.88	(378)
CO2 associated with electricity for lightin	ng	(332))) x	0.52	=	198.14	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	cable	0.52 × 0.0	1 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				1083.11	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.64	(384)
El rating (section 14)					88.9	(385)

User Details:														
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49					
			roperty /	Address: /10	BIOCKIN	I - Grou	nd Floor							
Address : 1 Overall dwelling dimen	IN, DIOCK IN, Harri C	lose, Lon	don, Tw	/10										
Ground floor	50113.		Area 5	a(m²) 0.14	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 125.35	(3a)				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n	I) 5	0.14	(4)									
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	125.35	(5)				
2. Ventilation rate:														
Number of chimneys Number of open flues	main s heating	secondar heating 0 0	y] + [_] + [_	other 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)				
Number of intermittent fan	S					0	X 7	10 =	0	(7a)				
Number of passive vents						0	X	10 =	0	(7b)				
Number of flueless gas fire	40 = Air ch	o nanges per hou	(7c) Ir											
Infiltration due to chimneys If a pressurisation test has be Number of storeys in the	0	(8)												
Additional infiltration Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	25 for steel or timber sent, use the value corre ns); if equal user 0.35	frame or sponding to	0.35 for	masonr er wall are	ry constr a (after	uction	[(9)	-1]x0.1 =	0](10)](11)				
If suspended wooden flo	oor, enter 0.2 (unsea	aled) or 0.	1 (seale	d), else	enter 0				0	(12)				
If no draught lobby, ente	er 0.05, eise enter 0	trippod							0	(13)				
Window infiltration	and doors draught s	sinpped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)				
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) ·	+ (15) =		0	(15)				
Air permeability value, c	50. expressed in cu	bic metre	s per ho	our per so	duare m	etre of e	envelope	area	4	(10)				
If based on air permeabilit	y value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)				
Air permeability value applies	if a pressurisation test h	as been don	e or a deg	gree air pei	rmeability	is being u	sed			_ ``				
Number of sides sheltered	l								4	(19)				
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.7	(20)				
Infiltration rate incorporation	ng shelter factor			(21) = (18)) x (20) =				0.14	(21)				
Infiltration rate modified fo	r monthly wind spee	d						1	1					
Jan Feb N	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind spe	ed from Table 7						i	i	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	J					
Wind Factor $(22a)m = (22)$)m ÷ 4													
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]					
Adjuste	ed infiltr	ation rat	e (allowi	ing for sh	elter an	d wind s	speed) =	(21a) x	(22a)m	_	_			
------------------------	-------------------------	--------------------------------	---------------------------	-------------------------------	-------------------------	----------------------	-----------------	-------------------------------	------------------------	-----------------------	--------------	-----------	-----------	-------------
<u> </u>	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate ette	<i>Ctive air</i> al ventila	change	rate for ti	he applic	cable ca	Se						0.5	(220)
lf exh	aust air h	eat pump	using App	endix N. (2	3b) = (23a) x Fmv (e	equation (1	N5)), othe	rwise (23h	(23a) = (23a)			0.5	(23a)
lf bala	anced wit	h heat reco	overv: effic	iency in %	allowing fo	or in-use f	actor (fron	n Table 4h) =	<i>,)</i> = (200)			0.5	(230)
a) If					with hor		on ((1 / 1		y = (2)	2h)m i (226) v [1 (220)	/6.5	(230)
a) II					0.27			1K) (24a	$a_{1} = (2)$	$\frac{20}{10.27}$		1 - (230)	- 100j	(24a)
(24a)III-					uithout	boot roc	0.20	1) () () 4h)m (2)	$\frac{0.27}{2h} + ($	0.27 226)	0.20	l	(210)
0) II								VIV) (241.	$p_{\text{ini}} = (2)$	20)m + (1	230)	0	1	(24b)
(240)11=		0			0	- :				0	0	0		(240)
C) IT	whole r if (22b)r	iouse ex	tract ver	itilation c then (24c	or positiv (23b)) other	ventilatio	c) = (22)	$p_{\rm m} \pm 0$	5 v (23h	n)			
(24c)m=	0				0	0		$\frac{0}{0} = \frac{22}{22}$				0	1	(24c)
d) If	natural	l ventilati	n or wh		<u> </u>		l ventilativ	n from	oft	, ,	, ,	ů	I	· · · ·
i u	if (22b)r	n = 1, th	en (24d)	m = (22t))m othe	rwise (2	$^{2}4d)m =$	0.5 + [(2	2b)m ² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in bo	k (25)				1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
	a fallenerer								1					
3. Fie		s and ne	eat loss		er:	Not Ar						le volue		
ELEN		area	ss (m²)	Openin	gs 2	Net Ar	nea m²	W/m2	ue !K	AXU (W/	K)	k-value	K	AXK kJ/K
Doors						1.91	x	1	=	1.91				(26)
Windo		e 1				1 46		L/[1/(1.2)+	0.04] =	1.67	Ħ			(27)
Windo	ws Type	2				2.43		/[1/(1.2)+	0.041 -	2.78	Fi i			(27)
Window	ws Type	33				2.43		/[1/(1 2)+	0.041 -	2.70	4			(27)
Windo		5 U				3.24		/[1/(1 2)+	0.041	3.71	\exists			(27)
	wsiype	54				6	X'	/[//(1.2)+	0.04] =	6.87	╡,			(27)
	- 4					50.14	1 ×	0.1	=	5.014			\dashv	(28)
walls	Type1	42.	2	13.13	3	29.07	7 X	0.16	=	4.65			\exists	(29)
Walls	Туре2	22.	4	1.91		20.49) X	0.15	=	3.08				(29)
Total a	area of e	elements	, m²			114.7	4							(31)
Party v	wall					10.45	5 X	0	=	0				(32)
Party c	ceiling					50.14	1				[(32b)
* for win ** includ	dows and le the area	l roof wind as on both	ows, use e sides of ir	effective wil nternal wall	ndow U-va s and part	lue calcul itions	lated using	formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				29.69) (33)
Heat c	apacity	Cm = S	(A x k)						((28).	(30) + (3	2) + (32a).	(32e) =	7935.8	89 (34)
Therm	al mass	parame	eter (TMI	⁻ = Cm ÷	- TFA) in	kJ/m²K			Indica	ative Value	: Low		100	(35)
For desi can be u	ign asses used inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	constructi	on are noi	t known pr	ecisely the	e indicative	e values of	f TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix I	K						9.08	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	- (36) =			38.77	7 (37)

Ventila	ation hea	at loss ca	alculated	monthl	у	-			(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.24	12.1	11.95	11.23	11.09	10.36	10.36	10.22	10.65	11.09	11.38	11.67		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	51.01	50.87	50.72	50	49.85	49.13	49.13	48.98	49.42	49.85	50.14	50.43		_
Heatle	nee nara	motor (F		/m2k					(40)m	Average = - (39)m ÷	Sum(39) _{1.}	12 /12=	49.96	(39)
(40)m=	1.02	1.01	1.01	1	0.99	0.98	0.98	0.98	0.99	0.99	1	1.01		
			I	I	Į		Į	I	L,	Average =	Sum(40)1	₁₂ /12=	1	(40)
Numbe	er of day	rs in moi	nth (Tab	le 1a)		r			r			·		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
Assum	ned occu	ipancy, l	N								1.	69		(42)
if TF	A > 13.9	9, N = 1	+ 1.76 x	: [1 - exp	(-0.0003	849 x (TF	A -13.9)2)] + 0.(0013 x (TFA -13.	.9)			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		74	.44		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed i	to achieve	a water us	se target o	f			
not more		ilities per			aler use, i						ī			
Hot wat	Jan er usage i	Feb a litres per	Mar day for e	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	(43)	Sep	Oct	Nov	Dec		
(44)m-	81.88	78.0	75.03	72.05	60.07	66.99	66.00	60.07	72.05	75.03	78.0	81.88		
(++)11-	01.00	70.9	75.55	12.35	03.31	00.33	00.33	03.37	12.33	Total = Su	m(44)1 12 =	01.00	893.25	(44)
Energy	content of	hot water	used - ca	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	0Tm / 3600) kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)	000.20	
(45)m=	121.43	106.2	109.59	95. <mark>5</mark> 4	91.68	79.11	73.31	84.12	85.13	9 <mark>9.21</mark>	108.29	117.6		
If instan	to no o uo u	ator booti	na of noin	hof waa (m	botwata	cotorogo)	ontor 0 in	haven /16	· · · ·	Total = Su	m(45) ₁₁₂ =		1171.2	(45)
						siorage),					40.04			(40)
(46)m= Water	storage	15.93 loss:	16.44	14.33	13.75	11.87	11	12.62	12.77	14.88	16.24	17.64		(40)
Storag	e volum	e (litres)	includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	ind no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherv	vise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
water	storage	loss: urer's de	eclared I	oss facti	or is kno	wn (kWł	n/dav).					0		(48)
Tempe	erature f	actor fro	m Table	2b			"duy).					0		(49)
Energy	/ lost fro	m water	storage	_∼ e. kWh/ve	ear			(48) x (49)) =			10		(50)
b) If m	nanufact	urer's de	eclared	cylinder	loss fact	or is not	known:					10		()
Hot wa	ater stora	age loss	factor fi	rom Tabl	le 2 (kW	h/litre/da	ay)				0.	02		(51)
Volum	munity n e factor	eating s from Ta	ee secti ble 2a	on 4.3							1	02		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(52)
Energy	y lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)	,							1.	03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)

If cylinde	er contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (57	7)m = (56)i	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61))m
(62)m=	176.7	156.13	164.87	149.04	146.95	132.6	128.58	139.4	138.62	154.48	161.78	172.87		(62)
Solar DH	W input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no solai	r contributi	ion to wate	er heating)		
(add ad	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	176.7	156.13	164.87	149.04	146.95	132.6	128.58	139.4	138.62	154.48	161.78	172.87		
I								Outp	out from wa	ater heate	r (annual)₁	12	1822.04	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	84.6	75.25	80.66	74.56	74.7	69.1	68.6	72.19	71.1	77.21	78.8	83.32		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in th <mark>e c</mark>	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table {	and 5a):									
Metabo	olic gain	s (Table	5) Wat	ts										
WIC LOD	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	84.71	84.71	84.71	84. <mark>7</mark> 1	84.71	84.71	84.71	84.71	84.71	8 <mark>4.7</mark> 1	84.71	84.71		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	13.16	11.69	9.5	7.2	5.38	4.54	4.91	6.38	8.56	10.87	12.69	13.52		(67)
Appliar	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L ²	13 or L1:	3a), also	see Tal	ble 5				
(68)m=	147.6	149.13	145.27	137.05	126.68	116.93	110.42	108.89	112.75	120.96	131.34	141.09		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	31.47	31.47	31.47	31.47	31.47	31.47	, 31.47	31.47	31.47	31.47	31.47	31.47		(69)
Pumps	and fai	ns gains	(Table {	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-67.77	-67.77	-67.77	-67.77	-67.77	, -67.77	-67.77	-67.77	-67.77	-67.77	-67.77	-67.77		(71)
Water	heating	gains (T	able 5)											
(72)m=	113.7	111.99	, 108.41	103.56	100.41	95.97	92.2	97.03	98.75	103.77	109.45	111.99		(72)
Total i	nternal	aains =				(66)	m + (67)m	ı + (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	322.87	321.21	311.6	296.22	280.88	265.86	255.94	260.71	268.47	284.02	301.88	315.01		(73)
6. Sol	ar gains	S:												
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	х		g_		FF		Gains	
	٦	Table 6d		m²		Tab	ole 6a	Т	able 6b	Та	able 6c		(W)	

Northeast 0.9x	0.77	x	3.24	x	11.28	x	0.45	x	0.7	=	7.98	(75)
Northeast 0.9x	0.77	x	6	x	11.28	x	0.45	x	0.7	i =	14.78] (75)
Northeast 0.9x	0.77	x	3.24	x	22.97	x	0.45	x	0.7	i =	16.24	(75)
Northeast 0.9x	0.77	x	6	×	22.97	×	0.45	x	0.7	i =	30.08	(75)
Northeast 0.9x	0.77	x	3.24	x	41.38	x	0.45	x	0.7	i =	29.27	- (75)
Northeast 0.9x	0.77	x	6	×	41.38	×	0.45	x	0.7	i =	54.2	(75)
Northeast 0.9x	0.77	x	3.24	x	67.96	x	0.45	x	0.7	=	48.06	(75)
Northeast 0.9x	0.77	x	6	×	67.96	×	0.45	x	0.7	=	89.01	(75)
Northeast 0.9x	0.77	x	3.24	×	91.35	×	0.45	x	0.7] =	64.61	(75)
Northeast 0.9x	0.77	x	6	×	91.35	×	0.45	x	0.7] =	119.64	(75)
Northeast 0.9x	0.77	x	3.24	x	97.38	x	0.45	x	0.7] =	68.88	(75)
Northeast 0.9x	0.77	x	6	×	97.38	×	0.45	x	0.7] =	127.55	(75)
Northeast 0.9x	0.77	x	3.24	x	91.1	×	0.45	x	0.7] =	64.43	(75)
Northeast 0.9x	0.77	x	6	x	91.1	x	0.45	x	0.7	=	119.32	(75)
Northeast 0.9x	0.77	x	3.24	x	72.63	x	0.45	x	0.7	=	51.37	(75)
Northeast 0.9x	0.77	x	6	×	72.63	×	0.45	x	0.7	=	95.12	(75)
Northeast 0.9x	0.77	x	3.24	x	50.42	x	0.45	x	0.7	=	35.66	(75)
Northeast 0.9x	0.77	x	6	X	50.42	x	0.45	х	0.7	=	66.04	(75)
Northeast 0.9x	0.77] x	3.24	x	28.07	x	0.45	x	0.7] =	19.85	(75)
Northeast 0.9x	0.77	x	6	x	28.07	×	0.45	x	0.7	=	3 <mark>6.76</mark>	(75)
Northeast 0.9x	0.7 <mark>7</mark>] x	3.24	x	14.2	x	0.45	x	0.7	=	10.04	(75)
Northeast 0.9x	0.77] ×	6	×	14.2	x	0.45	x	0.7	=	18.59	(75)
Northeast 0.9x	0.77] x	3.24	x	9. <mark>2</mark> 1	×	0.45	x	0.7	=	6.52	(75)
Northeast 0.9x	0.77	x	6	x	9.21	x	0.45	x	0.7	=	12.07	(75)
Northwest 0.9x	0.77	x	1.46	x	11.28	x	0.45	x	0.7] =	3.6	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	1.46	×	22.97	x	0.45	x	0.7] =	7.32	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7] =	12.18	(81)
Northwest 0.9x	0.77	x	1.46	x	41.38	×	0.45	x	0.7	=	13.19	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	×	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	x	1.46	x	67.96	x	0.45	x	0.7	=	21.66	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	1.46	x	91.35	x	0.45	x	0.7	=	29.11	(81)
Northwest 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(81)
Northwest 0.9x	0.77	x	1.46	x	97.38	x	0.45	x	0.7	=	31.04	(81)
Northwest 0.9x	0.77	x	2.43	×	97.38	×	0.45	x	0.7	=	51.66	(81)
Northwest 0.9x	0.77	x	1.46	×	91.1	×	0.45	x	0.7] =	29.03	(81)
Northwest 0.9x	0.77	x	2.43	×	91.1	×	0.45	x	0.7	=	48.33	(81)
Northwest 0.9x	0.77	x	1.46	×	72.63	x	0.45	x	0.7	=	23.15	(81)
Northwest 0.9x	0.77	x	2.43	×	72.63	x	0.45	x	0.7	=	38.53	(81)
Northwest 0.9x	0.77	x	1.46	×	50.42	×	0.45	x	0.7] =	16.07	(81)

Northw	vest 0.9x	0.77)	2.	43	x	5	50.42) x [0.45	x	0.7	=	26.75	(81)
Northw	est 0.9x	0.77		< <u>1</u> .	46	x	2	28.07	i × i		0.45	i × ľ	0.7	=	8.95	(81)
Northw	est 0.9x	0.77	>	(2.	43	x	2	28.07	İ x [0.45	 × [0.7	=	14.89	(81)
Northw	est 0.9x	0.77	>	< <u>1</u> .	46	x		14.2	i _× i		0.45	Ξ×Γ	0.7	=	4.52	(81)
Northw	vest 0.9x	0.77	,	(2.	43	x		14.2	i _× i		0.45	Ξ×Γ	0.7	=	7.53	(81)
Northw	est 0.9x	0.77	>	(1.	46	x		9.21] × [0.45	 × [0.7	=	2.94	(81)
Northw	vest 0.9x	0.77	,	2.	43	x		9.21] × [0.45	 	0.7	=	4.89	(81)
	L			L			L		J L			L				
Solar	gains in	watts, ca	alculate	d for eac	h month	า			(83)m	= Sı	um(74)m .	(82)m				
(83)m=	32.34	65.83	118.6	194.78	261.82	2	79.12	261.12	208.	16	144.52	80.45	40.69	26.41]	(83)
Total g	gains – i	nternal a	and sola	ar (84)m	= (73)m	+ (83)m	, watts						-		
(84)m=	355.21	387.04	430.2	491	542.7	5	44.98	517.05	468.	88	412.99	364.47	342.57	341.42		(84)
7. Me	ean inter	rnal temp	perature	e (heating	g seasor	า)										
Temp	perature	during h	neating	periods i	n the liv	ing	area	from Tab	ole 9,	Th	1 (°C)				21	(85)
Utilis	ation fac	ctor for g	ains for	living ar	ea, h1,n	n (s	ee Ta	able 9a)								
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec]	
(86)m=	0.95	0.93	0.9	0.81	0.68		0.52	0.4	0.4	5	0.67	0.85	0.93	0.95		(86)
Mear	interna	l temper	ature in	living ar	ea T1 (f		w ste	$\frac{1}{2}$	in T	able	2 9c)		•		-	
(87)m=	19.08	19.29	19.69	20.22	20.64		0.88	20.96	20.9	94	20.75	20.22	19.58	19.04		(87)
Tama						L		from To							J	
1 emp					20.09		ening 20.1			, IT 1	20.1	20.09	20.08	20.08	1	(88)
(00)11-	20.07	20.07	20.07	20.00	20.00		20.1	20.1	20.	<u> </u>	20.1	20.00	20.00	20.00	J	(00)
Utilis	ation fac	ctor for g	ains for	rest of c	lwelling,	h2	,m (se	e Table	9a)		0.01	0.00	0.00	0.05	1	(00)
(89)m=	0.94	0.92	0.88	0.79	0.64		0.46	0.32	0.3	1	0.61	0.83	0.92	0.95		(69)
Mear	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9 <mark>c)</mark>			7	
(90)m=	17.5	17.8	18.38	19.13	19.69	1	9.99	20.07	20.0)6	19.85	19.14	18.23	17.46		(90)
											f	LA = Livi	ing area ÷ (4) =	0.43	(91)
Mear	n interna	l temper	ature (f	or the wh	nole dwe	ellin	g) = f	LA x T1	+ (1 -	– fL	A) x T2				_	
(92)m=	18.18	18.44	18.94	19.6	20.1	2	20.38	20.45	20.4	14	20.24	19.61	18.81	18.14		(92)
Apply	/ adjustr	ment to t	he mea	n interna	I tempe	ratu	ure fro	m Table	e 4e, v	whe	re appro	opriate	_	1	7	
(93)m=	18.18	18.44	18.94	19.6	20.1	2	20.38	20.45	20.4	4	20.24	19.61	18.81	18.14		(93)
8. Sp	ace hea	ating requ	uiremer	nt												
Set T	i to the tilisation	mean int	ernal te	emperatu	ire obtai able 9a	nec	at st	ep 11 of	Table	e 9b	o, so tha	t Ti,m=	(76)m an	d re-cal	culate	
	Jan	Feb	Mar		May	Τ	Jun	Lut	A	IU	Sen	Oct	Nov	Dec	1	
Utilis	ation fac	tor for a	ains. hr	<u>n:</u>	May		Uarr	Uui		*9	Cop	000	1101	200	1	
(94)m=	0.92	0.9	0.86	0.77	0.64		0.48	0.35	0.4	Ļ	0.62	0.81	0.9	0.93]	(94)
Usefu	ul gains,	hmGm	, W = (9	94)m x (8	4)m			<u> </u>	I	!					J	
(95)m=	327.94	349.65	370.05	378.88	346.82	2	61.36	182.63	188.	17	255.85	296.19	307.45	317.35]	(95)
Mont	hly aver	age exte	ernal ter	nperatur	e from T	abl	e 8	•	·						-	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Heat	loss rat	e for me	an inter	nal temp	erature,	Lm	۱, W :	=[(39)m	x [(93	3)m-	- (96)m]			-	
(97)m=	707.84	688.75	631.02	535.04	418.82	2	83.75	189.35	197.	92	303.3	448.99	587.02	702.89		(97)
Spac	e heatin	g require	ement f	or each r	nonth, k	Wh	n/mon	th = 0.02	24 x [((97)	m – (95)m] x (4	41)m	1	7	
(98)m=	282.64	227.88	194.17	112.44	53.57		0	0	0		0	113.68	201.29	286.84		

	Total per year (kWh/ye	ear) = Sum(98) _{15,912} =	1472.49	(98)
Space heating requirement in kWh/m²/year			29.37	(99)
9b. Energy requirements – Community heating scheme				_
This part is used for space heating, space cooling or water Fraction of space heat from secondary/supplementary heat	heating provided by a comi ting (Table 11) '0' if none	munity scheme.	0	(301)
Fraction of space heat from community system $1 - (301) =$			1	(302)
The community scheme may obtain heat from several sources. The proce	edure allows for CHP and up to fou	ــــا Ir other heat sources; the	latter	
includes boilers, heat pumps, geothermal and waste heat from power stat Fraction of heat from Community heat pump	ions. See Appendix C.	Γ	1	(303a)
Fraction of total space heat from Community heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for co	mmunity heating system		1	(305)
Distribution loss factor (Table 12c) for community heating s	ystem		1.2	(306)
Space heating			kWh/year	-
Annual space heating requirement			1472.49	
Space heat from Community heat pump	(98) x (304a) x (3	805) x (306) =	1766.99	(307a)
Efficiency of secondary/supplementary heating system in %	6 (from Table 4a or Append	ix E)	0	(308
Space heating requirement from secondary/supplementary	r system (98) x (301) x 100	0 ÷ (308) =	0	(309)
Water heating				_
Annual water heating requirement			1822.04	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (3	305) x (306) =	2186.44	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e)) + (310a)(310e)] =	39.53	(313)
Cooling System Energy Efficiency Ratio		Γ	0	(314)
Space cooling (if there is a fixed cooling system, if not enter	r 0) = (107) ÷ (314) =	Γ	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	from outside	Г	113.47	(330a)
warm air heating system fans			0	_ (330b)
pump for solar water heating			0	 (330g)
Total electricity for the above, kWh/year	=(330a) + (330b)	+ (330g) =	113.47	(331)
Energy for lighting (calculated in Appendix L)			232.38	(332)
Electricity generated by PVs (Appendix M) (negative quant	ity)		-730.07	(333)
Total delivered energy for all uses $(307) + (309) + (310) + (310)$	312) + (315) + (331) + (332	2)(237b) =	3569.22	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor Ei kg CO2/kWh kg	missions g CO2/year	
CO2 from other sources of space and water heating (not C Efficiency of heat source 1 (%)	HP) Pusing two fuels repeat (363) to (3	66) for the second fuel	208	(367a)
CO2 associated with heat source 1	07b)+(310b)] x 100 ÷ (367b) x	0.52 =	986.46](367)

Electrical energy for heat distribution

[(307b)+(310b)] x 100 ÷ (367b) x [(313) x

(372)

Total CO2 associated with community s	systems	(363)(366) + (368)(37	72)	=	1006.98	(373)
CO2 associated with space heating (see	condary)	(309) x	0] =	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52] =	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1006.98	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	58.89	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	120.61	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl	icable	0.52 × 0.	01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				807.57	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				16.11	(384)
El rating (section 14)					88.63	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20 ⁷	12	oportu (Stroma Softwa	a Numi ire Ver	ber: sion:	loor	Versio	n: 1.0.5.49	
Addross I	N Block N Ham C		lon TW	4001855. 140	DIUCK IN	I - IVIIU F	1001			
Address :	IN, DIOCK IN, HAITI C	iose, Lond	1011, 199	10						
Ground floor			Area	0.14	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 125.35	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	50	0.14	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	125.35	(5)
2. Ventilation rate:	-	_								
Number of chimneys Number of open flues	$\begin{array}{c c} main & s \\ heating & l \\ \hline 0 & + \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array}$	econdary heating 0 0	' · · · · · · · · · · · · · · · · · · ·	0 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent far	าร				- F	0	x ′	10 =	0	(7a)
Number of passive vents						0	x ^	10 =	0	_](7b)
Number of flueless gas fir	res					0	X 4	40 =	0	(7c)
								Air ch	anges per ho	ur ¬
Infiltration due to chimney	vs, flues and fans = $($	a)+(6b)+(7a	()+(7b)+(7b)	$(\mathbf{C}) =$	ontinuo fre	0	(16)	÷ (5) =	0	(8)
Number of storeys in th Additional infiltration Structural infiltration: 0.	e dwelling (ns) 25 for steel or timber	frame or (0.35 for	masonr	v constru	uction	(9)·	-1]x0.1 =	0	(9) (10) (11)
if both types of wall are pro- deducting areas of openin	esent, use the value corres gs); if equal user 0.35	sponding to t	the greate	er wall area	a (after				0],
If suspended wooden fi	oor, enter 0.2 (unsea	led) of 0.1	(seale	a), eise	enter U				0	(12)
Il no draught lobby, ent	er 0.05, eise enter 0	trippod							0	(13)
Window infiltration	s and doors draught s	inpped		0.25 - [0.2	x (14) ÷ 1	001 =		-	0	$]^{(14)}_{(15)}$
Infiltration rate				(8) + (10) -	⊦ (11) + (1	2) + (13) -	+ (15) =		0	$\int_{(16)}^{(13)}$
Air permeability value,	a50, expressed in cul	oic metres	per ho	ur per so	uare me	etre of e	nvelope	area	4](17)
If based on air permeabili	ty value, then (18) = [(17) ÷ 20]+(8)	, otherwis	se (18) = (16)		•		0.2	(18)
Air permeability value applies	s if a pressurisation test ha	s been done	e or a deg	ree air per	meability i	is being us	sed	I		
Number of sides sheltered	d			(22)					4	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporati	ng shelter factor	_		(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified fo	or monthly wind spee	d 1	<u> </u>					_		
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7				1				1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4	,					r	1		
(22a)m= 1.27 1.25 1	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	elter and	d wind s	peed) =	(21a) x	(22a)m			-		
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula If me	ate etteo echanica	ctive air al ventila	change	rate for ti	ne applio	cable ca	se						0.5	(23a)
lf exh	aust air he	eat pump (usina App	endix N. (2	3b) = (23a) × Fmv (e	equation (N	N5)) . othe	rwise (23b)) = (23a)			0.5	(23b)
If bala	anced with	heat reco	overy: effic	ciency in %	allowing fo	or in-use fa	actor (from	n Table 4h) =				0.5 76 F	(23c)
a) If	halance	d mech	anical ve	entilation	with hea	at recove	⊃rv (M\/⊦	HR) (24a) m = (22	2h)m + ('	23h) x ['	1 – (23c)	- 1001	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(24a)
b) If	halance	d mech:	l anical ve	<u>I</u> Intilation	without	heat rec	overv (N	///) (24h)m – (22	2b)m + ('	23h)			
(24b)m=	0	0			0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	I tract ver	ntilation c	r positiv	e input v	l ventilatio	n from c	L outside					
i i	f (22b)n	n < 0.5 ×	(23b), t	then (24c	c) = (23b); otherv	vise (24	c) = (22k	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilatio	n from l	oft					
i	f (22b)n	n = 1, th	en (24d))m = (22b)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN		Gros	ss	Openin	gs	Net Ar	ea	U-valu	Je	AXU		k-value	e	AXk
_		area	(m²)	m	2	A ,r	n²	W/m2	K	(VV/ł	<)	kJ/m ² ·l	<	kJ/K
Doors						1.91	X	1	= [1.91				(26)
Windov	ws Type	e 1				1.46	x1/	/[1/(1.2)+	0.04] =	1.67				(27)
Window	ws Type	e 2				2.43	X1/	/[1/(1.2)+	0.04] =	2.78				(27)
Window	ws Type	e 3				3.24	x1/	/[1/(1.2)+	0.04] =	3.71				(27)
Window	ws Type	94				6	x1/	/[1/(1.2)+	0.04] =	6.87				(27)
Walls 7	Гуре1	42.2	2	13.13	3	29.07	' X	0.16	=	4.65				(29)
Walls 7	Гуре2	22.4	4	1.91		20.49) X	0.15	= [3.08				(29)
Total a	rea of e	lements	, m²			64.6								(31)
Party v	vall					10.45	j x	0	=	0				(32)
Party f	loor					50.14							$\neg $	(32a)
Party c	eiling					50.14					Ī		7	(32b)
* for win ** includ	dows and le the area	roof wind as on both	ows, use e sides of ii	effective wil nternal wall	ndow U-va s and parti	lue calcula itions	ated using	formula 1	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				24.6	8 (33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	4426.	09 (34)
Therma	al mass	parame	ter (TMI	P = Cm ÷	TFA) in	kJ/m²K			Indicat	ive Value:	: Low		100	(35)
For desig	gn assess ised inste	sments wh ad of a de	ere the de tailed calc	etails of the rulation.	constructio	on are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Therma	al bridge	es : S (L	x Y) cal	lculated u	using Ap	pendix ł	<						6.07	(36)
if details	of therma	al bridging	are not kr	10wn (36) =	= 0.05 x (31	1)								
Total fa	abric he	at loss							(33) +	(36) =			30.7	5 (37)

Ventila	ation hea	at loss ca	alculated	dmonthl	у				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.24	12.1	11.95	11.23	11.09	10.36	10.36	10.22	10.65	11.09	11.38	11.67		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	42.99	42.85	42.7	41.98	41.83	41.11	41.11	40.97	41.4	41.83	42.12	42.41		_
Heatl		motor (l	ער ים וו	/m21/					(40)m	Average =	Sum(39)1.	12 /12=	41.94	(39)
(40)m-			1LP, VV	0.84	0.83	0.82	0.82	0.82	0.83	= (39)III .	0.84	0.85		
(40)11-	0.00	0.00	0.00	0.04	0.00	0.02	0.02	0.02	0.00	Average =	Sum(40)1	12/12=	0.84	(40)
Numb	er of day	s in mo	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum	ned occu	ipancy,	N								1	69		(42)
if TF	A > 13.9	9, N = 1	+ 1.76 ×	(1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13	.9)			
if TF Annua	A £ 13.9	9, N = 1	aterusa	ne in litre	e ner da	ve hV ve	erane –	(25 x N)	+ 36		74	4.4		(42)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed i	to achieve	a water us	se target o	f 74	.44		(43)
not mor	e that 125	litres per	person pe	r day (all w	vater use, l	hot and co	ld)		i	-				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage il	n litres pei	r day for ea	ach month 1	$Vd,m \neq fa$	ctor from 1	l able 1c x	(43)		r	1			
(44)m=	81.88	78.9	75.93	72.95	69.97	66.99	66.99	69.97	72.95	75.93	78.9	81.88	222.25	
Energy	content of	hot water	used - ca	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E)))))))))))))))))))) kWh/mor	l otal = Su oth (see Ta	m(44) ₁₁₂ = ables 1b, 1	= c, 1d)	893.25	(44)
(45)m=	121.43	106.2	109.59	95.54	91.68	79.11	73.31	84.12	85.13	9 <mark>9.21</mark>	108.29	117.6		
			Į					Į		Total = Su	r m(45) ₁₁₂ =	=	1171.2	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)		-			
(46)m=	18.21	15.93	16.44	14.33	13.75	11.87	11	12.62	12.77	14.88	16.24	17.64		(46)
Storac	siorage ie volum	e (litres)) includir	na anv se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munitv h	eating a	and no ta	ank in dv	vellina. e	nter 110) litres in	(47)				0		()
Otherv	vise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:												
a) If m _	nanufact	urer's de	eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Tempe _	erature f	actor fro	m Table	2b				(0		(49)
b) If n	y lost fro nanufact	m water urer's de	r storage eclared (e, KVVh/ye cvlinder	ear loss fact	or is not	known:	(48) X (49)) =		1	10		(50)
Hot wa	ater stora	age loss	factor f	rom Tab	le 2 (kW	h/litre/da	ay)				0.	02		(51)
If com	munity h	eating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a m Tabla	2h							1.	03		(52)
Tempe				: ZU 				(47) × (64)) y (FQ) y (50)	0	.6		(53)
Enter	(50) or (54) in <i>(</i> 5	55)	;, KVV11/Y	ədi			(47) X (51)) x (32) X (55) =	1.	03 03		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m	L			(00)
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
(/					I						1			x = /

If cylinde	er contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (57	7)m = (56)i	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	inual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mod	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61))m
(62)m=	176.7	156.13	164.87	149.04	146.95	132.6	128.58	139.4	138.62	154.48	161.78	172.87		(62)
Solar DH	W input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no solai	r contributi	ion to wate	er heating)		
(add ad	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	176.7	156.13	164.87	149.04	146.95	132.6	128.58	139.4	138.62	154.48	161.78	172.87		
I								Outp	out from wa	ater heate	r (annual)₁	12	1822.04	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	84.6	75.25	80.66	74.56	74.7	69.1	68.6	72.19	71.1	77.21	78.8	83.32		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in th <mark>e c</mark>	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	Table {	and 5a):									
Metabo	olic gain	s (Table	5) Wat	ts										
WIO LOD	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	84.71	84.71	84.71	84. <mark>7</mark> 1	84.71	84.71	84.71	84.71	84.71	8 <mark>4.7</mark> 1	84.71	84.71		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	13.16	11.69	9.5	7.2	5.38	4.54	4.91	6.38	8.56	10.87	12.69	13.52		(67)
Appliar	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L ²	13 or L1:	3a), also	see Tal	ble 5				
(68)m=	147.6	149.13	145.27	137.05	126.68	116.93	110.42	108.89	112.75	120.96	131.34	141.09		(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	31.47	31.47	31.47	31.47	31.47	31.47	, 31.47	31.47	31.47	31.47	31.47	31.47		(69)
Pumps	and fai	ns gains	(Table {	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-67.77	-67.77	-67.77	-67.77	-67.77	, -67.77	-67.77	-67.77	-67.77	-67.77	-67.77	-67.77		(71)
Water	heating	gains (T	able 5)											
(72)m=	113.7	111.99	, 108.41	103.56	100.41	95.97	92.2	97.03	98.75	103.77	109.45	111.99		(72)
Total i	nternal	aains =				(66)	m + (67)m	ı + (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	322.87	321.21	311.6	296.22	280.88	265.86	255.94	260.71	268.47	284.02	301.88	315.01		(73)
6. Sol	ar gains	S:												
Solar g	ains are o	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orienta	ation: A	Access F	actor	Area		Flu	х		g_		FF		Gains	
	٦	Table 6d		m²		Tab	ole 6a	Т	able 6b	Та	able 6c		(W)	

Northeast 0.9x	0.77	x	3.24	x	11.28	x	0.45	x	0.7	=	7.98	(75)
Northeast 0.9x	0.77	x	6	x	11.28	x	0.45	x	0.7	i =	14.78] (75)
Northeast 0.9x	0.77	x	3.24	x	22.97	x	0.45	x	0.7	i =	16.24	(75)
Northeast 0.9x	0.77	x	6	×	22.97	×	0.45	x	0.7	i =	30.08	(75)
Northeast 0.9x	0.77	x	3.24	x	41.38	x	0.45	x	0.7	i =	29.27	- (75)
Northeast 0.9x	0.77	x	6	×	41.38	×	0.45	x	0.7	i =	54.2	(75)
Northeast 0.9x	0.77	x	3.24	x	67.96	x	0.45	x	0.7	=	48.06	(75)
Northeast 0.9x	0.77	x	6	×	67.96	×	0.45	x	0.7	=	89.01	(75)
Northeast 0.9x	0.77	x	3.24	×	91.35	×	0.45	x	0.7] =	64.61	(75)
Northeast 0.9x	0.77	x	6	×	91.35	×	0.45	x	0.7] =	119.64	(75)
Northeast 0.9x	0.77	x	3.24	x	97.38	x	0.45	x	0.7] =	68.88	(75)
Northeast 0.9x	0.77	x	6	×	97.38	×	0.45	x	0.7] =	127.55	(75)
Northeast 0.9x	0.77	x	3.24	x	91.1	×	0.45	x	0.7] =	64.43	(75)
Northeast 0.9x	0.77	x	6	x	91.1	x	0.45	x	0.7	=	119.32	(75)
Northeast 0.9x	0.77	x	3.24	x	72.63	x	0.45	x	0.7	=	51.37	(75)
Northeast 0.9x	0.77	x	6	×	72.63	×	0.45	x	0.7	=	95.12	(75)
Northeast 0.9x	0.77	x	3.24	x	50.42	x	0.45	x	0.7	=	35.66	(75)
Northeast 0.9x	0.77	x	6	X	50.42	x	0.45	х	0.7	=	66.04	(75)
Northeast 0.9x	0.77] x	3.24	x	28.07	x	0.45	x	0.7] =	19.85	(75)
Northeast 0.9x	0.77	x	6	x	28.07	×	0.45	x	0.7	=	3 <mark>6.76</mark>	(75)
Northeast 0.9x	0.7 <mark>7</mark>] x	3.24	x	14.2	x	0.45	x	0.7	=	10.04	(75)
Northeast 0.9x	0.77] x	6	×	14.2	x	0.45	x	0.7	=	18.59	(75)
Northeast 0.9x	0.77] x	3.24	x	9. <mark>2</mark> 1	×	0.45	x	0.7	=	6.52	(75)
Northeast 0.9x	0.77	x	6	x	9.21	x	0.45	x	0.7	=	12.07	(75)
Northwest 0.9x	0.77	x	1.46	x	11.28	x	0.45	x	0.7] =	3.6	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	1.46	×	22.97	x	0.45	x	0.7] =	7.32	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7] =	12.18	(81)
Northwest 0.9x	0.77	x	1.46	x	41.38	×	0.45	x	0.7	=	13.19	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	×	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	x	1.46	x	67.96	x	0.45	x	0.7	=	21.66	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	1.46	x	91.35	x	0.45	x	0.7	=	29.11	(81)
Northwest 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(81)
Northwest 0.9x	0.77	x	1.46	x	97.38	x	0.45	x	0.7	=	31.04	(81)
Northwest 0.9x	0.77	x	2.43	×	97.38	×	0.45	x	0.7	=	51.66	(81)
Northwest 0.9x	0.77	x	1.46	×	91.1	×	0.45	x	0.7] =	29.03	(81)
Northwest 0.9x	0.77	x	2.43	×	91.1	×	0.45	x	0.7	=	48.33	(81)
Northwest 0.9x	0.77	x	1.46	×	72.63	x	0.45	x	0.7	=	23.15	(81)
Northwest 0.9x	0.77	x	2.43	×	72.63	x	0.45	x	0.7	=	38.53	(81)
Northwest 0.9x	0.77	x	1.46	×	50.42	×	0.45	x	0.7] =	16.07	(81)

Northw	est 0.9x	0.77	x	2.4	43	x	5	50.42) × [0.45	x	0.7	=	26.75	(81)
Northw	est 0.9x	0.77	x	1.4	46	x	2	28.07	i × ľ		0.45	×	0.7	= =	8.95	(81)
Northw	est 0.9x	0.77	x	2.4	43	x	2	28.07	i _× [0.45	x	0.7	= =	14.89	(81)
Northw	est 0.9x	0.77	x	1.4	46	x		14.2	i _× [0.45	×	0.7	=	4.52	(81)
Northw	est 0.9x	0.77	x	2.4	43	x		14.2	i _ [0.45	- x	0.7	=	7.53	(81)
Northw	est 0.9x	0.77	x	1.4	46	x		9.21	× [0.45	×	0.7	=	2.94	(81)
Northw	est 0.9x	0.77	x	2.4	43	x		9.21	× [0.45	- x	0.7	=	4.89	(81)
	L							-	J L							
Solar o	gains in	watts, ca	alculated	d for eac	h month	ı			(83)m	= Su	um(74)m .	(82)m				
(83)m=	32.34	65.83	118.6	194.78	261.82	2	79.12	261.12	208.	16	144.52	80.45	40.69	26.41		(83)
Total g	gains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (83)m	, watts					•		-	
(84)m=	355.21	387.04	430.2	491	542.7	5	44.98	517.05	468.8	88	412.99	364.47	342.57	341.42]	(84)
7. Me	an inter	nal temp	berature	(heatinc	seasor	ר)							-		_	
Temp	oerature	during h	eating p	periods in	n the livi	ing	area	from Tab	ole 9,	Th1	1 (°C)				21	(85)
Utilisa	ation fac	tor for a	ains for	living are	ea, h1,n	n (s	ее Та	ble 9a)			、 ,					
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec	7	
(86)m=	0.94	0.92	0.88	0.78	0.62		0.46	0.34	0.39	9	0.61	0.83	0.92	0.95	1	(86)
Moon	intorno	tompor	oturo in	living or	I		w ete	no 2 to 7			I		-		_	
(87)m-		19.68	20 04	20.49	20.8		0 95	20.98	20.9		20.86	20.46	19.92	19.45	1	(87)
(01)						<u> </u>					20.00		10.02	10.10		
Temp	perature	during h	leating p	beriods in	n rest of	t dw	elling	from Ta	able 9	, Th	12 (°C)	00.00		0.04		(00)
(88)m=	20.2	20.21	20.21	20.22	20.22	2	20.24	20.24	20.2	4	20.23	20.22	20.22	20.21		(00)
Util <mark>is</mark> a	ation fac	tor for g	ains for	rest of d	welling,	h2,	,m (se	e Table	9a)					r	-	
(89)m=	0.94	0.91	0.86	0.75	0.59		0.41	0.29	0.33	3	0.56	0.8	0.91	0.94		(89)
Mear	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9 <mark>c)</mark>				
(90)m=	18.16	18.45	18.96	19.59	20	2	20.19	20.23	20.2	22	20.1	19.57	18.8	18.13		(90)
											f	LA = Liv	ing area ÷ (4) =	0.43	(91)
Mean	n interna	l temper	ature (fo	or the wh	ole dwe	ellin	g) = f	LA x T1	+ (1 -	− fL/	A) × T2					
(92)m=	18.73	18.98	19.42	19.98	20.34	2	20.51	20.55	20.5	5	20.43	19.95	19.28	18.7	7	(92)
Apply	/ adjustr	nent to t	he meai	n interna	l tempe	ratu	ire fro	m Table	4e, v	whe	re appro	priate	_ <u>ı</u>		_	
(93)m=	18.73	18.98	19.42	19.98	20.34	2	20.51	20.55	20.5	55	20.43	19.95	19.28	18.7		(93)
8. Sp	ace hea	ting requ	uiremen	t												
Set T	i to the	mean int	ernal te	mperatu	re obtai	ned	at st	ep 11 of	Table	e 9b	, so that	t Ti,m=	:(76)m an	d re-ca	culate	
the ut	tilisation	factor fo	or gains	using Ta	able 9a	1				- 1		0.1			7	
1.1411.4	Jan	Feb	Mar	Apr	Мау		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Utilisa (04)m-			ains, nr	1:	0.50		0.42	0.21	0.24	5	0.57	0.70	0.80	0.02	7	(94)
		0.9 hmCm	$\frac{0.05}{100}$	$\frac{0.74}{100 \times 100}$	() () () () () () () () () () () () () (0.43	0.31	0.5	5	0.57	0.79	0.69	0.93		(34)
(95)m-	326 29	346.66	, VV = (9 363.65	4)111 X (0 364.09	321 77	2	33.06	159.85	165	84	236 31	287 71	304 38	316	7	(95)
Mont	hlv aver	ane exte	rnal ten		$\frac{1}{1} \int_{-\infty}^{\infty} \frac{1}{1} \int_{$		e 8	100.00		~	200.01	201.1				(00)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	4	14.1	10.6	7.1	4.2	7	(96)
Heat	loss rate	e for me	an interr	nal temp	ı erature	Lm	1.W=	I =[(39)m	x [(93	 5)m–	 - (96)m	1		<u> </u>		
(97)m=	620.3	603.16	551.87	465.12	361.6	2	43.08	162.43	169.8	82	261.88	391.35	513.06	614.79	7	(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	<u>1</u> 24 x [((97)	m – (95))m] x (41)m	I	_]	
(98)m=	218.74	172.37	140.03	72.74	29.64	Τ	0	0	0	Í	0	77.11	150.25	222.3	7	
						-										

	Tota	al per year (kWh/y	ear) = Sum(98) _{15,912} =	1083.18	(98)
Space heating requirement in kWh/m²/year				21.6	(99)
9b. Energy requirements – Community heating s	cheme		-		_
This part is used for space heating, space cooling	g or water heating prov	vided by a com	munity scheme.		
Fraction of space heat from secondary/suppleme	intary heating (Table 1	1) '0' if none	l	0	
Fraction of space heat from community system 1	- (301) =		l	1	(302)
includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community heat pump	is. The procedure allows for m power stations. See Appe	CHP and up to fo endix C.	ur other heat sources; tr	ne latter 1	(303a)
Fraction of total space heat from Community hea	ıt pump		(302) x (303a) =	1	 (304a)
Factor for control and charging method (Table 4c	x(3)) for community he	ating system	ĺ	1	 (305)
Distribution loss factor (Table 12c) for community	/ heating system		[1.2	(306)
Space heating				kWh/year	
Annual space heating requirement			[1083.18	
Space heat from Community heat pump		(98) x (304a) x (305) x (306) =	1299.82	(307a)
Efficiency of secondary/supplementary heating s	ystem in % (from Tabl	e 4a or Append	dix E)	0	(308
Space heating requirement from secondary/supp	lementary system	(98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				1822.04	٦
If DHW from community scheme:					
Water heat from Community heat pump		(64) x (303a) x (305) x (306) =	2186.44	(310a)
Electricity used for heat distribution	0.0*	1 × [(307a)(307e	e) + (310a)(310e)] =	34.86	(313)
Cooling System Energy Efficiency Ratio			l	0	(314)
Space cooling (if there is a fixed cooling system,	if not enter 0)	= (107) ÷ (314) =	=	0	(315)
Electricity for pumps and fans within dwelling (Ta mechanical ventilation - balanced, extract or positive control of the second	ble 4f): itive input from outside		[113.47	(330a)
warm air heating system fans			[0	(330b)
pump for solar water heating			[0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	113.47	(331)
Energy for lighting (calculated in Appendix L)			[232.38	(332)
Electricity generated by PVs (Appendix M) (nega	tive quantity)]	-730.07	(333)
Total delivered energy for all uses (307) + (309) -	+ (310) + (312) + (315)) + (331) + (33	2)(237b) =	3102.04	(338)
12b. CO2 Emissions – Community heating scher	ne				
	En kW	ergy /h/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heat Efficiency of heat source 1 (%)	ing (not CHP) there is CHP using two fuel	s repeat (363) to (366) for the second fuel	208	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x	0.52 =	869.89	(367)

Electrical energy for heat distribution

0.52

Total CO2 associated with community s	ystems	(363)(366) + (368)(37	2)	=	887.98	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	ion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			887.98	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	58.89	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	=	120.61	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	icable	0.52 ×	0.01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				688.57	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.73	(384)
El rating (section 14)					90.3	(385)

User Details:												
Assessor Name: Software Name: S	troma FSAP 2012	2		Stroma Softwa	a Num Ire Ver	ber: sion:		Versic	on: 1.0.5.49			
		Pi	roperty A	Address:	Block C) - Grou	nd Floor					
Address : 0	, Block O, Ham Clo	ose, Lon	don, IV	/10								
Ground floor	лнъ.		Area	a(m²) 0.59	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 176.47	(3a)		
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e))+(1n) 7	0.59	(4)							
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	176.47	(5)		
2. Ventilation rate:		_		_		_						
Number of chimneys Number of open flues	main se heating heating 0 + 0 +	econdar eating 0 0	y +] +] +	0 0] = [total 0 0	x 4	40 = 20 =	m³ per hour 0 0	(6a) (6b)		
Number of intermittent fans						0	X .	10 =	0	(7a)		
Number of passive vents					Г	0	x	10 =	0	(7b)		
Number of flueless gas fires	0 nanges per hou	(7c)										
Infiltration due to chimneys, f	0	(8)										
Number of storeys in the d Additional infiltration Structural infiltration: 0.25	welling (ns) for steel or timber f	rame or	0.35 for	masonr	y constr	uction	[(9)	-1]x0.1 =	0 0 0	(9) (10) (11)		
if both types of wall are preser deducting areas of openings); If suspended wooden floor	nt, use the value corresp if equal user 0.35 . enter 0.2 (unseale	oonding to ed) or 0.	the greate	er wall area d). else	a <i>(after</i> enter 0				0] (12)		
If no draught lobby, enter (0.05, else enter 0	,	(-,,					0	(13)		
Percentage of windows an	d doors draught str	ripped							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 cubi	ic metre	s per ho	ur per so	quare m	etre of e	nvelope	area	4	(17)		
If based on air permeability v	alue, then (18) = [(17	7) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)		
Air permeability value applies if a	pressurisation test has	been don	e or a deg	iree air pei	meability i	is being u	sed		r			
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			4	(19)		
Infiltration rate incorporating	shelter factor			(21) = (18)	x (20) =				0.1	(21)		
Infiltration rate modified for m	onthly wind speed								0.14](=.)		
Jan Feb Ma	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind speed	from Table 7			0					1			
(22)m= 5.1 5 4.9	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7				
Wind Factor $(22a)m = (22)m$	÷4						1	1	I			
(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]			

Adjust	ed infiltr	ation rat	e (allowi	ing for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
• • •	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul If m	ate etter	<i>ctive air</i> al ventils	change	rate for i	the appli	cable ca	se						0.5	(232)
lf exh	haust air h	eat pump	usina App	endix N. (2	23b) = (23a	a) × Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
If bal	anced with	heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (from	n Table 4h) =	, (,			76.5	(23c)
a) If	halance	d mech	anical ve	ntilation	with he	at recove	≏rv (M\/ł	HR) (24a) m = (22	2h)m + (23h) x [′	1 – (23c)	10.3 1001	(230)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	balance	d mech	i anical ve	entilation	without	L heat rec	L coverv (N	I //V) (24b	m = (22)	I 2b)m + ()	1 23b)]	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	use ex	r tract ver	ntilation of	r positiv	i ve input v	r ventilatio	n from c	utside				1	
- /	if (22b)n	n < 0.5 >	(23b), t	then (24	c) = (23b); other	wise (24	c) = (22k	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	/e input	ventilatio	on from I	oft				-	
	if (22b)n	n = 1, th	en (24d) I	m = (22	b)m othe	erwise (2	4d)m = 0	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effe	ctive air	change	rate - er	nter (24a	a) or (24b	o) or (24)	c) or (24	d) in box	(25)				1	(05)
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28	J	(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramet	er:									
ELEN		Gros area	ss (m²)	Openir m	igs 1 ²	Net Ar A ,r	ea n²	U-valı W/m2	ue K	A X U (W/I	K)	k-value kJ/m²-	э К	A X k kJ/K
Doo <mark>rs</mark>						1.91	x	1	= [1.91				(26)
Windo	ws Type	91				2.43	x1,	/[1/(1.2)+	0.04] =	2.78	F			(27)
Windo	ws Type	2				2.61	x1/	/[1/(1.2)+	0.04] =	2.99	F			(27)
Windo	ws Type	e 3				4.92	x1,	/[1/(1.2)+	0.04] =	5.63	5			(27)
Floor						70.59) x	0.1		7.059	Ξ r			(28)
Walls	Type1	22.	6	9.96	3	12.64	ı x	0.16		2.02			\dashv	(29)
Walls	Type2	22.	6	1.91	 	20.69) x	0.15		3.11	= i		\dashv	(29)
Total a	area of e	lements	, m²			115.7	9							(31)
Party	wall					39.05	5 X	0	= [0				(32)
Party	ceiling					70.59		L	เ				\dashv	(32b)
* for wir	ndows and	roof wind	ows, use e	effective w	indow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	paragraph	L h 3.2	(````
** incluc	de the area	as on both	sides of ir	nternal wal	lls and part	titions								
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				25.51	(33)
Heat c	capacity	Cm = S	(A x k)						((28)	(30) + (32	2) + (32a).	(32e) =	11939.82	2 (34)
Therm	al mass	parame	eter (TMF	⁻ = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For des can be i	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	e constructi	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	<						8.69	(36)
if details	s of therma	al bridging	are not kr	10wn (36) :	= 0.05 x (3	1)			(00)	(26)			r	—],
		at 1055	olouloto	manth	.,				(33) +	= (JOC) =	'2E\m v (E)		34.19	(37)
ventila		LIUSS C			y Movi	lun	11	A	(38)m	= 0.33 × (20)m X (5)	Dec	1	
	Jan	гер	Iviar	l Abr	Iviay	Jun	Jui	l Aug	Sep			Dec	J	

(38)m=	17.24	17.03	16.83	15.81	15.61	14.59	14.59	14.38	15	15.61	16.02	16.42		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	51.43	51.23	51.02	50	49.8	48.78	48.78	48.58	49.19	49.8	50.21	50.62		
		motor (l	אי ים ור	/m2k					(40)m	Average = $-(20)m$	Sum(39)1.	12 /12=	49.95	(39)
(40)m=	0 73		$1 \square P$, VV	0.71	0 71	0.69	0.69	0.69	(40)m	= (39)m ÷	(4)	0.72		
(40)11-	0.75	0.70	0.72	0.71	0.71	0.00	0.00	0.00	0.7	Average =	Sum(40)1	/12=	0.71	(40)
Numbe	er of day	/s in mo	nth (Tab	le 1a)		-	-	-				L		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ar:	
Assum if TF	ed occu A > 13.9	ipancy, 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	-13.9)2)] + 0.()013 x (⁻	TFA -13.	2. 9)	.26		(42)
Annual	A£13.9 Laverad	9, N = 1 ie hot w:	ater usad	ne in litre	es per da	av Vd av	erage =	(25 x N)	+ 36		87	[,] 88		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t	to achieve	a water us	se target o	f	.00		(40)
not more	e that 125	litres per	person pel	r day (all w	ater use, l	hot and co	ld)							
Listwate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
					vu,iii = ia			(43)	22.42	00.04				
(44)m=	96.67	93.16	89.64	86.13	82.61	79.1	79.1	82.61	86.13	89.64	93.16	96.67	1054.6	
Ener <mark>gy a</mark>	content of	hot water	used - cal	lculated mo	onthly $= 4$.	190 x Vd,r	n x nm x E)))))))))))))))))))	kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)	1054.0	(44)
(45)m=	143.36	125.39	129.39	112.8	108.24	93.4	86.55	99.32	100.5	117.13	127.85	138.84		
									-	Total = Su	m(45) ₁₁₂ =	=	1382.75	(45)
lf instant	aneous w	ater heati	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)			,		
(46)m=	21.5	18.81	19.41	16.92	16.24	14.01	12.98	14.9	15.08	17.57	19.18	20.83		(46)
Storag	e volum	le (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)				•		()
Otherw Water	/ise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m watei	⁻ storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	anufact	urer's d	eclared o	cylinder l	oss fact	or is not	known:							
Hot wa	iter stora	age loss	tactor fr	rom I abl	e 2 (kW	h/litre/da	iy)				0.	.02		(51)
Volume	e factor	from Ta	ble 2a	011 4.0							1.	.03		(52)
Tempe	rature f	actor fro	m Table	2b							0	0.6		(53)
Energy	v lost fro	m watei	[.] storage	e, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	.03		(54)
Enter	(50) or ((54) in (5	55)								1.	.03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	d solar sto	orage, (57)i	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	om Appendi	хH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nnual) fro	om Table			0		(58)					
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(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=	198.64	175.31	184.66	166.3	163.51	146.89	141.83	154.59	154	172.4	181.34	194.12		(62)
Solar DH	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)	-	-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	198.64	175.31	184.66	166.3	163.51	146.89	141.83	154.59	154	172.4	181.34	194.12		
			-	-				Outp	out from wa	ater heate	r (annual)₁	12	2033.59	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	91.89	81.63	87.24	80.3	80.21	73.85	73	77.24	76.21	83.17	85.31	90.39		(65)
in <mark>clu</mark>	ıde (57)ı	n in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernai ga	ains (see	Table 5	5 and 5a):								_	
Metab	olic gain	s (Table	5) Wat	ts										
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see [·]	Table 5					
(67)m=	18.97	16.85	13.7	10.37	7.75	6.55	7.07	9.19	12.34	15.67	18.29	19.5		(67)
Applia	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	198.67	200.73	195.54	184.48	170.52	157.39	148.63	146.57	151.76	162.82	176.78	189.9		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also se	e Table	5				
(69)m=	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3		(69)
Pumps	and far	ns dains	(Table 5	5a)			ļ	1				1		
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.a. ev	aporatio	n (nega	ı tive valu	es) (Tab	le 5)	I							
(71)m=	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41		(71)
Water	heating	gains (T	able 5)											
(72)m=	123.51	121.48	117.26	111.53	107.81	102.57	98.12	103.82	105.85	111.78	118.48	121.49		(72)
Total i	nternal	nains -	l			(66)	l)m + (67)m	L 1 + (68)m +	L + (69)m + ([L 1)m + (72)	l		
(73)m=	398.05	395.96	383.41	363.29	342.98	323.42	310.72	316.49	326.86	347.18	370.46	387.79		(73)
6. So	lar gains	S:												
Solar g	ains are o	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	e applicat	le orientat	ion.		
-														

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9>	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(75)
Northeast 0.9>	0.77	x	2.61	×	11.28	×	0.45	×	0.7	=	6.43	(75)

Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	٦,	< 🗌	11.28	x	0.45	x	0.7	=	• [12.12	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	ī,	< 📃	22.97] ×	0.45	×	0.7	=	ן י	12.18	- (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	ī,	<	22.97] x	0.45	×	0.7	=	ן י	13.09	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	_ _ ,	<	22.97	x	0.45	×	0.7	=	۰ľ	24.67	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	ī,	<u>ر</u> .	41.38] ×	0.45	×	0.7	=	ן י	21.95	- (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	ī,	<	41.38] ×	0.45	×	0.7	=	ן י	23.58	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	ī,	<u>ر</u>	41.38] ×	0.45	×	0.7	=	ן י	44.44	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	ī,	(67.96] ×	0.45	×	0.7	=	ן י	36.05	- (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	- ,	< (67.96	x	0.45	x	0.7	=	١	38.72	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	ī,	<	67.96] ×	0.45	×	0.7	=	۰ľ	72.99	_ (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	Ī,	<	91.35	x	0.45	×	0.7	=	ן י	48.46	– (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	_ _ ,	< .	91.35	x	0.45	x	0.7	=	١	52.04	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	ī,	<	91.35] x	0.45	×	0.7	=	ן י	98.11	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	ī,	<	97.38	x	0.45	×	0.7	=	Ī	51.66	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	- ,	<	97.38	x	0.45	×	0.7	=	Ī	55.48	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	- ,	<	97.38	x	0.45	×	0.7	=	Ē	104.59	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43] ,	(91.1	x	0.45	×	0.7	=	• [48.33	(75)
Northea	ast 0.9x	0.77	;	x	2.61] >	(91.1	x	0.45	x	0.7		•	51.9	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	- - -	<	91.1	x	0.45	x	0.7	=	- [97.84	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43],	<	72.63	l 🖈	0.45	x	0.7	=	Ī	38.53	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	2.61],		72.63	x	0.45	x	0.7	=	• [41.38	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92],	<	72.63	x	0.45	x	0.7	=	• [78	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	2.43)	<	50.42	x	0.45	x	0.7	=	• [26.75	(75)
Northea	ast 0.9x	0.77	;	x	2.61)	< 🔼 :	50.42	x	0.45	x	0.7	=	• [28.73	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92] >	<	50.42	x	0.45	x	0.7	=	• [54.15	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43)	(28.07	x	0.45	x	0.7	=	- [14.89	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61] ,	(28.07	x	0.45	×	0.7	=	- [15.99	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92)	(28.07	x	0.45	×	0.7	=	• [30.14	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43)	(14.2	x	0.45	×	0.7	=	• [7.53	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	2.61)	<	14.2	x	0.45	×	0.7	=	• [8.09	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	4.92)	<	14.2	x	0.45	×	0.7	=	- [15.25	(75)
Northea	ast <mark>0.9x</mark>	0.77	3	x	2.43)	<	9.21	x	0.45	×	0.7	=	- [4.89	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	2.61)	<	9.21	x	0.45	×	0.7	=	• [5.25	(75)
Northea	ast <mark>0.9x</mark>	0.77	3	x	4.92)	<	9.21	x	0.45	×	0.7	=	- [9.9	(75)
Solar g	pains in	watts, ca	lculate	d	for each mor	<u>nth</u>			(83)m	n = Sum(74)m .	<mark>(82)</mark> m			_		(0.0)
(83)m=	24.53	49.93	89.97		147.75 198.6	51	211.74	198.07	157	.91 109.63	61.02	30.87	20.03			(83)
				וג ד.	(04)(01) = (73)(04)(01)(01)(01)(01)(01)(01)(01)(01)(01)(01		- (03)III		47		400.0	404.00	407.00	<u>, </u>		(94)
(04)M=	422.58	445.9	4/3.3/		511.04 541.5	ла	535.15	8.800	472	430.48	408.2	401.32	407.83	<u>`</u>		(04)
7. Me	an inte	rnal temp	erature	Э (heating seas	on)		·	-					F		٦
Temp	erature	e during h	eating	ре 	eriods in the l	ivin	g area	trom Tal	ble 9	, Ih1 (°C)					21	(85)
Utilisa	ation fa	ctor for ga	ains for	r li T	ving area, h1	,m	(see Ta	able 9a)			<u> </u>					
	Jan	rep	war	1	Apr Ma	iy	Jun	Jul	I A	ug Sep	Uct	INOV		;		

(86)m=	0.96	0.94	0.92	0.84	0.72	0.55	0.41	0.46	0.68	0.87	0.94	0.96	I		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)						
(87)m=	19.65	19.8	20.09	20.48	20.78	20.94	20.98	20.98	20.87	20.51	20.04	19.64	I		(87)
Temp	erature	durina h	eating r	eriods ir	n rest of	dwelling	from Ta	ble 9 Tl	h2 (°C)						
(88)m=	20.32	20.32	20.32	20.33	20.34	20.35	20.35	20.35	20.34	20.34	20.33	20.33	1		(88)
Utilisa	ition fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)							
(89)m=	0.95	0.94	0.91	0.82	0.69	0.5	0.35	0.4	0.63	0.85	0.93	0.96	I		(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=	18.49	18.7	19.12	19.68	20.08	20.29	20.34	20.33	20.21	19.72	19.06	18.47	I		(90)
			-			-	-		f	LA = Livin	g area ÷ (4	ł) =	0.38		(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	LA x T1	+ (1 – fL	A) x T2			•			
(92)m=	18.93	19.12	19.48	19.98	20.34	20.54	20.58	20.58	20.46	20.02	19.43	18.91	I		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	i ature fro	n Table	4e, whe	ere appro	opriate					
(93)m=	18.93	19.12	19.48	19.98	20.34	20.54	20.58	20.58	20.46	20.02	19.43	18.91	I		(93)
8. Spa	ace hea	ting requ	uirement												
Set Ti	to the r	nean int	ernal tei	mperatur	re obtain	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate		
the ut	ilisation	factor fo	or gains	using Ta	ble 9a										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisa	ition fac	tor for g	ains, hm	1:											
(94)m=	0.94	0.92	0.89	0.81	0.69	0.51	0.37	0.42	0.64	0.83	0.91	0.94			(94)
Usefu	l gains,	hmGm .	, W = (9	4)m x (84	4)m										
(95)m=	<mark>39</mark> 6.67	412	421.33	415.86	371.73	274.89	190.69	197.72	279.46	340.72	367.04	385.03			(95)
Month	nly avera	age exte	rnal terr	iperature	e from Ta	able 8									
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	1 <mark>0.6</mark>	7.1	4.2			(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m∙	– (96)m]					
(97)m=	752.25	728.38	662.48	554.04	430.44	289.59	194.19	202.87	312.66	469.11	618.92	744.45			(97)
Space	e heatin	g require	ement fo	r each m	honth, k	Nh/moni	th = 0.02	24 x [(97))m – (95)m] x (4′	1)m		I		
(98)m=	264.55	212.6	179.42	99.49	43.68	0	0	0	0	95.52	181.35	267.41			
								Tota	l per year	(kWh/year) = Sum(98	8)15,912 =	1344.	03	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								19.0	4	(99)
9b. Ene	ergy rec	uiremer	nts – Coi	mmunity	heating	scheme	;					-			
This pa	art is use	ed for sp	ace hea	ting, spa	ace cooli	ing or wa	ater heat	ing prov	ided by	a comm	unity sch	ieme.			
Fractio	n of spa	ice heat	from se	condary/	/supplen	nentary l	neating (Table 1	1) '0' if n	one			0		(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1		(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sour	rces. The p	orocedure	allows for	CHP and ι	up to four o	other heat	sources; tl	ne latter		
includes Fractio	<i>boilers, h</i> n of hea	<i>eat pumps</i> at from C	s, geotheri Commun	<i>nal and wa</i> itv heat i	aste heat f oump	rom powei	r stations.	See Apper	ndix C.			[1		(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pum	2			(3	02) x (303;	a) =			(304a)
Factor	for cont	rol and o	charaina	method	(Table /	4c(3)) fo	r commi	unitv hea	tina svst	tem	, , , , , , , , , ,	·	1		(305)
Distribu	ution los	s factor	(Table 1	2c) for c	commun	ity heati	ng svste	m	9-90			 	1.2		(306)
Snace	hosting	n	、 ·	-,		,	5 -) - 10					l	<u>ـــــ</u>	hear	l` í
Annual	space	s heating	requiren	nent									1344	03	
	Space											l			l

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1612.83	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2033.59	1
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2440.31](310a)
Electricity used for heat distribution	0.01 × [(307a)…(307	7e) + (310a)(310e)] =	40.53	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from ou	ıtside		134.56	- (330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	134.56	(331)
Energy for lighting (calculated in Appendix L)			335	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3</mark>)
Tota <mark>l delivered energy for</mark> all u <mark>ses (</mark> 307) + (309) + (310) + (312) +	(<mark>315) +</mark> (331) + (<mark>33</mark>	32)(237b) =	3 <mark>792.6</mark> 3	(338)
12b. CO2 Emissions – Community heating scheme				
CO2 from other sources of space and water heating (not CHP)	Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO2/year	
Efficiency of heat source 1 (%)	vo fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(31	0b)] x 100 ÷ (367b) x	0.52	= 1011.34	(367)
Electrical energy for heat distribution [(3	13) x	0.52	21.04	(372)
Total CO2 associated with community systems (36	3)(366) + (368)(37	2) =	1032.37	(373)
CO2 associated with space heating (secondary) (30	9) x	0 =	= 0	(374)
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (37	(3) + (374) + (375) =		1032.37	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	69.84	(378)
CO2 associated with electricity for lighting (33	2))) x	0.52	173.87	(379)
Energy saving/generation technologies (333) to (334) as applicabl Item 1	e	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			897.17	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			12.71	(384)
El rating (section 14)			89.6	(385)

User Details:												
Assessor Name: Software Name:	Stroma FSAP 20)12		Stroma Softwa	a Num are Ver	ber: sion:	-1	Versio	on: 1.0.5.49			
A dalama a a		P Slago Lar	roperty /	Address:	Block C) - Mid F	loor					
Address : 1 Overall dwelling dimer	O, BIOCK O, Ham O	Jose, Lon	idon, Tv	V10								
Ground floor			Area 7	a(m²) 0.59	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 176.47	(3a)		
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	1e)+(1r	I) 7	0.59	(4)							
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	176.47	(5)		
2. Ventilation rate:												
Number of chimneys Number of open flues	main heating 0 + 0 +	secondar heating 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m³ per hour 0 0](6a)](6b)		
Number of intermittent fan	S					0	X .	10 =	0	(7a)		
Number of passive vents					Γ	0	x	10 =	0	(7b)		
Number of flueless gas fire	0 anges per hou	(7c)										
Infiltration due to chimney	0	(8)										
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dwelling (ns) 25 for steel or timbe	r frame or	0.35 for	masonr	ry constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)		
if both types of wall are pre deducting areas of opening If suspended wooden flo	esent, use the value corr gs); if equal user 0.35 DOr, enter 0.2 (unse	esponding to aled) or 0.	the greate	er wall are ed), else	a (after enter 0				0	(12)		
If no draught lobby, ente	er 0.05, else enter 0)							0	(13)		
Percentage of windows	and doors draught	stripped							0	(14)		
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)		
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)		
Air permeability value, o	50, expressed in cu	ubic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)		
If based on air permeabilit	y value, then $(18) = 1$	(17) ÷ 20]+(8	3), otherwi	se (18) = (16)	:			0.2	(18)		
Number of sides sheltered	n a pressunsation test n	ias been don	le or a deg	free all pei	meaning	is being u	sea		4	7(19)		
Shelter factor	a			(20) = 1 -	[0.075 x (1	9)] =			0.7	(10)		
Infiltration rate incorporati	ng shelter factor			(21) = (18)) x (20) =				0.14	(21)		
Infiltration rate modified fo	r monthly wind spee	ed										
Jan Feb I	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind spe	ed from Table 7											
(22)m= 5.1 5 4	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7				
Wind Factor (22a)m = (22)m ÷ 4											
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]			

Adjust	ed infiltr	ation rat	e (allowi	ing for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m	-			_	
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul	ate etter	ctive air	change	rate for t	he appli	cable ca	se						0.5	(220)
lf exh	aust air h	eat pump i	using App	endix N. (2	23b) = (23a) x Fmv (e	equation (N	(5)) othe	rwise (23b) = (23a)			0.5	(23a)
If bal	anced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use fa	actor (from	n Table 4h) =) (200)			0.5	(230)
a) If	halance	d mech	anical ve	ntilation	with he	at recove	arv (M\/F	HR) (24a	/ a)m = (22	2h)m + (23h) 🗙 [ʻ	1 – (23c)	10.5	(230)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	halance	d mech:	anical ve	Intilation	without	heat rec		() (24h)	1 - (22)	$\frac{1}{2}$	23h)		1	. ,
(24b)m=						0			0		0	0	1	(24b)
c) If			tract ver	L	or positiv		/entilatio	n from c					J	. ,
0) 11	if (22b)n	0.30 ex	: (23b), 1	then (24	c) = (23b)); otherv	vise (24	c) = (22b	b) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	on or wh	ole hous	se positiv	ve input	ventilatio	on from I	oft	0 51	3	3	-	
(0.1.1)	if (22b)n	n = 1, th	en (24d)	m = (22)	b)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]			1	(244)
(24a)m=			0			0	0		0	0	0	0		(240)
Effe	ctive air		rate - er	1 ter (24a)	1) or (24b)	o) or (240	c) or (24		(25)	0.07	0.07	0.00	1	(25)
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(23)
3. He	at l <mark>osse</mark>	s and he	at loss	paramet	er:									
ELEN		Gros area	ss (m²)	Openin m	lgs	Net Ar	ea n²	U-valı W/m2	ue K	A X U (W/	K)	k-value	e K	A X k kJ/K
Doors			(,			1.91	x	1	=	1.91				(26)
Windo		e 1				2.43		/[1/(1.2)+	0.041 =	2 78	Ħ			(27)
Windo	ws Type	2				2.40		/[1/(1.2)+	0.041 =	2.00	Ħ			(27)
Windo	ws Type	3				4.02		/[1/(1.2)+	0.041 -	5.63	4			(27)
Walls	Tvne1	220		0.06	2	12.64		0.16		2.03				(29)
Walls	Tvpe2	22.	<u></u>	1.91	,	20.69		0.10		3 11	╡┟		\dashv	(29)
Total a	area of e	lements	 . m²			45.2		0.10	[0.11				(31)
Party	wall		,			39.05	x	0	= [0				(32)
Party f	loor					70.59			I				\dashv	(32a)
Party	ceiling					70.59					Г		\dashv	(32b)
* for win	dows and	roof wind	ows, use e	effective wi	indow U-va	lue calcul	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	L as given in	paragraph	 h 3.2	`
** incluc	le the area	as on both	sides of ir	nternal wal	ls and part	itions								
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				18.45	(33)
Heat c	apacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6998.5	2 (34)
Therm	al mass	parame	ter (TMI	P = Cm -	÷ TFA) in	⊨kJ/m²K			Indica	tive Value	: Low		100	(35)
For des can be i	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	constructi	on are not	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						4.56	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			23.01	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

(38)m=	17.24	17.03	16.83	15.81	15.61	14.59	14.59	14.38	15	15.61	16.02	16.42		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	40.25	40.04	39.84	38.82	38.61	37.6	37.6	37.39	38	38.61	39.02	39.43		
		mater /l		/2021					(40)	Average =	Sum(39)1	12 /12=	38.77	(39)
	0.57		$\neg LP$), VV	0.55	0.55	0.53	0.53	0.53	(40)m	= (39)m ÷	(4)	0.56		
(40)11=	0.57	0.57	0.50	0.55	0.55	0.55	0.55	0.55	0.54	Average =	Sum(40)1	12/12=	0.55	(40)
Numbe	er of day	/s in mo	nth (Tab	le 1a)	-	-	-					L		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ar:	
Assum if TF if TF	ed occu A > 13.9	ipancy, 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	-13.9)2)] + 0.()013 x (⁻	TFA -13.	9) 2.	26		(42)
Annua	l averag	e hot wa	ater usa	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		87	.88		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t	to achieve	a water us	se target o	ſ			
not more	, inal 125				aler use, i									
Hot wate	Jan er usage i	Feb	Mar day for e	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m-	96.67	03.16	89.64	86 13	82.61	70.1	70 1	82.61	86.13	89.64	03.16	96.67		
(44)11=	90.07	93.10	09.04	00.15	02.01	79.1	19.1	02.01		$\frac{09.04}{100} = Su$	m(44)1 12 =	90.07	1054.6	(44)
Ener <mark>gy o</mark>	content of	hot water	used - ca	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E) Tm / 3600	kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)		
(45)m=	143.36	125.39	129.39	112.8	108.24	93.4	86.55	99.32	100.5	117.13	127.85	138.84		
lf in stand							enten O in	haven (40		Tota <mark>l = Su</mark>	m(45) ₁₁₂ =	=	1 <mark>382.75</mark>	(45)
it instant	aneous w	ater neati	ng at point 1	t of use (no I	not water	r storage), I	enter 0 in I	boxes (46)) to (61)			·		(10)
(46)m= Water	21.5 storage	18.81 loss:	19.41	16.92	16.24	14.01	12.98	14.9	15.08	17.57	19.18	20.83		(46)
Storag	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss: uror's d	oclarad I	oss fact	or ie kno	wp (k\//k	v/dav).							(40)
Tempe	ariura f	actor fro	m Table	2h			i/uay).					0		(40)
Energy	lost fro	m water	r storage	× k\//h/v/	ar			(48) x (49)	. =			10		(49)
b) If m	anufact	urer's d	eclared of	cylinder l	loss fact	or is not	known:	(10) / (10)	,		'	10		(00)
Hot wa	ter stor	age loss	factor fi	rom Tabl	e 2 (kW	h/litre/da	ıy)				0.	.02		(51)
If comr	nunity h a factor	from To	ee secti	on 4.3										(50)
Tempe	rature f	actor fro	om Table	2b							1.	.03		(52)
Enera	lost fro	m wate	rstorage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		03		(54)
Enter	(50) or ((54) in (8	55)	,, ,						,	1.	.03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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	хH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nnual) fro	om Table	93							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(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=	198.64	175.31	184.66	166.3	163.51	146.89	141.83	154.59	154	172.4	181.34	194.12		(62)
Solar DH	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)	-	-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	198.64	175.31	184.66	166.3	163.51	146.89	141.83	154.59	154	172.4	181.34	194.12		
			-	-				Outp	out from wa	ater heate	r (annual)₁	12	2033.59	(64)
Heat g	ains froi	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	91.89	81.63	87.24	80.3	80.21	73.85	73	77.24	76.21	83.17	85.31	90.39		(65)
in <mark>clu</mark>	ıde (57)ı	n in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernai ga	ains (see	Table 5	5 and 5a):								_	
Metab	olic gain	s (Table	5) Wat	ts										
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02	113.02		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see [·]	Table 5					
(67)m=	18.97	16.85	13.7	10.37	7.75	6.55	7.07	9.19	12.34	15.67	18.29	19.5		(67)
Applia	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	198.67	200.73	195.54	184.48	170.52	157.39	148.63	146.57	151.76	162.82	176.78	189.9		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also se	e Table	5				
(69)m=	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3		(69)
Pumps	and far	ns dains	(Table 5	5a)			ļ	1				1		
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.a. ev	aporatio	n (nega	ı tive valu	es) (Tab	le 5)	I							
(71)m=	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41	-90.41		(71)
Water	heating	gains (T	able 5)											
(72)m=	123.51	121.48	117.26	111.53	107.81	102.57	98.12	103.82	105.85	111.78	118.48	121.49		(72)
Total i	nternal	nains -	l			(66)	l)m + (67)m	L 1 + (68)m +	L + (69)m + ([L 1)m + (72)	l		
(73)m=	398.05	395.96	383.41	363.29	342.98	323.42	310.72	316.49	326.86	347.18	370.46	387.79		(73)
6. So	lar gains	S:												
Solar g	ains are o	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	e applicat	le orientat	ion.		
-														

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9>	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(75)
Northeast 0.9>	0.77	x	2.61	×	11.28	×	0.45	×	0.7	=	6.43	(75)

Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	٦,	< 🗌	11.28	x	0.45	x	0.7	=	• [12.12	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	ī,	< 📃	22.97] ×	0.45	×	0.7	=	ן י	12.18	- (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	ī,	(22.97	x	0.45	×	0.7	=	ן י	13.09	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	_ _ ,	<	22.97	x	0.45	×	0.7	=	۰ľ	24.67	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	ī,	<u>ر</u> .	41.38] ×	0.45	×	0.7	=	ן י	21.95	- (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	ī,	<	41.38] ×	0.45	×	0.7	=	ן י	23.58	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	ī,	<u>ر</u>	41.38] ×	0.45	×	0.7	=	ן י	44.44	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	ī,	(67.96] ×	0.45	×	0.7	=	ן י	36.05	- (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	- ,	< (67.96	x	0.45	x	0.7	=	١	38.72	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	ī,	<	67.96] ×	0.45	×	0.7	=	۰ľ	72.99	_ (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	Ī,	<	91.35	x	0.45	×	0.7	=	ן י	48.46	– (75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	_ _ ,	< .	91.35	x	0.45	x	0.7	=	١	52.04	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	ī,	< .	91.35] x	0.45	×	0.7	=	ן י	98.11	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43	ī,	<	97.38	x	0.45	×	0.7	=	Ī	51.66	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61	- ,	<	97.38	x	0.45	×	0.7	=	Ī	55.48	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	- ,	<	97.38	x	0.45	×	0.7	=	Ē	104.59	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43] ,	(91.1	x	0.45	×	0.7	=	• [48.33	(75)
Northea	ast 0.9x	0.77	;	x	2.61] >	<	91.1	x	0.45	x	0.7		•	51.9	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92	- - -	<	91.1	x	0.45	x	0.7	=	- [97.84	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43],	<	72.63	l 🖈	0.45	x	0.7	=	Ī	38.53	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	2.61],		72.63	x	0.45	x	0.7	=	• [41.38	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92],	<	72.63	x	0.45	x	0.7	=	• [78	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	2.43)	<	50.42	x	0.45	x	0.7	=	• [26.75	(75)
Northea	ast 0.9x	0.77	;	x	2.61)	< 🔼 :	50.42	x	0.45	x	0.7	=	• [28.73	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92] >	<	50.42	x	0.45	x	0.7	=	• [54.15	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43)	(28.07	x	0.45	x	0.7	=	- [14.89	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.61] ,	(28.07	x	0.45	×	0.7	=	- [15.99	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	4.92)	(28.07	x	0.45	×	0.7	=	• [30.14	(75)
Northea	ast <mark>0.9x</mark>	0.77	;	x	2.43)	(14.2	x	0.45	×	0.7	=	• [7.53	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	2.61)	<	14.2	x	0.45	×	0.7	=	• [8.09	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	4.92)	<	14.2	x	0.45	×	0.7	=	- [15.25	(75)
Northea	ast <mark>0.9x</mark>	0.77	3	x	2.43)	<	9.21	x	0.45	×	0.7	=	- [4.89	(75)
Northea	ast <mark>0.9x</mark>	0.77	,	x	2.61)	<	9.21	x	0.45	×	0.7	=	• [5.25	(75)
Northea	ast <mark>0.9x</mark>	0.77	3	x	4.92)	<	9.21	x	0.45	×	0.7	=	- [9.9	(75)
Solar g	pains in	watts, ca	lculate	d	for each mor	<u>nth</u>			(83)m	n = Sum(74)m .	<mark>(82)</mark> m			_		(00)
(83)m=	24.53	49.93	89.97		147.75 198.6	51	211.74	198.07	157	.91 109.63	61.02	30.87	20.03			(83)
				וג ד.	(04)(01) = (73)(04)(01)(01)(01)(01)(01)(01)(01)(01)(01)(01		- (03)III		47		400.0	404.00	407.00	<u>, </u>		(94)
(04)M=	422.58	445.9	4/3.3/		511.04 541.5	ла	535.15	8.800	472	430.48	408.2	401.32	407.83	<u>`</u>		(04)
7. Me	an inte	rnal temp	erature	Э (heating seas	on)		·	-					F		٦
Temp	erature	e during h	eating	ре 	eriods in the l	ivin	g area	trom Tal	ble 9	, Ih1 (°C)					21	(85)
Utilisa	ation fa	ctor for ga	ains for	r li T	ving area, h1	,m	(see Ta	able 9a)			<u> </u>					
	Jan	rep	war	1	Apr Ma	iy	Jun	Jul	I A	ug Sep	Uct	INOV		;		

(86)m=	0.94	0.93	0.88	0.78	0.62	0.44	0.32	0.36	0.57	0.81	0.91	0.95	I		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)						
(87)m=	20.13	20.26	20.49	20.77	20.93	20.99	21	21	20.96	20.77	20.44	20.12			(87)
Temp	erature	durina h	eating p	periods ir	n rest of	dwellina	from Ta	ble 9. Ti	h2 (°C)						
(88)m=	20.46	20.46	20.46	20.48	20.48	20.49	20.49	20.49	20.49	20.48	20.47	20.47	1		(88)
Utilisa	tion fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)		-					
(89)m=	0.94	0.92	0.87	0.76	0.59	0.41	0.29	0.32	0.54	0.79	0.9	0.94	I		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)					
(90)m=	19.28	19.47	19.79	20.19	20.4	20.48	20.49	20.49	20.45	20.19	19.73	19.27	I		(90)
			-	-	_		-		f	LA = Livin	g area ÷ (4	+) =	0.38		(91)
Mean	interna	l temper	ature (fc	or the wh	ole dwe	llina) = fl	LA x T1	+ (1 – fL	A) x T2						
(92)m=	19.6	19.77	20.05	20.41	20.6	20.67	20.68	20.68	, 20.64	20.41	19.99	19.59	I		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate					
(93)m=	19.6	19.77	20.05	20.41	20.6	20.67	20.68	20.68	20.64	20.41	19.99	19.59	I		(93)
8. Spa	ace hea	ting requ	uirement	t											
Set Ti	to the r	mean int	ernal ter	mperatui	re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate		
the ut	ilisation	factor fo	or gains	using Ta	ble 9a										
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec															
Utilisa	ition fac	tor for g	ains, hm	n:											
(94)m=	0.93	0.91	0.86	0.76	0.6	0.42	0.3	0.34	0.55	0.78	0.89	0.93			(94)
Usefu	l gains,	hmGm .	, W = (9	4)m x (84	4)m										
(95)m=	391.49	404.15	407.05	385.91	324.86	225.34	152.93	159.29	239.37	319.5	358.05	380.45			(95)
Month	nly avera	age exte	rnal terr	nperature	e from Ta	able 8									
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2			(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m : -	x [(93)m	– (96)m]					
(97)m=	615.79	595.3	539.99	446.63	343.53	228.25	153.43	160.09	248.59	378.85	503.18	606.91			(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4′	1)m				
(98)m=	166.88	128.46	98.9	43.72	13.89	0	0	0	0	44.15	104.49	168.49			
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	768.98		(98)
Space	e heatin	g require	ement in	kWh/m²	/year								10.89		(99)
9b. Ene	ergy rec	uiremer	nts – Coi	mmunity	heating	scheme						-			
This pa	art is use	ed for sp	ace hea	ating, spa	ace cool	ing or wa	ater heat	ting prov	ided by a	a comm	unity sch	ieme.			
Fractio	n of spa	ice heat	from se	condary/	/supplen	nentary l	neating (Table 1	1) '0' if n	one	,		0		(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1		(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sou	rces. The p	orocedure	allows for	CHP and ι	up to four o	other heat	sources; tl	ne latter		
includes Eractio	boilers, h	eat pumps	s, geotheri	mal and wa	aste heat f	rom powei	r stations.	See Appel	ndix C.			1	1		(3032)
Fractio	n of tota		boot fro	m Comn	punip subity b					(2)	02) v (202		1		(303a)
Factor	for cort	an space	neat 110			zai pump	, ,	unity has	ting ave	(3	02) X (303)	a) =	1		(3048)
Pietrile	ior cont	roi and o		method	(Table	4C(3)) 10	r commu	unity nea	lting sys	tem		l	1		(305)
		s ractor		120) IOF (Jornmun	ity neatli	iy syste	111				l	1.2		(ວບບ)
Space	heating											I	kWh/y	ear	
Annual	space	neating	requiren	ient									768.98		

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	922.78	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2033.59]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2440.31	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307	/e) + (310a)(310e)] =	33.63	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from ou	ıtside		134.56	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	134.56	(331)
Energy for lighting (calculated in Appendix L)	_		335	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3</mark>)
Tota <mark>l delivered energy for all uses (</mark> 307) + (309) + (310) + (312) +	(<mark>315) +</mark> (331) + (<mark>33</mark>	32)(237b) =	3 <mark>102.5</mark> 8	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor	Emiss <mark>ions</mark> kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	vo fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(31	0b)] x 100 ÷ (367b) x	0.52	839.15	(367)
Electrical energy for heat distribution [(3	13) x	0.52 =	17.45	(372)
Total CO2 associated with community systems (36	3)(366) + (368)(37)	2) =	856.61	(373)
CO2 associated with space heating (secondary) (30	9) x	0 =	= 0	(374)
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (37	3) + (374) + (375) =		856.61	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	69.84	(378)
CO2 associated with electricity for lighting (33	2))) x	0.52	173.87	(379)
Energy saving/generation technologies (333) to (334) as applicabl Item 1	e	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			721.4	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			10.22	(384)
El rating (section 14)			91.64	(385)

			User D	etails:									
Assessor Name: Software Name:	Stroma FSAP 201	12		Stroma Softwa	a Num Ire Ver	ber: sion:		Versic	on: 1.0.5.49				
	D. Dia di D. Liarra Ol	P	roperty A	Address:	Block R	l - Groui	nd Floor						
Address :	R, Block R, Ham Cl	ose, Lon	don, IW	/10									
Ground floor	IONS.		Area 5	a(m²) 8.65	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 146.63](3a)			
Total floor area TFA = (1a)-	-(1b)+(1c)+(1d)+(1e	e)+(1n	I) 5	8.65	(4)								
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	146.63	(5)			
2. Ventilation rate:													
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} & \text{s} \\ \text{heating} & \text{H} \\ \hline 0 & + \end{array} $	econdar neating 0 0	y + [0 0] = [total 0 0	x 4	40 = 20 =	m³ per hour 0 0	(6a) (6b)			
Number of intermittent fans						0	X .	10 =	0	(7a)			
Number of passive vents					Γ	0	x	10 =	0	(7b)			
Number of open flues 0 $+$ 0 $+$ 0 $=$ 0 $\times 20 =$ Number of intermittent fans 0 $\times 10 =$ 0 $\times 10 =$ Number of passive vents 0 $\times 10 =$ 0 $\times 40 =$ Number of flueless gas fires 0 $\times 40 =$ 4 4 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) \div													
Infiltration due to chimneys, If a pressurisation test has been		(8)											
Number of storeys in the Additional infiltration Structural infiltration: 0.25	dwelling (ns) for steel or timber	frame or	0.35 for	masonr	y constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)			
if both types of wall are prese deducting areas of openings If suspended wooden floo	ent, use the value corres); if equal user 0.35 pr. enter 0.2 (unsea	sponding to led) or 0.	the greate	er wall area d). else	a <i>(after</i> enter 0](12)			
If no draught lobby, enter	0.05, else enter 0	,	(-,,					0	(13)			
Percentage of windows a	nd 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, q5	0, expressed in cut	oic metre	s per ho	ur per so	quare m	etre of e	nvelope	area	4	(17)			
If based on air permeability	value, then (18) = [(1	17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)			
Air permeability value applies if	a pressurisation test ha	s been don	e or a deg	iree air pei	meability	is being u	sed		[
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			4	(19)			
Infiltration rate incorporating	shelter factor			(21) = (18)	x (20) =	/-			0.7	(20)			
Infiltration rate modified for	monthly wind speed	d		. , . ,					0.14](=.)			
Jan Feb M	ar Apr Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec					
Monthly average wind spee	d from Table 7	1			r		-		I				
(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 $(22a)m = (22)r$		1					1	1	I				
(22a)m= 1.27 1.25 1.2	3 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18					

Adjusted	l infiltra	tion rate	e (allowi	ng for sł	nelter an	d wind s	speed) =	= (21a) x	(22a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calculate	e effect	ive air (change i tion:	rate for t	he appli	cable ca	se						-	
If exhau	ist air has		uon. Ising Anne	andix N (2	3h) - (23a) × Fmv (e	acuation ((N5)) othe	arwisa (23t	(23a)			0.5	(238)
lf baland	ood with I	hoot room			(25a) = (25a)	or in uso f	actor (fro	m Table $4k$) –) – (23a)			0.5	(230)
									$\eta = 0$	0h)	00h) [1 (00 a)	76.5	(23c)
								HR)(24)	a)m = (2)	$\frac{2D}{1}$ m + (23D) × [1 - (23C)) ÷ 100]]	(24a)
(24a)III=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.20	0.27	0.27	0.20	J	(240)
					without	neat rec	covery (INIV) (241	p)m = (2)	2b)m + (. 1	23D)		1	(24b)
(240)11=		0	0		0	0		0		0	0	0	J	(240)
C) IT WI	nole no (22h)m	use exit	(23b) t	itilation (hen (24)	or positiv	e input v	ventilati Mise (24	on from (22)	outside b) $m \pm 0$	5 v (23h	.)			
(24c)m=	0	0.0	0		0			0			0	0	1	(24c)
		ontilatio	on or wh				l ventilati	ion from			ů	ů	J	
if ((22b)m	= 1, th	en (24d)	m = (22)	b)m othe	rwise (2	(4d)m =	0.5 + [(2	22b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effecti	ve air c	hange	rate - er	nter (24a) or (24b) or (24	c) or (24	4d) in bo	x (25)	•				
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
2 Hoot		and he	at loss r	aramat	or:									
		Gros			ae	Not Ar	22	Ll-val		ΔΧΠ		k-value	<u> </u>	AXK
		area	(m²)	m	93 ²	A,r	n ²	W/m2	2K	(W/I	K)	kJ/m ² ·l	K	kJ/K
Doo <mark>rs</mark>						1.91	x	1	=	1.91				(26)
Windows	s Type	1				3.24	×	1/[1/(1.2)+	+ 0.04] =	3.71	Fi i			(27)
Windows	s Type :	2				2.52	77 ×	1/[1/(1.2)+	• 0.04] =	2.89	F			(27)
Windows	s Type	3				7.56	×	1/[1/(1.2)+	0.04] =	8.66	5			(27)
Windows	s Type	4				2.43	x	1/[1/(1.2)+	+ 0.04] =	2.78	=			(27)
Windows	s Type	5				2.43	×	1/[1/(1.2)+	+ 0.04] =	2.78				(27)
Floor						58.65	5 X	01	=	5 865				(28)
Walls Tv	ne1	41.0	8	18.1		22.0		0.16	╡_	3.66	╡╏		\dashv	(29)
Walls Tv	ne2	20.1	2	1.01		22.0		0.10		4.00	╡╏		\dashv	(29)
Total are	poz		2 m ²	1.91		400.0	<u>-</u> ^	0.15		4.09	L			(21)
Porty wa		Smernes	,			120.0	<u> </u>				—			
	ui					12.02	<u>2</u> ×	0	=	0			\dashv	
* for windo	lling	oofwind		footivowi	ndouillus	58.65		a formula	1/[/1/11.00]	(a) · 0 0 41 c		naroaronk		(32b)
** include t	the areas	on both	sides of in	nternal wal	ls and part	itions	aleu usin	giornula	1/[(1/ U -vait	ue)+0.04j a	is given in	paragraph	1 3.2	
Fabric he	eat loss	s, W/K =	= S (A x	U)				(26)(30) + (32) =				36.35	(33)
Heat cap	bacity C	;m = S(Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	9203.1	2 (34)
Thermal	mass p	barame	ter (TMF	⁻ = Cm ÷	- TFA) in	ı kJ/m²K			Indica	ative Value	: Low		100	(35)
For design	assessn	nents wh	ere the de	tails of the	constructi	on are no	t known p	recisely th	e indicative	e values of	TMP in Ta	able 1f		,
can be use	bridaci	u or a dei a · c /I		ulation. culated i	ising An	nondiv I	K						40.07	
if details of	f thermal	bridaina	are not kn	own (36) -	= 0.05 x /3	1)							10.27	(36)
						/								

Total fa	abric he	at loss							(33) +	(36) =			46.62	(37)
Ventila	tion hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	14.32	14.15	13.98	13.14	12.97	12.12	12.12	11.95	12.46	12.97	13.31	13.64		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	60.94	60.77	60.6	59.75	59.59	58.74	58.74	58.57	59.08	59.59	59.92	60.26		
Heat lo	oss para	meter (H	HLP). W/	′m²K					(40)m	Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	59.71	(39)
(40)m=	1.04	1.04	1.03	1.02	1.02	1	1	1	1.01	1.02	1.02	1.03		
Nhamba								11	,	Average =	Sum(40)1.	₁₂ /12=	1.02	(40)
NUMDE	Jan	s in mor Feb	nth (Tab Mar	e 1a) Apr	Mav	Jun	Jul	Αυα	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
													1	
Assum if TF	ed occu A > 13.9	ipancy, i 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0)013 x (⁻	TFA -13.	9) 1.	94		(42)
if TF	A £ 13.9	9, N = 1			`	,		, ,1	,		,			
Annua Reduce	l averag	e hot wa	ater usag	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36 a water us	se target o	80	.35		(43)
not more	e th <mark>at 125</mark>	litres per p	person per	day (all w	ater use, l	not and col	ld)			io larger e				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	n litres p <mark>e</mark> r	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	<mark>8</mark> 8.39	85.17	<mark>8</mark> 1.96	78. <mark>7</mark> 4	75.53	72.32	72.32	75.53	78.74	81.96	85.17	88.39		
Energy (content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd.n	n x nm x D)))))))))))))))))))	- kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ =	c. 1d)	964.22	(44)
(45)m=	131.07	114.64	118.3	103.13	98.96	85.39	79.13	90.8	91.89	107.09	116.89	126.94		
								11		Total = Su	m(45) ₁₁₂ =	-	1264.24	(45)
lf instant	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)) to (61)					
(46)m=	19.66	17.2	17.74	15.47	14.84	12.81	11.87	13.62	13.78	16.06	17.53	19.04		(46)
Storag	e volum	e (litres)	includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherw	vise if no	stored	hot wate	er (this in	cludes i	nstantan	ieous co	ombi boile	ers) ente	er '0' in (47)			
Water	storage	loss: uror'o de	olorod	ooo foota	r io kno		(dov)						I	(10)
a) II II Tompo		uleis de	m Toblo	255 18CIU		WII (KVVI	i/uay).					0		(48)
Enorm	loct fro	m water			or			$(48) \times (40)$	_			0		(49)
b) If m	anufact	urer's de	eclared of	, kvvn/ye vlinder l	oss fact	or is not	known:	(40) X (49)	-		1	10		(50)
Hot wa	ter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)				0.	02		(51)
If comr	nunity h	eating s	ee secti	on 4.3										
Volum	e tactor	trom Tal	ble 2a m Tablo	2h							1.	03		(52)
Enorm			atoroaa		or			(17) ~ (54)	V (FO) v (52)		.0		(53)
Energy	(50) or (11 water 54) in <i>(5</i>	storage	, KVVN/YE	dl			(47) X (51)	x (52) X (55) =	1.	03		(54) (55)
	(33) 01 (,								L I.	00	l	(00)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylind	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3		-			-		0		(58)
Prima	y circuit	loss cal	culated	for each	month ((59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	d for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	ı
(62)m=	186.35	164.57	173.57	156.63	154.24	138.89	134.41	146.08	145.38	162.36	170.39	182.22		(62)
Solar D	HW 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 (G)	-	-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(64)m=	186.35	164.57	173.57	156.63	154.24	138.89	134.41	146.08	145.38	162.36	170.39	182.22		_
								Outp	out from w	ater heate	r (annual)₁	12	1915.08	(64)
Hea <mark>t g</mark>	lains fro	m water	heating	, kWh/m	onth 0.2	<mark>5 ´</mark> [0.85	× (45)m	n + (61)n	n] + 0.8 x	(<mark>46)m</mark> (+ (57)m	+ (59)m	1	
(65)m=	87.8	78.06	83.56	77.09	77.13	71.19	70.53	74.41	73.35	79.83	81.66	86.43		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	a Table {	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16		(66)
Lightir	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.11	13.42	10.92	8.26	6.18	5.22	5.64	7.33	9.83	12.48	14.57	15.53		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	-		
(68)m=	169.53	171.29	166.86	157.42	145.51	134.31	126.83	125.07	129.5	138.94	150.85	162.05		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a), also se	e Table	5			_	
(69)m=	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72		(69)
Pumps	s and fai	ns gains	(Table &	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73		(71)
Water	heating	gains (T	able 5)										-	
(72)m=	118.02	116.16	112.31	107.07	103.66	98.87	94.8	100.02	101.87	107.3	113.42	116.17		(72)
Total						(66)	$m \pm (67)m$	0 L (68)m	(60)m I	(70)m + (7)	(1)m + (72)	m	-	
Total	Internal	gains =	1			(66)	iii + (07)ii	1 + (00)11 -	F (09)III +	(70)11 + (7	1) (72)			
(73)m=	354.81	gains = 353.02	342.23	324.9	307.49	290.55	279.41	284.56	293.35	310.87	330.99	345.9		(73)

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest0.9x	0.77	x	3.24	x	36.79		0.45	x	0.7] =	26.02	(79)
Southwest0.9x	0.77	x	2.52	x	36.79	İ	0.45	x	0.7	j =	20.24	
Southwest0.9x	0.77	x	3.24	x	62.67	İ	0.45	x	0.7	=	44.33	
Southwest0.9x	0.77	x	2.52	x	62.67	İ	0.45	x	0.7	j =	34.48	
Southwest0.9x	0.77	x	3.24	x	85.75	Ì	0.45	x	0.7] =	60.65	(79)
Southwest0.9x	0.77	x	2.52	x	85.75		0.45	x	0.7] =	47.17	(79)
Southwest0.9x	0.77	x	3.24	x	106.25		0.45	x	0.7] =	75.15	(79)
Southwest0.9x	0.77	x	2.52	x	106.25		0.45	x	0.7] =	58.45	(79)
Southwest0.9x	0.77	x	3.24	x	119.01	Ì	0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	2.52	x	119.01		0.45	x	0.7] =	65.47	(79)
Southwest0.9x	0.77	x	3.24	x	118.15		0.45	x	0.7] =	83.56	(79)
Southwest0.9x	0.77	x	2.52	x	118.15		0.45	x	0.7] =	64.99	(79)
Southwest0.9x	0.77	x	3.24	x	113.91	Ì	0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	2.52	x	113.91		0.45	x	0.7] =	62.66	(79)
Southwest0.9x	0.77	x	3.24	x	104.39	İ	0.45	x	0.7] =	73.83	(79)
Southwest0.9x	0.77	x	2.52	×	104.39		0.45	х	0.7		57.43	(79)
Southwest0.9x	0.77	x	3.24	x	92.85		0.45	x	0.7	j -	65.67	(79)
Southwest0.9x	0.77	x	2.52	х	92.85		0.45	x	0.7] =	51.08	(79)
Southwest0.9x	0.77	x	3.24	x	69.27		0.45	x	0.7] =	48.99	(79)
Southwest0.9x	0.77	x	2.52	x	69.27		0.45	x	0.7	=	38.1	(79)
Southwest0.9x	0.77	x	3.24	x	44.07	i	0.45	x	0.7] =	31.17	(79)
Southwest0.9x	0.77	x	2.52	х	44.07	Ì	0.45	x	0.7] =	24.24	(79)
Southwest0.9x	0.77	x	3.24	x	31.49		0.45	x	0.7] =	22.27	(79)
Southwest0.9x	0.77	x	2.52	x	31.49		0.45	x	0.7] =	17.32	(79)
Northwest 0.9x	0.77	x	7.56	x	11.28	x	0.45	x	0.7] =	18.62	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	×	0.45	x	0.7] =	5.99	(81)
Northwest 0.9x	0.77	x	7.56	x	22.97	x	0.45	x	0.7	=	37.9	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	×	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	x	7.56	x	41.38	x	0.45	x	0.7	=	68.29	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	×	0.45	x	0.7] =	21.95	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	x	7.56	x	67.96	x	0.45	x	0.7	=	112.15	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	×	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	×	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	7.56	x	91.35	×	0.45	x	0.7	=	150.75	(81)
Northwest 0.9x	0.77	x	2.43	×	91.35	×	0.45	×	0.7] =	48.46	(81)
Northwest 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7] =	48.46	(81)

Northwest 0.9x 0.77 x 7.56 x 97.3 Northwest 0.9x 0.77 x 2.43 x 97.3 Northwest 0.9x 0.77 x 2.43 x 97.3 Northwest 0.9x 0.77 x 2.43 x 97.3 Northwest 0.9x 0.77 x 7.56 x 91.1 Northwest 0.9x 0.77 x 7.56 x 91.1		0.45 0.45	× 0.7	=	160.71	(81)
Northwest 0.9x 0.77 x 2.43 x 97.3 Northwest 0.9x 0.77 x 2.43 x 97.3 Northwest 0.9x 0.77 x 2.43 x 97.3 Northwest 0.9x 0.77 x 7.56 x 91.1 Northwest 0.9x 0.77 x 7.56 x 91.1		0.45	x 0.7		F4.00	=
Northwest 0.9x 0.77 x 2.43 x 97.3 Northwest 0.9x 0.77 x 7.56 x 91.1 Northwest 0.9x 0.77 x 7.56 x 91.1					51.66	(81)
Northwest 0.9x 0.77 x 7.56 x 91.1 Northwest 0.9x 0.77 x 0.10 x 0.11	^	0.45	x 0.7	=	51.66	(81)
Northwest o ex 0 77	x	0.45	x 0.7	=	150.35	(81)
0.77 × 2.43 × 91.1	x	0.45	x 0.7	=	48.33	(81)
Northwest 0.9x 0.77 x 2.43 x 91.1	x	0.45	x 0.7	=	48.33	(81)
Northwest 0.9x 0.77 x 7.56 x 72.6	x	0.45	x 0.7	=	119.86	(81)
Northwest 0.9x 0.77 x 2.43 x 72.6	x	0.45	x 0.7	=	38.53	(81)
Northwest 0.9x 0.77 x 2.43 x 72.6	x	0.45	x 0.7	=	38.53	(81)
Northwest 0.9x 0.77 x 7.56 x 50.4	x	0.45	× 0.7	=	83.21	(81)
Northwest 0.9x 0.77 x 2.43 x 50.4	x	0.45	x 0.7	=	26.75	(81)
Northwest 0.9x 0.77 x 2.43 x 50.4	x	0.45	× 0.7	=	26.75	(81)
Northwest 0.9x 0.77 x 7.56 x 28.0	x	0.45	× 0.7	=	46.32	(81)
Northwest 0.9x 0.77 x 2.43 x 28.0	x	0.45	× 0.7	=	14.89	(81)
Northwest 0.9x 0.77 x 2.43 x 28.0	x	0.45	× 0.7	=	14.89	(81)
Northwest 0.9x 0.77 x 7.56 x 14.2	x	0.45	x 0.7	=	23.43	(81)
Northwest 0.9x 0.77 x 2.43 x 14.2	x	0.45	x 0.7	=	7.53	(81)
Northwest 0.9x 0.77 x 2.43 x 14.2	×	0.45	× 0.7	=	7.53	(81)
Northwest 0.9x 0.77 x 7.56 x 9.21	x	0.45	× 0.7	=	15.21	(81)
Northwest 0.9x 0.77 x 2.43 x 9.21		0.45	0.7	=	4.89	(81)
Northwest 0.9x 0.77 x 2.43 x 9.21	× 🗌	0.45	x 0.7	=	4.89	(81)
Solar gains in watts, calculated for each month	(83)m = Su	um(74)m(82))m	1		(22)
(83)m= 76.85 141.07 220.01 317.84 397.3 412.59 39	0.22 328.17	253.45 163	93.9	64.57		(83)
$\begin{bmatrix} 1 \text{ otal gains} - \text{ internal and solar (84)m} = (73)\text{m} + (83)\text{m}, \text{ w} \\ \hline (84)\text{m} = \boxed{424 \text{ cs}} + 404 \text{ os} + 562 \text{ otal} + 542 \text{ otal} + 704 \text{ s} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 \text{ otal} + 642 \text{ otal} + 702 $		E4C 04 474	06 404 0	440.47	l	(84)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	9.64 612.73	546.81 474	424.9	410.47		(04)
7. Mean internal temperature (heating season)						
Temperature during heating periods in the living area from	n Table 9, Th1	1 (°C)			21	(85)
Utilisation factor for gains for living area, h1,m (see Table	9a)					
Jan Feb Mar Apr May Jun	ul Aug	Sep C	oct Nov	Dec		(00)
(86)m = 0.94 0.92 0.87 0.78 0.64 0.49 0.92 0.87 0.78 0.64 0.49 0.91	37 0.42	0.62 0.8	33 0.92	0.95		(86)
Mean internal temperature in living area T1 (follow steps	to 7 in Table	e 9c)		1	1	
(87)m= 19.07 19.34 19.77 20.29 20.68 20.9 2	.97 20.95	20.79 20.	27 19.59	19.02		(87)
Temperature during heating periods in rest of dwelling fro	m Table 9, Th	n2 (°C)				
(88)m= 20.05 20.05 20.06 20.07 20.07 20.08 2	.08 20.08	20.08 20.	07 20.07	20.06		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see	able 9a)					
(89)m= 0.94 0.91 0.86 0.75 0.6 0.43	.3 0.34	0.56 0.	8 0.91	0.94		(89)
Mean internal temperature in the rest of dwelling T2 (follo	w steps 3 to 7	in Table 9c	:)		-	
<u>_</u>	.06 20.05	19.87 19	.2 18.24	17.41		(90)
(90)m= 17.47 17.86 18.48 19.21 19.72 19.99 2		I				

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

(92)m=	18.14	18.48	19.02	19.66	20.12	20.37	20.44	20.43	20.25	19.65	18.81	18.09		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate			-	
(93)m=	18.14	18.48	19.02	19.66	20.12	20.37	20.44	20.43	20.25	19.65	18.81	18.09		(93)
8. Space heating requirement														
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a														
ine ui	Jan	Feh	Mar		Mav	Jun	.lul	Αυσ	Sen	Oct	Nov	Dec]	
l Utilisa	tion fac	tor for g	ains, hm):	may	Uun	Uui	, tug	000	000	1101	000	J	
(94)m=	0.92	0.89	0.83	0.74	0.6	0.45	0.33	0.37	0.58	0.78	0.89	0.93		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m								1	
(95)m=	396.18	438.72	469.36	474.52	425.67	315.56	218.7	226.19	315.22	371.67	376.9	380.04		(95)
Month	ly avera	age exte	ernal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	1	1	1	
(97)m=	843.64	825.47	758.63	643.12	501.9	338.91	225.53	235.96	363.56	539.38	701.5	836.96		(97)
Space	e heatin	g require	ement fo	or each m	nonth, k	Nh/moni	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		1	
(98)m=	332.92	259.9	215.21	121.39	56.72	0	0	0	0	124.77	233.71	339.95		
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	1684.57	(98)
Space	heatin	g require	ement in	kWh/m ²	/year								28.72	(99)
9b. Ene	ergy rec	uiremer	nts – Cor	mmunity	heating	scheme	e e e e e e e e e e e e e e e e e e e				_			
This pa	rt is use	ed for sp	bace hea	iting, spa	ace co <mark>ol</mark> i	ing or wa	ater heat	ting prov	ided by	a c <mark>omm</mark>	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary/	supplen	nentary I	heating (Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace he <mark>at</mark>	from co	mmunity	system	1 – (301	1) =						1	(302)
The com	munity so	heme ma	y obtain he	eat fro <mark>m se</mark>	everal sour	rces. The p	procedure	allows for	CHP and u	up to four	other heat	sources; t	he latter	
includes Eractio	boilers, h	eat pumps	s, geotheri	nal and wa	aste heat f	rom powel	r stations.	See Appei	ndix C.				1	(303a)
							(302) x (3030) -					(3042)		
Fraction of total space field from Community field pump $(302) \times (3030) =$									a) –	1				
Distribution loss factor (Table 12c) for community begging system									12					
									k\Wb/yoo	(000)				
Annual	space	e heating	requiren	nent									1684.57	
Space heat from Community heat pump (98) x (304a) x (305) x (306) =									=	2021.48	(307a)			
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)									0	(308				
Space heating requirement from secondary/supplementary system $(98) \times (301) \times 100 \div (308) =$										0	(309)			
Water	heating	I												_
Annual	water h	neating r	equirem	ent									1915.08	
IT DHVV from community scheme: Water heat from Community heat pump (64) x (303a) x (305) x (306) =								=	2298.1	(310a)				
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] =								(310e)] =	43.2	(313)				
Cooling	g Syster	n Energ	y Efficie	ncy Ratio	C								0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$								0	(315)					
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	Г	111.8	(330a)											
--	-----------------	------------------------	--------											
warm air heating system fans	Ľ	0	(330b)											
pump for solar water heating	Г	0	(330g)											
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) =	Г	111.8	(331)											
Energy for lighting (calculated in Appendix L)	Ī	266.91	(332)											
Electricity generated by PVs (Appendix M) (negative quantity)	Ē	-730.07	(333)											
Total delivered energy for all uses $(307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =$		3968.22	(338)											
12b. CO2 Emissions – Community heating scheme														
Energy Emission f kWh/year kg CO2/kW	actor E /h k	missions g CO2/year												
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the sec	cond fuel	208	(367a)											
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52	=	1077.82	(367)											
Electrical energy for heat distribution [(313) x 0.52	=	22.42	(372)											
Total CO2 associated with community systems (363)(366) + (368)(372)	=	1100.24	(373)											
CO2 associated with space heating (secondary) (309) x 0	=	0	(374)											
CO2 associated with water from immersion heater or instantaneous heater (312) x	=	0	(375)											
Total CO2 associated with space and water heating (373) + (374) + (375) =		1100.24	(376)											
CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52	=	58.03	(378)											
CO2 associated with electricity for lighting (332))) x 0.52	=	138.53	(379)											
Energy saving/generation technologies (333) to (334) as applicable Item 1 0.52 ×	0.01 =	-378.91	(380)											
Total CO2, kg/year sum of (376)(382) =	Г	917.88	(383)											
Dwelling CO2 Emission Rate (383) ÷ (4) =		15.65	(384)											
El rating (section 14)	Ē	88.13	(385)											

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201	12		Stroma Softwa	a Num are Ver	ber: sion:	loor	Versio	on: 1.0.5.49	
	P. Block P. Hom Cl		openy A	Address:	BIOCK R	C - IVIICI F	1001			
Address : 1 Overall dwelling dimen		USE, LUII	JON, TVV	10						
Ground floor	510113.		Area 58	1(m²) 8.65	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m³) 146.63	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n) 58	8.65	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	146.63	(5)
2. Ventilation rate:				_						
Number of chimneys Number of open flues	$ \begin{array}{ccc} \text{main} & \text{s} \\ \text{heating} & \text{h} \\ \hline 0 & + \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array} $	econdary neating 0 0	y	0 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	s				- F	0	× ´	10 =	0	(7a)
Number of passive vents						0	x ′	10 =	0	_](7b)
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)
								Air ch	anges <mark>per</mark> ho	ur
Infiltration due to chimneys	s, flues and fans = (6 en carried out or is intende	a)+(6b)+(7a	a)+(7b)+(7 I to (17), o	7c) = otherwise c	ontinue fro	0 om (9) to ((16)	÷ (5) =	0	(8)
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dw <mark>elling</mark> (ns) 25 for steel or timber	frame or	0.35 for	masonr	y constr	uction	[(9)·	-1]x0.1 =	000000000000000000000000000000000000000	(9) (10) (11)
if both types of wall are pre deducting areas of opening	sent, use the value corres (s); if equal user 0.35	sponding to	the greate	er wall area	a (after					-
If suspended wooden fig	oor, enter 0.2 (unsea	led) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0	(0	(13)
Vindow infiltration	and doors draught s	rippea		0 25 - [0 2	$\mathbf{v}(14) \div 1$	001 -			0	
				(8) ± (10) .	× (14) ÷ 1	00] – 2) <u>+ (13) -</u>	⊾ (15) –		0	(15)
	50 expressed in cut	nic metres	s nor ho			etre of e		area	0	(10)
If based on air permeabilit	y value then $(18) = [(1)$	7) ÷ 20]+(8). otherwis	se $(18) = ($	16)		invelope	alea	4	(17)
Air permeability value applies	if a pressurisation test ha	s been don	e or a deg	ree air per	, meability i	is being us	sed		0.2	
Number of sides sheltered			-		-	-			4	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified fo	r monthly wind speed	d .						-		
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22)$)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula If me	ate etter	ctive air	change i ition:	rate for t	he appli	cable ca	se						0.5	(232)
If exh	aust air h	eat pump	usina Appe	endix N. (2	3b) = (23a) × Fmv (e	equation (N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
If bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (from	n Table 4h) =	, (,			76.5	(23c)
a) If	balance	d mech	, anical ve	ntilation	with he	at recove	erv (MVI	HR) (24a	a)m = (2)	2b)m + (;	23b) x [*	1 – (23c)	- 1001	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(24a)
b) If	balance	d mech	ı anical ve	entilation	without	heat rec	L Coverv (N	и ЛV) (24b	m = (22)	2b)m + (2	23b)		I	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	tract ver	ntilation c	or positiv	e input v	ventilatio	n from o	outside			<u> </u>	1	
í	f (22b)n	n < 0.5 ×	k (23b), t	hen (24a	c) = (23b); otherv	wise (24	c) = (22k	o) m + 0.	.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft					
i	f (22b)n	n = 1, th	en (24d)	m = (22t	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			l	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	Į	(240)
Effec	ctive air	change	rate - er	nter (24a) or (24b	o) or (240	c) or (24	d) in box	x (25)	0.07	0.07	0.00	1	(25)
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. Hea	at l <mark>osse</mark>	s and he	at loss	oaramete	er:									
ELEN	IENT	Gros	SS (m ²)	Openin	gs	Net Ar	ea	U-valu	ue	AXU		k-value) /	A X k
Doore		area	(111-)	m	4	A ,r		VV/11/2		(KJ/III-•I	`	KJ/K (26)
Windo		.1				1.91		/[1/(1 2))	0.041	1.91				(20)
		;]				3.24		/[1/(1.2)+	0.04] =	3.71				(27)
window	ws type	2				2.52		/[1/(1.2)+	0.04] =	2.89	L.			(27)
vvindo	ws type -	3				7.56	x ¹ .	/[1/(1.2)+	0.04] =	8.66				(27)
Windo	ws Type _	94				2.43	x1,	/[1/(1.2)+	0.04] =	2.78				(27)
Window	ws Type	9 5 				2.43	x1.	/[1/(1.2)+	0.04] =	2.78	่ _			(27)
Walls 7	Гуре1	41.0	8	18.18	3	22.9	x	0.16	=	3.66				(29)
Walls 7	Гуре2	29.1	2	1.91		27.22	<u>2</u> X	0.15	=	4.09				(29)
Total a	rea of e	lements	, m²			70.2								(31)
Party v	vall					12.02	<u>2</u> X	0	=	0				(32)
Party fl	loor					58.65	5				[(32a)
Party c	eiling					58.65	5				[(32b)
* for wind ** includ	dows and e the area	roof wind as on both	ows, use e sides of ir	effective wil Internal wall	ndow U-va Is and part	alue calcul itions	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				30.48	(33)
Heat ca	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	5097.6	2 (34)
Therma	al mass	parame	ter (TMF	⊃ = Cm ÷	- TFA) in	ı kJ/m²K			Indica	tive Value:	Low		100	(35)
For desig can be u	gn assess ised inste	sments wh ad of a de	ere the de tailed calci	tails of the ulation.	constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therma	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						6.97	(36)

if details of thermal bridging are not known $(36) = 0.05 \times (31)$

Total fa	tal fabric heat loss (33) + (36) =													(37)
Ventilat	tion hea	t loss ca	alculated	I monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	14.32	14.15	13.98	13.14	12.97	12.12	12.12	11.95	12.46	12.97	13.31	13.64		(38)
Heat tra	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m=	51.78	51.61	51.44	50.59	50.42	49.57	49.57	49.41	49.91	50.42	50.76	51.1		_
Heat lo	ss parai	meter (H	ILP). W/	′m²K					ر (40)m	Average = = (39)m ÷	Sum(39) ₁ . (4)	12 /12=	50.55	(39)
(40)m=	0.88	0.88	0.88	0.86	0.86	0.85	0.85	0.84	0.85	0.86	0.87	0.87]	
L		I							,	Average =	Sum(40)1.	₁₂ /12=	0.86	(40)
Numbe	r of day	s in mor	nth (Tab	le 1a)	Mov	lun	lul	Aug	Son	Oct	Nov	Dec	1	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(+1)11-	51	20	51	50	51	50	51	51	50	01	50	51		()
4 \//0	tor boot			romonti									0.01	
4. vva	ter neat	ing ener	gy requi	rement:								κννη/γ	ear:	
Assum	ed occu	pancy, N	N	14	(40 (TE	- 40.0		040 /		1.	94]	(42)
if TF/	4 > 13.9 4 £ 13.9	9, N = 1 ·). N = 1	+ 1.76 X	[1 - exp	(-0.0003	49 X (1F	-A -13.9)2)] + 0.0	013 X (IFA -13.	9)			
Ann <mark>ual</mark>	average	, e hot wa	ater usa	ge in litre	s per da	y Vd,av	erage =	(25 x N)	+ 36		80	.35		(43)
Reduce t	he annua that 125	l average litres per r	hot water person per	usage by day (all w	5% if the a ater use. I	lwelling is o not and co	designed (Id)	to achieve	a water us	se target o	f			
، المار المار المار المار المار المار المار المار المار المار المار المار المار المار المار المار المار المار ا المار المار المار المار المار المار المار المار المار المار المار المار المار المار المار المار المار المار الم	lon		Mor		Mov	lup			Sen	Oct	Nov	Dee	1	
Hot wate	r usage in	litres per	day for ea	Apr ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	Sep	Oct	INOV	Dec	J	
(44)m=	88.39	85.17	81.96	78,74	75.53	72.32	72.32	75.53	78,74	81.96	85.17	88.39	1	
										Total = Su	m(44) ₁₁₂ =		9 <mark>64.22</mark>	(44)
Ener <mark>gy c</mark>	ontent of	hot water	used - cal	culated mo	onthly $=$ 4.	190 x Vd,n	n x nm x D	0Tm / 3600	kWh/mor	nth (<mark>see Ta</mark>	bles 1b, 1	c, 1d)		
(45)m=	131.07	114.64	118.3	103.13	98.96	85.39	79.13	90.8	91.89	107.09	116.89	126.94		
lf instant	aneous wa	ater heatir	na at point	of use (no	hot water	storage).	enter 0 in	boxes (46)	- to (61)	Total = Su	m(45) ₁₁₂ =	=	1264.24	(45)
(46)m-	19.66	17.2	17 74	15.47	14.84	12.81	11.87	13.62	13.78	16.06	17 53	19.04	1	(46)
Water s	storage	loss:	17.74	10.47	14.04	12.01	11.07	10.02	10.70	10.00	17.00	10.04		(/
Storage	e volume	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ime ves	sel		0		(47)
If comn	nunity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherw	ise if no	stored	hot wate	er (this in	cludes i	nstantan	eous co	ombi boile	ers) ente	er '0' in (47)			
a) If m	anufacti	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/dav):					0	1	(48)
Tempe	rature fa	actor from	m Table	2b		X	, , ,					0]	(49)
Energy	lost froi	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10]	(50)
b) If m	anufactu	urer's de	eclared o	ylinder l	oss fact	or is not	known:						1	
Hot wa	ter stora	ige loss	factor fr	om Tabl	e 2 (kW	h/litre/da	iy)				0.	02		(51)
Volume	factor f	From Tab	ee sectio ble 2a	011 4.3							1	03	1	(52)
Tempe	rature fa	actor from	m Table	2b							0	.6	1	(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	03	j	(54)
Enter (50) or (54) in (5	5)								1.	03]	(55)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylind	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3		-			-		0		(58)
Prima	y circuit	loss cal	culated	for each	month ((59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	d for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	ı
(62)m=	186.35	164.57	173.57	156.63	154.24	138.89	134.41	146.08	145.38	162.36	170.39	182.22		(62)
Solar D	HW 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 (G)	-	-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(64)m=	186.35	164.57	173.57	156.63	154.24	138.89	134.41	146.08	145.38	162.36	170.39	182.22		_
								Outp	out from w	ater heate	r (annual)₁	12	1915.08	(64)
Hea <mark>t g</mark>	lains fro	m water	heating	, kWh/m	onth 0.2	<mark>5 ´</mark> [0.85	× (45)m	n + (61)n	n] + 0.8 x	(<mark>46)m</mark> (+ (57)m	+ (59)m	1	
(65)m=	87.8	78.06	83.56	77.09	77.13	71.19	70.53	74.41	73.35	79.83	81.66	86.43		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	a Table {	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16		(66)
Lightir	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.11	13.42	10.92	8.26	6.18	5.22	5.64	7.33	9.83	12.48	14.57	15.53		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	-		
(68)m=	169.53	171.29	166.86	157.42	145.51	134.31	126.83	125.07	129.5	138.94	150.85	162.05		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a), also se	e Table	5			_	
(69)m=	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72		(69)
Pumps	s and fai	ns gains	(Table &	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73		(71)
Water	heating	gains (T	able 5)										-	
(72)m=	118.02	116.16	112.31	107.07	103.66	98.87	94.8	100.02	101.87	107.3	113.42	116.17		(72)
Total						(66)	$m \pm (67)m$	0 L (68)m	(60)m I	(70)m + (7)	(1)m + (72)	m	-	
Total	Internal	gains =	1			(66)	iii + (07)ii	1 + (00)11 -	F (09)III +	(70)11 + (7	1) (72)			
(73)m=	354.81	gains = 353.02	342.23	324.9	307.49	290.55	279.41	284.56	293.35	310.87	330.99	345.9		(73)

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest0.9x	0.77	x	3.24	x	36.79		0.45	x	0.7] =	26.02	(79)
Southwest0.9x	0.77	x	2.52	x	36.79	İ	0.45	x	0.7	j =	20.24	
Southwest0.9x	0.77	x	3.24	x	62.67	İ	0.45	x	0.7	=	44.33	
Southwest0.9x	0.77	x	2.52	x	62.67	İ	0.45	x	0.7	j =	34.48	
Southwest0.9x	0.77	x	3.24	x	85.75	Ì	0.45	x	0.7] =	60.65	(79)
Southwest0.9x	0.77	x	2.52	x	85.75		0.45	x	0.7] =	47.17	(79)
Southwest0.9x	0.77	x	3.24	x	106.25		0.45	x	0.7] =	75.15	(79)
Southwest0.9x	0.77	x	2.52	x	106.25		0.45	x	0.7] =	58.45	(79)
Southwest0.9x	0.77	x	3.24	x	119.01		0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	2.52	x	119.01		0.45	x	0.7] =	65.47	(79)
Southwest0.9x	0.77	x	3.24	x	118.15		0.45	x	0.7] =	83.56	(79)
Southwest0.9x	0.77	x	2.52	x	118.15		0.45	x	0.7] =	64.99	(79)
Southwest0.9x	0.77	x	3.24	x	113.91	Ì	0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	2.52	x	113.91		0.45	x	0.7] =	62.66	(79)
Southwest0.9x	0.77	x	3.24	x	104.39	İ	0.45	x	0.7] =	73.83	(79)
Southwest0.9x	0.77	x	2.52	×	104.39		0.45	х	0.7		57.43	(79)
Southwest0.9x	0.77	x	3.24	x	92.85		0.45	x	0.7	j -	65.67	(79)
Southwest0.9x	0.77	x	2.52	х	92.85		0.45	x	0.7] =	51.08	(79)
Southwest0.9x	0.77	x	3.24	x	69.27		0.45	x	0.7] =	48.99	(79)
Southwest0.9x	0.77	x	2.52	x	69.27		0.45	x	0.7	=	38.1	(79)
Southwest0.9x	0.77	x	3.24	x	44.07	i	0.45	x	0.7] =	31.17	(79)
Southwest0.9x	0.77	x	2.52	х	44.07	Ì	0.45	x	0.7] =	24.24	(79)
Southwest0.9x	0.77	x	3.24	x	31.49		0.45	x	0.7] =	22.27	(79)
Southwest0.9x	0.77	x	2.52	x	31.49		0.45	x	0.7] =	17.32	(79)
Northwest 0.9x	0.77	x	7.56	x	11.28	x	0.45	x	0.7] =	18.62	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	×	0.45	x	0.7] =	5.99	(81)
Northwest 0.9x	0.77	x	7.56	x	22.97	x	0.45	x	0.7	=	37.9	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	×	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	x	7.56	x	41.38	x	0.45	x	0.7	=	68.29	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	×	0.45	x	0.7] =	21.95	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	x	7.56	x	67.96	x	0.45	x	0.7	=	112.15	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	×	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	×	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	7.56	x	91.35	×	0.45	x	0.7	=	150.75	(81)
Northwest 0.9x	0.77	x	2.43	×	91.35	×	0.45	×	0.7] =	48.46	(81)
Northwest 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7] =	48.46	(81)

Northwest 0.9	0.77		x	7.5	6	x	g	7.38	x		0.45	x	0.7		=	160.71	(81)
Northwest 0.9	0.77		x	2.4	3	x	g	7.38	x		0.45	x	0.7		=	51.66	(81)
Northwest 0.9	0.77		x	2.4	3	x	g	7.38	x		0.45	x	0.7		=	51.66	(81)
Northwest 0.9	0.77		x	7.5	6	x	9	91.1	x		0.45	x	0.7		=	150.35	(81)
Northwest 0.9	0.77		x	2.4	3	x		91.1	x		0.45	x	0.7		=	48.33	(81)
Northwest 0.9	0.77		x	2.4	3	x	9	91.1	x		0.45	x	0.7		=	48.33	(81)
Northwest 0.9	0.77		x	7.5	6	x	7	2.63	x		0.45	x	0.7		=	119.86	(81)
Northwest 0.9	0.77		x	2.4	3	x	7	2.63	x		0.45	x	0.7		=	38.53	(81)
Northwest 0.9	0.77		x	2.4	3	x	7	2.63	x		0.45	x	0.7		=	38.53	(81)
Northwest 0.9	0.77		x	7.5	6	x	5	60.42	x		0.45	x	0.7		=	83.21	(81)
Northwest 0.9	0.77		x	2.4	3	x	5	60.42	x		0.45	x	0.7		=	26.75	(81)
Northwest 0.9	0.77		x	2.4	3	x	5	60.42	x		0.45	x	0.7		=	26.75	(81)
Northwest 0.9	0.77		x	7.5	6	x	2	8.07	x		0.45	x	0.7		=	46.32	(81)
Northwest 0.9	0.77		x	2.4	3	x	2	8.07) x		0.45	x	0.7		=	14.89	(81)
Northwest 0.9	0.77		x	2.4	3	x	2	8.07	x		0.45	x	0.7		=	14.89	(81)
Northwest 0.9	0.77		x	7.5	6	x		14.2	x		0.45	x	0.7		=	23.43	(81)
Northwest 0.9	0.77		x	2.4	3	x		14.2	x		0.45	x	0.7		=	7.53	(81)
Northwest 0.9	0.77		x	2.4	3	x		14.2	x		0.45	x	0.7		=	7.53	(81)
Northwest 0.9	0.77		x	7.5	6	х	9	9.21	x		0.45	x	0.7		=	15.21	(81)
Northwest 0.9	0.77		x	2.4	3	х	9	9.21] ×		0.45	x	0.7		=	4.89	(81)
Northwest 0.9	0.77		x	2.4	3	x		9.21	x		0.45	x	0.7		=	4.89	(81)
									-								
Sola <mark>r gains i</mark>	n watts, ca	alculat	ed	for each	n mont	h			(83)m	n = Su	m(74)m	. <mark>(8</mark> 2)m					
(83)m= 76.85	5 141.07	220.0	1	317.84	397.3	4	12.59	390.22	328	8.17	253.45	163.19	93.9	64	.57		(83)
Total gains -	- internal a	and so	lar	= 84)m ו	: (73)m) + (83)m	, watts	-								(2.1)
(84)m= 431.6	6 494.09	562.2	4	642.74	704.8	7	03.14	669.64	612	2.73	546.81	474.06	6 424.9	41	0.47		(84)
7. Mean int	ernal temp	peratu	re (heating	seaso	n)											
Temperatu	e during h	neating	g pe	eriods ir	the liv	/ing	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisation fa	actor for g	ains fo	or li	ving are	a, h1,ı	n (s	ee Ta	ble 9a)			i						
Jan	Feb	Ma	r	Apr	Мау	′	Jun	Jul	A	ug	Sep	Oct	Nov		Dec		
(86)m= 0.94	0.91	0.85		0.74	0.59		0.43	0.32	0.3	36	0.57	0.8	0.91	0.	95		(86)
Mean interr	nal temper	ature	in li	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in T	Table	9c)						
(87)m= 19.46	6 19.72	20.1		20.54	20.82	ź	20.95	20.99	20.	.98	20.88	20.5	19.92	19	.41		(87)
Temperatu	e during h	neating	a be	eriods ir	rest o	f dv	velling	from Ta	able 9	9, Th	2 (°C)						
(88)m= 20.18	3 20.18	20.19	3	20.2	20.2		20.21	20.21	20.	.22	20.21	20.2	20.2	20	.19		(88)
Utilisation f	actor for a	ains fo	or r	est of d	vellina	h2	m (se	e Table	(9a)		I		I				
(89)m= 0.93	0.9	0.83		0.71	0.55	<u> </u>	0.38	0.26	0.	3	0.52	0.77	0.9	0.	94		(89)
Mean interr			in t	he rest :	of dwo	lling	י ד <i>ַ</i> /f	u ollow sta		L to 7	in Table						
(90)m= 18.11	18.48	19.0	3 T	19.64	20		20.17	20.2	20	.2	20.09	, 90) 19.6	18.79	18	.06		(90)
											fL	A = Liv	ving area ÷	(4) =		0.42	(91)
																-	· /

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

(92)m=	18.68	19	19.48	20.02	20.35	20.5	20.53	20.53	20.43	19.98	19.26	18.63		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.68	19	19.48	20.02	20.35	20.5	20.53	20.53	20.43	19.98	19.26	18.63		(93)
8. Spa	ace hea	ting requ	uirement	t										
Set Ti the ut	to the r ilisation	nean int factor fo	ernal ter or gains	mperatur using Ta	e obtain ble 9a	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calo	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	ـــــــــــــــــــــــــــــــــــــ									1	
(94)m=	0.91	0.88	0.82	0.71	0.56	0.4	0.29	0.33	0.53	0.76	0.88	0.92		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	394.11	434.2	459.58	453.76	393.65	281.74	192.25	199.88	289.8	359.55	372.83	378.44		(95)
Month	nly avera	age exte	ernal 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	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]		i	1	
(97)m=	744.44	727.76	667.62	562.33	435.95	292.39	194.96	203.95	315.73	473.03	617.42	737.25		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mont	th = 0.02	24 x [(97])m – (95 I)m] x (4	1)m		1	
(98)m=	260.64	197.27	154.78	78.17	31.47	0	0	0	0	84.43	176.11	266.96		-
_								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	1249.83	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								21.31	(99)
9b. En	ergy rec	uiremer	nts – Cor	mmunity	heating	scheme			\ \		_			
This pa	art is use	ed for sp	ace hea	ating, spa	ace cooli	ing or wa	ater heat	ting prov	ided by	a c <mark>omm</mark> one	unity sch	neme.	0	– (301)
Fractio	n of spa	ice heat	from co	mmunity	system	1 - (301)	1) =		1) 0 111	one	_		1	(302)
The corr		bomo mo	v obtain b	not from co	woral sour	The r	rooduro	allows for	CHP and	up to four	othor hoat	sourcos: t	ho lattor	
includes	boilers, h	eat pump	s, geotheri	mal and wa	aste heat f	rom power	r stations.	See Apper	ndix C.		olnei neal	sources, i	ne lallel	
Fractio	n of hea	at from C	Commun	ity heat p	oump								1	(303a)
Fractio	n of tota	al space	heat fro	m Comm	nunity he	eat pump	D			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribu	ution los	s factor	(Table 1	12c) for c	ommun	ity heatir	ng syste	m					1.2	(306)
Space	heating	9											kWh/year	
Annual	space	heating	requiren	nent									1249.83	
Space	heat fro	m Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1499.8	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/sup	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annual	heating water h	l neating r	equirem	ient									1915.08	7
If DHW Water	from content	ommuni m Comr	ty schen nunitv he	ne: eat pumr)				(64) x (30	03a) x (30	5) x (306) :	=	2298.1](310a)
Electric	city used	d for hea	, at distrib	ution				0.01	× [(307a).	(307e) +	- (310a)…([310e)] =	37.98	 (313)
Cooling	g Syster	n Energ	y Efficie	ncy Ratio	C					·			0	(314)
Space	cooling	(if there	is a fixe	d cooline	g systen	n, if not e	enter 0)		= (107) ÷	· (314) =			0	(315)
-	5	-		•			,						L	

Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside				111.8	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year =(330	0a) + (330b) + (3	330g) =		111.8	(331)
Energy for lighting (calculated in Appendix L)				266.91	(332)
Electricity generated by PVs (Appendix M) (negative quantity)				-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (33	31) + (332)((237b) =		3446.54	(338)
12b. CO2 Emissions – Community heating scheme					
Energy kWh/yea	Em ar kg	ission facto CO2/kWh	or En kg	nissions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat	at (363) to (366)	for the second	fuel	208	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ ((367b) x	0.52	=	947.65	(367)
Electrical energy for heat distribution [(313) x		0.52	=	19.71	(372)
Total CO2 associated with community systems (363)(366) + ((368)(372)		= [967.36	(373)
CO2 associated with space heating (secondary) (309) x		0	= [0	(374)
CO2 associated with water from immersion heater or instantaneous heater	(312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating (373) + (374) + ((375) =		[967.36	(376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x		0.52	=	58.03	(378)
CO2 associated with electricity for lighting (332))) x		0.52	=	138.53	(379)
Ene <mark>rgy saving/gener</mark> ation tech <mark>nolo</mark> gies (333) to (334) as applicable Item 1	0.52	x 0.01	=	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =				785	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				13.38	(384)
El rating (section 14)				89.85	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201	12 Dr	conorty /	Stroma Softwa	a Num are Ver	ber: sion:	loor	Versio	n: 1.0.5.49	
Addrose J	R Block R Ham Cl		don TW	4001855.	DIUCK	с төр г	1001			
Address :	R, DIUCK R, Halli Ci	USE, LONG	JON, TVV	10						
Ground floor	510115.		Area 58	1(m²) 8.65	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m³) 146.63	(3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e	e)+(1n)) 58	8.65	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	146.63	(5)
2. Ventilation rate:	-									
Number of chimneys Number of open flues	$ \begin{array}{ccc} \text{main} & \text{s} \\ \text{heating} & \text{H} \\ \hline 0 & + \\ \hline 0 & + \\ \hline 0 & + \\ \hline \end{array} $	econdary neating 0 0	/ +] +] +	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	s				- <u> </u>	0	x ′	10 =	0	(7a)
Number of passive vents						0	x ^	10 =	0	_](7b)
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)
Infiltration due to chimney	fluos and fans - (f	a)+(6b)+(7a	a)+(7b)+(7	70) -	Г			Air ch	anges per ho	ur Too
Initiation due to chimneys If a pressurisation test has be Number of storeys in the	en carried out or is intend en dwelling (ns)	ed, proceed	l to (17), o	c) = otherwise c	ontinue fro	0 om (9) to ((16)	÷ (5) =	0	(8)
Additional infiltration Structural infiltration: 0.2	25 for steel or timber	frame or	0.35 for	masonr	y constr	uction	[(9)·	-1]x0.1 =	0	(10) (11)
if both types of wall are pre deducting areas of opening	sent, use the value corres is); if equal user 0.35	sponding to	the greate	er wall area	a (after					-
If suspended wooden flo	or, enter 0.2 (unsea	led) or 0.7	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped		0.25 [0.2	v (14) · 1	001 -			0	(14)
				(8) , (10)	x (14) ÷ 1 ∟ (11) ∟ (1	(12) = (12)	. (15) -		0	(15)
	50 overceed in out	oio motror	n nor ho	(0) + (10) ·		2) + (13) + (1		oroo	0	
If based on air permeabilit	50, expressed in curve $(18) = [(1)$	JC metres) otherwis	ui pei su se (18) = (16)		invelope	alea	4	
Air permeability value applies	if a pressurisation test ha	s been done	e or a deq	ree air per	meability i	is being us	sed		0.2	
Number of sides sheltered	, 		0	,	,	0			4	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporating	ng shelter factor			(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified fo	r monthly wind speed	d					_			_
Jan Feb M	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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)	im ÷ 4									
(22a)m= 1.27 1.25 1.	23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltra	ation rat	e (allowi	ing for sł	nelter ar	nd wind s	speed)	= (21a) x	(22a)m				_		
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16			
Calcula	ate effec	tive air	change	rate for t	he appl	icable ca	ise								
lf evb	aust air he		using Ann	endix N (2	23h) - (23)	a) v Emv (4	equation	(N5)) othe	nwise (23t	(23a)			0.8) 	
If bala	anced with	heat reco	werv: effic	viency in %		for in-use f	factor (fr	(110)) , our) –) = (20a)			0.	, 	(23D)
		d maa ab							-)	0h)	00k) [4 (00-	76	5	(23C)
a) II								VHR) (24)	a)m = (2	20)m + (1 0 27	230) × [1 - (230)) ÷ 100]]		(24a)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.20	0.27	0.27	0.28	J		(24a)
D) IT	balance	a mecha	anical ve	entilation		neat red	covery	(IMV) (24)	p)m = (2)	2b)m + (1	230)		1		(24b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(240)
c) If : :	whole h		tract ver	tilation (or positiv	ve input	ventilat	tion from (22)	outside	E (22)	-)				
(24c)m-		0.0 ×			(23) = (23)			(22) = (22)	$\frac{1}{1}$			0	1		(24c)
(24C)III=		0			0				0 1-ft	0	0	0	J		(240)
a) ii i	f (22b)m	v = 1, th	en (24d))m = (22	b)m othe	ve input erwise (2	ventila 24d)m =	uon from = 0.5 + [(2	101t 22b)m² x	0.5]					
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	1		(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24) or (24	r) or (2	 24d) in bo	x (25)				1		
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28	1		(25)
· /							I				I]		
3. Hea	at losses	s and he	eat loss	paramet	er:										
ELEN		Gros	SS (m²)	Openin	lgs	Net Ar	rea m²	U-val W/m	ue 2K	A X U	K)	k-valu	e K	A X	k C
Doors		aroa	()			1 91	<u> </u>			1 91		110/111		10,11	(26)
Window		1				2.24		··	I	2.74	H				(27)
Windo		2				0.50		.1/[1/(1 2)_		0.00	H				(27)
Minder	ws Type	2				2.52	/		0.04] =	2.89	4				(27)
	ws type —	3				7.56	, ,	(1/[1/(1.2)-	F 0.04] =	8.66					(27)
VVINdo	ws Type	4				2.43	· · · ·	(1/[1/(1.2)-	+0.04] =	2.78					(27)
Window	ws Type	5				2.43)	<1/[1/(1.2)-	+ 0.04] =	2.78					(27)
Walls 7	Гуре1	41.0	8	18.1	8	22.9)	0.16	=	3.66					(29)
Walls 7	Гуре2	29.1	2	1.91		27.22	2 >	0.15	=	4.09					(29)
Roof		58.6	65	0		58.65	5 >	• 0.1	=	5.87					(30)
Total a	rea of e	lements	, m²			128.8	5								(31)
Party v	vall					12.02	2	< 0	=	0					(32)
Party fl	loor					58.65	5				ī				(32a)
* for wind ** includ	dows and e the area	roof wind s on both	ows, use e sides of ir	effective wi nternal wal	indow U-v Is and par	alue calcul titions	lated usi	ng formula	1/[(1/U-vali	ue)+0.04] a	as given in	paragrap	L		J
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30) + (32) =				36.	35	(33)
Heat ca	apacity (Cm = S((Axk)						((28).	(30) + (3	2) + (32a).	(32e) =	3865	5.97	(34)
Therma	al mass	parame	ter (TMI	P = Cm -	÷ TFA) ii	ר kJ/m²K	<u> </u>		Indica	ative Value	: Low		10	0	(35)
For desig can be u	gn assess Ised instea	ments wh ad of a dea	ere the de tailed calc	etails of the ulation.	construc	tion are no	t known j	precisely th	e indicativ	e values of	f TMP in Ta	able 1f			J · ,
Therma	al bridge	es : S (L	x Y) cal	culated	using Ap	opendix l	К						20	.9	(36)
if details	of therma	l bridgina	are not kr	10wn (36) =	= 0.05 x (3	31)							L		J

Total fa	abric hea	at loss							(33) +	(36) =			57.25	(37)
Ventila	tion hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	14.32	14.15	13.98	13.14	12.97	12.12	12.12	11.95	12.46	12.97	13.31	13.64		(38)
Heat tr	ansfer c	oefficier	nt, W/K				_		(39)m	= (37) + (3	38)m		_	
(39)m=	71.57	71.4	71.23	70.38	70.21	69.37	69.37	69.2	69.71	70.21	70.55	70.89		
Heat lo	ss para	meter (H	HLP), W/	/m²K					(40)m	Average = = (39)m ÷	Sum(39) ₁ . (4)	12 /12=	70.34	(39)
(40)m=	1.22	1.22	1.21	1.2	1.2	1.18	1.18	1.18	1.19	1.2	1.2	1.21]	
Numbe			th (Tab						,	Average =	Sum(40) ₁ .	₁₂ /12=	1.2	(40)
NUMBE	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)
	I						1	11					1	
4. Wa	ter heat	ing ener	gy requi	irement:								kWh/ye	ear:	
												, i i i i i i i i i i i i i i i i i i i	1	
Assum if TF	ed occu A > 13.9	pancy, i). N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.0)013 x (⁻	TFA -13.	1. 9)	94	J	(42)
if TF	A £ 13.9), N = 1			()_/] * • • •			-,		_	
Annual	averag	e hot wa	ater usag	ge in litre	es per da	y Vd,av	erage =	(25 x N)	+ 36	so target e	80	.35		(43)
not more	e th <mark>at 125</mark>	litres per p	person per	r day (all w	ater use, l	hot and co	ld)	lo acifieve	a water us	se largel o				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					1	
(44)m=	<mark>8</mark> 8.39	85.17	<mark>8</mark> 1.96	78. <mark>7</mark> 4	75.53	72.32	72.32	75.53	78.74	81.96	85.17	88.39		
_										Total = Su	m(44) ₁₁₂ =	=	964.22	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x L	01m/3600	kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)	1	
(45)m=	131.07	114.64	118.3	103.13	98.96	85.39	79.13	90.8	91.89	107.09	116.89	126.94		-
lf instant	aneous w	ater heatir	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)	Total = Su	m(45) ₁₁₂ =	=	1264.24	(45)
(46)m=	19.66	17.2	17.74	15.47	14.84	12.81	11.87	13.62	13.78	16.06	17.53	19.04]	(46)
Water	storage	loss:											-	
Storag	e volum	e (litres)	includir	ig any so	Diar or V	/WHRS	storage	within sa	ame ves	sei		0	J	(47)
It comr	nunity n vise if no	eating a	na no ta hot wate	INK IN OW Ar (this in	elling, e Icludes i	nter 110 nstantar) litres in	(47) mbi boili	ers) ente	er '0' in (47)			
Water	storage	loss:	not wate			notantai								
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0]	(48)
Tempe	rature fa	actor fro	m Table	2b								0]	(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		1	10]	(50)
b) If m	anufact	urer's de	eclared of footor fr	cylinder l	oss fact	or is not	known:						1	
If comr	nunity h	eating s	ee secti	on 43	e z (kvvi	n/iitie/ua	iy)				0.	02	J	(51)
Volume	e factor	from Tal	ble 2a								1.	03	1	(52)
Tempe	rature fa	actor fro	m Table	2b							0	.6	1	(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	1.	03]	(54)
Enter	(50) or (54) in (5	5)								1.	03	J	(55)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylind	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3		-			-		0		(58)
Prima	y circuit	loss cal	culated	for each	month ((59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	d for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	ı
(62)m=	186.35	164.57	173.57	156.63	154.24	138.89	134.41	146.08	145.38	162.36	170.39	182.22		(62)
Solar D	HW 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 (G)	-	-	-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(64)m=	186.35	164.57	173.57	156.63	154.24	138.89	134.41	146.08	145.38	162.36	170.39	182.22		_
								Outp	out from w	ater heate	r (annual)₁	12	1915.08	(64)
Hea <mark>t g</mark>	lains fro	m water	heating	, kWh/m	onth 0.2	<mark>5 ´</mark> [0.85	× (45)m	n + (61)n	n] + 0.8 x	(<mark>46)m</mark> (+ (57)m	+ (59)m	1	
(65)m=	87.8	78.06	83.56	77.09	77.13	71.19	70.53	74.41	73.35	7 <mark>9.8</mark> 3	81.66	86.43		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. In	ternal ga	ains (see	a Table {	5 and 5a):									
Metab	olic gair	s (Table	5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16	97.16		(66)
Lightir	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	15.11	13.42	10.92	8.26	6.18	5.22	5.64	7.33	9.83	12.48	14.57	15.53		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	-		
(68)m=	169.53	171.29	166.86	157.42	145.51	134.31	126.83	125.07	129.5	138.94	150.85	162.05		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a), also se	e Table	5			_	
(69)m=	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72	32.72		(69)
Pumps	s and fai	ns gains	(Table &	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73	-77.73		(71)
Water	heating	gains (T	able 5)										-	
(72)m=	118.02	116.16	112.31	107.07	103.66	98.87	94.8	100.02	101.87	107.3	113.42	116.17		(72)
Total						(66)	$m \pm (67)m$	0 L (68)m	(60)m I	(70)m + (7)	(1)m + (72)	m	-	
Total	Internal	gains =	1			(66)	iii + (07)ii	1 + (00)11 -	F (09)III +	(70)11 + (7	1) (72)			
(73)m=	354.81	gains = 353.02	342.23	324.9	307.49	290.55	279.41	284.56	293.35	310.87	330.99	345.9		(73)

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southwest0.9x	0.77	x	3.24	x	36.79		0.45	x	0.7] =	26.02	(79)
Southwest0.9x	0.77	x	2.52	x	36.79	İ	0.45	x	0.7	j =	20.24	
Southwest0.9x	0.77	x	3.24	x	62.67	İ	0.45	x	0.7	=	44.33	
Southwest0.9x	0.77	x	2.52	x	62.67	İ	0.45	x	0.7	j =	34.48	
Southwest0.9x	0.77	x	3.24	x	85.75	Ì	0.45	x	0.7] =	60.65	(79)
Southwest0.9x	0.77	x	2.52	x	85.75		0.45	x	0.7] =	47.17	(79)
Southwest0.9x	0.77	x	3.24	x	106.25		0.45	x	0.7] =	75.15	(79)
Southwest0.9x	0.77	x	2.52	x	106.25		0.45	x	0.7] =	58.45	(79)
Southwest0.9x	0.77	x	3.24	x	119.01	Ì	0.45	x	0.7] =	84.17	(79)
Southwest0.9x	0.77	x	2.52	x	119.01		0.45	x	0.7] =	65.47	(79)
Southwest0.9x	0.77	x	3.24	x	118.15		0.45	x	0.7] =	83.56	(79)
Southwest0.9x	0.77	x	2.52	x	118.15		0.45	x	0.7] =	64.99	(79)
Southwest0.9x	0.77	x	3.24	x	113.91	Ì	0.45	x	0.7] =	80.57	(79)
Southwest0.9x	0.77	x	2.52	x	113.91		0.45	x	0.7] =	62.66	(79)
Southwest0.9x	0.77	x	3.24	x	104.39	İ	0.45	x	0.7] =	73.83	(79)
Southwest0.9x	0.77	x	2.52	×	104.39		0.45	х	0.7		57.43	(79)
Southwest0.9x	0.77	x	3.24	x	92.85		0.45	x	0.7	j -	65.67	(79)
Southwest0.9x	0.77	x	2.52	х	92.85		0.45	x	0.7] =	51.08	(79)
Southwest0.9x	0.77	x	3.24	x	69.27		0.45	x	0.7] =	48.99	(79)
Southwest0.9x	0.77	x	2.52	x	69.27		0.45	x	0.7	=	38.1	(79)
Southwest0.9x	0.77	x	3.24	x	44.07	i	0.45	x	0.7] =	31.17	(79)
Southwest0.9x	0.77	x	2.52	х	44.07	Ì	0.45	x	0.7] =	24.24	(79)
Southwest0.9x	0.77	x	3.24	x	31.49		0.45	x	0.7] =	22.27	(79)
Southwest0.9x	0.77	x	2.52	x	31.49		0.45	x	0.7] =	17.32	(79)
Northwest 0.9x	0.77	x	7.56	x	11.28	x	0.45	x	0.7] =	18.62	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	×	0.45	x	0.7] =	5.99	(81)
Northwest 0.9x	0.77	x	7.56	x	22.97	x	0.45	x	0.7	=	37.9	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	×	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	x	7.56	x	41.38	x	0.45	x	0.7	=	68.29	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	×	0.45	x	0.7] =	21.95	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	x	7.56	x	67.96	x	0.45	x	0.7	=	112.15	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	×	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	×	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	7.56	x	91.35	×	0.45	x	0.7	=	150.75	(81)
Northwest 0.9x	0.77	x	2.43	×	91.35	×	0.45	×	0.7] =	48.46	(81)
Northwest 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7] =	48.46	(81)

Northwest 0.9x	0.77	x	7.56	6	x	97.38	x	0.45	x	0.7	=	160.71	(81)
Northwest 0.9x	0.77	x	2.43	3	× [97.38		0.45	x	0.7	=	51.66	(81)
Northwest 0.9x	0.77	x	2.43	3	×	97.38	_ x	0.45	x	0.7	=	51.66	(81)
Northwest 0.9x	0.77	x	7.56	6	x	91.1	x	0.45	x	0.7	=	150.35	(81)
Northwest 0.9x	0.77	x	2.43	3	×	91.1	x	0.45	×	0.7	=	48.33	(81)
Northwest 0.9x	0.77	x	2.43	3	×	91.1	x	0.45	x	0.7	=	48.33	(81)
Northwest 0.9x	0.77	x	7.56	6	×	72.63	x	0.45	x	0.7	=	119.86	(81)
Northwest 0.9x	0.77	x	2.43	3	×	72.63	x	0.45	×	0.7	=	38.53	(81)
Northwest 0.9x	0.77	x	2.43	3	x	72.63	×	0.45	x	0.7	=	38.53	(81)
Northwest 0.9x	0.77	x	7.56	6	x	50.42	x	0.45	x	0.7	=	83.21	(81)
Northwest 0.9x	0.77	x	2.43	3	x	50.42	×	0.45	x	0.7	=	26.75	(81)
Northwest 0.9x	0.77	x	2.43	3	x	50.42	×	0.45	x	0.7	=	26.75	(81)
Northwest 0.9x	0.77	x	7.56	δ	×	28.07	x	0.45	×	0.7	=	46.32	(81)
Northwest 0.9x	0.77	x	2.43	3	x	28.07	×	0.45	x	0.7	=	14.89	(81)
Northwest 0.9x	0.77	x	2.43	3	x	28.07	x	0.45	x	0.7	=	14.89	(81)
Northwest 0.9x	0.77	x	7.56	6	x	14.2	x	0.45	x	0.7	=	23.43	(81)
Northwest 0.9x	0.77	x	2.43	3	x	14.2	x	0.45	x	0.7	=	7.53	(81)
Northwest 0.9x	0.77	x	2.43	3	×	14.2	х	0.45	x	0.7	=	7.53	(81)
Northwest 0.9x	0.77	×	7.56	3	x	9.21	x	0.45	x	0.7	- 1	15.21	(81)
Northwest 0.9x	0.77	×	2.43	3	x	9.21] ×	0.45	x	0.7	=	4.89	(81)
Northwest 0.9x	0.7 <mark>7</mark>	x	2.43	3	× [9.21	x	0.45	x	0.7	=	4.89	(81)
							7						
Sola <mark>r gain</mark> s in	watts, calc	ulated	for each	month			(83)m	n = Sum(74)m .	<mark>(8</mark> 2)m	_	1		
(83)m= 76.85	141.07 2	20.01	317.84	397.3	41	2.59 390.22	328	.17 253.45	163.19	9 93.9	64.57		(83)
Total gains –	internal and	d solar	(84)m =	(73)m ·	+ (8 	33)m, watts	1	i				1	
(84)m= 431.66	494.09 5	62.24	642.74	704.8	70	669.64	612	.73 546.81	474.00	6 424.9	410.47		(84)
7. Mean inte	rnal temper	ature (heating	season)								
Temperature	e during hea	ating pe	eriods in	the livi	nga	area from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisation fa	ctor for gair	ns for li	ving are	a, h1,m	(se	ee Table 9a)					·	1	
Jan	Feb	Mar	Apr	May	<u> </u>	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.95	0.93	0.89	0.81	0.69	C	0.54 0.42	0.4	47 0.67	0.85	0.93	0.95		(86)
Mean interna	al temperati	ure in li	ving are	a T1 (fo	ollo	w steps 3 to 7	7 in T	able 9c)					
(87)m= 18.66	18.94 ⁻	19.41	20.01	20.5	2	0.81 20.93	20.	91 20.66	20.02	19.25	18.61		(87)
Temperature	e during hea	ating pe	eriods in	rest of	dw	elling from Ta	able 9	9, Th2 (°C)					
(88)m= 19.9	19.91 [·]	19.91	19.92	19.92	1	9.93 19.93	19.	94 19.93	19.92	19.92	19.91		(88)
Utilisation fa	ctor for gair	ns for re	est of dw	vellina.	h2.	m (see Table	9a)					-	
(89)m= 0.94	0.92	0.87	0.78	0.64		0.47 0.33	0.3	38 0.61	0.82	0.92	0.95		(89)
Mean intern	al temperati	ure in f	he rest o	of dwelli	na	T2 (follow str	eps 3	to 7 in Tabl	e 9c)			ı	
(90)m= 16.81	17.21	17.88	18.72	19.38	1	9.77 19.89	19.	87 19.6	18.76	17.66	16.74		(90)
L	<u> </u>	I				I	•	f	LA = Liv	/ing area ÷ (4	4) =	0.42	(91)

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

(92)m=	17.59	17.94	18.52	19.26	19.85	20.21	20.33	20.31	20.04	19.29	18.33	17.53		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	17.59	17.94	18.52	19.26	19.85	20.21	20.33	20.31	20.04	19.29	18.33	17.53		(93)
8. Spa	ace hea	ting requ	uirement	t										
Set Ti	to the r	nean int	ernal ter	mperatur using Ta	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calo	culate	
ine ui	Jan	Feh	Mar	Anr	Mav	Jun	Jul	Αυσ	Sen	Oct	Nov	Dec		
Utilisa	ation fac	tor for a	ains, hm):	may	Udit	Uui	, tug	000	000	1107	200		
(94)m=	0.92	0.89	0.85	0.76	0.64	0.49	0.36	0.41	0.61	0.8	0.89	0.93		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	397.26	441.5	475.91	489.44	451.05	345.64	244.18	250.8	335.64	380.04	379.37	380.8		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	1	·	I	
(97)m=	951.1	931.03	856.45	729.31	572.23	388.91	258.45	270.29	414.33	610.11	792.11	944.95		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k	Nh/mont	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	412.05	328.96	283.12	172.71	90.16	0	0	0	0	171.17	297.17	419.72		
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2175.07	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								37.09	(99)
9b. En	ergy rec	uiremer	nts – Cor	mmunity	heating	scheme	-				_		_	
This pa	art is use	ed for sp	ace hea	iting, spa	ace co <mark>ol</mark> i	ing or wa	ater heat	ting prov	ided by a	a c <mark>omm</mark>	unity sch	neme.		
Fractio	n of spa	ace neat	from se	condary/	supplen	nentary r	neating (Table T	1) 'U' if n	one			0	(301)
Fractio	n of spa	ace he <mark>at</mark>	from co	mmunity	system	1 – (301	1) =						1	(302)
The com	imunity so	cheme ma	y obtain he	eat fro <mark>m se</mark>	everal sour	rces. The p	procedure	allows for	CHP and u	up to four	other heat	sources; t	he latter	
Fractio	boilers, h	eat pump: at from (s, geotheri	nal and wa	aste heat f	rom powei	r stations.	See Appei	ndıx C.				1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump)			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating syst	tem			1	(305)
Distrib	ution los	s factor	(Table 1	I2c) for c	commun	ity heatir	ng syste	m					1.2	(306)
Space	heating	q											kWh/yea	-
Annua	space	heating	requiren	nent									2175.07	
Space	heat fro	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) =	=	2610.08	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/sup	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water Annual	heating water h	j neating r	equirem	ent									1915.08	7
lf DHW Water	/ from co	ommuni m Comr	ty schen nunitv he	ne: eat pumr)				(64) x (30)3a) x (30	5) x (306) :	=	2298.1	(310a)
Electric	city used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	49.08	(313)
Cooling	g Syster	n Energ	y Efficie	ncy Ratio	C								0	(314)
Space	coolina	(if there	is a fixe	d cooline	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
•	5		_	•			,							

Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	111.8	(330a)
warm air heating system fans	0	(330b)
nump for solar water beating	0	(330g)
Total electricity for the charge WM/h (see	0	
=(330a) + (330b) + (330g) =	111.8	(331)
Energy for lighting (calculated in Appendix L)	266.91	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =	4556.82	(338)
12b. CO2 Emissions – Community heating scheme		
Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel	208	(367a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.52	1224.68	(367)
Electrical energy for heat distribution [(313) x 0.52	25.47	(372)
Total CO2 associated with community systems (363)(366) + (368)(372)	1250.16	(373)
CO2 associated with space heating (secondary) (309) x 0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x 0.52	= 0	(375)
Total CO2 associated with space and water heating (373) + (374) + (375) =	1250.16	(376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x 0.52	58.03	(378)
CO2 associated with electricity for lighting (332))) x 0.52	138.53	(379)
Energy saving/generation technologies (333) to (334) as applicable		
1 0.52 x 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =	1067.8	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =	18.21	(384)
El rating (section 14)	86.2	(385)

User Details:		
Assessor Name: Stroma Number: Software Name: Stroma FSAP 2012 Software Version: Version	n: 1.0.5.49	
Property Address: Block S - Ground Floor		
Address: S, Block S, Ham Close, London, TW10		
Area(m²) Av. Height(m) Ground floor 67.39 (1a) x 2.5 (2a) = [Volume(m ³) 168.47 (3a)	
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 67.39 (4)		
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = $	168.47 (5)	
2. Ventilation rate:		
Mumber of chimneysmain heatingsecondary heatingothertotalNumber of open flues 0 $+$ 0 $+$ 0 $=$ 0 $\times 40 =$ $[$ 0 $+$ 0 $+$ 0 $=$ 0 $\times 20 =$ $[$	m³ per hour 0 (6a) 0 (6b)	
Number of intermittent fans 0 x 10 =	0 (7a)	
Number of passive vents 0 x 10 =	0 (7b)	
Number of flueless gas fires	0 (7c)	
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0 \div (5) = [$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	0 (8)	
Number of storeys in the dwelling (ns) Additional infiltration Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0 (9) 0 (10) 0 (11)	
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)	
If no draught lobby, enter 0.05, else enter 0	0 (13)	
Percentage of windows and doors draught stripped	0 (14)	
Window infiltration 0.25 - [0.2 x (14) ÷ 100] =	0 (15)	
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)	
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	4 (17)	
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$	0.2 (18)	
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	(10)	
Shelter factor $(20) = 1 - [0.075 \times (19)] =$	0.7 (20)	
Infiltration rate incorporating shelter factor (21) = (18) × (20) =	0.14 (21)	
Infiltration rate modified for monthly wind speed		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Monthly average wind speed from Table 7		
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7		
Wind Factor (22a)m = (22)m ÷ 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		

Adjust	ed infiltr	ation rat	e (allowi	ng for sl	nelter and	d wind s	peed) =	(21a) x	(22a)m					
~ / /	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul If m	ate ette echanic	<i>ctive air</i> al ventila	change	rate for a	the applic	cable ca	se						0.5	(23a)
lf exh	aust air h	eat pump	usina App	endix N. (2	23b) = (23a) × Fmv (e	equation (N	N5)) . othei	rwise (23b) = (23a)			0.5	(23b)
If bala	anced wit	h heat reco	overv: effic	iencv in %	allowing fo	or in-use fa	actor (from	n Table 4h) =	, (,			0.5	(23c)
a) If	halance	d mech	anical ve	ntilation	with her	at recove	arv (MN/F	HR) (24a	n = (2)	2h)m + (23h) 🗸 [ʻ	1 – (23c)	10.3	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	halance	d mech:	l anical ve	Intilation		heat rec	overv (N	///) (24h	1 = (22)	2b)m + ('	23h)		J	
(24b)m=				0		0		0	0	0	0	0	1	(24b)
c) If	whole h		I tract ver	L tilation (n positiv	e input v	l ventilatio	n from c	L utside				J	
0) 11	if (22b)r	$n < 0.5 \times$	(23b), 1	hen (24	c) = (23b)); otherv	vise (24	c) = (22t	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	on or wh	ole hous	se positiv	e input	ventilatio	on from l	oft			•		
	if (22b)r	n = 1, the	en (24d)	m = (22	b)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(24d)
Effe	ctive air	change	rate - er	nter (24a	a) or (24b) or (24	c) or (24	d) in boy	(25)	i	i	i	1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	oaramet	er:									
ELEN	/IENT	Gros	s	Openir	igs	Net Ar	ea	U-valu	Je	AXU		k-value	e l	AXk
D		area	(m²)	n	12	A,n	n ²	VV/m2	K	(VV/I	<) 	kJ/m ² ·l	К	kJ/K
Doors	-					1.91	X			1.91				(26)
Windo		e 1				3.48	x1/	/[1/(1.2)+	0.04] =	3.98				(27)
Windo	ws Type	e 2				4.41	x ^{1/}	/[1/(1.2)+	0.04] =	5.05	Ľ			(27)
Windo	ws Type	e 3				3.15	x1/	/[1/(1.2)+	0.04] =	3.61				(27)
Floor						67.39) X	0.1	=	6.739				(28)
Walls	Type1	41.9	92	11.0	4	30.88	3 X	0.16	=	4.94				(29)
Walls	Type2	7.0	5	1.91	l	5.14	x	0.15	=	0.77				(29)
Total a	area of e	elements	, m²			116.3	6							(31)
Party v	wall					34.88	s x	0	=	0				(32)
Party of	ceiling					67.39)							(32b)
* for win	idows and	l roof wind	ows, use e	effective w	indow U-va	lue calcul	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	1 3.2	
** includ	le the are	as on both	sides of in	nternal wai	lls and part	itions		(26) (30)	+ (32) -					
		55, W/K =	= 5 (A X	0)				(20)(30)	((20)	(20) + (2)	2) + (22a)	(220) -	27	(33)
Therm		CIII = S(AXK)	2 – Cm	· TEA) in	k l/m2k			((20)	.(30) + (32	2) + (32a). : Low	(320) =	11328.	2 (34)
For desi	ian asses	sments wh		$= 0 \Pi$	- TFA) III	on are not	known pr	ecisely the	indicative		TMP in Ta	ahle 1f	100	(35)
can be u	used inste	ad of a de	tailed calc	ulation.	00110111001		nnown pr		, maioaive	values of				
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						8.92	(36)
if details	of therm	al bridging	are not kr	own (36) :	= 0.05 x (3	1)								
Fotal f	abric he	at loss							(33) +	(36) =			35.92	(37)
Ventila	ation hea	at loss ca	alculated	n monthl	y 				(38)m	= 0.33 × (25)m x (5)	_	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m=	16.46	16.26	16.07	15.09	14.9	13.93	13.93	13.73	14.32	14.9	15.29	15.68		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	52.38	52.18	51.99	51.01	50.82	49.85	49.85	49.65	50.24	50.82	51.21	51.6		
Hoatle		motor (l	/// (D IL	/m2k					(40)m	Average =	Sum(39)	12 /12=	50.97	(39)
(40)m=	0.78			0.76	0.75	0.74	0.74	0.74	0.75	= (39)III ÷	(4)	0.77		
(40)11-	0.70	0.77	0.11	0.70	0.75	0.74	0.74	0.74	0.75	Average =	Sum(40)1	/12=	0.76	(40)
Numbe	er of day	/s in mo	nth (Tab	le 1a)		-	-		-			L		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ar:	
Assum if TF	ied occu A > 13.9	ipancy, 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.()013 x (TFA -13.	<u>2</u> . 9)	18		(42)
if TF	A £ 13.9	9, N = 1						(0 -)						
Annua Reduce	l averag	e hot wa al average	ater usag hot water	ge in litre usage by a	es per da 5% if the c	ay Vd,av Iwelling is	erage = designed t	(25 x N) to achieve	+ 36 a water us	se target o	<u>د</u>	36		(43)
not more	e that 125	litres per	person pe	r day (all w	ater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	94.6	91.16	87.72	84.28	80.84	77.4	77,4	80.84	84.28	87.72	91.16	94.6		
Energy o	content of	hot water	used - ca	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)))))))))))))))))))) kWh/mor	Total = Su oth (see Ta	m(44) ₁₁₂ = bles 1b, 1	= [c, 1d)	1032.02	(44)
(45)m=	140.29	122.7	126.62	110.39	105.92	91.4	84.7	97.19	98.35	114.62	125.11	135.87		
										Total = Su	m(45) ₁₁₂ =	=	1 <mark>3</mark> 53.14	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)					
(46)m=	21.04	18.41	18.99	16.56	15.89	13.71	12.7	14.58	14.75	17.19	18.77	20.38		(46)
Storag	e volum	ioss. ie (litres)) includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	nunitv h	eating a	and no ta	ank in dw	vellina. e	nter 110	litres in	(47)				•		()
Otherv	vise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		<i>.</i>		(1) • (1)	(1)							
a) if m		urer's d	eclared I	OSS TACL	or is kno	wn (kvvr	n/day):					0		(48)
Enorm	v loot fro	actor Iro		2D	oor			$(40) \times (40)$	\ _			0		(49)
b) If m	anufact	urer's de	eclared of	e, kvvn/ye cylinder l	ear loss fact	or is not	known:	(40) X (49)) =		1	10		(50)
Hot wa	ater stor	age loss	factor fi	rom Tabl	e 2 (kW	h/litre/da	iy)				0.	02		(51)
If com	munity h	eating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a m Table	2h							1.	03		(52)
Energy	/ lost fro	m watai	storade	~ 20 . k\//b///	aar			(47) x (51) y (52) y (53) -		.0		(53)
Enter	(50) or ((54) in (5	55)	, KVVII/ yt	Jai			(47) × (51)) ^ (JZ) ^ (55) –	1.	03		(54)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m	L	-		. ,
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	l d solar sto	nage, (57)	n = (56)m	x [(50) – (L H11)] ÷ (5	0), else (5	I 7)m = (56)	n where (L H11) is fro	m Appendi	хH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nnual) fro	om Table			0]	(58)					
Primar	y circuit	loss cal	lculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	tactor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	a cylinde T	r thermo	stat)		1	(70)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26]	(59)
Combi	loss ca	culated	for each	month	(61)m =	(60) ÷ 36	65 × (41)m					_	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.57	172.63	181.89	163.88	161.2	144.89	139.97	152.47	151.84	169.89	178.61	191.14		(62)
Solar DI	-IW input o	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 (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output	t from w	ater hea	iter	-	-		-			-		-	•	
(64)m=	195.57	172.63	181.89	163.88	161.2	144.89	139.97	152.47	151.84	169.89	178.61	191.14		
								Outp	out from wa	ater heate	r (annual)₁	12	2003.98	(64)
Heat g	ains froi	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	1]	
(65)m=	90.87	80.74	86.32	79.5	79.44	73.19	72.38	76.54	75.5	82.33	84.4	89.4]	(65)
in <mark>clu</mark>	ıde (57)ı	m in calo	culation	of (65)m	only if c	vlinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	heating	
5. In	ternai da	ains (see	Table 5	5 and 5a):						_			
Motab		e (Toble	5) Mot	te										
Metab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m=	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06		(66)
Lightin	a dains	(calcula	ted in A	opendix	L equat	ion 19 o	rl9a)a	lso see '	Table 5				1	
(67)m=	17.7	15.72	12.78	9.68	7.23	6.11	6.6	8.58	11.51	14.62	17.06	18.19	1	(67)
Annlia		ins (calc	L ulated in			uation L	13 or I 1	l 3a) also		L	<u> </u>		1	
(68)m=	191.13	193.11	188.12	177.48	164.04	151.42	142.99	141	146	156.64	170.07	182.7	1	(68)
Cookir				nnendiv		tion 15	or 152			5			1	. ,
(60)m-	19 yan 15	33.01			L, Equa		33.01), also se 33.01		33.01	33.01	33.01	1	(69)
(03)III=		00.01	(Table /	[33.91 [55.91	55.91	55.51	55.51	55.91	55.91	55.51	55.91]	(00)
Pumps				$\frac{5a}{1}$	0		0			0	0	0	1	(70)
(70)m=	0	0	,		<u> </u>		0	0	0	0	0	0]	(70)
Losses	s e.g. ev	aporatic	on (nega	tive valu	es) (Tab	ole 5)							1	(74)
(71)m=	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	J	(71)
Water	heating	gains (T	Table 5)		1		i			1		1	1	()
(72)m=	122.14	120.15	116.02	110.41	106.77	101.65	97.29	102.87	104.86	110.66	117.22	120.16	J	(72)
Total i	nternal	gains =			-	(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	im 	•	
(73)m=	386.68	384.7	372.64	353.28	333.77	314.89	302.59	308.17	318.09	337.64	360.07	376.76		(73)
6. So	lar gains	8:												
Solar g	ains are c	alculated	using sola -	r flux from	l'able 6a	and assoc	lated equa	ations to co	onvert to th	ie applicat	ole orientat	ion.	o ·	
()rient:	ation 4	ACCESS F	actor	Area		Flu	X		α		E F		Gains	

Southw	esto ov	0.77		v	2.40	٦ .		95 75	1	0.45		0.7		65 1 <i>1</i>	7(79)
Southw	esto ov	0.77		^ v	2.40	」^ 1、		106.25]	0.45	٦Û	0.7	=	90.72	$\frac{(70)}{(70)}$
Southw	vesto ov	0.77		`	2.40	」^ 1、		110.23]	0.45	╡Ĵ	0.7	= -	00.72	(73)
Southw	vesto ov	0.77		^	2.40	」^ 1、		119.01]	0.45	╡Ĵ	0.7	=	90.41	$\frac{(73)}{(79)}$
Southw	vesto ov	0.77		^	2.40	」 ^ 1 ↓		112.01]	0.45		0.7	=	09.70	$ \begin{bmatrix} (73) \\ (79) \end{bmatrix} $
Southw	vesto ov	0.77		^	3.40	」^ 1↓		113.91]	0.45	╡Ĵ	0.7	=	70.0	-(70)
Southw	vesto ov	0.77		^	3.40	」^ 1 ↓		104.39]	0.45	╡Ĵ	0.7	=	79.3	-(70)
Southw	lesto ov	0.77		^	3.40	」^ 1.		92.85]	0.45	╡Û	0.7		70.54	= (73)
Southw		0.77		× 	3.48	」^ 1.		69.27]	0.45	╡ Û	0.7		52.62	(79)
Southw		0.77		× 	3.48	」^ 1.		44.07] T	0.45	╡ Û	0.7		33.48	(79)
Northw		0.77		x	3.48	」 × 1		31.49		0.45		0.7	=	23.92	
Northw		0.77		x	4.41	」× 1		11.28		0.45	×	0.7	=	10.86	(81)
Northwo	est 0.9x	0.77		x	3.15	×		11.28		0.45	×	0.7	=	7.76	(81)
Northwo	est 0.9x	0.77		x	4.41	×		22.97	X	0.45	×	0.7	=	22.11	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	3.15	×		22.97	×	0.45	×	0.7	=	15.79	(81)
Northwo	est <mark>0.9x</mark>	0.77		x	4.41	X		41.38	×	0.45	×	0.7	=	39.83	(81)
Northw	est <mark>0.9x</mark>	0.77		x	3.15	×		41.38	x	0.45	x	0.7	=	28.45	(81)
Northw	est <mark>0.9x</mark>	0.77		x	4.41	×		67.96	x	0.45	x	0.7	=	65.42	(81)
Northwe	est 0.9x	0.77		x	3.15	X		67.96	x	0.45	x	0.7		46.73	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41	X		91.35] x	0.45	x	0.7	=	87.94	(81)
Northwe	est 0.9x	0.77		x	3.15	x		91.35] ×	0.45	x	0.7	=	62.81	(81)
Northwe	est <mark>0.9x</mark>	0.7 <mark>7</mark>		x	4.41] x		97.38] ×	0.45	x	0.7	=	93.75	(81)
Northwe	est <mark>0.9x</mark>	0. <mark>77</mark>		x	3.15	x		97.38	x	0.45	x	0.7	=	<mark>6</mark> 6.96	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41] x		91.1	×	0.45	x	0.7	=	87.7	(81)
Northwe	est 0.9x	0.77		x	3.15	x		91.1	x	0.45	x	0.7	=	62.64	(81)
Northw	est <mark>0.9x</mark>	0.77		x	4.41	x		72.63	x	0.45	x	0.7	=	69.92	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	3.15	X		72.63	x	0.45	x	0.7	=	49.94	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41] ×		50.42	x	0.45	x	0.7	=	48.54	(81)
Northw	est <mark>0.9x</mark>	0.77		x	3.15] ×		50.42	x	0.45	x	0.7	=	34.67	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41	j x		28.07	x	0.45	x	0.7	=	27.02	(81)
Northw	est <mark>0.9x</mark>	0.77		x	3.15	j ×		28.07] x	0.45	×	0.7	= =	19.3	(81)
Northw	est <mark>0.9x</mark>	0.77		x	4.41	j ×		14.2] x	0.45	×	0.7		13.67	(81)
Northw	est <mark>0.9x</mark>	0.77		x	3.15	j x		14.2] x	0.45	×	0.7	=	9.76	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41] ×		9.21] x	0.45	×	0.7	=	8.87	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	3.15	, 1 x		9.21] x [0.45	×	0.7		6.34	(81)
	I					1	L		J]		
Solar o	ains in	watts, cal	culate	ed	for each mon	th			(83)m	n = Sum(74)m .	(82)m				
(83)m=	46.57	85.51	133.43	3	192.86 241.1	6	250.47	236.88	199	.16 153.75	98.94	56.91	39.13		(83)
Total g	jains –	internal an	nd sol	ar	(84)m = (73)r	n +	(83)n	n, watts		· · · ·		•			
(84)m=	433.25	470.21	506.07	7	546.15 574.9	3	565.36	539.47	507	.33 471.83	436.58	3 416.98	415.88		(84)
7. M <u>e</u>	an inte	rnal tempe	eratur	e (heating seaso	on)									
Temp	erature	e during he	eating	ре	eriods in the li	ving	g area	from Tal	ble 9,	, Th1 (°C)				21	(85)
Utilisa	ation fa	ctor for gai	ins fo	r li	ving area, h1,	,m (see T	able 9a)							

Jul

Aug

Jun

Oct

Sep

Nov

Dec

Apr

May

Mar

Feb

Jan

(86)m=	0.95	0.93	0.9	0.82	0.69	0.53	0.4	0.43	0.65	0.84	0.93	0.96		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	bllow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.59	19.78	20.09	20.48	20.77	20.94	20.98	20.98	20.87	20.51	20	19.56		(87)
Temp	erature	durina h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9 Ti	h2 (°C)					
(88)m=	20.27	20.28	20.28	20.29	20.29	20.31	20.31	20.31	20.3	20.29	20.29	20.28	I	(88)
Utilisa	ation fac	tor for a	ains for	rest of d	wellina.	h2.m (se	e Table	9a)						
(89)m=	0.94	0.93	0.89	0.8	0.66	0.48	0.34	0.37	0.6	0.82	0.92	0.95		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to 7	7 in Tabl	le 9c)				
(90)m=	18.37	18.64	19.08	19.64	20.03	20.25	20.29	20.29	20.17	19.69	18.97	18.34		(90)
									f	fLA = Livin	g area ÷ (4	ł) =	0.42	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = f	LA × T1	+ (1 – fL	A) × T2			•		
(92)m=	18.88	19.11	19.5	19.99	20.34	20.53	20.58	20.58	, 20.46	20.03	19.4	18.85		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.88	19.11	19.5	19.99	20.34	20.53	20.58	20.58	20.46	20.03	19.4	18.85		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the r	nean int	ernal ter	mperatur using Ta	re obtair	ied at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Util <mark>isa</mark>	ation fac	tor for g	ains, hm	1:										
(94)m=	0.93	0.91	0.87	0.79	0.66	0.5	0.3 <mark>6</mark>	0.4	0.61	0.81	0.9	0.94		(94)
Usefu	<mark>l g</mark> ains,	hmGm	, W = (9	4)m x (84	4)m									
(95)m=	403.18	427.79	440.04	430.68	380.74	280.41	194.63	201.99	287.45	353.74	376.34	389.76		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8	40.0	40.4	444	10.0	74	4.0		(06)
(96)m= Hoat	4.3	4.9	0.5	ol tompo		14.0	-[(30)m	16.4 v [(03)m	(96)m	10.6	7.1	4.2		(90)
(97)m=	763.62	741.66	675.81	565.78	439.28	295.83	198.45	207.37	319.58	479.23	630.07	755.92		(97)
Space	e heatin	a require	ement fo	r each m	honth, k	Nh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	268.16	210.92	175.41	97.27	43.56	0	0	0	0	93.37	, 182.69	272.42		
								Tota	l per year	(kWh/year) = Sum(9	B) _{15,912} =	1343.81	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								19.94	(99)
9b. En	ergy rec	uiremer	nts – Cor	mmunity	heating	scheme	•					L		
This pa	art is use	ed for sp	ace hea	ting, spa	ace cool	ing or wa	ater heat	ting prov	ided by	a comm	unity sch	ieme.		
Fractio	n of spa	ace heat	from se	condary/	/supplen	nentary l	heating	(Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	' system	1 – (30	1) =						1	(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sou	rces. The p	orocedure	allows for	CHP and l	up to four o	other heat	sources; tl	ne latter	
includes Fractio	boilers, h	eat pumps	s, geothern	mal and wa ity boat i	aste heat f	rom powe	r stations.	See Appei	ndix C.			1	1	(303a)
Fractio	n of tota		boot fro				_			(2)	00) v (202	->		(204a)
							J			. (3	UZ) X (303)	a) =	1	(304a)
Factor	for cont	rol and (charging	method	(Table -	4c(3)) to	r commi	unity hea	ating sys	tem			1	(305)
Distribu	ution los	s factor	(Table 1	2c) for c	commun	ity heati	ng syste	m					1.2	(306)
Space	heating	9	-										kWh/ye	ear
Annual	space	neating	requiren	nent									1343.81	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1612.57	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary system	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2003.98]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2404.78	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307	e) + (310a)(310e)] =	40.17	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	utside		128.46	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	128.46	(331)
Energy for lighting (calculated in Appendix L)			312.51	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3</mark>)
Tota <mark>l delivered energy for</mark> all u <mark>ses (</mark> 307) + (309) + (310) + (312) +	(315) + (331) + (33	32)(237b) =	3728.24	(338)
12b. CO2 Emissions – Community heating scheme				
CO2 from other sources of space and water beating (not CHP)	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source 1 (%)	wo fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.52 =	1002.41	(367)
Electrical energy for heat distribution [(3	13) x	0.52	20.85	(372)
Total CO2 associated with community systems (3)	63)(366) + (368)(372	2) =	1023.26	(373)
CO2 associated with space heating (secondary) (3	09) x	0 =	= 0	(374)
CO2 associated with water from immersion heater or instantaneo	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		1023.26	(376)
CO2 associated with electricity for pumps and fans within dwelling	j (331)) x	0.52	66.67	(378)
CO2 associated with electricity for lighting (3)	32))) x	0.52	162.19	(379)
Energy saving/generation technologies (333) to (334) as applicab Item 1	le	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			873.21	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			12.96	(384)
El rating (section 14)			89.59	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSA	P 2012	roportu	Stroma Softwa	a Num ire Ver	ber: sion:	loor	Versio	n: 1.0.5.49	
Addross I	S Block S H	am Close, Lon	don TW	4001855. 140	DIUCK O	- IVIIU F	1001			
Address :	S, BIUCK S, H	am Close, Lon	uon, 1vv	10						
Ground floor	1310113.		Area 6	a(m²) 7.39	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 168.47	(3a)
Total floor area TFA = (1a	ı)+(1b)+(1c)+(1	d)+(1e)+(1n	i) 6	7.39	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	168.47	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	main heating 0	secondar heating + 0 + 0	y] + [_] + [0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent far					- F	0	x ′	10 =	0	(7a)
Number of passive vents						0	x ^	10 =	0	_](7b)
Number of flueless gas fir	es					0	X 4	40 =	0	(7c)
								Air ch	anges <mark>per</mark> ho	ur
Infiltration due to chimney	s, flues and far	1S = (6a) + (6b) + (7)	a)+(7b)+(7	7c) =	ontinue fro	0 0 (9) to ((16)	÷ (5) =	0	(8)
Number of storeys in th Additional infiltration Structural infiltration: 0.	e dwelling (ns) 25 for steel or t	imber frame or	0.35 for	masonr	y constr	uction	[(9)·	-1]x0.1 =	0	(9) (10) (11)
if both types of wall are pro deducting areas of openin	esent, use the valu gs); if equal user 0.	e corresponding to .35	the greate	er wall area	a (after					` <i>`</i>
If suspended wooden fi	oor, enter 0.2 (unsealed) or 0.	1 (seale	a), eise	enter U				0	(12)
Il no draught lobby, ent	er 0.05, eise er	iter U							0	
Window infiltration		ugni sinppeu		0 25 - [0 2	x (14) - 1	001 =			0	
				(8) + (10) -	F (11) + (1	2) + (13) -	+ (15) =		0	(15)
Air permeability value	150 expressed	in cubic metre	s ner ho	ur per so	uare m	etre of e	nvelone	area	0	$\int_{(17)}^{(10)}$
If based on air permeabili	tv value. then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)		intelepe	aioa	4	
Air permeability value applies	if a pressurisation	test has been don	e or a deg	ıree air pei	meability i	is being us	sed		0.2	
Number of sides sheltered	b								4	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporati	ng shelter facto	or		(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified for	or monthly wind	speed								
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table	7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-		-	_	
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul	ate effec	ctive air	change	rate for t	he appli	cable ca	se							(22.5)
lf ovh	oust air h		using Ann	andix N (2	(23a) – (23a	a) v Emv (e	auation (N	(5)) other	wise (23h) – (23a)			0.5	(234)
If bal	anced with			iency in %	allowing f		actor (from	Table <i>1</i> b) –) – (200)			0.5	(23D)
		d moob)- .))))))) (00h) [4	(020)	76.5	(23c)
a) II								1K) (24a	0.26	20)11 + (2)	230) X [-(230)] - 100j	(24a)
(24a)II-		0.23				boot roc	0.20	1) () () 4h)m (01	$\frac{0.27}{(h)m} + \frac{1}{2}$	0.27	0.20	J	(210)
D) II									0) m = (22	20)m + (2 0	230)	0	1	(24b)
(240)III=										0	0	0	J	(240)
с) п	if (22b)n	ouse ex n < 0.5 >	(23b), 1	then (24	c) = (23b); otherv	wise (24	c) = (22b	butside b) m + 0.	5 × (23b)	-	_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural if (22b)n	ventilation = 1, th	on or wh en (24d)	ole hous m = (221	se positiv c)m othe	ve input erwise (2	ventilatio 4d)m = 0	on from l 0.5 + [(2	oft 2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in box	(25)					
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
2 40	ot loogo	a and he		ooromot	ori								,	
			at 1055			Not Ar	00		10			k volu	_	
ELEN		area	ss (m²)	r	95 1 ²	A,r	ea n²	W/m2	K	(W/ł	<)	k-value kJ/m ² ·	F K	kJ/K
Doors						1.91	x	1	= [1.91				(26)
Windo	ws Type	e 1				3.48	x1,	/[1/(1.2)+	0.04] =	3.98	F			(27)
Windo	ws Type	2				4.41	x1/	/[1/(1.2)+	0.04] =	5.05	Ħ			(27)
Windo	ws Type	e 3				3.15	x1/	/[1/(1.2)+	0.04] =	3.61	5			(27)
Walls	Type1	41.9	92	11.0	4	30.88	3 X	0.16	= [4.94				(29)
Walls -	Type2	7.0	5	1.91		5.14	x	0.15		0.77				(29)
Total a	area of e	lements	, m²			48.97	,							(31)
Party v	wall					34.88	3 X	0	=	0				(32)
Party f	loor					67.39			'		i		\dashv	(32a)
Party of	ceiling					67.39)				Г		\dashv	(32b)
* for win ** inclua	dows and le the area	roof wind	ows, use e sides of ir	effective wi nternal wal	ndow U-va Is and part	alue calcul titions	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	∟ s given in	paragraph	n 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)	·			(26)(30)	+ (32) =				20.2	7 (33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	6610	.9 (34)
Therm	al mass	parame	eter (TMI	- = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
For desi can be u	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						4.88	(36)
if details	s of therma	al bridging	are not kr	10wn (36) =	= 0.05 x (3	1)								1```
Total f	abric he	at loss							(33) +	(36) =			25.1	5 (37)
Ventila	ation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)		•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

(38)m=	16.46	16.26	16.07	15.09	14.9	13.93	13.93	13.73	14.32	14.9	15.29	15.68		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3				
(39)m=	41.6	41.41	41.21	40.24	40.05	39.07	39.07	38.88	39.46	40.05	40.43	40.82	1	
Heat lo	oss para	meter (H	HLP), W/	/m²K					(40)m	Average = = (39)m ÷	Sum(39) ₁ (4)	12 /12=	40.19	(39)
(40)m=	0.62	0.61	0.61	0.6	0.59	0.58	0.58	0.58	0.59	0.59	0.6	0.61		
Numbe	er of day	/s in mo	nth (Tab	le 1a)	-	-				Average =	Sum(40)₁.	₁₂ /12=	0.6	(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	I	(41)
4. Wa	ter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum if TF	ed occu A > 13.9 A £ 13.9	upancy, 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.()013 x (TFA -13.	2. 9)	18		(42)
Annual	averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		8	36		(43)
Reduce	the annua that 125	al average litres per	hot water person per	usage by r dav (all w	5% if the a rater use. I	lwelling is hot and co	designed (Id)	to achieve	a water us	se target o	f			
normore		Ech	Mor		Mov	lup		Aug	Son	Oct	Nov	Dee		
Hot wate	an Frusage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	Sep	Oct	INOV	Dec		
(44)m=	94.6	91.16	87.72	84.28	80.84	77.4	77.4	80.84	84.28	87.72	91.16	94.6		
										Total = Su	m(44) ₁₁₂ =		1032.02	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	bles 1b, 1	c, 1d)		
(45)m=	140.29	122.7	126.62	110.39	105.92	91.4	84.7	97.19	98.35	114.62	125.11	135.87		
lf instant	aneous w	vater heati	na at point	of use (no	o hot water	storage).	enter 0 in	boxes (46) to (61)	Tota <mark>l = Su</mark>	m(45) ₁₁₂ =	-	1 <mark>3</mark> 53.14	(45)
(46)m-	21.04	18.41	18 99	16 56	15.89	13 71	127	14 58	14.75	17 10	18 77	20.38		(46)
Water	storage	loss:	10.00	10.00	10.00	10.71	12.1	14.00	14.75	17.15	10.77	20.00		()
Storage	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	and no ta	nk in dw	velling, e	nter 110) litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
Tempe	rature f	actor fro	m Table	2b		,	, , , , , , , , , , , , , , , , , , ,					0		(49)
Energy	v lost fro	m water	⁻ storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	anufact	urer's de	eclared o	cylinder l	oss fact	or is not	known:							
Hot wa	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02		(51)
Volume	e factor	from Ta	ble 2a	011 4.3							1	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(52)
Energy	lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)	,							1.	03	1	(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	1	(56)
If cylinde	er 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	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	1	(57)

Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0]	(58)
Primar	y circuit	loss cal	lculated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	tactor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	a cylinde T	r thermo	stat)		1	(70)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26]	(59)
Combi	loss ca	culated	for each	month	(61)m =	(60) ÷ 36	65 × (41)m					_	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.57	172.63	181.89	163.88	161.2	144.89	139.97	152.47	151.84	169.89	178.61	191.14		(62)
Solar DI	-IW input of	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 (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output	t from w	ater hea	iter	-	-		-			-		-	•	
(64)m=	195.57	172.63	181.89	163.88	161.2	144.89	139.97	152.47	151.84	169.89	178.61	191.14		
								Outp	out from wa	ater heate	r (annual)₁	12	2003.98	(64)
Heat g	ains froi	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	1]	
(65)m=	90.87	80.74	86.32	79.5	79.44	73.19	72.38	76.54	75.5	82.33	84.4	89.4]	(65)
in <mark>clu</mark>	ıde (57)ı	m in calo	culation	of (65)m	only if c	vlinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	heating	
5. In	ternai da	ains (see	Table 5	5 and 5 a):						_			
Motab		e (Toble	5) Mot	te										
Metab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m=	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06	109.06		(66)
Lightin	a dains	(calcula	ted in A	opendix	L equat	ion 19 o	rl9a)a	lso see '	Table 5				1	
(67)m=	17.7	15.72	12.78	9.68	7.23	6.11	6.6	8.58	11.51	14.62	17.06	18.19	1	(67)
Annlia		ins (calc	L ulated in			uation L	13 or I 1	l 3a) also		L	<u> </u>		1	
(68)m=	191.13	193.11	188.12	177.48	164.04	151.42	142.99	141	146	156.64	170.07	182.7	1	(68)
Cookir				nnendiv		tion 15	or 152			5			1	. ,
(60)m-	19 yan 15	33.01			L, Equa		33.01), also se 33.01		33.01	33.01	33.01	1	(69)
(03)III=		00.01		[33.91 [55.91	55.91	55.51	55.51	55.51	55.91	55.51	55.91]	(00)
Pumps				$\frac{5a}{1}$	0		0			0	0	0	1	(70)
(70)m=	0	0	, U		<u> </u>		0	0	0	0	0	0]	(70)
Losses	s e.g. ev	aporatic	on (nega	tive valu	es) (Tab	ole 5)							1	(74)
(71)m=	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	-87.25	J	(71)
Water	heating	gains (T	Table 5)		1		i			1		1	1	()
(72)m=	122.14	120.15	116.02	110.41	106.77	101.65	97.29	102.87	104.86	110.66	117.22	120.16	J	(72)
Total i	nternal	gains =			-	(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	im 	•	
(73)m=	386.68	384.7	372.64	353.28	333.77	314.89	302.59	308.17	318.09	337.64	360.07	376.76		(73)
6. So	lar gains	8:												
Solar g	ains are c	alculated	using sola -	r flux from	l'able 6a	and assoc	lated equa	ations to co	onvert to th	e applicat	ole orientat	ion.	o .	
()rient:	ation 4	ACCESS F	actor	Area		Flu	X		α		E F		Gains	

Southw	esto ov	0.77		v	2.40	٦ .		95 75	1	0.45		0.7		65 1 <i>1</i>	7(79)
Southw	esto ov	0.77		^ v	2.40	」^ 1、		106.25]	0.45	٦Û	0.7	=	90.72	$\frac{(70)}{(70)}$
Southw	vesto ov	0.77		`	2.40	」^ 1、		110.23]	0.45	╡Ĵ	0.7	= -	00.72	(73)
Southw	vesto ov	0.77		^	2.40	」^ 1、		119.01]	0.45	╡Ĵ	0.7	=	90.41	$\frac{(73)}{(79)}$
Southw	vesto ov	0.77		^	2.40	」 ^ 1 ↓		112.01]	0.45		0.7	=	09.70	$ \begin{bmatrix} (73) \\ (79) \end{bmatrix} $
Southw	vesto ov	0.77		^	3.40	」^ 1↓		113.91]	0.45	╡Ĵ	0.7	=	70.0	-(70)
Southw	vesto ov	0.77		^	3.40	」^ 1 ↓		104.39]	0.45	╡Ĵ	0.7	=	79.3	-(70)
Southw	lesto ov	0.77		^	3.40	」^ 1.		92.85]	0.45	╡Û	0.7		70.54	= (73)
Southw		0.77		× 	3.48	」^ 1.		69.27]	0.45	╡ Û	0.7		52.62	(79)
Southw		0.77		× 	3.48	」^ 1.		44.07] T	0.45	╡ Û	0.7		33.48	(79)
Northw		0.77		x	3.48	」 × 1		31.49		0.45		0.7	=	23.92	
Northw		0.77		x	4.41	」× 1		11.28		0.45	×	0.7	=	10.86	(81)
Northwo	est 0.9x	0.77		x	3.15	×		11.28		0.45	×	0.7	=	7.76	(81)
Northwo	est 0.9x	0.77		x	4.41	X		22.97	X	0.45	×	0.7	=	22.11	(81)
Northwo	est <mark>0.9x</mark>	0.77		x	3.15	×		22.97	×	0.45	×	0.7	=	15.79	(81)
Northwo	est <mark>0.9x</mark>	0.77		x	4.41	X		41.38	×	0.45	×	0.7	=	39.83	(81)
Northw	est <mark>0.9x</mark>	0.77		x	3.15	×		41.38	x	0.45	x	0.7	=	28.45	(81)
Northw	est <mark>0.9x</mark>	0.77		x	4.41	×		67.96	x	0.45	x	0.7	=	65.42	(81)
Northwe	est 0.9x	0.77		x	3.15	X		67.96	x	0.45	x	0.7		46.73	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41	X		91.35] x	0.45	x	0.7	=	87.94	(81)
Northwe	est 0.9x	0.77		x	3.15	x		91.35] ×	0.45	x	0.7	=	62.81	(81)
Northwe	est <mark>0.9x</mark>	0.7 <mark>7</mark>		x	4.41] x		97.38] ×	0.45	x	0.7	=	93.75	(81)
Northwe	est <mark>0.9x</mark>	0. <mark>77</mark>		x	3.15	x		97.38	x	0.45	x	0.7	=	<mark>6</mark> 6.96	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41] x		91.1	×	0.45	x	0.7	=	87.7	(81)
Northwe	est 0.9x	0.77		x	3.15	x		91.1	x	0.45	x	0.7	=	62.64	(81)
Northw	est <mark>0.9x</mark>	0.77		x	4.41	x		72.63	x	0.45	x	0.7	=	69.92	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	3.15	X		72.63	x	0.45	x	0.7	=	49.94	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41] ×		50.42	x	0.45	x	0.7	=	48.54	(81)
Northw	est <mark>0.9x</mark>	0.77		x	3.15] ×		50.42	x	0.45	x	0.7	=	34.67	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	4.41	j x		28.07	x	0.45	x	0.7	=	27.02	(81)
Northw	est <mark>0.9x</mark>	0.77		x	3.15	j ×		28.07] x	0.45	×	0.7	= =	19.3	(81)
Northw	est <mark>0.9x</mark>	0.77		x	4.41	j ×		14.2] x	0.45	×	0.7		13.67	(81)
Northw	est <mark>0.9x</mark>	0.77		x	3.15	j x		14.2] x	0.45	×	0.7	=	9.76	(81)
Northw	est <mark>0.9x</mark>	0.77		x	4.41] ×		9.21] x	0.45	×	0.7	=	8.87	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	3.15	, 1 x		9.21] x [0.45	×	0.7		6.34	(81)
	I					1	L		J]		
Solar o	ains in	watts, cal	culate	ed	for each mon	th			(83)m	n = Sum(74)m .	(82)m				
(83)m=	46.57	85.51	133.43	3	192.86 241.1	6	250.47	236.88	199	.16 153.75	98.94	56.91	39.13		(83)
Total g	jains –	internal an	nd sol	ar	(84)m = (73)r	n +	(83)n	n, watts		· · · ·		•			
(84)m=	433.25	470.21	506.07	7	546.15 574.9	3	565.36	539.47	507	.33 471.83	436.58	3 416.98	415.88		(84)
7. M <u>e</u>	an inte	rnal tempe	eratur	e (heating seaso	on)									
Temp	erature	e during he	eating	ре	eriods in the li	ving	g area	from Tal	ble 9,	, Th1 (°C)				21	(85)
Utilisa	ation fa	ctor for gai	ins fo	r li	ving area, h1,	,m (see T	able 9a)							

Jul

Aug

Jun

Oct

Sep

Nov

Dec

Apr

May

Mar

Feb

Jan

(86)m=	0.94	0.91	0.86	0.76	0.6	0.43	0.32	0.35	0.55	0.79	0.9	0.94	I	(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	20.06	20.23	20.47	20.76	20.92	20.98	21	21	20.96	20.76	20.39	20.04		(87)
Temp	erature	durina h	eating p	eriods ir	n rest of	dwellina	from Ta	able 9. Tl	h2 (°C)					
(88)m=	20.41	20.42	20.42	20.43	20.44	20.45	20.45	20.45	20.44	20.44	20.43	20.42	I	(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)	-	-				
(89)m=	0.93	0.9	0.85	0.73	0.57	0.4	0.28	0.31	0.51	0.76	0.89	0.94	l	(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.14	19.38	19.73	20.13	20.34	20.43	20.45	20.45	20.4	20.14	19.63	19.12		(90)
						-	-	-	1	iLA = Livin	g area ÷ (4	ł) =	0.42	(91)
Mean	interna	l temper	ature (fc	or the wh	ole dwe	llina) = fl	LA x T1	+ (1 – fL	A) × T2					
(92)m=	19.53	19.73	20.04	20.39	20.58	20.66	20.68	20.68	20.63	20.4	19.95	19.51		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.53	19.73	20.04	20.39	20.58	20.66	20.68	20.68	20.63	20.4	19.95	19.51	l	(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the I	mean int	ernal ter	mperatur	re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a					-				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										(0.4)
(94)m=	0.92	0.89	0.84	0.73	0.58	0.41	0.29	0.33	0.53	0.76	0.88	0.93		(94)
Usetu	i gains,	nmGm	, vv = (9)	4)m x (84	4)m	000.0	459.50	405.00	0.47.00	224 52	007.40	205.22		(05)
(95)m=	398.01	419.09	424.2	399.78	335.18	233.3	158.59	165.22	247.96	331.53	367.18	385.32		(95)
	ily avera	age exte					16.6	16.4	14.1	10.6	71	4.2		(96)
	4.5	4.9	o.o				-[(20)m	v [(02)m	(06)m	1	7.1	4.2		(00)
(97)m-	633 43	614 19	558 04	462 38	355 75	236.93	159.26	166 25	- (90)111 257.85	302 35	519.45	624.85	1	(97)
Space	hoatin		ament fo		$rac{1}{2}$		1 - 0.02	100.20	m = (95)	m x (4)	1)m	024.00		(0.)
(98)m=	175.16	131.11	99.58	45.07	15.3		11 = 0.02	$- + \times [(37)]$		45.25	109.63	178.21	1	
· /						I	I	Tota	l per year	(kWh/year) = Sum(9	B) _{15,912} =	799.31	(98)
Space	e heatin	a require	ement in	kWh/m²	?/vear								11.86	(99)
	Jinoaan	groquire			heating								11.00	
90. En	ergy rec		ns - Cor	nmunity	neating	scheme			ided by					
Fractio	n of spa	ace heat	from se	condary/	supplen/supple	nentary l	heating ((Table 1	10ed by 1) '0' if n	one	unity Scr	ieme.	0	(301)
Fractio	n of spa	ace heat	from co	mmunity	' system	1 – (30 ⁻	1) =						1	(302)
The com	munity so	heme ma	y obtain he	eat from se	everal sou	rces. The p	orocedure	allows for	CHP and i	up to four o	other heat	l sources; tl	he latter	
includes	boilers, h	eat pumps	, s, geotheri	mal and wa	aste heat f	rom powe	r stations.	See Appei	ndix C.					
Fractio	n of hea	at from C	Commun	ity heat	pump								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump	C			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distribu	ution los	s factor	(Table 1	I2c) for c	commun	ity heatii	ng syste	m					1.2	(306)
Space	heating	9										-	kWh/ye	ar
Annual	space	heating	requiren	nent									799.31	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	959.17	(307a)
Efficiency of secondary/supplementary heating system in % (from	n Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2003.98]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2404.78	-](310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	33.64	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	utside		128.46	- (330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	128.46	(331)
Energy for lighting (calculated in Appendix L)			312.51	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3)</mark>
Tota <mark>l deliv</mark> ered energy for all u <mark>ses (</mark> 307) + (309) + (310) + (312) +	(315) + (331) + (33	32)(237b) =	3074.85	(338)
12b. CO2 Emissions – Community heating scheme				
CO2 from other sources of space and water heating (not CHP)	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	_
Efficiency of heat source 1 (%)	wo fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.52	839.37	(367)
Electrical energy for heat distribution [(3	313) x	0.52	17.46	(372)
Total CO2 associated with community systems (3)	63)(366) + (368)(372	2) =	856.83	(373)
CO2 associated with space heating (secondary) (3)	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneo	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (3)	73) + (374) + (375) =		856.83	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	66.67	(378)
CO2 associated with electricity for lighting (3)	32))) x	0.52	= 162.19	(379)
Energy saving/generation technologies (333) to (334) as applicab Item 1		0.52 x 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			706.79	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			10.49	(384)
El rating (section 14)			91.57	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49	
	Q Dia di Q Liam Q	P	roperty /	Address:	Block S	5 - Top F	loor			
Address :	S, Block S, Ham C	lose, Lon	don, IVV	10						
Ground floor	SIONS.		Area 5	a(m²) 0.12	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 125.3](3a)
Total floor area TFA = (1a)	+(1b)+(1c)+(1d)+(1	e)+(1r	n) 5	0.12	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	125.3	(5)
2. Ventilation rate:				_						
Number of chimneys Number of open flues	$ \begin{array}{c} \text{main} \\ \text{heating} \\ \hline 0 \\ \hline 0 \\ \end{array} + \begin{bmatrix} 0 \\ \hline 0 \\ \end{array} $	secondar heating 0 0	y] + [] + [0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	S					0	X .	10 =	0	(7a)
Number of passive vents						0	x '	10 =	0	(7b)
Number of flueless gas fire	es				Ē	0	X 4	40 =	0	(7c)
Infiltration due to chimneys	langes per not	rر ارھ								
If a pressurisation test has be Number of storeys in the Additional infiltration Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	en carried out or is intende e dwelling (ns) 25 for steel or timber sent, use the value corre (s); if equal user 0.35	frame or	d to (17), o 0.35 for the greate	otherwise c masonr er wall area	continue fro ry constr a (after	om (9) to (uction	(16) [(9)	-1]x0.1 =	0	(9) (10) (11)
If suspended wooden flo	oor, enter 0.2 (unsea	aled) or 0.	.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) ·	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, q	50, expressed in cu	bic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)
Air permeability value applies	y value, then $(10) = [($	$(7) \div 20]+(6)$	b), otherwis	se(10) = (rmeehility	is hoing u	sod		0.2	(18)
Number of sides sheltered	n a pressunsation test ne	as been don	ie ol a deg	nee an per	Ποαριπτγ	is being u	360		Δ	(19)
Shelter factor				(20) = 1 - [[0.075 x (1	9)] =			0.7	(20)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)) x (20) =				0.14	(21)
Infiltration rate modified for	monthly wind spee	d								-
Jan Feb M	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)	m ÷ 4								-	
(22a)m= 1.27 1.25 1.	23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m	_	-	-	-	
. .	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul If m	late effec	ctive air	change	rate for t	the appli	cable ca	se						0.5	(220)
lfext	naust air h	eat numn	using App	endix N (2	23b) = (23a	a) x Fmv (e	equation (N	(5)) othe	wise (23h) = (23a)			0.5	(23a)
lf bal	anced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (from	n Table 4h) =) (200)			0.5	(230)
a) If	halance	d mech	anical ve	ntilation	with he	at recove	arv (M\\/F	HR) (24a	()m - (2)	2h)m + ('	23h) 🗸 [1	I – (23c)	10.0 $\div 1001$	(230)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	balance	d mech	I anical ve	Intilation	without	L heat rec	overv (N	L /\\/) (24b	m = (22)	L 2b)m + (;	L 23b)		1	
(24b)m=	0	0		0	0	0		0	0	0	0	0]	(24b)
c) If	whole h	use ex	I tract ver	tilation o	r positiv	l ve input v	/entilatic	n from c	outside				1	
-,	if (22b)n	n < 0.5 >	< (23b), t	hen (24	c) = (23b); otherv	vise (24	c) = (22b	o) m + 0.	5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	/e input	ventilatio	on from I	oft			•	-	
	if (22b)n	n = 1, th	en (24d)	m = (22	b)m othe	erwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]		r	1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a	ı) or (24b	o) or (240	c) or (24	d) in bo>	(25)				1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	eat l <mark>osse</mark>	s and he	eat loss	oaramet	er:									
ELEN		Gros area	ss (m²)	Openin m	igs 1 ²	Net Ar A ,r	ea n²	U-valı W/m2	le K	A X U (W/ł	<)	k-value kJ/m²·	e K	A X k kJ/K
Doors						1.91	x	1] = [1.91				(26)
Windo	ws Type	e 1				2.43	x1/	/[1/(1.2)+	0.04] =	2.78	Fi i			(27)
Windo	ws Type	2				5.88	x1/	/[1/(1.2)+	0.04] =	6.73	Fi i			(27)
Windo	ws Type	93				2.43	x1/	/[1/(1.2)+	0.04] =	2.78	5			(27)
Walls	Type1	37.6	65	10.7	4	26.91	x	0.16		4.31				(29)
Walls	Type2	4.7	,	1.91		2.79	×	0.15		0.42	= F		\dashv	(29)
Roof		50.1	12	0		50.12	2 X	0.1		5.01	\dashv		\dashv	(30)
Total a	area of e	lements	, m²	L]	92.47	,		เ		L			(31)
Party	wall					33.88	x	0	= [0				(32)
Partv	floor					50.12	,		L				\dashv	(32a)
* for wir	ndows and	roof wind	ows, use e	effective wi	indow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	L Is given in	paragraph	L h 3.2	
** inclue	de the area	as on both	sides of ir	nternal wal	lls and part	titions								
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				23.94	(33)
Heat o	capacity	Cm = S	(A x k)						((28)	(30) + (32	2) + (32a).	(32e) =	4247.5	55 <mark>(34</mark>)
Therm	al mass	parame	eter (TMI	P = Cm -	÷ TFA) ir	∩ kJ/m²K			Indica	tive Value:	: Low		100	(35)
For des can be	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	e constructi	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						13.07	, (36)
if details	s of therma	al bridging	are not kr	own (36) =	= 0.05 x (3	1)				(2.2)				
I otal f	abric he	at loss	-1	L					(33) +	(36) =	05) (7)		37.01	(37)
ventila	ation hea	at loss ca	alculated	n monthly	y I na			•	(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	

(38)m=	12.24	12.09	11.95	11.23	11.08	10.36	10.36	10.21	10.65	11.08	11.37	11.66		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3				
(39)m=	49.25	49.11	48.96	48.24	48.1	47.37	47.37	47.23	47.66	48.1	48.38	48.67		
Heat lo	oss para	imeter (H	HLP), W	/m²K					(40)m	Average = = (39)m ÷	Sum(39)1. (4)	12 /12=	48.2	(39)
(40)m=	0.98	0.98	0.98	0.96	0.96	0.95	0.95	0.94	0.95	0.96	0.97	0.97		
Numbe	er of day	/s in mo	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	0.96	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assum if TF	ed occu A > 13.9 A £ 13.9	upancy, 9, N = 1 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	⁻ A -13.9)2)] + 0.()013 x (TFA -13.	1. 9)	69		(42)
Annual	averag	je hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		74	.42		(43)
Reduce	the annua that 125	al average litres per	hot water	usage by a	5% if the a	lwelling is hot and co	designed i Id)	to achieve	a water us	se target o	f			
normore		Leb	Mar		Max	luna		A	Can	Oct	Neu			
Hot wate	Jan er usage i	n litres per	viar day for ea	Apr ach month	Vd,m = fa	ctor from 1	JUI Table 1c x	Aug (43)	Sep	Oct	INOV	Dec		
(44)m=	81.87	78.89	75.91	72,94	69.96	66.98	66.98	69.96	72.94	75.91	78.89	81.87		
(,		10.00	10.01	12.01	00.00	00.00		00.00		Total = Su	m(44) ₁₁₂ =		893.09	(44)
Energy o	content of	[:] hot water	used - cal	lculated mo	onthly = 4.	190 x Vd,r	m x nm x E	0Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	bles 1b, 1	c, 1d)		
(45)m=	121.41	106.18	109.57	95.53	91.66	79.1	73.29	84.1	85.11	99.19	108.27	117.57		
lf instant	aneous w	vator hoati	na at noint	t of use (no	hot water	r storage)	enter () in	hoves (46) to (61)	Tota <mark>l = S</mark> u	m(45) ₁₁₂ =	=	1170.98	(45)
(46)	10.01	45.00		14.22	40.75	14.9C	40.00	10,60	10 (07)	14.00	16.04	17.64		(46)
Water	storage	loss:	10.44	14.55	13.75	11.00	10.99	12.02	12.77	14.00	10.24	17.04		(40)
Storage	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	neating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherw	ise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
a) If m	storage	ioss: urer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
Tempe	rature f	actor fro	m Table	2b			"day).					0		(49)
Enerav	lost fro	m water	storage	_~ . kWh/ve	ear			(48) x (49)) =		1	10		(50)
b) If m	anufact	urer's de	eclared of	cylinder l	loss fact	or is not	known:				· · ·			()
Hot wa	ter stor	age loss	factor fr	rom Tabl	le 2 (kW	h/litre/da	ay)				0.	02		(51)
Volume	nunity r e factor	from Ta	ble 2a	on 4.3							1	02		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(52)
Eneray	v lost fro	m water	· storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)	, ,							1.	03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nual) fro	om Table	93							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month (61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	176.68	156.11	164.85	149.02	146.94	132.59	128.57	139.38	138.6	154.46	161.76	172.85		(62)
Solar DH	-IW input of	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix C	G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	176.68	156.11	164.85	149.02	146.94	132.59	128.57	139.38	138.6	154.46	161.76	172.85		_
							-	Outp	out from wa	ater heate	r (annual)₁	12	1821.82	(64)
Heat g	ains froi	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	x (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m]	
(65)m=	84.59	75.25	80.65	74.56	74.7	69.09	68.59	72.19	71.09	77.2	78.79	83.31		(65)
in <mark>clu</mark>	ıde (57)ı	m in calo	culation	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	Table 5	and 5a):									
Metabo	olic gain	s (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	<mark>8</mark> 4.68	84.68	84.68	84. <mark>68</mark>	84.68	84.68	84.68	84.68	84.68	84.68	84.68	84.68		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equati	ion L9 oi	r L9a), a	lso see ⁻	Table 5					
(67)m=	13.17	11.7	9.52	7.2	5.38	4.55	4.91	6.39	8.57	10.88	12.7	13.54		(67)
Applia	nces gai	ins (calc	ulated ir	Append	lix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m=	147.55	149.08	145.22	137	126.64	116.89	110.38	108.85	112.71	120.92	131.29	141.04		(68)
Cookir	ng gains	(calcula	ted in A	opendix	L, equat	ion L15	or L15a), also se	e Table	5				
(69)m=	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47	31.47		(69)
Pumps	and far	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-67.75	-67.75	-67.75	-67.75	-67.75	-67.75	-67.75	-67.75	-67.75	-67.75	-67.75	-67.75		(71)
Water	heating	gains (T	able 5)											
(72)m=	113.69	111.98	108.41	103.55	100.4	95.96	92.19	97.02	98.74	103.76	109.44	111.98		(72)
Total i	nternal	aains =				(66)	ı m + (67)m	n + (68)m +	L + (69)m + (<u>.</u> (70)m + (7	1)m + (72)	m	1	
(73)m=	322.82	321.16	311.54	296.16	280.83	265.81	255.89	260.66	268.42	283.97	301.83	314.96		(73)
6. So	lar gains	8:												
Solar g	ains are o	alculated	using sola	r flux from	Table 6a a	and assoc	iated equa	tions to co	onvert to th	e applicat	le orientat	ion.		

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.43	×	11.28	x	0.45	x	0.7	=	5.99	(75)
Northeast 0.9x	0.77	x	2.43	×	22.97	x	0.45	x	0.7] =	12.18	(75)

Northeast 0.9x	0.77	×	2.43	×	41.38	x	0.45	×	0.7	=	21.95	(75)
Northeast 0.9x	0.77	×	2.43	Ī×	67.96	x	0.45	x	0.7	=	36.05	(75)
Northeast 0.9x	0.77	x	2.43] ×	91.35	x	0.45	x	0.7	=	48.46	(75)
Northeast 0.9x	0.77	x	2.43] ×	97.38	x	0.45	x	0.7	=	51.66	(75)
Northeast 0.9x	0.77	x	2.43] ×	91.1	x	0.45	x	0.7	=	48.33	(75)
Northeast 0.9x	0.77	x	2.43] ×	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	×	2.43] ×	50.42	x	0.45	x	0.7	=	26.75	(75)
Northeast 0.9x	0.77	x	2.43	×	28.07	x	0.45	x	0.7	=	14.89	(75)
Northeast 0.9x	0.77	x	2.43	×	14.2	x	0.45	x	0.7	=	7.53	(75)
Northeast 0.9x	0.77	x	2.43	×	9.21	x	0.45	x	0.7	=	4.89	(75)
Northwest 0.9x	0.77	x	2.43	×	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	5.88	×	11.28	x	0.45	×	0.7	=	14.48	(81)
Northwest 0.9x	0.77	×	2.43	×	22.97	x	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	×	5.88	×	22.97	x	0.45	x	0.7	=	29.48	(81)
Northwest 0.9x	0.77	x	2.43	×	41.38	x	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	×	5.88	×	41.38	x	0.45	x	0.7	=	53.11	(81)
Northwest 0.9x	0.77	x	2.43	×	67.96	x	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	5.88	X	67.96	х	0.45	х	0.7	=	87.23	(81)
Northwest 0.9x	0.77	×	2.43	X	91.35	x	0.45	x	0.7	=	48.46	(81)
Northwest 0.9x	0.77	x	5.88	x	91.35	×	0.45	x	0.7	=	117.25	(81)
Northwest 0.9x	0.7 <mark>7</mark>	x	2.43	x	97.38	x	0.45	x	0.7	=	5 <mark>1.66</mark>	(81)
Northwest 0.9x	0.77	x	5.88	×	97.3 <mark>8</mark>	x	0.45	x	0.7	=	125	(81)
Northwest 0.9x	0.77	x	2.43] x	91.1	x	0.45	x	0.7	=	48.33	(81)
Northwest 0.9x	0.77	x	5.88	×	91.1	x	0.45	x	0.7	=	116.94	(81)
Northwest 0.9x	0.77	x	2.43	×	72.63	x	0.45	x	0.7	=	38.53	(81)
Northwest 0.9x	0.77	x	5.88	×	72.63	x	0.45	x	0.7	=	93.22	(81)
Northwest 0.9x	0.77	x	2.43	×	50.42	x	0.45	x	0.7	=	26.75	(81)
Northwest 0.9x	0.77	x	5.88	×	50.42	x	0.45	x	0.7	=	64.72	(81)
Northwest 0.9x	0.77	x	2.43	×	28.07	x	0.45	x	0.7	=	14.89	(81)
Northwest 0.9x	0.77	x	5.88	×	28.07	x	0.45	x	0.7	=	36.03	(81)
Northwest 0.9x	0.77	x	2.43	×	14.2	x	0.45	x	0.7	=	7.53	(81)
Northwest 0.9x	0.77	x	5.88	×	14.2	x	0.45	x	0.7	=	18.22	(81)
Northwest 0.9x	0.77	×	2.43	×	9.21	x	0.45	x	0.7	=	4.89	(81)
Northwest 0.9x	0.77	x	5.88	x	9.21	x	0.45	×	0.7	=	11.83	(81)
Solar gains in	watte calcul	bate	for each mon	th		(83)m	a = Sum(74)m	(82)m				
(83)m= 26.45	53.85 97.	01	159.32 214.1	6 2	28.32 213.59	170	.27 118.21	65.8	33.28	21.6		(83)
Total gains – i	nternal and s	olar	(84)m = (73)r	n + (83)m , watts				1 1		ł	
(84)m= 349.27	375 408	.56	455.49 494.9	9 4	94.12 469.48	430	.94 386.64	349.7	8 335.12	336.56		(84)
7. Mean inter	nal temperat	u <u>re (</u>	heating sease	on)	•		• •		• •			
Temperature	during heatir	ng pe	eriods in the li	ving	area from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisation fac	tor for gains	for li	ving area. h1	.m (s	ee Table 9a)		. ,				<u> </u>	

 is a local for game for himing a local many coordinate out														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(86)m=	0.95	0.94	0.9	0.83	0.71	0.55	0.42	0.47	0.68	0.86	0.93	0.95		(86)
---------------------	-----------------	------------------------	-----------------------	---------------------------------	---------------------	-------------	-------------	------------	-------------	--------------	-------------	-------------	---------------	--------
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)					
(87)m=	19.14	19.33	19.71	20.21	20.63	20.88	20.96	20.94	20.75	20.24	19.63	19.11		(87)
Temp	erature	during h	neating p	beriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	20.1	20.1	20.1	20.11	20.12	20.13	20.13	20.13	20.12	20.12	20.11	20.11		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.94	0.93	0.89	0.81	0.67	0.49	0.35	0.39	0.63	0.84	0.92	0.95		(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=	17.61	17.89	18.42	19.14	19.7	20.01	20.1	20.09	19.87	19.19	18.32	17.57		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.42	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	18.25	18.49	18.96	19.59	20.09	20.37	20.46	20.45	20.24	19.63	18.86	18.22		(92)
Apply	adjustn	nent to tl	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.25	18.49	18.96	19.59	20.09	20.37	20.46	20.45	20.24	19.63	18.86	18.22		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the r	nean int	ernal ter	mperatui	re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	llisation	Tactor IC	or gains		ible 9a	l	1.1	A	Can	Oct	Novi	Dee		
Litilies	Jan tion fac	tor for a	ains hr	Apr	iviay	Jun	Jui	Aug	Sep	Oct	INOV	Dec		
(94)m=	0.92	0.91	0.87	0.79	0.67	0.51	0.37	0.42	0.64	0.82	0.9	0.93		(94)
Usefu	l gains.	hmGm	. W = (9	4)m x (84	4)m									
(95)m=	322.98	340.27	355.07	359.56	329.19	250.06	175.77	181.12	245.74	286.74	301.53	313.22		(95)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	687.09	667.46	610.02	515.68	403.36	273.53	182.78	191.04	292.71	434.29	569.2	682.23		(97)
Space	e heatin	g require	ement fo	r each n	honth, k	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4′	1)m		1	
(98)m=	270.9	219.87	189.69	112.41	55.18	0	0	0	0	109.77	192.72	274.54		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	1425.08	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								28.43	(99)
9b. En	ergy rec	luiremer	nts – Coi	mmunity	heating	scheme)							
This pa	art is use	ed for sp	ace hea	ting, spa	ace cool	ing or wa	ater heat	ting prov	ided by	a comm	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary/	/supplen	nentary l	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sou	rces. The p	procedure	allows for	CHP and u	up to four o	other heat	sources; ti	he latter	
includes Fractio	boilers, h	eat pumps at from C	s, geotheri Commun	<i>nal and wa</i> ity heat i	aste heat f numn	rom powei	r stations.	See Appei	ndix C.				1	(303a)
Fractio	n of tota		beat fro		ounity be	aat numr	h			(3)	02) v (303	a) —	1	(304a)
Factor	for cont	rol and	charaina		(Table	4c(2)) fo	r commi	unity hos	ting eve	tom	02) X (303	a) –		(3044)
Dietrib		s factor	(Table 1			ity beating		m	ung sys				1	
			(I able	120/1010	Jonnun	ity neath	ng syste	111					1.2	(300)
	neating) heating	roquiren	ant									kWh/ye	ar
Annual	space	reating	equiren	ient									1425.08	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1710.1	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary syster	n (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1821.82	1
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2186.18](310a)
Electricity used for heat distribution	0.01 × [(307a)…(307	e) + (310a)(310e)] =	38.96	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from ou	utside		95.54	- (330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	95.54	(331)
Energy for lighting (calculated in Appendix L)	_		232.64	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3)</mark>
Tota <mark>l delivered energy for</mark> all u <mark>ses (</mark> 307) + (309) + (310) + (312) +	(315) + (331) + (33	32)(237b) =	3 <mark>494.3</mark> 9	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emiss <mark>ions</mark> kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	wo fuels repeat (363) to	(366) for the second fue	el 208](367a)
CO2 associated with heat source 1 [(307b)+(37	10b)] x 100 ÷ (367b) x	0.52	972.2	(367)
Electrical energy for heat distribution [(3	13) x	0.52	20.22	(372)
Total CO2 associated with community systems (36	63)(366) + (368)(372	2) =	992.42	(373)
CO2 associated with space heating (secondary) (30)9) x	0 =	= 0	(374)
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (37	73) + (374) + (375) =		992.42	(376)
CO2 associated with electricity for pumps and fans within dwelling	j (331)) x	0.52	49.59	(378)
CO2 associated with electricity for lighting (33	32))) x	0.52	= 120.74	(379)
Energy saving/generation technologies (333) to (334) as applicab Item 1	le	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			783.84	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			15.64	(384)
El rating (section 14)			88.96	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 201	2		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49	
A daha a a		Pi Piana Lana	roperty A	Address:	Block I	- Grour	nd Floor			
Address : 1 Overall dwelling dimer	I, BIOCK I, Ham Ci	ose, Lond	JON, TVV	10						
Ground floor			Area	a(m²) 7.51	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 218.78	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n	I) 8 [.]	7.51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	218.78	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	$ \begin{array}{ccc} \text{main} & \text{s} \\ \text{heating} & \text{H} \\ \hline 0 & + \end{array} $	econdar neating 0 0	y +] +] +	0 0] = [total 0 0	x 4	40 = 20 =	m³ per hour 0 0	(6a) (6b)
Number of intermittent fan	S					0	X .	10 =	0	(7a)
Number of passive vents						0	x	10 =	0	(7b)
Number of flueless gas fire	es				Ē	0	X 4	40 = Air ch	0	(7c)
Infiltration due to chimney If a pressurisation test has be	s, flues and fans = (f en carried out or is intend	a)+(6b)+(7 ed, proceed	a)+(7b)+(7 d to (17), c	7c) = otherwise c	continue fre	0 om (9) to ((16)	÷ (5) =		(8)
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dw <mark>elling</mark> (ns) 25 for steel or timber	frame or	0.35 for	masonr	ry constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)
if both types of wall are pre deducting areas of opening If suspended wooden flo	sent, use the value corres gs); if equal user 0.35 Dor, enter 0.2 (unsea	sponding to led) or 0.	the greate	er wall area ed), else	a (after enter 0				0	⊐](12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	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, c	50, expressed in cut	oic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)
If based on air permeabilit	y value, then (18) = [(1	17) ÷ 20]+(8	3), otherwis	se (18) = (16)				0.2	(18)
Air permeability value applies	if a pressurisation test ha	s been don	e or a deg	ree air pei	rmeability	is being u	sed			
Shelter factor	,			(20) = 1 - [[0.075 x (1	9)] =			0.7	(19)
Infiltration rate incorporation	ng shelter factor			(21) = (18)) x (20) =				0.14](21)
Infiltration rate modified fo	r monthly wind speed	b								
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4						-	-		
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16]	
Calcula	ate effe	ctive air	change	rate for t	he appli	cable ca	se				-		-	(220)
lf exh	aust air h	eat numn	using App	endix N (2	3b) = (23a	i) x Fmv (e	equation (N	(5)) othe	rwise (23b) = (23a)			0.5	(238)
lf bala	anced with	n heat reco	overv: effic	ciency in %	allowing f	or in-use fa	actor (from	n Table 4h) =	() = (20u)			0.5	(230)
a) If	halance	nd mech	anical v	antilation	with he	at recove	arv (M/\/F	-IR) (2/2	$\frac{7}{2}m - (2)$	2h)m + ('	23h) v [[,]	1 _ (23c)	10.5	(230)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	balance	d mech	anical ve	entilation	without	heat rec	overv (N	///) (24h	1_{0})m = (22)	2b)m + (;	23b)		1	
(24b)m=	0	0		0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	I Iouse ex	I tract ver	L ntilation of	or positiv	re input v	ventilatio	n from o	L outside				1	
i i	f (22b)r	n < 0.5 >	< (23b), t	then (24	c) = (23b); otherv	vise (24	c) = (22k	o) m + 0.	.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural	ventilati	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	loft				-	
i	f (22b)r	n = 1, th	en (24d)	m = (22k)	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]	r	r	1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - ei	nter (24a) or (24t	o) or (24	c) or (24	d) in box	x (25)	1	1	i	1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28	J	(25)
3. Hea	at l <mark>osse</mark>	s and he	eat loss	paramete	er:									
ELEN	IE <mark>NT</mark>	Gros	SS (m ²)	Openin	gs	Net Ar	ea	U-val	ue	AXU		k-value	e e	A X k
Doors		alea	(111-)	11		A ,I		1		1.01		KJ/11-•1	r.	(26)
Window		<u>1</u>				1.91		/[1/(1 2)+	- 0.041	1.91	H			(20)
Window		2				1.44		/[1/(1.2)+	0.041	CO.1	H			(27)
Windo		2				1.44		/[1/(1.2))	0.04]	1.65				(27)
Windo	ws Type	- 1				2.43		/[1/(1.2)+	0.04] =	2.78				(27)
	ws type	; 4 				2.43		/[1/(1.2)+	0.04] =	2.78				(27)
	ws type	5				4.2	X	/[1/(1.2)+	0.04] =	4.81				(27)
vvindo	ws type -	-				2.43	x ¹ .	/[1/(1.2)+	0.04] =	2.78				(27)
Windo	ws Type _	e /				2.43	x1,	/[1/(1.2)+	0.04] =	2.78				(27)
Window	ws Type	8 8				4.2	x1.	/[1/(1.2)+	0.04] =	4.81				(27)
Window	ws Type	9				4.2	x1,	/[1/(1.2)+	0.04] =	4.81				(27)
Floor						87.51	x	0.1	=	8.751				(28)
Walls 7	Гуре1	65.5	55	25.2		40.35	j x	0.16	=	6.46				(29)
Walls 7	Гуре2	53.9	95	1.91		52.04	x	0.15	=	7.83				(29)
Total a	rea of e	elements	s, m²			207.0	1							(31)
Party c	eiling					87.51					[(32b)
* for wind	dows and e the area	l roof wind as on both	ows, use e sides of ii	effective wi nternal wal	ndow U-va Is and part	alue calcul titions	ated using	ı formula 1	/[(1/U-valı	ıe)+0.04] a	ns given in	paragraph	h 3.2	

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	53.8	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	13082.91	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Low	100	(35)
For design appropriate where the details of the construction are not know	n providely the indicative values of TMD in Table 1f		-

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

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	əs : S (L	x Y) cal	culated	using Ap	pendix l	K						15.17	(36)
if details	of therma	al bridging	are not kn	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			68.97	(37)
Ventila	tion hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	21.37	21.12	20.86	19.6	19.35	18.09	18.09	17.83	18.59	19.35	19.85	20.36]	(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	90.34	90.09	89.84	88.57	88.32	87.06	87.06	86.8	87.56	88.32	88.82	89.33		
									1	Average =	Sum(39)1.	12 /12=	88.51	(39)
Heat lo	oss para	meter (H	HLP), W/	/m²K					(40)m	= (39)m ÷	- (4)		1	
(40)m=	1.03	1.03	1.03	1.01	1.01	0.99	0.99	0.99	1	1.01	1.02	1.02		_
Numbe	er of day	/s in moi	nth (Tab	le 1a)					,	Average =	: Sum(40)₁.	12 /12=	1.01	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
				•							•			
4. Wa	ater hea	tina ener	rav reau	irement:								kWh/ve	ear:	
			37 - 1											
Assum		ipancy,	N	(1 ovo	(0.0003	ио _У (тг	- 120		012 v /	TEA 42	2.	59		(42)
if TF	A > 13.3 A £ 13.9	9, $N = 1$ 9, $N = 1$	+ 1.70 X	li - exp	(-0.0003	049 X (11	-A -13.9)2)] + 0.0	013 X (IFA -13.	.9)			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		95	.71		(43)
Reduce	the annua	al average	hot water	usage by	5% if the c	lwelling is	designed :	to achieve	a water us	se target o	of			
not more	e that 125	litres per j	berson pel	r day (all w	ater use, i	not and co								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	105.29	101.46	97.63	93.8	89.97	86.14	86.14	89.97	93.8	97.63	101.46	105.29		
Finance	content of	botwator	used col	la data di ma	anthly 1	100 v Vd -). Tm / 2600	-	Total = Su	1m(44) ₁₁₂ =	=	1148.57	(44)
Energy			useu - cai		571011y = 4.	190 x va,r	11 X 11111 X L	1 3000	KVVN/MON		ables ID, I	<i>c, 10)</i>	1	
(45)m=	156.14	136.56	140.92	122.85	117.88	101.72	94.26	108.17	109.46	127.56	139.24	151.21		
lf instan	taneous v	ater heati	na at point	t of use (no	o hot water	r storage).	enter 0 in	boxes (46) to (61)	Total = Su	Im(45) ₁₁₂ =	•	1505.96	(45)
(46)-	22.42	20.49	21.14	10.42	17.69	15.26	14.14	16.00	16.42	10.12	20.80	22.69	1	(46)
Water	storage	loss:	21.14	10.43	17.00	15.20	14.14	10.22	10.42	19.15	20.89	22.00		(40)
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0]	(47)
If com	munity h	eating a	ind no ta	ank in dw	velling, e	nter 110) litres in	(47)					1	
Otherv	vise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	ər '0' in ((47)			
Water	storage	loss:												
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0]	(48)
Tempe	erature f	actor fro	m Table	2b								0]	(49)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)	=		1	10		(50)
b) If m	nanufact	urer's de	eclared of	cylinder l	oss fact	or is not	known:							
Hot wa	ater stor	age loss	tactor fr	rom Tabl	e 2 (kW	h/litre/da	ay)				0.	02	J	(51)
	nunity f	from To	ee secti ble 20	UN 4.3								00	1	(50)
Tempe	e laciol erature f	actor fro	m Tahle	2b								03 6		(52) (53)
pc												.0	J	(00)

Energy Enter	/ lost fro (50) or (m water (54) in (5	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L'.			(00)
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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 Append	l lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3	-		-	-	-		0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)	i		
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	211.41	186.48	196.19	176.35	173.16	155.22	149.54	163.44	162.95	182.84	192.74	206.49		(62)
Solar DH	-IW input of	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter						-		-			
(64)m=	211.41	186.48	196.19	176.35	173.16	155.22	149.54	163.44	162.95	182.84	192.74	206.49		
								Outp	out from wa	ater heatei	r (annual)₁	12	2156.8	(64)
Hea <mark>t g</mark>	ains fro	m water	heating.	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	9 <mark>6.14</mark>	85.35	91.08	83.64	83.42	76.62	75.56	80.19	79.19	86.64	89.09	94.5		(65)
in <mark>clu</mark>	<mark>ide</mark> (57)i	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e 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=	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5		(66)
Lightin	g gains	(calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	20.9	18.56	15.1	11.43	8.54	7.21	7.79	10.13	13.6	17.26	20.15	21.48		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ble 5				
(68)m=	234.42	236.85	230.72	217.67	201.2	185.72	175.37	172.94	179.07	192.12	208.6	224.08		(68)
Cookin	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5				
(69)m=	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95		(69)
Pumps	and fai	ns gains	(Table :	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6		(71)
Water	heating	gains (T	able 5)											
(72)m=	129.22	127	122.41	116.17	112.12	106.41	101.56	107.78	109.99	116.45	123.74	127.01		(72)
Total i	nternal	gains =		!		(66)	m + (67)m	• • + (68)m +	• ⊦ (69)m + ((70)m + (7	1)m + (72)	m	I	
(73)m=	446.39	444.27	430.08	407.13	383.71	361.19	346.58	352.7	364.51	387.68	414.34	434.42		(73)
6. So	lar gains	5:	1	1	1		1		1	1	1			

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

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.44	x	11.28) x	0.45	x	0.7] =	3.55	(75)
Northeast 0.9x	0.77	x	1.44	x	11.28	x	0.45	x	0.7] =	3.55	(75)
Northeast 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7] =	5.99	
Northeast 0.9x	0.77	x	4.2	x	11.28	x	0.45	x	0.7] =	10.34	(75)
Northeast 0.9x	0.77	x	1.44	x	22.97	x	0.45	x	0.7] =	7.22	(75)
Northeast 0.9x	0.77	x	1.44	x	22.97	x	0.45	x	0.7	=	7.22	(75)
Northeast 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7] =	12.18	(75)
Northeast 0.9x	0.77	x	4.2	x	22.97	x	0.45	x	0.7	=	21.06	(75)
Northeast 0.9x	0.77	x	1.44	x	41.38	x	0.45	x	0.7] =	13.01	(75)
Northeast 0.9x	0.77	x	1.44	x	41.38	x	0.45	x	0.7] =	13.01	(75)
Northeast 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(75)
Northeast 0.9x	0.77	x	4.2	x	41.38	x	0.45	x	0.7] =	37.94	(75)
Northeast 0.9x	0.77	x	1.44	x	67.96	x	0.45	x	0.7] =	21.36	(75)
Northeast 0.9x	0.77	x	1.44	x	67.96	x	0.45	x	0.7] =	21.36	(75)
Northeast 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7] =	36.05	(75)
Northeast 0.9x	0.77	x	4.2	×	67.96	x	0.45	х	0.7] =	62.3	(75)
Northeast 0.9x	0.77	x	1.44	x	91.35	x	0.45	x	0.7] =	28.71	(75)
Northeast 0.9x	0.77	x	1.44	х	91.35] ×	0.45	x	0.7] =	28.71	(75)
Northeast 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7] =	48.46	(75)
Northeast 0.9x	0.77	x	4.2	x	91.3 <mark>5</mark>	x	0.45	x	0.7] =	83.75	(75)
Northeast 0.9x	0.77	x	1.44	x	97.38	×	0.45	x	0.7] =	30.61	(75)
Northeast 0.9x	0.77	x	1.44	x	97.38	x	0.45	x	0.7] =	30.61	(75)
Northeast 0.9x	0.77	x	2.43	x	97.38	x	0.45	x	0.7	=	51.66	(75)
Northeast 0.9x	0.77	x	4.2	x	97.38	x	0.45	x	0.7] =	89.29	(75)
Northeast 0.9x	0.77	x	1.44	x	91.1	x	0.45	x	0.7	=	28.64	(75)
Northeast 0.9x	0.77	x	1.44	x	91.1	x	0.45	x	0.7	=	28.64	(75)
Northeast 0.9x	0.77	x	2.43	x	91.1	x	0.45	x	0.7] =	48.33	(75)
Northeast 0.9x	0.77	x	4.2	x	91.1	x	0.45	x	0.7	=	83.53	(75)
Northeast 0.9x	0.77	x	1.44	x	72.63	x	0.45	x	0.7	=	22.83	(75)
Northeast 0.9x	0.77	x	1.44	x	72.63	x	0.45	x	0.7	=	22.83	(75)
Northeast 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	x	4.2	x	72.63	x	0.45	x	0.7] =	66.59	(75)
Northeast 0.9x	0.77	x	1.44	x	50.42	x	0.45	x	0.7	=	15.85	(75)
Northeast 0.9x	0.77	x	1.44	x	50.42	x	0.45	x	0.7	=	15.85	(75)
Northeast 0.9x	0.77	x	2.43	x	50.42	x	0.45	×	0.7] =	26.75	(75)
Northeast 0.9x	0.77	x	4.2	x	50.42	x	0.45	x	0.7] =	46.23	(75)
Northeast 0.9x	0.77	x	1.44	x	28.07	x	0.45	×	0.7	=	8.82	(75)
Northeast 0.9x	0.77	x	1.44	×	28.07	x	0.45	×	0.7] =	8.82	(75)
Northeast 0.9x	0.77	x	2.43	x	28.07	x	0.45	x	0.7] =	14.89	(75)

Northeast 0.9x	0.77	x	4.2	x	28.07	x	0.45	x	0.7	=	25.73	(75)
Northeast 0.9x	0.77	x	1.44	×	14.2	×	0.45	x	0.7	i =	4.46	(75)
Northeast 0.9x	0.77	x	1.44	x	14.2	×	0.45	x	0.7	i =	4.46	 (75)
Northeast 0.9x	0.77	x	2.43	×	14.2	x	0.45	x	0.7	i =	7.53	– (75)
Northeast 0.9x	0.77	x	4.2	x	14.2	×	0.45	x	0.7	i =	13.02	– (75)
Northeast 0.9x	0.77	x	1.44	×	9.21	×	0.45	x	0.7	i =	2.9	(75)
Northeast 0.9x	0.77	x	1.44	x	9.21	x	0.45	x	0.7	=	2.9	(75)
Northeast 0.9x	0.77	x	2.43	×	9.21	×	0.45	x	0.7	=	4.89	(75)
Northeast 0.9x	0.77	x	4.2	x	9.21	x	0.45	x	0.7] =	8.45	(75)
Southeast 0.9x	0.77	x	2.43	×	36.79	×	0.45	x	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	4.2	x	36.79	x	0.45	x	0.7	=	33.73	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	2.43	×	62.67	x	0.45	x	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	4.2	x	62.67	x	0.45	x	0.7] =	57.46	(77)
Southeast 0.9x	0.77	x	2.43	×	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	2.43	×	62.67	x	0.45	x	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	2.43	X	85.75	х	0.45	х	0.7] =	45.49	(77)
Southeast 0.9x	0.77	x	4.2	x	85.75	x	0.45	x	0.7] =	78.62	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77] x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	х	0.45	x	0.7] =	56.36	(77)
Southeast 0.9x	0.77	x	4.2	x	106.25	x	0.45	x	0.7] =	97.42	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	×	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	x	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	4.2	x	119.01	x	0.45	x	0.7	=	109.11	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	4.2	x	118.15	x	0.45	x	0.7	=	108.32	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	×	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	4.2	x	113.91	x	0.45	x	0.7] =	104.44	(77)
Southeast 0.9x	0.77	x	2.43	×	113.91	×	0.45	x	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	2.43	×	113.91	×	0.45	×	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	2.43	×	104.39	×	0.45	x	0.7] =	55.37	(77)
Southeast 0.9x	0.77	x	4.2	x	104.39	x	0.45	x	0.7	=	95.71	(77)
Southeast 0.9x	0.77	x	2.43	×	104.39	×	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	2.43	×	104.39	×	0.45	x	0.7	=	55.37	(77)

Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	9	2.85	x		0.45	x	0.7	=	49.25	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	4.	2	x	9	2.85] ×		0.45	×	0.7	= =	85.13	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	9	2.85	x		0.45	×	0.7	=	49.25	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	9	2.85	x		0.45	×	0.7	=	49.25	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	6	9.27	x		0.45	×	0.7	=	36.74	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	4.	2	x	6	9.27	x		0.45	×	0.7	=	63.51	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	13	x	6	9.27	Īx		0.45	x	0.7	= =	36.74	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	6	9.27	×		0.45	×	0.7	=	36.74	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	4	4.07	x		0.45	×	0.7	=	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	4.	2	x	4	4.07	x		0.45	x	0.7	=	40.41	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	4	4.07	x		0.45	x	0.7	=	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	4	4.07	x		0.45	x	0.7	=	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x	2.4	3	x	3	1.49	x		0.45	x	0.7	=	16.7	(77)
Southe	ast <mark>0.9x</mark> [0.77	x	4.	2	x	3	1.49	x		0.45	x	0.7	=	28.87	(77)
Southe	ast <mark>0.9x</mark> [0.77	x	2.4	3	x	3	1.49	x		0.45	x	0.7	=	16.7	(77)
Southe	ast <mark>0.9x</mark> [0.77	x	2.4	3	x	3	1.49	x		0.45	x	0.7	=	16.7	(77)
Southw	est <mark>0.9x</mark>	0.77	x	4.	2	x	3	6.79]		0.45	x	0.7	=	33.73	(79)
Southw	est _{0.9x}	0.77	x	4.	2	x	6	2.67]		0.45	x	0.7	=	57.46	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.	2	х	8	5.75]		0.45	×	0.7	=	78.62	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.	2	х	10	06.25] /		0.45	x	0.7	=	97.42	(79)
Southw	est <mark>0.9x</mark>	0.7 <mark>7</mark>	×	4.	2	x	1.	19.01]		0.45	x	0.7	=	109.11	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.	2	x	1.	18.15]		0.45	x	0.7	=	108.32	(79)
Southw	est <mark>0.9x</mark>	0.77	×	4.	2	х	1.	13.91			0.45	x	0.7	=	104.44	(79)
Southw	est _{0.9x}	0.77	x	4.	2	х	1(04.39]		0.45	x	0.7	=	9 <mark>5.71</mark>	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.	2	x	9	2.85]		0.45	x	0.7	=	85.13	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.	2	x	6	9.27]		0.45	x	0.7	=	63.51	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.	2	x	4	4.07]		0.45	×	0.7	=	40.41	(79)
Southw	est <mark>0.9x</mark>	0.77	x	4.	2	x	3	1.49]		0.45	x	0.7	=	28.87	(79)
Color	naina in	watta aala		for cool		L-			(00)		(74)	(00)				
501ar g (83)m=	149.44	262.34	379.61	504.99	597.25	n 6	06.84	579.27	(83)m 508	1 = Su .31	422.69	.(82)m 295.5	1 180.42	126.98	7	(83)
Total g	jains – i	nternal and	d solar	(84)m =	= (73)m	+ (83)m	, watts								,
(84)m=	595.83	706.61 8	809.69	912.12	980.96	9	, 68.03	925.85	861	.02	787.2	683.19	9 594.75	561.4	7	(84)
7. Me	an inter	nal tempe	rature	(heating	seaso	n)				•••••			•		-	
Temp	erature	during he	ating p	eriods ir	n the liv	ving	area f	rom Tal	ble 9	, Th1	(°C)				21	(85)
Utilisa	ation fac	ctor for gain	ns for l	iving are	ea, h1,r	n (s	ее Та	ble 9a)								
	Jan	Feb	Mar	Apr	Мау	'	Jun	Jul	A	ug	Sep	Oct	Nov	Dec]	
(86)m=	0.95	0.93	0.88	0.8	0.67		0.52	0.39	0.4	43	0.64	0.84	0.93	0.96		(86)
Mean	interna	l temperat	ure in l	iving ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	able	9c)					
(87)m=	19	19.3	19.74	20.26	20.65	2	20.88	20.96	20.	95	20.78	20.26	19.54	18.94		(87)
Temp	erature	during he	ating p	eriods ir	n rest o	f dw	/elling	from Ta	able	9, Th	2 (°C)					
(88)m=	20.06	20.06	20.06	20.07	20.08	2	20.09	20.09	20.	09	20.08	20.08	20.07	20.07		(88)
									_							

				1001 01 0	wonnig,	112,111 (OC		Juj						
(89)m=	0.95	0.92	0.86	0.77	0.63	0.46	0.32	0.36	0.58	0.81	0.92	0.95		(89)
Mear	internal	temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	17.38	17.82	18.44	19.17	19.69	19.98	20.06	20.05	19.86	19.18	18.17	17.31		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
Mear	internal	temper	ature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	_A) × T2					
(92)m=	17.93	18.33	18.89	19.54	20.02	20.29	20.37	20.36	20.18	19.55	18.64	17.87		(92)
Apply	v adjustn	nent to t	he mear	n interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	17.93	18.33	18.89	19.54	20.02	20.29	20.37	20.36	20.18	19.55	18.64	17.87		(93)
8. Sp	ace hea	ting requ	uirement	t										
Set T	i to the r tilisation	nean int factor fo	ernal ter	mperatui using Ta	re obtair ble 9a	ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Utilis	ation fac	tor for g	ains, hm):				1.65						
(94)m=	0.93	0.89	0.84	0.75	0.63	0.47	0.34	0.38	0.58	0.79	0.9	0.94		(94)
Usefu	ul gains,	hmGm ,	, W = (9	4)m x (84	4)m									
(95)m=	552.63	631.62	680.82	684.81	613.25	456.72	316.95	328.27	459.57	540.03	533.44	525.47		(95)
Mont	hly avera	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	1231 51	1209 61	an interr	al tempe	erature,	Lm , VV =	=[(39)m	x [(93)m	- (96)m	700.38	1024.94	1220 77		(97)
Spac	e heatin	a require	ement fo	or each m	nonth k	Nh/mon	f = 0.02	24 x [(97	m - (95))ml x (4	1)m	1220.11		(01)
(98)m=	505.09	388.41	321.39	185.4	90.17	0	0	0		186.26	353.88	517.31		
				<u> </u>				Tota	l per year	(kWh/yeai) = Sum(9	8)15,912 =	2 <mark>5</mark> 47.91	(98)
Spac	e heatin	a require	ement in	kWh/m²	²/vear							[29.12	(99)
Qh En		uiromor	ote – Co	mmunity	heating	schome						L		
This p	art is use	ed for sp	ace hea	ating spa	ace cool	ing or wa	ater heat	tina prov	vided by	a comm	unity scł	neme		
Fractio	on of spa	ice heat	from se	condary/	/supplen	nentary l	heating	(Table 1	1) '0' if n	one			0	(301)
Fractio	on of spa	ice heat	from co	mmunity	v system	1 – (30 ⁻	1) =					ĺ	1	(302)
The con	nmunity sc	heme may	v obtain he	eat from se	everal sou	rces. The I	, procedure	allows for	CHP and u	up to four	other heat	sources; th	ne latter]
includes	boilers, h	eat pumps	s, geotheri	mal and wa	aste heat f	rom powe	r stations.	See Appe	ndix C.					
Fractio	on of hea	at from C	Commun	ity heat	pump								1	(303a)
Fractio	on of tota	al space	heat fro	m Comn	nunity he	eat pump	C			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys [.]	tem]	1	(305)
Distrib	ution los	s factor	(Table ²	12c) for c	commun	ity heati	ng syste	m				[1.2	(306)
Space	heating	3				-						l	kWh/v	 vear
Annua	I space	heating	requiren	nent									2547.91	
Space	heat fro	m Comr	nunity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	= [3057.49	(307a)
Efficie	ncy of se	condar	, v/sunnle	mentary	heating	system	in % (fro	om Table	4a or A	nnendix	F)	l [0	(308
	heather			m ac ac	dom:/o		11 /0 (IIC					l	0	
Space	neating	requirer	nent tro	m secon	uary/su	piemen	tary syst	lem	(98) X (30	л) x 100 -	. (308) =		0	(309)

Water heating Annual water heating requirement				2156.8	7
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a)	x (305) x (306) =	2588.16	_](310a)
Electricity used for heat distribution		0.01 × [(307a)(30	07e) + (310a)(310e)] =	56.46	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling	system, if not ent	er 0) = (107) ÷ (314	4) =	0	(315)
Electricity for pumps and fans within dwe mechanical ventilation - balanced, extract	elling (Table 4f): ct or positive input	t from outside		176.82	_ (330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (33	80b) + (330g) =	176.82	(331)
Energy for lighting (calculated in Append	lix L)			369.08	(332)
Electricity generated by PVs (Appendix I	M) (negative quan	itity)		-730.07	(333)
Total delivered energy for all uses (307)	+ (309) + (310) +	(312) + (315) + (331) + (3	332)(237b) =	5461.48	(338)
12b. CO2 Emissions – Community heati	ng scheme				
CO2 from other sources of space and wa Effic <mark>iency</mark> of heat source 1 (%)	ater heating (not (If there is CH	kWh/year CHP) IP using two fuels repeat (363) t	kg CO2/kWh	kg CO2/year](367a)
CO2 associated with heat source 1	Ι	307b)+(310b)] x 100 ÷ (367b) x	0.52	= 1408.7	(367)
Electrical energy for heat distribution		[(313) x	0.52	29.3	(372)
Total CO2 associated with community sy	vstems	(363)(366) + (368)(3	72)	1438	(373)
CO2 associated with space heating (sec	ondary)	(309) x	0	= 0	(374)
CO2 associated with water from immers	ion heater or insta	antaneous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =		1438	(376)
CO2 associated with electricity for pump	s and fans within	dwelling (331)) x	0.52	91.77	(378)
CO2 associated with electricity for lightin	g	(332))) x	0.52	= 191.55	(379)
Energy saving/generation technologies (Item 1	333) to (334) as a	applicable	0.52 X 0.01 =	279.01] (380)
			0.32	-376.91	
Total CO2, kg/year	sum of (376)(382) :	=	0.52	1342.42	(383)
Total CO2, kg/year Dwelling CO2 Emission Rate	sum of (376)(382) : (383) ÷ (4) =	=	0.52	-376.91 1342.42 15.34](383)](384)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 207	12 Dr	oportu /	Stroma Softwa	a Num are Ver	ber: sion:	loor	Versio	n: 1.0.5.49	
Addross I	T Block T Ham Cl	PI Dee Lond	lon TW	10	DIUCK I		1001			
1 Overall dwelling dimer	I, BIOCK I, Hall Ci			10						
Ground floor			Area	1(m²) 7.51	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m³) 218.78	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n) 8	7.51	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	218.78	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	$ \begin{array}{ccc} \text{main} & \text{s} \\ \text{heating} & \text{I} \\ \hline 0 & + \end{array} $	econdary neating 0 0	/ · · · · · · · · · · · · · · · · · · ·	0 0] = [total 0 0	x 2	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	IS					0	x ′	10 =	0	(7a)
Number of passive vents					Γ	0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Ē	0	X 4	40 = Air ch	0 anges per ho	(7c)
Infiltration due to chimney If a pressurisation test has be	s, flues and fans = (6 en carried out or is intend	oa)+(6b)+(7a ded, proceed	a)+(7b)+(7 to (17), o	7c) = otherwise c	ontinue fro	0 om (9) to ((16)	÷ (5) =	0](8)](0)
Additional infiltration Structural infiltration: 0.2	25 for steel or timber	frame or	0.35 for	masonr	y constr	uction	[(9)	-1]x0.1 =	0 0 0 0	(9) (10) (11)
if both types of wall are pre deducting areas of opening If suspended wooden flo	esent, use the value corres gs); if equal user 0.35 oor, enter 0.2 (unsea	sponding to led) or 0.	the greate	er wall area d), else	a <i>(after</i> enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	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, o	50, expressed in cul	oic metres	s per ho	ur per so	quare m	etre of e	nvelope	area	4	(17)
If based on air permeabilit	y value, then (18) = [(1	17) ÷ 20]+(8), otherwis	se (18) = (16)				0.2	(18)
Air permeability value applies	if a pressurisation test ha	s been done	e or a deg	iree air pei	meability i	is being us	sed		4	
Shelter factor	1			(20) = 1 - [0.075 x (1	9)] =			4	(19)
Infiltration rate incorporation	ng shelter factor			(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified fo	or monthly wind spee	d							••••	
Jan Feb I	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4						-	-		
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjuste	ed infiltra	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula	ate effec	ctive air	change	rate for t	he appli	cable ca	se						0.5	(220)
lf exha	aust air he	eat pump	usina App	endix N. (2	3b) = (23a	a) x Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
lf bala	inced with	heat reco	overv: effic	viencv in %	allowing f	or in-use fa	actor (from	n Table 4h) =	, (,			0.5	(23c)
a) If I	balance	d mech	, anical ve	entilation	with he	at recove	erv (MV/	HR) (24a	a)m = (2)	2h)m + ('	23h) x [1	I – (23c)	10.3	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If I	balance	d mech	ı anical ve	entilation	without	heat rec	ı overv (N	и ЛV) (24b	m = (22)	1 2b)m + (2	23b)		1	
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If v	whole h	ouse ex	tract ver	ntilation c	or positiv	ve input v	ventilatic	n from o	outside		1		1	
i	f (22b)n	n < 0.5 >	‹ (23b), †	then (24c	c) = (23b); otherv	wise (24	c) = (22k	o) m + 0.	.5 × (23b)	-	_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	0 =1				
[] (24d)m	f (22b)m	n = 1, th	en (24d)	m = (22t)	o)m othe	erwise (2	(4d)m = 0	0.5 + [(2	2b)m² x	0.5			1	(24d)
(240)m=	0	0		0	0				. (05)	0	0	0	J	(240)
				nter (24a) or (240	0) OF (240	c) or (24		(25)	0.27	0.27	0.28	1	(25)
(23)11-	0.5	0.23	0.23	0.21	0.21	0.23	0.23	0.23	0.20	0.21	0.27	0.20		(20)
3. Hea	at l <mark>osse</mark> s	s and he	eat loss	paramete	er:									
ELEN		Gros area	ss (m²)	Openin m	gs 2	Net Ar A ,r	ea n²	U-valı W/m2	ue :K	A X U (W/ł	K)	k-value kJ/m²·l	e K	A X k kJ/K
ELEN Doors	IENT	Gros area	ss (m²)	Openin m	gs 2	Net Ar A ,r 1.91	ea n² X	U-valı W/m2	ue K	A X U (W/I 1.91	K)	k-value kJ/m²-l	e K	A X k kJ/K (26)
ELEN Doors Windov	IENT ws Type	Gros area	ss (m²)	Openin m	gs ²	Net Ar A ,r <u>1.91</u>	ea m ² x	U-valu W/m2 1 /[1/(1.2)+	ue ?K = [0.04] = [A X U (W/ł 1.91	K)	k-value kJ/m²·l	e K	A X k kJ/K (26) (27)
ELEM Doors Window Window	IENT ws Type ws Type	Gros area e 1 e 2	ss (m²)	Openin m	gs ,2	Net Ar A ,r <u>1.91</u> <u>1.44</u>	ea n ² x x1, x1,	U-valu W/m2 1 /[1/(1.2)+	ue K 0.04] = [0.04] = [A X U (W/ł 1.91 1.65 1.65	K)	k-value	e K	A X k kJ/K (26) (27) (27)
ELEM Doors Window Window Window	IENT ws Type ws Type ws Type	Gros area e 1 e 2 e 3	ss (m²)	Openin m	gs 2	Net Ar A ,r 1.91 1.44 1.44 2.43	ea n ² x x1, x1, x1, x1, x1,	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+	ue K 0.04] = [0.04] = [0.04] =	A X U (W/ł 1.91 1.65 1.65 2.78	<)	k-value	e K	A X k kJ/K (26) (27) (27) (27)
ELEM Doors Windov Windov Windov	IENT ws Type ws Type ws Type ws Type	Gros area 9 1 9 2 9 3 9 4	ss (m²)	Openin m	gs 2	Net Ar A ,r 1.91 1.44 1.44 2.43 2.43	ea n ² x x1 x1 x1 x1 x1	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	= [0.04] = [0.04] = [0.04] = [A X U (W/ł 1.91 1.65 2.78 2.78	<)	k-value	e K	A X k kJ/K (26) (27) (27) (27) (27)
ELEM Doors Window Window Window Window	IENT ws Type ws Type ws Type ws Type ws Type	Gros area 4 2 3 4 4 5	SS (m²)	Openin m	gs 2	Net Ar A ,r 1.91 1.44 2.43 2.43 4.2	ea m ² x x1, x1, x1, x1, x1, x1, x1, x1,	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	= [0.04] = [0.04] = [0.04] = [0.04] = [0.04] = [A X U (W/ł 1.91 1.65 1.65 2.78 2.78 4.81		k-value	e K	A X k kJ/K (26) (27) (27) (27) (27) (27)
ELEM Doors Window Window Window Window Window	IENT ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 2 1 2 2 2 3 2 4 2 5 2 6	55 (m²)	Openin m	gs 2	Net Ar A,r 1.91 1.44 2.43 2.43 4.2 2.43	ea m ² x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	ue 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.65 1.65 2.78 2.78 4.81 2.78	<)	k-value	e K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27)
ELEM Doors Windov Windov Windov Windov Windov	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 2 1 2 2 2 3 2 4 2 5 2 6 2 7	55 (m²)	Openin m	gs 2	Net Ar A ,r 1.91 1.44 2.43 2.43 4.2 2.43 2.43	ea m ² x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	ue 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/ł 1.91 1.65 2.78 2.78 4.81 2.78 2.78	<)	k-value	e K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27)
ELEM Doors Window Window Window Window Window Window	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 4 5 6 7 8	SS (m²)	Openin	gs	Net Ar A ,r 1.91 1.44 2.43 2.43 4.2 2.43 4.2 2.43 4.2	ea m ² x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	U-valu W/m2 (1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	ue 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.65 2.78 2.78 4.81 2.78 2.78 4.81		k-value	e K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEM Doors Window Window Window Window Window Window Window	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 4 5 6 6 7 8 8 9	SS (m²)	Openin	gs 2	Net Ar A,r 1.91 1.44 2.43 2.43 4.2 2.43 4.2 4.2 4.2	ea m ² x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	U-valu W/m2 1 (1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	$= \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix}$	A X U (W/ł 1.91 1.65 1.65 2.78 2.78 4.81 2.78 2.78 2.78 4.81 4.81		k-value	e K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEM Doors Window Window Window Window Window Window Window Window Window	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type	Gros area 4 2 3 4 4 5 6 6 7 8 8 9 65.5	55 (m ²)	Openin m	gs	Net Ar A,r 1.91 1.44 2.43 2.43 2.43 4.2 2.43 2.43 4.2 4.2 4.2 4.2	ea m ² x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	ue 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/k 1.91 1.65 1.65 2.78 2.78 4.81 2.78 2.78 4.81 4.81 4.81 6.46		k-value kJ/m²·l	e K	A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEM Doors Window Window Window Window Window Window Window Window Window Window	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type fype1 fype2	Gros area 2 4 2 3 4 5 6 7 8 9 <u>65.5</u> 53.5	55 55	Openin m 25.2	gs 2	Net Ar A,r 1.91 1.44 2.43 2.43 2.43 2.43 2.43 2.43 4.2 4.2 4.2 4.2 4.2 52.04	ea m ² x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	U-valu W/m2 1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ (1/(1.2)+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.65 1.65 2.78 2.78 4.81 2.78 2.78 4.81 4.81 4.81 6.46 7.83		k-value kJ/m²·I		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEM Doors Window Window Window Window Window Window Window Window Window Walls T Walls T	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type fype1 fype2 rea of e	Gross area a 1 a 2 a 3 a 4 a 5 a 6 a 7 a 8 a 9 a 6 53.6 lements	55 55 55 55 55 55	Openin m 25.2 1.91	gs 2	Net Ar A,r 1.91 1.44 1.44 2.43 2.43 2.43 4.2 2.43 2.43 4.2 4.2 4.2 4.2 4.2 4.2 4.2 1.9 52.04	ea m ² x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.16 0.15	$\begin{array}{c} 0.04\\$	A X U (W/I 1.91 1.65 2.78 2.78 2.78 4.81 2.78 2.78 4.81 4.81 4.81 6.46 7.83		k-value kJ/m²·l		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEM Doors Window Window Window Window Window Window Window Window Walls T Walls T Total a Party fl	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type rype1 Type2 rea of e oor	Gros area a 1 a 2 a 3 a 4 a 5 a 6 a 7 a 8 a 9 a 65.6 a 7 a 8 a 9 a 65.6 a 7 b 8 a 9 b 65.6 a 7 b 8 a 9 b 65.6 b 7 b 8 b 9 b 65.6 b 7 b 8 b 9 b 65.6 b 7 b 8 b 9 b 65.6 b 7 b 8 b 9 b 65.6 b 7 b 8 b 9 b 65.6 b 7 b 8 b 9 b 7 b	55 55 55 55 55 55	Openin m 25.2 1.91	gs 2	Net Ar A,r 1.91 1.44 1.44 2.43 2.43 4.2 2.43 2.43 4.2 4.2 4.2 4.2 4.2 4.2 4.2 52.04 119.5 87.51	ea m ² x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ (1/(1.2)+ (1/(1.2)+ /[1/(1.2)+ (1/(1.2)+ /[1/(ue 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/ł 1.91 1.65 2.78 2.78 4.81 2.78 4.81 4.81 4.81 6.46 7.83		k-value kJ/m²·l		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27
ELEM Doors Window Window Window Window Window Window Window Walls T Walls T Total a Party fl Party c	IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type rope1 Type2 rea of e oor eiling	Gros area 2 4 2 3 4 2 3 4 2 3 4 2 5 6 6 7 8 8 9 65.5 53.5 elements	55 55 55 55 55 5, m ²	Openin m 25.2 1.91	gs 2	Net Ar A,r 1.91 1.44 2.43 2.43 2.43 2.43 2.43 2.43 2.43 2	ea m ² x x ¹ , x	U-valu W/m2 1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.16 0.15	ue 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/k 1.91 1.65 1.65 2.78 2.78 4.81 2.78 4.81 4.81 4.81 6.46 7.83		k-value kJ/m²·l		A X k kJ/K (26) (27) (27) (27) (27) (27) (27) (27) (27

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

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	45.05	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	6957.21	(34)
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K	Indicative Value: Low	100	(35)
For design assessments where the details of the construction are not known p	precisely the indicative values of TMP in Table 1f		

can be ι	ised inste	ad of a dei	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						10.87	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								_
Total fa	abric he	at loss							(33) +	(36) =			55.92	(37)
Ventila	tion hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	21.37	21.12	20.86	19.6	19.35	18.09	18.09	17.83	18.59	19.35	19.85	20.36		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	77.29	77.03	76.78	75.52	75.27	74	74	73.75	74.51	75.27	75.77	76.28		
		motor (L	יאי (סור)	/m21/					(40)m	Average =	Sum(39) ₁	.12 /12=	75.46	(39)
	000 para		$1 \square P$, VV		0.96	0.95	0.95	0.94	0.95	= (39)m ÷	0.97	0.97		
(40)m=	0.88	0.88	0.88	0.86	0.80	0.85	0.85	0.84	0.85	0.80	0.87	(12)	0.86	
Numbe	er of day	vs in mor	nth (Tab	le 1a)					,	Average =	Sum(40)1	.12 / 12=	0.00	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter hea	ting ener	gy requi	irement:								kWh/ye	ear:	
		ipancy, I > N – 1	N 1 76 v	[1 - ovo	(-0.0003		-130	$(2)1 \pm 0$)013 v (⁻	TEA -13	2.5	59		(42)
if TF	A £ 13.	9, N = 1	1.70 /		(0.0000		A 10.0	/2/] 1 0.0		11 / 10.	.5)			
Ann <mark>ua</mark>	l averag	e hot wa	ater usaç	ge in <mark>litre</mark>	s per da	ay Vd,av	erage =	(25 x N)	+ 36		95.	.71		(43)
Reduce	the annua	al average	hot water	usage by {	5% if the a	welling is	designed a	to achieve	a water us	se target o	f			
normore				day (an w										
11-4-1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HOL WAL	er usage i	n littes per	day lor ea		vu,iii = la			(43)		i				
(44)m=	105.29	101.46	97.63	93.8	89.97	86.14	86.14	89.97	93.8	97.63	101.46	105.29		-]
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D)))))))))))))))))))	kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b, 10	c, 1d)	1148.57	(44)
(45)m=	156.14	136.56	140.92	122.85	117.88	101.72	94.26	108.17	109.46	127.56	139.24	151.21		
							1	1	-	Total = Su	m(45) ₁₁₂ =	:	1505.96	(45)
lf instan	taneous v	ater heatir	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46)) to (61)					
(46)m=	23.42	20.48	21.14	18.43	17.68	15.26	14.14	16.22	16.42	19.13	20.89	22.68		(46)
vvater	storage	IOSS:	inaludir		lor or M		otorogo	within or	mayaa	aal		_	l	(47)
Sillay				ig any so		/ V I K S				Sei	()		(47)
If comi	nunity r viso if n	eating a	na no ta	INK IN OW	elling, e cludes i	nter 110	Iltres in	(47) mbi boili	are) onto	or 'O' in (47)			
Water	storage	loss.	not wate			nstantai								
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):)		(48)
Tempe	erature f	actor fro	m Table	2b		,	• /)		(49)
Energy	lost fro	m water	storage	kWh/ve	ar			(48) x (49)	=					(50)
b) If m	anufact	urer's de	eclared of	cylinder l	oss fact	or is not	known:	()				10		(00)
Hot wa	ter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)				0.	02		(51)
If com	nunity h	eating s	ee secti	on 4.3										
Volum	e factor	from Tal	ble 2a	0							1.0	03		(52)
Iempe	erature f	actor fro	m Table	2b							0.	.6		(53)

Energy Enter	/ lost fro (50) or (m water (54) in (5	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L'.			(00)
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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 Append	l lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3	-		-	-	-		0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)	i		
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	211.41	186.48	196.19	176.35	173.16	155.22	149.54	163.44	162.95	182.84	192.74	206.49		(62)
Solar DH	-IW input of	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter						-		-			
(64)m=	211.41	186.48	196.19	176.35	173.16	155.22	149.54	163.44	162.95	182.84	192.74	206.49		
								Outp	out from wa	ater heatei	r (annual)₁	12	2156.8	(64)
Hea <mark>t g</mark>	ains fro	m water	heating.	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	9 <mark>6.14</mark>	85.35	91.08	83.64	83.42	76.62	75.56	80.19	79.19	86.64	89.09	94.5		(65)
in <mark>clu</mark>	<mark>ide</mark> (57)i	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e 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=	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5	129.5		(66)
Lightin	g gains	(calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	20.9	18.56	15.1	11.43	8.54	7.21	7.79	10.13	13.6	17.26	20.15	21.48		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ble 5				
(68)m=	234.42	236.85	230.72	217.67	201.2	185.72	175.37	172.94	179.07	192.12	208.6	224.08		(68)
Cookin	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5				
(69)m=	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95	35.95		(69)
Pumps	and fai	ns gains	(Table :	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6	-103.6		(71)
Water	heating	gains (T	able 5)											
(72)m=	129.22	127	122.41	116.17	112.12	106.41	101.56	107.78	109.99	116.45	123.74	127.01		(72)
Total i	nternal	gains =		!		(66)	m + (67)m	• • + (68)m +	• ⊦ (69)m + ((70)m + (7	1)m + (72)	m	I	
(73)m=	446.39	444.27	430.08	407.13	383.71	361.19	346.58	352.7	364.51	387.68	414.34	434.42		(73)
6. So	lar gains	5:	1	1	1		1		1	1	1			

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

Orientation:	Access Factor Table 6d	-	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.44	x	11.28) x	0.45	x	0.7] =	3.55	(75)
Northeast 0.9x	0.77	x	1.44	x	11.28	x	0.45	x	0.7] =	3.55	(75)
Northeast 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7] =	5.99	
Northeast 0.9x	0.77	x	4.2	x	11.28	x	0.45	x	0.7] =	10.34	(75)
Northeast 0.9x	0.77	x	1.44	x	22.97	x	0.45	x	0.7] =	7.22	(75)
Northeast 0.9x	0.77	x	1.44	x	22.97	x	0.45	x	0.7	=	7.22	(75)
Northeast 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7] =	12.18	(75)
Northeast 0.9x	0.77	x	4.2	x	22.97	x	0.45	x	0.7	=	21.06	(75)
Northeast 0.9x	0.77	x	1.44	x	41.38	x	0.45	x	0.7] =	13.01	(75)
Northeast 0.9x	0.77	x	1.44	x	41.38	x	0.45	x	0.7] =	13.01	(75)
Northeast 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(75)
Northeast 0.9x	0.77	x	4.2	x	41.38	x	0.45	x	0.7] =	37.94	(75)
Northeast 0.9x	0.77	x	1.44	x	67.96	x	0.45	x	0.7] =	21.36	(75)
Northeast 0.9x	0.77	x	1.44	x	67.96	x	0.45	x	0.7] =	21.36	(75)
Northeast 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7] =	36.05	(75)
Northeast 0.9x	0.77	x	4.2	×	67.96	x	0.45	х	0.7] =	62.3	(75)
Northeast 0.9x	0.77	x	1.44	x	91.35	x	0.45	x	0.7] =	28.71	(75)
Northeast 0.9x	0.77	x	1.44	х	91.35] ×	0.45	x	0.7] =	28.71	(75)
Northeast 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7] =	48.46	(75)
Northeast 0.9x	0.77	x	4.2	x	91.3 <mark>5</mark>	x	0.45	x	0.7] =	83.75	(75)
Northeast 0.9x	0.77	x	1.44	x	97.38	×	0.45	x	0.7] =	30.61	(75)
Northeast 0.9x	0.77	x	1.44	x	97.38	x	0.45	x	0.7] =	30.61	(75)
Northeast 0.9x	0.77	x	2.43	x	97.38	x	0.45	x	0.7	=	51.66	(75)
Northeast 0.9x	0.77	x	4.2	x	97.38	x	0.45	x	0.7] =	89.29	(75)
Northeast 0.9x	0.77	x	1.44	x	91.1	x	0.45	x	0.7	=	28.64	(75)
Northeast 0.9x	0.77	x	1.44	x	91.1	x	0.45	x	0.7	=	28.64	(75)
Northeast 0.9x	0.77	x	2.43	x	91.1	x	0.45	x	0.7] =	48.33	(75)
Northeast 0.9x	0.77	x	4.2	x	91.1	x	0.45	x	0.7	=	83.53	(75)
Northeast 0.9x	0.77	x	1.44	x	72.63	x	0.45	x	0.7	=	22.83	(75)
Northeast 0.9x	0.77	x	1.44	x	72.63	x	0.45	x	0.7	=	22.83	(75)
Northeast 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(75)
Northeast 0.9x	0.77	x	4.2	x	72.63	x	0.45	x	0.7] =	66.59	(75)
Northeast 0.9x	0.77	x	1.44	x	50.42	x	0.45	x	0.7	=	15.85	(75)
Northeast 0.9x	0.77	x	1.44	x	50.42	x	0.45	x	0.7	=	15.85	(75)
Northeast 0.9x	0.77	x	2.43	x	50.42	x	0.45	×	0.7] =	26.75	(75)
Northeast 0.9x	0.77	x	4.2	x	50.42	x	0.45	x	0.7] =	46.23	(75)
Northeast 0.9x	0.77	x	1.44	x	28.07	x	0.45	×	0.7	=	8.82	(75)
Northeast 0.9x	0.77	x	1.44	×	28.07	x	0.45	×	0.7] =	8.82	(75)
Northeast 0.9x	0.77	x	2.43	x	28.07	x	0.45	x	0.7] =	14.89	(75)

Northeast 0.9x	0.77	x	4.2	x	28.07	x	0.45	x	0.7	=	25.73	(75)
Northeast 0.9x	0.77	x	1.44	×	14.2	×	0.45	x	0.7	i =	4.46	(75)
Northeast 0.9x	0.77	x	1.44	x	14.2	×	0.45	x	0.7	i =	4.46	 (75)
Northeast 0.9x	0.77	x	2.43	×	14.2	x	0.45	x	0.7	i =	7.53	– (75)
Northeast 0.9x	0.77	x	4.2	x	14.2	×	0.45	x	0.7	i =	13.02	– (75)
Northeast 0.9x	0.77	x	1.44	×	9.21	×	0.45	x	0.7	i =	2.9	(75)
Northeast 0.9x	0.77	x	1.44	x	9.21	x	0.45	x	0.7	=	2.9	(75)
Northeast 0.9x	0.77	x	2.43	×	9.21	×	0.45	x	0.7	=	4.89	(75)
Northeast 0.9x	0.77	x	4.2	x	9.21	x	0.45	x	0.7] =	8.45	(75)
Southeast 0.9x	0.77	x	2.43	×	36.79	×	0.45	x	0.7] =	19.52	(77)
Southeast 0.9x	0.77	x	4.2	x	36.79	x	0.45	x	0.7	=	33.73	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	2.43	x	36.79	x	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	2.43	×	62.67	x	0.45	x	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	4.2	x	62.67	x	0.45	x	0.7] =	57.46	(77)
Southeast 0.9x	0.77	x	2.43	×	62.67	x	0.45	x	0.7] =	33.25	(77)
Southeast 0.9x	0.77	x	2.43	×	62.67	x	0.45	x	0.7	=	33.25	(77)
Southeast 0.9x	0.77	x	2.43	X	85.75	х	0.45	х	0.7] =	45.49	(77)
Southeast 0.9x	0.77	x	4.2	x	85.75	x	0.45	x	0.7] =	78.62	(77)
Southeast 0.9x	0.77	x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77] x	2.43	x	85.75	x	0.45	x	0.7	=	45.49	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	х	0.45	x	0.7] =	56.36	(77)
Southeast 0.9x	0.77	x	4.2	x	106.25	x	0.45	x	0.7] =	97.42	(77)
Southeast 0.9x	0.77	x	2.43	×	106.25	×	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	106.25	x	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	4.2	x	119.01	x	0.45	x	0.7	=	109.11	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	119.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	4.2	x	118.15	x	0.45	x	0.7	=	108.32	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	118.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	x	2.43	x	113.91	×	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	x	4.2	x	113.91	x	0.45	x	0.7] =	104.44	(77)
Southeast 0.9x	0.77	x	2.43	×	113.91	×	0.45	x	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	2.43	×	113.91	×	0.45	×	0.7] =	60.42	(77)
Southeast 0.9x	0.77	x	2.43	×	104.39	×	0.45	x	0.7] =	55.37	(77)
Southeast 0.9x	0.77	x	4.2	x	104.39	x	0.45	x	0.7	=	95.71	(77)
Southeast 0.9x	0.77	x	2.43	×	104.39	×	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	x	2.43	×	104.39	×	0.45	x	0.7	=	55.37	(77)

Southe	ast <mark>0.9x</mark>	0.77	x		2.43	7 ×	(9	2.85	x		0.45	×	0.7	=	Γ	49.25	(77)
Southe	ast 0.9x	0.77	x		4.2	ī,	(2.85] ×		0.45	×	0.7	=	Ē	85.13	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	ī,	(9	2.85] ×		0.45	×	0.7	=	Ē	49.25	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	_ ×	(9	92.85	x		0.45	×	0.7	=	Ē	49.25	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	ī,	(E	9.27	x		0.45	×	0.7	=	Ē	36.74	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		4.2	Ī,	(6	9.27	x		0.45	×	0.7	=	Ē	63.51	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	Ī,	۰ <u>-</u> 6	9.27	x		0.45	x	0.7	=	Ē	36.74	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	_ _	< C	9.27	x		0.45	x	0.7	=	Ē	36.74	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	_ ×	4	4.07	x		0.45	x	0.7	= =	Ē	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		4.2	_ ×	4	4.07	x		0.45	x	0.7	=		40.41	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	_ ×	4	4.07	x		0.45	×	0.7	=	Ē	23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	_ ×	4	4.07	x		0.45	x	0.7	=		23.38	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43] ×	(3	31.49	x		0.45	×	0.7	=		16.7	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		4.2	_ ×	(3	31.49	x		0.45	×	0.7	=		28.87	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43] ×	(3	31.49	x		0.45	x	0.7	=	[16.7	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43] ×	(3	31.49	x		0.45	×	0.7	=		16.7	(77)
Southw	est <mark>0.9x</mark>	0.77	х		4.2	×	(3	86.79]		0.45	x	0.7	=	[33.73	(79)
Southw	est0.9x	0.77	х		4.2) ×	6	62.67			0.45	x	0.7	=		57.46	(79)
Southw	est <mark>0.9x</mark>	0.77	x		4.2	×	6	35.75			0.45	x	0.7	=		78.62	(79)
Southw	est <mark>0.9x</mark>	0.77	x		4.2	×	(1	06.25] /]		0.45	x	0.7	=		97.42	(79)
Southw	est <mark>0.9x</mark>	0.7 <mark>7</mark>	x		4.2	X	1	19.01]		0.45	x	0.7	=	[109.11	(79)
Southw	est <mark>0.9x</mark>	0.77	x		4.2] ×	(1	18. <mark>15</mark>]		0.45	x	0.7	_ =		108.32	(79)
Southw	est <mark>0.9x</mark>	0.77	x		4.2	×	۲ <u>۱</u>	13.91			0.45	x	0.7	=		104.44	(79)
Southw	est _{0.9x}	0.77	x		4.2	×	(1)	04.39]		0.45	x	0.7	=		95.71	(79)
Southw	est <mark>0.9x</mark>	0.77	x		4.2) ×	(9	2.85]		0.45	x	0.7	=		85.13	(79)
Southw	est <mark>0.9x</mark>	0.77	x		4.2	×	(6	69.27]		0.45	×	0.7	=		63.51	(79)
Southw	est <mark>0.9x</mark>	0.77	X		4.2	`	4	4.07]		0.45	×	0.7	=		40.41	(79)
Southw	est <mark>0.9x</mark>	0.77	x		4.2) ×	(3	31.49]		0.45	×	0.7	=		28.87	(79)
Solar g	ains in	watts, ca	alculate	d for e	ach mon	nth			(83)m	n = Su	m(74)m	(82)m			-		(00)
(83)m=	149.44	262.34	379.61	504.9	9 597.2	25	606.84	579.27	508	8.31	422.69	295.5	1 180.42	126.98	}		(83)
i otal g	ains – II		and sola	r (84)r	n = (73)r	m +	(83)m	, watts	004	00	707.0	000.40	504.75	504.4			(04)
(84)m=	595.83	706.61	809.69	912.1	2 980.9	10	968.03	925.85	861	.02	181.2	683.15	9 594.75	561.4			(04)
7. Me	an inter	nal temp	perature	(heat	ng seas	on)					(c						_
Temp	erature	during h	neating p	period	in the li	ivin	g area	from Tal	ble 9	, Th1	(°C)					21	(85)
Utilisa	ation fac	tor for g	ains for	living	area, h1	,m ((see Ta	ible 9a)	<u> </u>	r					7		
(0.0)	Jan	Feb	Mar	Ар	Ma	iy	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	;		(00)
(86)m=	0.95	0.92	0.86	0.76	0.62	<u> </u>	0.46	0.34	0.3	58	0.58	0.81	0.92	0.96			(00)
Mean	interna	l temper	ature in	living	area T1	(fol	low ste	ps 3 to 7	7 in T	Table	9c)		-		-		(
(87)m=	19.37	19.67	20.06	20.5	20.79	9	20.94	20.98	20.	.98	20.87	20.48	19.85	19.32			(87)
Temp	erature	during h	eating p	period	in rest	of c	lwelling	from Ta	able 9	9, Th	2 (°C)				_,		
(88)m=	20.18	20.18	20.19	20.2	20.2	2	20.21	20.21	20.	.22	20.21	20.2	20.2	20.19			(88)

Utilis	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)							
(89)m=	0.94	0.91	0.84	0.73	0.58	0.41	0.28	0.32	0.53	0.78	0.91	0.95			(89)
Mear	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)					
(90)m=	17.99	18.41	18.98	19.59	19.97	20.16	20.2	20.2	20.08	19.57	18.7	17.92			(90)
									f	iLA = Livin	g area ÷ (4) =	0.3	34	(91)
Mear	n interna	l temper	ature (fo	or the wh	ole dwe	lling) = f	LA x T1	+ (1 – fL	A) × T2						
(92)m=	18.46	18.84	19.35	19.9	20.25	20.43	20.47	20.46	20.35	19.88	19.09	18.4			(92)
Apply	v adjustn	nent to tl	he mear	n interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate					
(93)m=	18.46	18.84	19.35	19.9	20.25	20.43	20.47	20.46	20.35	19.88	19.09	18.4			(93)
8. Sp	ace hea	ting requ	uirement	t		• • •				/			•		
Set T	i to the i tilisation	nean int factor fo	ernal ter or gains	mperatui using Ta	re obtair able 9a	ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilis	ation fac	tor for g	u ains, hm	<u>י</u> ו:		1	ļ				1				
(94)m=	0.92	0.89	0.83	0.72	0.58	0.43	0.3	0.34	0.54	0.77	0.89	0.93			(94)
Usefu	ul gains,	hmGm ,	, W = (9	4)m x (84	4)m		-	-							
(95)m=	550.79	626.28	668.47	658.68	572.67	412.4	281.58	292.95	425.44	524.39	529.07	524.22			(95)
Mont	hly aver	age exte	rnal terr	nperature	e from Ta	able 8									(20)
(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 (97)m-	1094 32	1073 98	an Interr	al tempe	erature,	LM , VV =	=[(39)m]	x [(93)m]	- (96)m	698.5	908 73	1082.96			(97)
Spac	e heatin	a require	ement fo	r each n	onth k	Wh/mon	fh = 0.02	233.73 24 x [(97	m - (95)	ml x (4)	1)m	1002.30			(01)
(98)m=	404.39	300.85	236.56	123.74	52.77	0	0	0	0	12 <mark>9.54</mark>	273.36	415.7			
								Tota	al per year	(kWh/yea) = Sum(9	8)15,912 =	193	5.89	(98)
Spac	e heatin	g require	ement in	ı kWh/m²	²/year								22.	.13	(99)
9b En	erav rea	uiremer	nts – Coi	mmunitv	heating	scheme	ć								
This p	art is us	ed for sp	ace hea	ating, spa	ace cool	ing or wa	ater hea	ting prov	vided by	a comm	unity scł	neme.			
Fractio	on of spa	ace heat	from se	condary	/supplen	nentary l	heating	(Table 1	1) '0' if n	one	,		()	(301)
Fractio	on of spa	ace heat	from co	mmunity	v system	1 – (30 ⁻	1) =						,		(302)
The con	nmunity so	cheme may	y obtain he	eat from se	everal sou	rces. The _l	procedure	allows for	CHP and u	up to four	other heat	sources; ti	he latter		_
includes	s boilers, h	eat pumps	s, geotheri	mal and wa	aste heat f	from powe	r stations.	See Appe	ndix C.						٦
Fractio	on of hea	at from C	Commun	iity heat	pump										(303a)
Fractio	on of tota	al space	heat fro	m Comn	nunity he	eat pump	р			(3	02) x (303	a) =			(304a)
Factor	for cont	rol and o	charging	g method	(Table	4c(3)) fo	or commu	unity hea	ating sys [.]	tem				I	(305)
Distrib	ution los	s factor	(Table 2	12c) for c	commun	ity heati	ng syste	m					1.	2	(306)
Space	heating	a											kW	h/year	
Annua	l space	heating	requiren	nent									193	6.89	7
Space	heat fro	m Comr	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	232	4.27	(307a)
Efficie	ncy of se	econdary	v/supple	mentarv	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		()	_](308
Snaco	hosting	requirer	ment fro	msecon	darv/eu	nlemen	tary eve	tom	(Q8) v (20	1) x 100	, (308) –]](300)
Opace	nearing	requirer		11 36001	uai y/30	plemen	nary sys	GIII		.,	. (000) -		((303)

Water heating Annual water heating requirement				2156.8	1
If DHW from community scheme: Water heat from Community heat pump		(64) x (303a) x (305) x (306) =	2588.16	_](310a)
Electricity used for heat distribution		0.01 × [(307a)(307e) + (310a)(310e)] =	49.12	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling sy	stem, if not enter 0)	= (107) ÷ (314) =	:	0	(315)
Electricity for pumps and fans within dwellin mechanical ventilation - balanced, extract of	g (Table 4f): r positive input from outs	side		176.82	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330b)) + (330g) =	176.82	(331)
Energy for lighting (calculated in Appendix	_)			369.08	(332)
Electricity generated by PVs (Appendix M)	(negative quantity)			-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (3	315) + (331) + (332	2)(237b) =	4728.26	(338)
12b. CO2 Emissions – Community heating	scheme				
CO2 from other sources of anges and wate		kWh/year	kg CO2/kWh	kg CO2/year	
Efficiency of heat source 1 (%)	r heating (not CHP) If there is CHP using two	fuels repeat (363) to (366) for the second fue	208	(367a)
Efficiency of heat source 1 (%) CO2 associated with heat source 1	r heating (not CHP) If there is CHP using two [(307b)+(310l	fuels repeat (363) to (3 b)] x 100 ÷ (367b) x	366) for the second fue	208 1225.75	(367a) (367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	r heating (not CHP) If there is CHP using two [(307b)+(310 [(313	fuels repeat (363) to (3 b)] x 100 ÷ (367b) x b) x	366) for the second fue 0.52 = 0.52 =	208 1225.75 25.5](367a)](367)](372)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste	r heating (not CHP) If there is CHP using two [(307b)+(310 [(313 ems (363)	fuels repeat (363) to (3 b)] x 100 ÷ (367b) x b) x (366) + (368)(372)	366) for the second fue 0.52 = 0.52 = =	208 1225.75 25.5 1251.24](367a)](367)](372)](373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon	r heating (not CHP) If there is CHP using two [(307b)+(310) [(313 [(313 ems (363) dary) (309)	fuels repeat (363) to (3 b)] x 100 ÷ (367b) x c) x (366) + (368)(372) c) x	366) for the second fue 0.52 = 0.52 = = 0 =	208 1225.75 25.5 1251.24 0](367a)](367)](372)](373)](374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion	r heating (not CHP) If there is CHP using two [(307b)+(310] [(313 ems (363) dary) (309) heater or instantaneous	fuels repeat (363) to (3 b)] x 100 ÷ (367b) x c) x (366) + (368)(372) (x c) heater (312) x	366) for the second fue 0.52 = 0.52 = 0 0 = 0.52 =	208 1225.75 25.5 1251.24 0](367a)](367)](372)](373)](374)](375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and wate	r heating (not CHP) If there is CHP using two [(307b)+(310] [(313 ems (363) dary) (309) heater or instantaneous r heating (373)	fuels repeat (363) to (3 b)] x 100 \div (367b) x b) x c) x c) x c) x c) x c) x c) x c) x c	366) for the second fue 0.52 = 0.52 = 0 0 = 0.52 =	208 1225.75 25.5 1251.24 0 0 1251.24)(367a) (367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and wate CO2 associated with electricity for pumps a	r heating (not CHP) If there is CHP using two [(307b)+(310] [(313 ems (363) dary) (309) heater or instantaneous r heating (373) nd fans within dwelling	the fuels repeat (363) to (3 b)] x 100 \div (367b) x b) x b) x b) x b) x c) x c) x c) x c) x c) x c) x c) x c	366) for the second fue 0.52 = 0.52 = 0 = 0.52 = 0.52 =	208 1225.75 25.5 1251.24 0 0 1251.24 91.77](367a)](367)](372)](373)](374)](375)](376)](378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and wate CO2 associated with electricity for pumps a CO2 associated with electricity for lighting	r heating (not CHP) If there is CHP using two [(307b)+(310) [(313 ems (363) dary) (309) heater or instantaneous r heating (373) nd fans within dwelling (332)	$(100 \pm (363) + (367b) \times (367b) \times (367b) \times (366) + (368) \dots (372) \times (366) + (368) \dots (372) \times (312) \times (312) \times (374) + (374) + (375) = (331)) \times (312) \times ($	366) for the second fue 0.52 = 0.52 = 0 = 0 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 = 0.52 =	208 1225.75 25.5 1251.24 0 0 1251.24 91.77 191.55](367a)](367)](372)](373)](374)](375)](376)](378)](379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and wate CO2 associated with electricity for pumps a CO2 associated with electricity for lighting Energy saving/generation technologies (33 Item 1	r heating (not CHP) If there is CHP using two [(307b)+(310) [(313 ems (363) dary) (309) heater or instantaneous r heating (373) nd fans within dwelling (332) 3) to (334) as applicable	fuels repeat (363) to (3b)] x 100 ÷ (367b) xf) xf) xf) xf) xf) xf) xf) xf	366) for the second fue $ \begin{array}{c} 0.52 \\ 0.52 \\ \end{array} = \\ 0 \\ 0.52 \\ 0.52 \\ 0.52 \\ 0.52 \\ \end{array} $	208 1225.75 25.5 1251.24 0 0 1251.24 91.77 191.55](367a)](367)](372)](373)](374)](375)](376)](378)](379)](380)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and wate CO2 associated with electricity for pumps a CO2 associated with electricity for lighting Energy saving/generation technologies (33 Item 1	r heating (not CHP) If there is CHP using two [(307b)+(310) [(313 ems (363) dary) (309) heater or instantaneous r heating (373) nd fans within dwelling (332) 3) to (334) as applicable n of (376)(382) =	$fuels repeat (363) to (3b)] \times 100 \div (367b) xf) xf) xf) xf) xf) xf) xf) xf$	366) for the second fue $ \begin{array}{c} 0.52 \\ 0.52 \\ \end{array} = \\ 0 \\ 0.52 \\ 0.52 \\ 0.52 \\ 0.52 \\ \end{array} $	208 1225.75 25.5 1251.24 0 0 1251.24 91.77 191.55 -378.91 1155.66](367a)](367)](372)](373)](374)](375)](376)](378)](378)](380)](380)](383)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community syste CO2 associated with space heating (secon CO2 associated with water from immersion Total CO2 associated with space and wate CO2 associated with electricity for pumps a CO2 associated with electricity for lighting Energy saving/generation technologies (33 Item 1 Total CO2, kg/year Dwelling CO2 Emission Rate (38	r heating (not CHP) If there is CHP using two [(307b)+(310) [(313)] [(313) [(313)] [(313) [(313)] [(313) [(313)] [(313) [(313)]	$fuels repeat (363) to (3b)] x 100 \div (367b) xf) xf) xf) xf) xf) xf) xf) xf$	366) for the second fue $ \begin{array}{c} 0.52 \\ 0.52 \\ \end{array} = \\ 0.52 \\ 0.52 \\ 0.52 \\ 0.52 \\ 0.52 \\ 0.52 \\ 0.51 \\ 0.52 \\ 0.52 \\ 0.52 \\ 0.51 \\ 0.52 \\ 0.52 \\ 0.51 \\ 0.52 \\ 0.52 \\ 0.51 \\ 0.51 \\ 0.51 \\ 0.52 \\ 0.51 $	208 1225.75 25.5 1251.24 0 0 1251.24 91.77 191.55 -378.91 1155.66 13.21](367a)](367)](372)](373)](374)](375)](376)](378)](378)](380)](383)](384)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49	
		P Iooo I oo	roperty /	Address: /10	BIOCK L	J - Groui	nd Floor			
Address : 1 Overall dwelling dimen	Sions:	iose, Lon	don, Tw	/10						
Ground floor	510115.		Area	a(m²) 7.17	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 192.92	(3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1r	1) 7	7.17	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	192.92	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	main s heating • 0 + 0 +	secondar heating 0 0	y] + [_] + [_	other 0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fan	S					0	X '	10 =	0	(7a)
Number of passive vents						0	X	10 =	0	(7b)
Number of flueless gas fire						0	X	40 = Air ch	0 nanges per hou	(7c) J
Infiltration due to chimneys If a pressurisation test has be Number of storeys in the Additional infiltration	s, flues and fans = (en carried out or is intend e dwelling (ns)	6a)+(6b)+(7 led, proceed	a)+(7b)+(7 d to (17), c	7c) = otherwise c	continue fro	0 om (9) to ((16)	÷ (5) =	0	(8) (9)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	25 for steel or timber sent, use the value corre (s); if equal user 0.35	frame or sponding to aled) or 0	0.35 for the greate	masonr er wall are ed)else	ry constr a (after enter 0	uction	((*)	110011 -	0](10)](11)](12)
If no draught lobby, ente	er 0.05. else enter 0		(.,,					0	(13)
Percentage of windows	and doors draught s	stripped							0	(14)
Window infiltration	-			0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, q	50, expressed in cu	bic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)
If based on air permeabilit	y value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)
Air permeability value applies	if a pressurisation test ha	as been don	e or a deg	gree air pei	rmeability	is being u	sed			٦
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			4	(19)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)) x (20) =				0.1	$\int_{(21)}^{(20)}$
Infiltration rate modified fo	r monthly wind spee	d		. , . ,					0.14	
Jan Feb M	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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)	ım ÷ 4								•	
(22a)m= 1.27 1.25 1.	23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	

Adjuste	ed infiltr	ation rat	e (allowi	ing for sh	elter an	d wind s	speed) =	(21a) x	(22a)m					
<u> </u>	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula If me	ate ette echanic	<i>Ctive air</i> al ventila	change	rate for ti	he applic	cable ca	ISE						0.5	(23a)
lf exh	aust air h	eat pump	usina App	endix N. (2	3b) = (23a) × Fmv (e	equation (I	N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
lf bala	anced wit	h heat reco	overv: effic	iencv in %	allowing fo	or in-use f	actor (fron	n Table 4h) =	, (,			0.5	(230)
a) If	halance	d mech	anical ve	ntilation	with her	at recove	orv (MV/	HR) (24:	′ a)m – (2'	2h)m + (23h) v [[,]	1 – (23c)	- 1001	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28	÷ 100]	(24a)
b) If	halance	d mech	anical ve		without	heat rec	noverv (N	1 //\/) (24h	1 = (2)	2b)m + ('	23h)			· · · ·
(24b)m=					0	0					0	0		(24b)
c) If	whole h		tract ver		or positiv	e input v	ventilatio	n from (Jutside					
i i	if (22b)r	n < 0.5 >	< (23b), t	then (24c	c) = (23b); other	wise (24	c) = (22	o) m + 0	.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilati	on or wh	ole hous	e positiv	e input	ventilatio	on from	loft	!	!			
i	if (22b)r	n = 1, th	en (24d)	m = (22b	o)m othe	rwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]	-			
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	d) in bo	x (25)			·		
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	at l <mark>oss</mark> e	s and he	eat loss	paramete	er:									
ELEN		Gros	ss	Openin	gs	Net Ar	rea	U-val	ue	AXU		k-value		AXk
		area	(m²)	m	2	A ,r	m²	W/m2	2K	(W/I	K)	kJ/m²·l	<	kJ/K
Doors						1.91	X	1	=	1.91				(26)
Windo	ws Type	e 1				1.3	x1	/[1/(1.2)+	• 0.04] =	1.49				(27)
Windov	ws Type	e 2				2.43	x1	/[1/(1.2)+	0.04] =	2.78				(27)
Windo	ws Type	e 3				8.4	x1	/[1/(1.2)+	0.04] =	9.62				(27)
Windo	ws Type	e 4				6.12	x1	/[1/(1.2)+	0.04] =	7.01				(27)
Floor						77.17	7 X	0.1	=	7.717				(28)
Walls 7	Type1	43.2	28	18.25	5	25.03	3 X	0.16	=	4				(29)
Walls ⁻	Type2	28.	8	1.91		26.89	x 6	0.15	=	4.04	ן ר			(29)
Total a	area of e	elements	s, m²			149.2	4							(31)
Party v	wall					19.67	7 X	0	=	0				(32)
Party c	ceiling					77.17	7	L			i		≓ ⊢	(32b)
* for win ** includ	dows and le the are	l roof wind as on both	ows, use e sides of ir	effective wil nternal wall	ndow U-va 's and part	lue calcul itions	lated using	g formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	n 3.2	
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30) + (32) =				38.57	(33)
Heat c	apacity	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	12156.4	41 (34)
Therm	al mass	parame	eter (TMI	⊃ = Cm ÷	- TFA) in	⊨kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be ι	ign asses Jsed inste	sments wh ad of a de	ere the de tailed calc	etails of the ulation.	constructi	on are noi	t known pr	recisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix I	K						12.51	(36)
if details	of therm	al bridging	are not kr	10wn (36) =	= 0.05 x (3	1)								
i otal fa	abric he	at loss							(33) +	(36) =			51.08	(37)

Ventila	tion hea	at loss ca	alculated	dmonthl	у	-			(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	18.84	18.62	18.4	17.29	17.06	15.95	15.95	15.73	16.39	17.06	17.51	17.95		(38)
Heat tr	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	69.93	69.7	69.48	68.37	68.14	67.03	67.03	66.81	67.48	68.14	68.59	69.04		
								•	-	Average =	Sum(39)1.	12 /12=	68.31	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K				1	(40)m	= (39)m ÷	(4)			
(40)m=	0.91	0.9	0.9	0.89	0.88	0.87	0.87	0.87	0.87	0.88	0.89	0.89	0.00	
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12/12=	0.89	(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)
			!	!	!		!	!			!	I		
4 Wa	ater heat	tina ener	rav reau	irement:								kWh/ve	ear:	
		ing ono	igy ioqu										part	
		ipancy, l	N 1 76 y	(1 ovo	(0 0003		- 120	\2\ <u>1 - 0 (</u>	1012 v (*	TEA 12	2.	41		(42)
if TF	A > 13.9 A £ 13.9	9, N = 1 9, N = 1	+ 1.70 X	r [i - exh	(-0.0003	949 X (11	-A -13.9)2)] + 0.0	JU13 X (IFA - 13.	.9)			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		91	.37		(43)
Reduce	the annua e that 125	l average	hot water person pe	usage by r day (all w	5% if the a	lwelling is	designed i Id)	to achieve	a water us	se target o	f			
			Mar					A	0.00	Ort	New	Dea		
Hot wate	Jan er usage il	n litres per	dav for e	Apr ach month	Vd.m = fa	ctor from 7	JUI Table 1c x	(43)	Sep	Oct	NOV	Dec		
(44)m-	100.5	96.85	03 10	89.54	85.88	82.23	82.23	85.88	89.54	03.10	96.85	100.5		
(44)111-	100.5	30.03	33.13	03.34	00.00	02.25	02.20	05.00		Total = Su	m(44)1 12 =	100.5	1096.39	(44)
Energy (content of	hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)		
(45)m=	149.04	130.35	134.51	117.27	112.52	97.1	89.98	103.25	104.48	121.77	132.92	144.34		
										Total = Su	m(45) ₁₁₂ =	-	1437.54	(45)
lf instan	taneous w	ater heatii	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)					
(46)m=	22.36	19.55	20.18	17.59	16.88	14.57	13.5	15.49	15.67	18.26	19.94	21.65		(46)
Storag	storage	IUSS:	includir		alar ar M		storada	within sa	me ves	ما		0		(47)
If com	munity h		and no to	ng any su ank in du	velling e	ntor 110	litros in	(17)		501		0		(47)
Otherv	vise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		,					,	,	,			
a) If m	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	nanufact	urer's de	eclared (cylinder rom Tabl	loss fact	or is not b/litro/da	known:					00		(54)
If com	munity h	eating s	ee secti	on 4.3			iy)				0.	02		(51)
Volum	e factor	from Ta	ble 2a								1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
Energy	/ lost fro	m water	. storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)

If cylinde	er contain	s dedicate	d solar sto	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (57	7)m = (56)i	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circui	t loss (an	inual) fro	om Table	e 3	-						0		(58)
Primar	y circui	t loss cal	culated	for each	month (59)m = (58) ÷ 36	5 × (41)	m					
(mod	dified by	/ factor fi	om Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water he	eating ca	alculated	l for eacl	n month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m
(62)m=	204.32	180.28	189.79	170.76	167.8	150.59	145.25	158.53	157.98	177.04	186.41	199.62		(62)
Solar DH	- IW input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	204.32	180.28	189.79	170.76	167.8	150.59	145.25	158.53	157.98	177.04	186.41	199.62		
								Outp	out from wa	ater heate	r (annual)₁	12	2088.38	(64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	93.78	83.28	88.95	81.79	81.64	75.08	74.14	78.55	77.54	84.71	86.99	92.21		(65)
inclu	de (57)	m in calo	culation	of (65)m	only i <mark>f</mark> c	ylinder is	s in th <mark>e</mark> c	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal g	ains (see	Table 5	and 5a):									
Metabo	olic dair	ns (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35		(66)
Lightin	g gains	(calcula	ted in Ap	opendix l	L, equat	ion L9 oi	^r L9a), a	lso see	Table 5					
(67)m=	19.03	16.9	13.74	10.4	7.78	6.57	7.1	9.22	12.38	15.72	18.34	19.56		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L ²	13 or L1	3a), also	see Tal	ole 5				
(68)m=	213.42	215.64	210.06	198.18	183.18	169.08	159.67	157.45	163.03	174.91	189.91	204.01		(68)
Cookin	ig gains	s (calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03		(69)
Pumps	and fa	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. e	/aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28		(71)
Water	heating	gains (T	able 5)											
(72)m=	126.05	123.93	119.55	113.59	109.73	104.28	99.65	105.58	107.69	113.86	120.82	123.94		(72)
Total i	nterna	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (70)m + (7	1)m + (72)	m		
(73)m=	417.6	415.58	402.46	381.28	359.79	339.03	325.52	331.36	342.2	363.59	388.18	406.61		(73)
6. Sol	lar gain	s:		•		•					•			
Solar g	ains are	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orienta	ation:	Access F	actor	Area		Flu	X	-	g	-	FF		Gains	
		i able 6d		m²		Tab	ble 6a	Т	able 6b	Ta	able 6c		(VV)	

Northeast 0.9x	0.77	x	8.4	x	11.28	x	0.45	x	0.7	=	20.69	(75)
Northeast 0.9x	0.77	x	6.12	x	11.28	x	0.45	x	0.7	i =	15.07	- (75)
Northeast 0.9x	0.77	x	8.4	x	22.97	x	0.45	x	0.7	i =	42.11	- (75)
Northeast 0.9x	0.77	x	6.12	x	22.97	x	0.45	x	0.7	i =	30.68	- (75)
Northeast 0.9x	0.77	x	8.4	x	41.38	x	0.45	x	0.7	j =	75.88] (75)
Northeast 0.9x	0.77	x	6.12	x	41.38	x	0.45	x	0.7	i =	55.28	(75)
Northeast 0.9x	0.77	x	8.4	x	67.96	x	0.45	x	0.7	=	124.61	_ (75)
Northeast 0.9x	0.77	x	6.12	x	67.96	x	0.45	x	0.7	=	90.79	(75)
Northeast 0.9x	0.77	x	8.4	x	91.35	x	0.45	x	0.7] =	167.5	(75)
Northeast 0.9x	0.77	x	6.12	x	91.35	×	0.45	x	0.7	=	122.04	(75)
Northeast 0.9x	0.77	x	8.4	x	97.38	x	0.45	x	0.7	=	178.57	(75)
Northeast 0.9x	0.77	x	6.12	x	97.38	x	0.45	x	0.7	=	130.1	(75)
Northeast 0.9x	0.77	x	8.4	x	91.1	x	0.45	x	0.7	=	167.05	(75)
Northeast 0.9x	0.77	x	6.12	x	91.1	x	0.45	x	0.7] =	121.71	(75)
Northeast 0.9x	0.77	x	8.4	x	72.63	x	0.45	x	0.7	=	133.17	(75)
Northeast 0.9x	0.77	x	6.12	x	72.63	x	0.45	x	0.7] =	97.03	(75)
Northeast 0.9x	0.77	x	8.4	x	50.42	x	0.45	x	0.7] =	92.46	(75)
Northeast 0.9x	0.77	x	6.12	×	50.42	x	0.45	х	0.7	=	67.36	(75)
Northeast 0.9x	0.77	x	8.4	x	28.07) x	0.45	x	0.7] =	51.47	(75)
Northeast 0.9x	0.77	x	6.12	х	28.07] ×	0.45	x	0.7] =	37.5	(75)
Northeast 0.9x	0.77] x	8.4	x	14.2	x	0.45	x	0.7	=	26.03	(75)
Northeast 0.9x	0.77	x	6.12	×	14.2	x	0.45	x	0.7] =	18.97	(75)
Northeast 0.9x	0.77	x	8.4	x	9.21	x	0.45	x	0.7] =	16.9	(75)
Northeast 0.9x	0.77	x	6.12	x	9.21	x	0.45	x	0.7	=	12.31	(75)
Northwest 0.9x	0.77	x	1.3	x	11.28	x	0.45	x	0.7	=	3.2	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	1.3	x	22.97	x	0.45	x	0.7	=	6.52	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	x	1.3	x	41.38	x	0.45	x	0.7	=	11.74	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	x	1.3	x	67.96	x	0.45	x	0.7	=	19.28	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	1.3	x	91.35	x	0.45	x	0.7	=	25.92	(81)
Northwest 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(81)
Northwest 0.9x	0.77	x	1.3	x	97.38	x	0.45	x	0.7	=	27.64	(81)
Northwest 0.9x	0.77	x	2.43	x	97.38	x	0.45	x	0.7	=	51.66	(81)
Northwest 0.9x	0.77	x	1.3	×	91.1	×	0.45	x	0.7	=	25.85	(81)
Northwest 0.9x	0.77	x	2.43	×	91.1	x	0.45	x	0.7] =	48.33	(81)
Northwest 0.9x	0.77	x	1.3	x	72.63	x	0.45	x	0.7	=	20.61	(81)
Northwest 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(81)
Northwest 0.9x	0.77	x	1.3	×	50.42	x	0.45	x	0.7] =	14.31	(81)

Northw	est 0.9x	0.77	x	2.4	43	x	5	50.42	×		0.45	x	0.7	=	26.75	(81)
Northw	est 0.9x	0.77	×	1.	3	x	2	28.07	İ x [0.45	_ × [0.7	=	7.97	(81)
Northw	est 0.9x	0.77	×	2.4	13	x	2	28.07	× [0.45	×	0.7	=	14.89	(81)
Northw	est 0.9x	0.77	×	1.	3	x		14.2	i x [0.45		0.7	=	4.03	(81)
Northw	est 0.9x	0.77	×	2.4	43	x		14.2	İ x [0.45	_ × [0.7	=	7.53	(81)
Northw	est 0.9x	0.77	×	1.	3	x		9.21	× [0.45	_ × [0.7	=	2.61	(81)
Northw	est 0.9x	0.77	×	2.4	43	x		9.21	İ×「		0.45		0.7	=	4.89	(81)
	L								J L							
Solar g	gains in	watts, ca	alculate	d for eac	h month	n			(83)m	= Su	um(74)m .	(82)m				
(83)m=	44.95	91.5	164.85	270.73	363.91	3	87.97	362.94	289.	34	200.87	111.82	56.56	36.71		(83)
Total g	jains – i	nternal a	nd sola	r (84)m =	= (73)m	+ (83)m	, watts	-						-	
(84)m=	462.55	507.07	567.31	652.01	723.7		727	688.45	620.	.7	543.07	475.41	444.74	443.32		(84)
7. Me	an inter	rnal temp	perature	(heating	seasor	n)										
Temp	erature	during h	eating	periods i	n the liv	ing	area	from Tab	ole 9,	Th1	1 (°C)				21	(85)
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,n	n (s	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May	Τ	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec]	
(86)m=	0.96	0.95	0.92	0.84	0.7		0.54	0.41	0.4	7	0.7	0.88	0.95	0.97		(86)
Me <mark>an</mark>	interna	temper	ature in	living ar	ea T1 (f	follo	w ste	ps 3 to 7	7 in Ta	able	e 9c)		-		-	
(87)m=	19.17	19.38	19.76	20.28	20.68	Т	20.9	20.97	20.9	95	20.78	20.26	19.65	19.14		(87)
Temr		during h		eriods in		f dw	elling	from Ta			2 (°C)				4	
(88)m=	20.16	20.16	20.17	20.18	20.18		20.19	20,19	20.2	2	20.19	20.18	20.18	20.17	1	(88)
						- <u> </u>									J	
Utilisa						n2	,m (se ∩ 48		9a)	0	0.64	0.86	0.94	0.96	1	(89)
(03)11-	0.30	0.34	0.3	0.01	0.07		0.40	0.04	0.5	5	0.04	0.00	0.34	0.30	J	(00)
Mean		l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)			1	(00)
(90)m=	17.7	17.99	18.55	19.28	19.82		20.1	20.17	20.1	6	19.96 f	19.27	18.39	17.66		
											1		ing alea ÷ (4	+) =	0.28	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	ellin	g) = f	LA × T1	+ (1 -	- fL	A) x T2				7	
(92)m=	18.11	18.38	18.89	19.56	20.06	2	20.33	20.39	20.3	88	20.19	19.55	18.74	18.07		(92)
Apply	adjustr	ment to t	he mea	n interna	l tempe	ratu	ire fro	om Table	4e, v	whe	re appro	opriate	1 40 74	40.07	1	(02)
(93)m=	18.11	18.38	18.89	19.56	20.06		20.33	20.39	20.3	88	20.19	19.55	18.74	18.07		(93)
8. Sp	ace nea i to tho	aung requ moon int	urremen ornal to	(mporatu	ro obtai	n	l at at	on 11 of	Table	- 0h	o co tha	t Ti m-	(76)m an	d ro, colu	sulato	
the ut	tilisation	factor fo	or gains	using Ta	able 9a	nec	1 81 51	epiror	Table	5 90	, so ina	L 11,111=	(70)11 an	u ie-cai	Julate	
	Jan	Feb	Mar	Apr	May	Τ	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec]	
Utilisa	ation fac	tor for g	ains, hn	ו.						- 1					.	
(94)m=	0.94	0.92	0.88	0.8	0.66		0.49	0.36	0.4	1	0.64	0.84	0.92	0.95		(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (8	4)m								-		-	
(95)m=	435.52	468.31	501	518.94	477.29	3	57.41	247.13	255.	11	349.43	399.58	409.03	419.92		(95)
Montl	hly aver	age exte	rnal ten	nperature	e from T	abl	e 8		1						1	
(96)m=	4.3	4.9	6.5	8.9	11.7	Ļ	14.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Heat	loss rat	e tor mea	an interi	hal temp	erature,	Lm T	1,W:	=[(39)m :	x [(93	5)m-	- (96)m		700.00	057.00	1	(07)
(97)m=	0 booti-	939.5	000.08	1 /28.98	000th		003.0 /mar	$\frac{234.33}{100000000000000000000000000000000000$		00 (07)	410.73	009.60	(198.36 (11)m	991.08	J	(37)
Space (98)m-	394 34				68 85	T		u1 = 0.02 	<u>4 X [(</u>	(эт) 	0 – III 0	156 20	280.31	400 00	1	
(00)///-	L+		<u></u>	L	I 30.00		<u> </u>	L Ŭ_	Ľ		0	.00.20		1.00.00		

			-		-
	То	tal per year (kWh/y	$ear) = Sum(98)_{15,912} =$	2035.36	(98)
Space heating requirement in kWh/m²/yea	r		[26.37	(99)
9b. Energy requirements – Community hea	ting scheme				
This part is used for space heating, space of Fraction of space heat from secondary/supp	ooling or water heating pro Dementary heating (Table	vided by a com 11) '0' if none	munity scheme.	0	(301)
Fraction of space heat from community sys	tem 1 – (301) =		Γ	1] (302)
The community scheme may obtain heat from several	sources. The procedure allows fo	or CHP and up to fo	ur other heat sources; th	e latter	-
Fraction of heat from Community heat pump	eat from power stations. See App C	endix C.	[1	(303a)
Fraction of total space heat from Communit	y heat pump		(302) x (303a) =	1	(304a)
Factor for control and charging method (Tal	ole 4c(3)) for community he	eating system	[1	(305)
Distribution loss factor (Table 12c) for comm	nunity heating system		[1.2	(306)
Space heating				kWh/year	_
Annual space heating requirement				2035.36	
Space heat from Community heat pump		(98) x (304a) x (305) x (306) =	2442.43	(307a)
Efficiency of secondary/supplementary hear	ting system in % (from Tab	le 4a or Append	dix E)	0	(308
Space heating requirement from secondary	supplementary system	(98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating			r and a second se		7
If DHW from community scheme:				2088.38	
Water heat from Community scheme.		(64) x (303a) x (305) x (306) =	2506.05	(310a)
Electricity used for heat distribution	0.0	01 × [(307a)(307e	e) + (310a)(310e)] =	49.48	(313)
Cooling System Energy Efficiency Ratio			[0	(314)
Space cooling (if there is a fixed cooling sys	stem, if not enter 0)	= (107) ÷ (314) =	=	0	(315)
Electricity for pumps and fans within dwellin mechanical ventilation - balanced, extract o	g (Table 4f): r positive input from outsid	e	٦	147.11	(330a)
warm air heating system fans			Γ	0	_](330b)
pump for solar water heating			Ī	0] (330g)
Total electricity for the above, kWh/year		=(330a) + (330b) + (330g) =	147.11] (331)
Energy for lighting (calculated in Appendix I	_)		ſ	336.02] (332)
Electricity generated by PVs (Appendix M)	(negative quantity)		Ī	-730.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315	5) + (331) + (33	2)(237b) =	4701.53	(338)
12b. CO2 Emissions – Community heating	scheme				
	Er k\	nergy Vh/year	Emission factor kg CO2/kWh	Emissions <g co2="" td="" year<=""><td></td></g>	
CO2 from other sources of space and wate	r heating (not CHP)				_
Efficiency of heat source 1 (%)	If there is CHP using two fue	els repeat (363) to (366) for the second fuel	208	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] ;	(100 ÷ (367b) x	0.52 =	1234.74	(367)

[(307b)+(310b)] x 100 ÷ (367b) x

[(313) x

(367)

(372)

1234.74

25.68

0.52

0.52

Total CO2 associated with community s	systems	(363)(366) + (368)(37	2)	=	1260.42	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immer	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	vater heating	(373) + (374) + (375) =			1260.42	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x	0.52	=	76.35	(378)
CO2 associated with electricity for light	ng	(332))) x	0.52	=	174.4	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl	icable	0.52	x 0.01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				1132.26	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				14.67	(384)
El rating (section 14)					87.58	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP	2012	roportu	Stroma Softwa	a Numi are Ver	ber: sion:	loor	Versio	n: 1.0.5.49	
Addrose J	LI Block II Han	n Close I on	don TM	4001855. /10	DIUCK U	- IVIIQ F	1001			
Address :		n Ciose, Lon	uon, 1 w	10						
Ground floor	люна.		Area	a(m²) 7.17	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 192.92	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)	+(1e)+(1n	1) 7	7.17	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	192.92	(5)
2. Ventilation rate:	-	_								
Number of chimneys Number of open flues	main heating 0	secondar heating + 0 + 0	y] + [_] + [_	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)
Number of intermittent fa	ins					0	x ′	10 =	0	(7a)
Number of passive vents	;				Ē	0	x ^	10 =	0	_](7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
Infiltration due to chimne	ys, flues and fans	= (6a)+(6b)+(7	a)+(7b)+(7 d to (17), c	7c) = otherwise c	ontinue fro	0 om (9) to ((16)	Air ch ÷ (5) =	anges per ho	ur] ⁽⁸⁾
Number of storeys in the Additional infiltration Structural infiltration: 0	he dwelling (ns) .25 for steel or tim	ber frame or	0.35 for	masonr	y constru	uction	(9)·	-1]x0.1 =	0 0 0 0	(9) (10) (11)
It both types of wall are p deducting areas of openi If suspended wooden t	resent, use the value c ngs); if equal user 0.35 floor_enter 0.2 (un	orresponding to sealed) or 0	the greate	er wall area	a (atter enter 0				0	7(12)
If no draught lobby en	ter 0.05 else ente	r ()	1 (00010	u), 0100					0	$ = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} $
Percentage of windows	s and doors draug	ht stripped							0	$\int_{(14)}^{(10)}$
Window infiltration	5			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	cubic metre	s per ho	ur per so	quare me	etre of e	nvelope	area	4	(17)
If based on air permeabil	lity value, then (18)	= [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)
Air permeability value applie	es if a pressurisation te	st has been don	e or a deg	ıree air pei	meability i	is being us	sed			_
Number of sides sheltere	ed			(20) – 1 - [0 075 v (1	9)1 –			4	(19)
Sheller factor	ting chalter factor			(20) - 1 - [v (20) -	5)] –			0.7	
		aad		(21) = (10)	x (20) -				0.14	(21)
			hul	Δυα	Son	Oct	Nov	Dec		
	wai _ Api _ W	ay Jun	Jui	Aug	Seh	001		Dec		
$(22)_{m=}$ 5 1 5		3 3.8	3.8	37	4	43	45	47		
(<u>)</u>			5.0	5.7	4	- 1 .J	4.0	-+./		
Wind Factor (22a)m = (2	2)m ÷ 4	00 005	0.05	0.00		4.00	4.40	4.40	l	
(22a)III= 1.27 1.25	1.23 1.1 1.	00 0.95	0.95	0.92	Т	1.08	1.12	1.18		

Adjuste	ed infiltr	ation rat	e (allowi	ing for sh	elter an	d wind s	speed) =	= (21a) x	(22a)m			-		
<u> </u>	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcula If me	ate effe	<i>ctive air</i> al ventila	change	rate for t	he applic	cable ca	ISE						0.5	(23a)
lf exh	aust air h	eat pump	usina App	endix N. (2	3b) = (23a) × Fmv (e	equation (N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
lf bala	anced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (fror	m Table 4h) =	, (,			0.5	(230)
a) If	halance	d mech	anical ve	ntilation	with he	at recov	erv (MV	HR) (24:	′ a)m – (2'	2h)m + (23h) v [1 - (23c)	- 1001	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	1 - (230)	÷ 100]	(24a)
b) If	halance	d mech	anical ve	entilation	without	heat rec	roverv (M\/) (24k	1 = (22)	2b)m + (23b)			
(24b)m=	0			0	0	0				0	0	0		(24b)
c) If	whole h		tract ver		or positiv	e input	l ventilati	on from (Jutside					
i i	if (22b)r	n < 0.5 >	< (23b), 1	then (24c	c) = (23b); other	wise (24	lc) = (22	o) m + 0.	.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilati	on from	loft	1	<u> </u>			
í	if (22b)r	n = 1, th	en (24d)	m = (22b)m othe	rwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	c) or (24	1d) in bo	x (25)					
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	at losse	s and he	eat loss i	paramete	er:							_		
ELEN		Gros	ss	Openin	gs	Net Ar	rea	U-val	ue	AXU		k-value	9	AXk
		area	(m²)	m	2	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²·l	<	kJ/K
Doors						1.91	x	1	=	1.91				(26)
Windov	ws Type	€1				1.3	x1	/[1/(1.2)+	0.04] =	1.49				(27)
Windo	ws Type	e 2				2.43	x1	/[1/(1.2)+	0.04] =	2.78				(27)
Windo	ws Type	e 3				8.4	x1	I/[1/(1.2)+	0.04] =	9.62				(27)
Windov	ws Type	e 4				6.12	x1	I/[1/(1.2)+	0.04] =	7.01				(27)
Walls 7	Гуре1	43.2	28	18.25	5	25.03	3 x	0.16	=	4				(29)
Walls ⁻	Гуре2	28.	8	1.91		26.89	x f	0.15	=	4.04			$\neg \square$	(29)
Total a	rea of e	elements	s, m²			72.08	3							(31)
Party v	vall					19.67	7 X	0	=	0				(32)
Party f	loor					77.17	7				i		\neg	(32a)
Party c	eiling					77.17	7				[(32b)
* for win ** includ	dows and le the area	l roof wind as on both	lows, use e sides of ir	effective wil nternal wall	ndow U-va 's and part	lue calcul itions	lated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	n paragraph	 1 3.2	
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30) + (32) =				30.85	(33)
Heat c	apacity	Cm = S	(A x k)						((28)	.(30) + (3	2) + (32a)	(32e) =	6754.5	1 (34)
Therm	al mass	parame	eter (TM	⊃ = Cm ÷	- TFA) in	⊨kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be u	gn asses: Ised inste	sments wh ad of a de	nere the de tailed calc	etails of the ulation.	constructi	on are no	t known p	recisely the	e indicative	e values of	TMP in T	able 1f		
Therm	al bridg	es : S (L	. x Y) cal	culated u	using Ap	pendix l	K						7.95	(36)
if details	of therma	al bridging	are not kr	10wn (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			38.8	(37)

Ventila	tion hea	at loss ca	alculated	monthl	у	-			(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	18.84	18.62	18.4	17.29	17.06	15.95	15.95	15.73	16.39	17.06	17.51	17.95		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	57.65	57.42	57.2	56.09	55.86	54.75	54.75	54.53	55.19	55.86	56.31	56.75		
								•	-	Average =	Sum(39)1.	12 /12=	56.03	(39)
Heat lo	oss para	meter (H	HLP), W/	/m²K				1	(40)m	= (39)m ÷	(4)			
(40)m=	0.75	0.74	0.74	0.73	0.72	0.71	0.71	0.71	0.72	0.72	0.73	0.74	0.70	
Numbe	er of day	s in moi	nth (Tab	le 1a)					,	<pre>Average =</pre>	Sum(40)₁.	12/12=	0.73	(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)
			!	ļ	!		!	!			!	<u>. </u>		
4 Wa	ater heat	tina ener	rav reau	irement [.]								kWh/ve	ar:	
			igy ioqu											
		ipancy, l	N 1 76 v	[1 ovp	(0 0003		- 120	\2\ <u>1 - 0 (</u>	1012 v (*	FEA 12	2.	41		(42)
if TF	A £ 13.9	9, N = 1 9, N = 1	+ 1.70 X	r [i - exh	(-0.0003	949 X (11	A -13.9)2)] + 0.0	JU13 X (IFA - 13.	.9)			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		91	.37		(43)
Reduce	the annua that 125	l average	hot water person pe	usage by r dav (all w	5% if the a ater use. I	lwelling is	designed i Id)	to achieve	a water us	se target o	f			
			Max					A	0.00	Ort	New	Dec		
Hot wate	Jan er usage i	n litres per	Iviar dav for ea	Apr ach month	Vd.m = fa	ctor from 7	JUI Table 1c x	(43)	Sep	Oct	NOV	Dec		
(44)m-	100.5	96.85	03 10	89.54	85.88	82.23	82.23	85.88	89.54	03 10	96.85	100.5		
(44)111-	100.5	30.03	33.13	03.34	00.00	02.25	02.20	05.00		Total = Su	m(44)1 12 =	100.0	1096.39	(44)
Energy (content of	hot water	used - ca	lculated me	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	oth (see Ta	bles 1b, 1	c, 1d)	1000.00	
(45)m=	149.04	130.35	134.51	117.27	112.52	97.1	89.98	103.25	104.48	121.77	132.92	144.34		
										Fotal = Su	m(45) ₁₁₂ =	=	1437.54	(45)
lf instan	taneous w	ater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)					
(46)m=	22.36	19.55	20.18	17.59	16.88	14.57	13.5	15.49	15.67	18.26	19.94	21.65		(46)
Storag	storage	IUSS:	includir		alar ar M		storada	within sa	me ves	ما		0		(47)
If com	munity h		and no to	ng any su ank in du	velling e	ntor 110	litros in	(17)		501		0		(47)
Otherv	vise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		,					,	,	,			
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	nanufact	urer's de	eclared (cylinder com Tabl	loss fact	or is not b/litro/da	known:							(54)
If com	munity h	leating s	ee secti	on 4.3			iy)				0.	.02		(51)
Volum	e factor	from Ta	ble 2a								1.	.03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energy	/ lost fro	m water	. storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	.03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)

If cylinde	er contain	s dedicate	d solar sto	rage, (57)r	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (57	7)m = (56)i	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circui	t loss (an	inual) fro	om Table	e 3	-						0		(58)
Primar	y circui	t loss cal	culated	for each	month (59)m = (58) ÷ 36	5 × (41)	m					
(mod	dified by	/ factor fi	om Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water he	eating ca	alculated	l for eacl	n month	(62)m =	0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m
(62)m=	204.32	180.28	189.79	170.76	167.8	150.59	145.25	158.53	157.98	177.04	186.41	199.62		(62)
Solar DH	- IW input	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0'	if no sola	r contributi	ion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter											
(64)m=	204.32	180.28	189.79	170.76	167.8	150.59	145.25	158.53	157.98	177.04	186.41	199.62		
								Outp	out from wa	ater heate	r (annual)₁	12	2088.38	(64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/mo	onth 0.2	5´[0.85	× (45)m	+ (61)m] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	93.78	83.28	88.95	81.79	81.64	75.08	74.14	78.55	77.54	84.71	86.99	92.21		(65)
inclu	de (57)	m in calo	culation	of (65)m	only i <mark>f</mark> c	ylinder is	s in th <mark>e</mark> c	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal g	ains (see	Table 5	and 5a):									
Metabo	olic dair	ns (Table	5). Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35	120.35		(66)
Lightin	g gains	(calcula	ted in Ap	opendix l	L, equat	ion L9 oi	^r L9a), a	lso see	Table 5					
(67)m=	19.03	16.9	13.74	10.4	7.78	6.57	7.1	9.22	12.38	15.72	18.34	19.56		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L ²	13 or L1	3a), also	see Tal	ole 5				
(68)m=	213.42	215.64	210.06	198.18	183.18	169.08	159.67	157.45	163.03	174.91	189.91	204.01		(68)
Cookin	ig gains	s (calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03	35.03		(69)
Pumps	and fa	ns gains	(Table 5	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. e	/aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28	-96.28		(71)
Water	heating	gains (T	able 5)											
(72)m=	126.05	123.93	119.55	113.59	109.73	104.28	99.65	105.58	107.69	113.86	120.82	123.94		(72)
Total i	nterna	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (70)m + (7	1)m + (72)	m		
(73)m=	417.6	415.58	402.46	381.28	359.79	339.03	325.52	331.36	342.2	363.59	388.18	406.61		(73)
6. Sol	lar gain	s:		•		•					•			
Solar g	ains are	calculated	using sola	r flux from	Table 6a a	and associ	ated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orienta	ation:	Access F	actor	Area		Flu	X	-	g	-	FF		Gains	
	-	i able 6d		m²		Tab	ble 6a	Т	able 6b	Ta	able 6c		(VV)	

Northeast 0.9x	0.77	x	8.4	x	11.28	x	0.45	x	0.7	=	20.69	(75)
Northeast 0.9x	0.77	x	6.12	x	11.28	x	0.45	x	0.7	i =	15.07	- (75)
Northeast 0.9x	0.77	x	8.4	x	22.97	x	0.45	x	0.7	i =	42.11	- (75)
Northeast 0.9x	0.77	x	6.12	x	22.97	x	0.45	x	0.7	i =	30.68	- (75)
Northeast 0.9x	0.77	x	8.4	x	41.38	x	0.45	x	0.7	j =	75.88] (75)
Northeast 0.9x	0.77	x	6.12	x	41.38	x	0.45	x	0.7	i =	55.28	(75)
Northeast 0.9x	0.77	x	8.4	x	67.96	x	0.45	x	0.7	=	124.61	_ (75)
Northeast 0.9x	0.77	x	6.12	x	67.96	x	0.45	x	0.7	=	90.79	(75)
Northeast 0.9x	0.77	x	8.4	x	91.35	x	0.45	x	0.7] =	167.5	(75)
Northeast 0.9x	0.77	x	6.12	x	91.35	×	0.45	x	0.7	=	122.04	(75)
Northeast 0.9x	0.77	x	8.4	x	97.38	x	0.45	x	0.7	=	178.57	(75)
Northeast 0.9x	0.77	x	6.12	x	97.38	x	0.45	x	0.7	=	130.1	(75)
Northeast 0.9x	0.77	x	8.4	x	91.1	x	0.45	x	0.7	=	167.05	(75)
Northeast 0.9x	0.77	x	6.12	x	91.1	x	0.45	x	0.7] =	121.71	(75)
Northeast 0.9x	0.77	x	8.4	x	72.63	x	0.45	x	0.7	=	133.17	(75)
Northeast 0.9x	0.77	x	6.12	x	72.63	x	0.45	x	0.7] =	97.03	(75)
Northeast 0.9x	0.77	x	8.4	x	50.42	x	0.45	x	0.7] =	92.46	(75)
Northeast 0.9x	0.77	x	6.12	×	50.42	x	0.45	х	0.7	=	67.36	(75)
Northeast 0.9x	0.77	x	8.4	x	28.07) x	0.45	x	0.7] =	51.47	(75)
Northeast 0.9x	0.77	x	6.12	х	28.07] ×	0.45	x	0.7] =	37.5	(75)
Northeast 0.9x	0.77] x	8.4	x	14.2	x	0.45	x	0.7	=	26.03	(75)
Northeast 0.9x	0.77	x	6.12	×	14.2	x	0.45	x	0.7] =	18.97	(75)
Northeast 0.9x	0.77	x	8.4	x	9.21	x	0.45	x	0.7] =	16.9	(75)
Northeast 0.9x	0.77	x	6.12	x	9.21	x	0.45	x	0.7	=	12.31	(75)
Northwest 0.9x	0.77	x	1.3	x	11.28	x	0.45	x	0.7	=	3.2	(81)
Northwest 0.9x	0.77	x	2.43	x	11.28	x	0.45	x	0.7	=	5.99	(81)
Northwest 0.9x	0.77	x	1.3	x	22.97	x	0.45	x	0.7	=	6.52	(81)
Northwest 0.9x	0.77	x	2.43	x	22.97	x	0.45	x	0.7	=	12.18	(81)
Northwest 0.9x	0.77	x	1.3	x	41.38	x	0.45	x	0.7	=	11.74	(81)
Northwest 0.9x	0.77	x	2.43	x	41.38	x	0.45	x	0.7	=	21.95	(81)
Northwest 0.9x	0.77	x	1.3	x	67.96	x	0.45	x	0.7	=	19.28	(81)
Northwest 0.9x	0.77	x	2.43	x	67.96	x	0.45	x	0.7	=	36.05	(81)
Northwest 0.9x	0.77	x	1.3	x	91.35	x	0.45	x	0.7	=	25.92	(81)
Northwest 0.9x	0.77	x	2.43	x	91.35	x	0.45	x	0.7	=	48.46	(81)
Northwest 0.9x	0.77	x	1.3	x	97.38	x	0.45	x	0.7	=	27.64	(81)
Northwest 0.9x	0.77	x	2.43	x	97.38	x	0.45	x	0.7	=	51.66	(81)
Northwest 0.9x	0.77	x	1.3	×	91.1	×	0.45	x	0.7	=	25.85	(81)
Northwest 0.9x	0.77	x	2.43	×	91.1	x	0.45	x	0.7] =	48.33	(81)
Northwest 0.9x	0.77	x	1.3	x	72.63	x	0.45	x	0.7	=	20.61	(81)
Northwest 0.9x	0.77	x	2.43	x	72.63	x	0.45	x	0.7	=	38.53	(81)
Northwest 0.9x	0.77	x	1.3	×	50.42	x	0.45	x	0.7] =	14.31	(81)

Northw	west 0.9x 0.77 x 2.43 x 50.42						50.42) × [0.45	x	0.7	=	26.75	(81)	
Northw	est 0.9x	0.77	×	1.	3	x	2	28.07	İ x İ		0.45	×	0.7	=	7.97	(81)
Northw	est 0.9x	0.77	×	2.4	43	x	2	28.07	i _× [0.45	×	0.7	=	14.89	(81)
Northw	est 0.9x	0.77	×	1.	3	x		14.2	İ x İ		0.45	×	0.7	= =	4.03	(81)
Northw	est 0.9x	0.77	×	2.4	43	x		14.2	İ x İ		0.45	×	0.7	=	7.53	(81)
Northw	est 0.9x	0.77	×	1.	3	x		9.21	İ x İ		0.45	×	0.7	= =	2.61	(81)
Northw	est 0.9x	0.77	×	2.4	43	x		9.21	İ x İ		0.45	×	0.7	=	4.89	(81)
	L															
Solar g	gains in	watts, ca	alculate	d for eac	h month	n			(83)m	= Sı	um(74)m .	(82)m				
(83)m=	44.95	91.5	164.85	270.73	363.91	3	87.97	362.94	289.	34	200.87	111.82	56.56	36.71		(83)
Total g	jains – i	nternal a	and sola	r (84)m =	= (73)m	+ (83)m	, watts	-						-	
(84)m=	462.55	507.07	567.31	652.01	723.7		727	688.45	620	.7	543.07	475.41	444.74	443.32		(84)
7. Me	an inter	nal temp	perature	(heating	seasor	n)										
Temp	erature	during h	neating	periods i	n the liv	ing	area	from Tab	ole 9,	Th	1 (°C)				21	(85)
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,n	n (s	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.94	0.9	0.8	0.64		0.46	0.34	0.3	9	0.63	0.85	0.94	0.96		(86)
Me <mark>an</mark>	interna	temper	ature in	living ar	ea T1 (f	follo	w ste	ps 3 to 7	7 in Ta	able	e 9c)		•		-	
(87)m=	19.6	19.79	20.14	20.57	20.84		0.96	20.99	20.9	98	20.89	20.52	20.01	19.58		(87)
Temr		during		- Deriods in		f dw	elling	from Ta			2 (°C)					
(88)m=	20.3	20.3	20.3	20.32	20.32		20.33	20.33	20.3	34	20.33	20.32	20.31	20.31		(88)
						-L									J	
Utilisa					weiling,	n2	,m (se		9a)	4	0.58	0.83	0.03	0.96	1	(89)
(03)11-	0.35	0.33	0.03	0.11	0.0		0.42	0.23	0.5	4	0.50	0.00	0.95	0.30	J	(00)
Mean	interna	l temper	ature in	the rest	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)			1	(00)
(90)m=	18.4	18.68	19.17	19.78	20.14		20.3	20.33	20.3	32	20.22	19.73	19	18.37		(90)
											1		ing alea ÷ (+) =	0.28	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	ellin	g) = f	LA × T1	+ (1 -	- fL	A) x T2				1	
(92)m=	18.74	18.99	19.44	20	20.34	2	20.48	20.51	20.5	51	20.4	19.95	19.28	18.71	J	(92)
Apply	adjustr	nent to t	he mea	n interna	l tempe	ratu	ire fro	m Table	e 4e, v	whe	re appro	opriate	10.00	40.74	1	(02)
(93)m=	18.74	18.99	19.44	20	20.34		20.48	20.51	20.5	51	20.4	19.95	19.28	18.71		(93)
8. Sp	ace nea i to tho	lung requ moon int	urremen ornal to	t mporatu	ro obtai	n00	l at st	on 11 of	Tabl	o Ob	o co tha	t Ti m-	(76)m an	d ro, col	sulato	
the ut	tilisation	factor fo	or gains	using Ta	able 9a	neu	1 81 51	epiror	Table	5 90	, so ina	L 11,111=	(70)III ali	u ie-can	Julate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	Jg	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hn	n:									1			
(94)m=	0.94	0.92	0.87	0.76	0.6		0.43	0.31	0.3	6	0.59	0.82	0.91	0.94		(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (8	4)m										-	
(95)m=	433.86	464.81	492.42	496.57	437.38	3	12.37	211.93	220.	36	318.92	387.82	405.47	418.64	J	(95)
Montl	hly aver	age exte	ernal ten	nperature	e from T	abl	e 8		i						1	
(96)m=	4.3	4.9	6.5	8.9	11.7	<u> </u>	14.6	16.6	16.4	4	14.1	10.6	7.1	4.2	J	(96)
Heat	loss rate	e tor mea	an inter	hal temp	erature,	Lm	1,W =	=[(39)m :	x [(93	s)m-	- (96)m	500.00	005.00	000.05	1	(07)
(97)m=	032.18		$1^{(40.15)}$	022.33	482.5	3	22.09	$\frac{214.11}{10000000000000000000000000000000000$	223.	90 (07)	347.99 m (05	522.29	41)m	023.35	J	(37)
Space (98)m-	296 36	231 37			33 57	T		u1 = 0.02 	<u>4 X [(</u>	(1e) 	0 – III 0	אים חחון X (100 מיי	201.80	301 11	1	
(00)///-		<u> </u>	I 107.01	<u> </u>	<u> </u>		v	ΙŬ	L v		0					

Total per year (kWh/year) = Sum(98) _{15,9}	12 = 14	39.2	(98)
Space heating requirement in kWh/m²/year	18	3.65	(99)
9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating provided by a community scheme Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	ə.	0	(301)
Fraction of space heat from community system $1 - (301) =$		1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat source	ces; the latter		
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump		1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =		1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system	1	.2	(306)
Space heating	k٧	/h/year	-
Annual space heating requirement	14	39.2	
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	172	27.04	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0	(308
Space heating requirement from secondary/supplementary system (98) × (301) × 100 ÷ (308) =		0	(309)
Water heating			-
If DHW from community scheme:	208	38.38	
Water heat from Community heat pump (64) x (303a) x (305) x (306) =	250	06.05	(310a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e))] = 42	2.33	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$		0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	14	7.11	(330a)
warm air heating system fans		0	 (330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) =	14	7.11	(331)
Energy for lighting (calculated in Appendix L)	33	6.02	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	-73	0.07	(333)
Total delivered energy for all uses (307) + (309) + (310) + (312) + (315) + (331) + (332)(237b) =	39	86.14	(338)
12b. CO2 Emissions – Community heating scheme			
Energy Emission fac kWh/year kg CO2/kWh	tor Emissi kg CO2	ons 2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	d fuel	208	(3672)
CO2 associated with heat source 1 $[(307b)+(310b)] \times 100 \div (367b) \times 1052$	=		(367)

[(307b)+(310b)] x 100 ÷ (367b) x

[(313) x

Electrical energy for heat distribution

(367)

(372)

1056.24

21.97

0.52

0.52

Total CO2 associated with community s	systems	(363)(366) + (368)(37	2)	=	1078.21	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			1078.21	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	76.35	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	174.4	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl	icable	0.52 × 0	0.01 =	-378.91	(380)
Total CO2, kg/year	sum of (376)(382) =				950.04	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				12.31	(384)
El rating (section 14)					89.58	(385)

#
			User D	etails:										
Assessor Name: Software Name:	Stroma FSAP 20	12		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49					
	V Block V Hom C	P Iooo I oo	roperty /	Address:	BIOCK V	- Groui	nd Floor							
Address : 1 Overall dwelling dimen	sions:	iose, Lon	uon, i vv	10										
Ground floor	3013.		Area 5	a (m²) 0.27	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 125.68	(3a)				
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1r	I) 5	0.27	(4)									
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	125.68	(5)				
2. Ventilation rate:														
Number of chimneys Number of open flues	main s heating • 0 + 0 +	secondar heating 0 0	y] +] +	0 0] = [total 0 0	x 4	40 = 20 =	m ³ per hour	(6a) (6b)				
Number of intermittent fan	S					0	X .	10 =	0	(7a)				
Number of passive vents					Γ	0	x	10 =	0	(7b)				
Number of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $x40 =$ Number of open flues 0 $+$ 0 $+$ 0 $=$ 0 $x20 =$ Number of intermittent fans 0 $x10 =$ 0 $x10 =$ Number of passive vents 0 $x10 =$ 0 $x40 =$ Number of flueless gas fires 0 $x40 =$ 0 $x40 =$ Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 \div (5) = fi If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) fi Number of storeys in the dwelling (ns) fi fi fi Additional infiltration fi fi fi														
Infiltration due to chimneys	0	(8)												
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dw <mark>elling</mark> (ns) 25 for steel or timber	r frame or	0.35 for	masonr	ry constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)				
if both types of wall are pre deducting areas of opening If suspended wooden flo	sent, use the value corre s); if equal user 0.35 por, enter 0.2 (unsea	esponding to aled) or 0.	the greate	er wall area d), else	a (after enter 0				0	_](12)				
If no draught lobby, ente	er 0.05, else enter 0								0	(13)				
Percentage of windows	and doors draught	stripped							0	(14)				
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)				
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) ·	+ (15) =		0	(16)				
Air permeability value, q	50, expressed in cu	bic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)				
If based on air permeability	y value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)				
Air permeability value applies	if a pressurisation test h	as been don	ie or a deg	ree air pei	rmeability	is being u	sed							
Shelter factor				(20) = 1 - [[0.075 x (1	9)] =			0.7	(19)				
Infiltration rate incorporatir	ng shelter factor			(21) = (18)) x (20) =				0.14](21)				
Infiltration rate modified for	r monthly wind spee	ed							0.11					
Jan Feb M	/ar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind spe	ed 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)	 ım ÷ 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]					

Adjust	ed infiltr	ation rat	e (allowi	ing for sl	helter an	d wind s	peed) =	(21a) x	(22a)m					
0.1.	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul If m	ate ette	<i>Ctive air</i> al ventila	change	rate for a	the applic	cable ca	se						0.5	(232)
lf exh	aust air h	eat pump	usina App	endix N. (2	23b) = (23a) x Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
If bala	anced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (from	n Table 4h) =	, (,			0.5	(220)
a) If	halance	d mech	anical ve	ntilation	with he	at recove	⊃rv (M\/ŀ	HR) (24a) m = (22	2h)m + (23h) x [′	1 – (23c)	10.3	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	halance	l d mech	I anical ve	I	without	heat rec	overv (N	I /I\/) (24h	l = (22)	I 2b)m + (L 23h)		J	
(24b)m=	0	0		0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	i ouse ex	ract ver	ntilation (or positiv	re input v	/entilatic	n from c	utside				1	
-,	if (22b)r	n < 0.5 >	< (23b), t	hen (24	c) = (23b); other	wise (24	c) = (22b	o) m + 0.	.5 × (23b))			
(24c)m=	- 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	on or wh	ole hous	se positiv	ve input	ventilatio	on from I	oft	-	-	-		
	if (22b)r	n = 1, th	en (24d)	m = (22	b)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a	ı) or (24b	o) or (240	c) or (24	d) in boy I	(25) I				1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramet	er:									
ELEN		Gros area	ss (m²)	Openir n	igs 1 ²	Net Ar A ,r	ea n²	U-valı W/m2	ue K	A X U (W/	K)	k-value kJ/m²·	e K	A X k kJ/K
Doo <mark>rs</mark>						1.91	x	1	= [1.91				(26)
Windo	ws Type	e 1				2.43	x1,	/[1/(1.2)+	0.04] =	2.78	F			(27)
Windo	ws Type	e 2				1.44	x1,	/[1/(1.2)+	0.04] =	1.65	F			(27)
Windo	ws Type	e 3				6	x1,	/[1/(1.2)+	0.04] =	6.87	5			(27)
Floor						50.27	, x	0.1	= [5.027				(28)
Walls ⁻	Type1	30.	1	9.87	7	20.23	3 X	0.16	= 	3.24			\dashv	(29)
Walls ⁻	Type2	35.7	78	1.9		33.87	, x	0.15		5.09			\dashv	(29)
Total a	area of e	elements	, m²			116.1	5		เ		L			(31)
Partv v	wall					10.85		0	= [0				(32)
Party	ceilina					50.27	,		เ	Ū	L			(32b)
* for win	ndows and	l roof wind	ows, use e	effective w	indow U-va	alue calcul	 ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	paragraph		(020)
** incluc	le the area	as on both	sides of ir	nternal wa	lls and part	itions	0			, <u>-</u>	0			
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				26.57	(33)
Heat c	apacity	Cm = S((A x k)						((28)	(30) + (32	2) + (32a).	(32e) =	8012.9	1 (34)
Therm	al mass	parame	eter (TMI	⊃ = Cm ·	: TFA) in	ı kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be l	ign asses: used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	e constructi	on are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						8.74	(36)
if details	s of therma	al bridging	are not kr	nown (36) :	= 0.05 x (3	1)			(00)	(0.0)				 .
	abric he	at loss	ما میں اور د	ا بار م					(33) +	(36) =	(DE) (E)		35.3	(37)
ventila	ation hea				y 	1	11	Δ	(38)m	= 0.33 × (25)m x (5)		1	
	Jan	⊢eb	Iviar	Apr	May	Jun	Jul	Aug	Sep	Uct	INOV	Dec		

(38)m=	12.28	12.13	11.99	11.26	11.11	10.39	10.39	10.24	10.68	11.11	11.41	11.7		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	47.58	47.44	47.29	46.56	46.42	45.69	45.69	45.55	45.98	46.42	46.71	47		
Heat lo	oss para	meter (H	HLP). W	/m²K					(40)m	Average = = (39)m ÷	Sum(39) ₁	12 /12=	46.53	(39)
(40)m=	0.95	0.94	0.94	0.93	0.92	0.91	0.91	0.91	0.91	0.92	0.93	0.93		
										Average =	Sum(40)1	12 /12=	0.93	(40)
Numbe	er of day	s in moi	nth (Tab	le 1a)	Mari	line	1.1	A	0.00	Ort	New	Dee		
(41)m=	Jan 31	28	Mar 31	Apr 30	May 31	Jun 30	31 31	Aug 31	30	31	30	31		(41)
(+1)	01	20		00		00							I	(,
4. Wa	iter heat	tina ener	rav reau	irement:								kWh/ve	ear:	
													part	
Assum if TF	ed occu A > 13.9	ipancy, I 9, N = 1	N + 1.76 x	: [1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.	1 .9)	.7		(42)
If IF Annua	A £ 13.9 Laverad	9, N = 1 e hot wa	ater usad	ne in litre	es per da	v Vd.av	erage =	(25 x N)	+ 36		74	53		(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	welling is	designed t	to achieve	a water us	se target o	f		I	(10)
not more	e that 125	litres per	berson per	r day (all w	ater use, I	not and co								
Hot wate	Jan er usage i	Feb n litres per	Mar dav for ea	Apr ach month	May Vd.m = fa	Jun ctor from T	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	81.98	79	76.02	73.04	70.06	67.08	67.08	70.06	73.04	76.02	79	81.98		
(,	0.100		10.01							Total = Su	m(44) ₁₁₂ =		894.34	(44)
Ener <mark>gy</mark> o	content of	hot water	used - cal	lculated mo	onthly $= 4$.	190 x Vd,r	m x nm x D)Tm / 3600) kWh/mor	nth (<mark>see Ta</mark>	bles 1b, 1	c, 1d)		
(45)m=	121.58	106.33	109.72	95.66	91.79	79.21	73.4	84.22	85.23	99.33	108.42	117.74		
lf instan	taneous w	vater heatii	ng at point	t of use (no	o hot water	· storage),	enter 0 in	boxes (46) to (61)	Tota <mark>l = Su</mark>	m(45) ₁₁₂ =	-	1172.63	(45)
(46)m=	18.24	15.95	16.46	14.35	13.77	11.88	11.01	12.63	12.78	14.9	16.26	17.66		(46)
Water	storage	loss:			ļ		ļ	ļ		ļ				
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h vise if no	eating a	nd no ta	ank in dw ar (this in	velling, e ocludes i	nter 110 nstantar) litres in	(47) mbi boil	ers) entr	ər 'O' in <i>(</i>	47)			
Water	storage	loss:	not wate			notantai								
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear	or is not	known:	(48) x (49)) =		1	10		(50)
Hot wa	iter stora	age loss	factor fr	rom Tabl	le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If comr	nunity h	eating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a m Table	2h							1.	.03		(52)
Energy	lost fro	m water	storage	× 20	aar			$(47) \times (51)$) y (52) y (53) -		.6		(53)
Enter	(50) or ((54) in (5	55)	, r. v v i i/ y t	Jai			(-TT) X (UT)	, ^ (32) ^ (1.	.03		(54)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m	L			. ,
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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 Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m	_				
(moo	dified by	factor fi	rom Tab I	le H5 if t	here is s	solar wat	ter heatii	ng and a	i cylinde I	r thermo	stat)	r	I	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	176.85	156.26	165	149.15	147.07	132.7	128.67	139.5	138.72	154.6	161.92	173.02		(62)
Solar DH	-IW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter							-	-	-	'	
(64)m=	176.85	156.26	165	149.15	147.07	132.7	128.67	139.5	138.72	154.6	161.92	173.02		
								Outp	out from wa	ater heate	r (annual)₁	12	1823.47	(64)
Heat g	ains froi	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	_
(65)m=	84.65	75.3	80.7	74.6	74.74	69.13	68.63	72.23	71.13	77.25	78.85	83.37		(65)
inclu	ıde (57)ı	n in calo	ulation	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ate <mark>r is f</mark> r	om com	ı munitv h	eating	
5 Int	ernal da	ins (see	Table F	5 and 5a				9					3	
Motob		o (Toblo		to										
Metabo	olic gain	S (Table Feb	Mar	Apr	May	Jun		Αυσ	Sen	Oct	Nov	Dec	1	
(66)m =	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9		(66)
Lightin	a gaine		tod in Ar	pondiv			r ()a) a			01.0	01.0	01.0	i i	()
(67)m-	y yains	11.82				159	1 L9a), a	6 45	8 66	10.99	12.83	13.68		(67)
	10.01	11.02	9.01	1.20	J.44	4.55	4.30		0.00		12.05	15.00		(07)
Appila	nces ga	ns (caic					13 OF L1	3a), also 14			404.04		I	(69)
(68)m=	147.94	149.47	145.6	137.37	126.97	117.2	110.67	109.14	113.01	121.24	131.64	141.41	l	(00)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a) I), also se I	e Table	5	r		I	(00)
(69)m=	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49		(69)
Pumps	and far	ns gains	(Table 5	5a)		r				r	r	r	1	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	113.77	112.05	108.47	103.61	100.46	96.02	92.24	97.08	98.8	103.83	109.51	112.06		(72)
Total i	nternal	gains =				(66)	m + (67)m	n <mark>+ (68)m</mark> +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	323.49	321.81	312.16	296.73	281.34	266.28	256.35	261.14	268.93	284.53	302.45	315.61		(73)
6. So	lar gains	8:												
Solar g	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	e applicab	le orientat	ion.		

	Jan	Feb	Mar	Арі	' Mag	y	Jun	Jul	Ai	ug Sep		t Nov	Dec			
Utilisa	ation fac	ctor for ga	ains for	living a	area, h1,	m (see Ta	ble 9a)					1	-		
Temp	erature	during h	eating p	periods	in the li	ving	g area f	from Tab	ole 9,	Th1 (°C)					21	(85)
7. Me	an inter	rnal temp	erature	(heati	ng seaso	on)										
(84)m=	415.8	475.04	512.35	530.8	7 532.34	4	510.88	494.05	486	.71 480.82	451.2	22 412.26	395.13			(84)
Total g	ains – i	internal a	nd sola	r (84)n r	n = (73)n	n +	(83)m	, watts						-		
(83)m=	92.32	153.23	200.19	234.1	4 251		244.61	237.7	225	.58 211.89	166.6	69 109.81	79.51			(83)
Solar g	ains in	watts, ca	lculated	for ea	ach mon	th			(83)m	= Sum(74)m	(82)m	1		_		
	L]	L		J	L		1 1			L]	L		` ´
South	0.9x	0.77	×		6	x		40.4	x	0.45	⊢ ×	0.7	=		52.91	(78)
South	0.9x	0.77	x		6	, . x	5	5.42	x	0.45	×	0.7	=		72.58	(78)
South	0.9x	0.77			6	」 ^ x		2.59	」 】 × 】	0.45		0.7	=		108.17	(78)
South	0.9x	0.77	⊢^x		6	」		01.89	」 ^ _ x	0.45	⊢ ^	0.7	\exists		133.45	() (78)
South	0.9x	0.77	=	-	6	ר ו א ו		04.89	」	0.45	╡ ^ˆ	0.7	=		137.39	(78)
South	0.9x	0.77			6	י נ 1 ג		10.00 N8 01	」 ^ 、	0.45		0.7	=		141 47	
South	0.97	0.77	╡ Û		6	」 ^ 】 ↓		10.55	」 ^ 、	0.40	╡ ၞ	0.7	=		144 70	(⁷⁰⁾
South	0.97	0.77	╡ 、	<u> </u>	6	」^ 1 ~		10.23	」 ^]	0.45	╡ \$	0.7	=		144.38	(⁷⁰⁾
South	0.9x	0.77	╡ 、		6	」 ^ 1 ~		10.22	」 ^]	0.45	╡ 、	0.7	=		144.29	(78)
South	0.97	0.77	┤		6	」 ×] ↓		0.07] ^] _	0.45		0.7			127.75	(⁷⁰)
South	0.9X	0.77	└ `		6			6.57]	0.45		0.7	=		100.20	(78)
South		0.77			6			6.7E		0.45		0.7			9.9	$= \begin{bmatrix} (\prime \prime) \\ (7 0) \end{bmatrix}$
Southe	asto ov	0.77			2.43			1.49	×	0.45		0.7			16.7	
Southe	asto ou	0.77			1.44] X]		4.07		0.45	×	0.7	=		13.85	
Southe	ast 0.9x	0.77			2.43	X	4	4.07		0.45	×	0.7	=		23.38	
Southe	ast 0.9x	0.77			1.44] X]		9.27	X	0.45	×	0.7			21.77	
Southe	ast 0.9x	0.77	×		2.43	×	6	9.27	×	0.45	×	0.7			36.74	(77)
Southe	astoc	0.77	×		1.44	× 1	9	2.85	X] .	0.45		0.7	= =		29.19	
Southe	asi ().9x	0.77	×		2.43	× 1	9	2.85	X 1	0.45	×	0.7	=		49.25	(77)
Souther	ast 0.9x	0.77	×		1.44	×	1	04.39	X	0.45	×	0.7	=		32.81	(77)
Southe	ast 0.9x	0.77	X		2.43	X	1	04.39	×	0.45	×	0.7	=		55.37	(77)
Southe	ast 0.9x	0.77	×		1.44	X	1	13.91	×	0.45	×	0.7	=		35.81	(77)
Southe	ast 0.9x	0.77	×		2.43	×	1	13.91	×	0.45	×	0.7	=		60.42	(77)
Southe	ast 0.9x	0.77	×		1.44	×	1	18.15	×	0.45	×	0.7	=		37.14	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	x	1	18.15	x	0.45	x	0.7	=		62.67	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		1.44	x	1	19.01	x	0.45	x	0.7	=		37.41	(77)
Southe	ast <mark>0.9</mark> x	0.77	×		2.43	x	1	19.01	x	0.45	x	0.7	=		63.13	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		1.44	×	1	06.25	x	0.45	x	0.7	=		33.4	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	x	1(06.25	x	0.45	×	0.7	=		56.36	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		1.44	x	8	5.75	x	0.45	x	0.7	=		26.96	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	x	8	5.75	x	0.45	x	0.7	=		45.49	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		1.44	x	6	2.67	x	0.45	x	0.7	=		19.7	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43) ×	6	2.67	x	0.45	x	0.7	=		33.25	(77)

(86)m=	0.92	0.89	0.84	0.77	0.67	0.52	0.39	0.41	0.58	0.78	0.89	0.93		(86)
Mean	interna	l temper	ature in	living ar	⊨ ⊇a T1 (fr	u Now ste	ns 3 to 7	r in Tabl	e 9c)					
(87)m=	19.43	19.7	20.03	20.41	20.7	20.9	20.97	20.96	20.85	20.49	19.91	19.38		(87)
Tomp	oraturo	during h	L Leating r	L oriode ir	rest of	l dwelling	l from Ta		ا ایک (۹ ۲)					
(88)m=	20.13	20.13	20.13	20.15	20.15	20.16	20.16	20.16	20.15	20.15	20.14	20.14		(88)
Litilion	tion for	tor for a	l	root of d	wolling	L	L	(
(89)m=	0.91	0.88	0.83	0.74	0.63	0.47	0.32	9a) 0.34	0.53	0.74	0.87	0.92		(89)
()														
	18 04	18 42	18 89	19 42		$\frac{10}{20.07}$		20 14	20.01	e 9C) 19 54	18 74	17 98		(90)
(00)11-	10.04	10.42	10.00	10.42	10.02	20.07	20.14	20.14	f	LA = Livin	g area ÷ (4	4) =	0.48	(91)
							· • · · •	<i>(</i>) ()	A) T O		. .	,	0.40	
Mean	Interna	19.03	ature (fo		ole dwe	lling) = fl	LA × 11	+(1-1L)	A) × 12	20	10.3	18.65		(92)
	adiustn	hent to t	he mear	internal	temper	ature fro	m Table	40.00			19.5	10.05		(52)
(93)m=	18.71	19.03	19.44	19.9	20.24	20.47	20.54	20.53	20.42	20	19.3	18.65		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti	to the r	nean int	ernal ter	mperatui	re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:	0.00	0.40	0.05	0.07	0.54	0.74	0.00	0.04		(04)
(94)m=		0.86	0.81	(0.74)	0.63	0.49	0.35	0.37	0.54	0.74	0.86	0.91		(94)
(95)m=	372.51	408.04	, VV = (94	390.85	336.32	248.72	174.52	181.73	261.64	332.74	352.63	357.96		(95)
Month	lv aver	age exte	rnal terr	perature	e from Tr	able 8	11 1.02	101.10	201.01	002.77	002.00	001.00		()
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	⊑ =[(39)m∶	r [(93)m	– (96)m]				
(97)m=	685.59	670.41	611.91	512.02	396.63	268.14	179.94	188.28	290.47	436.12	569.92	679.31		(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=	232.93	176.31	146.46	87.25	44.87	0	0	0	0	76.91	156.45	239.09		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	1160.26	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								23.08	(99)
9b. En	ergy rec	luiremer	nts – Coi	mmunity	heating	scheme)							
This pa	art is use	ed for sp	ace hea	ting, spa	ace cool	ing or wa	ater heat	ting prov	ided by	a comm	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary,	/supplen	nentary l	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The com	munity so	heme mag	y obtain he	eat from se	everal sou	rces. The p	procedure	allows for	CHP and u	up to four o	other heat	sources; tl	ne latter	
includes Fractio	boilers, h	eat pumps at from C	s, geotheri	nal and wa ity beat i	aste heat f	rom powei	r stations.	See Appel	ndix C.			I	1	(303a)
Fractio					pump					(0)		、		
Fractio	n of tota	al space	neat fro	m Comn	nunity ne	eat pump	D			(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys ⁻	tem			1	(305)
Distribu	ution los	s factor	(Table 1	12c) for c	commun	ity heatii	ng syste	m					1.2	(306)
Space	heating	9										-	kWh/ye	ear
Annual	space	heating	requiren	nent									1160.26	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1392.31	(307a)
Efficiency of secondary/supplementary heating system in % (from	n Table 4a or Appen	idix E)	0	(308
Space heating requirement from secondary/supplementary syste	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1823.47	1
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2188.16](310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	35.8	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	utside		95.83	- (330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	95.83	(331)
Energy for lighting (calculated in Appendix L)			235.03	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3)</mark>
Tota <mark>l delivered energy for all uses (</mark> 307) + (309) + (310) + (312) +	- <mark>(315) + (</mark> 331) + (33	32)(237b) =	3 <mark>181.2</mark> 6	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	two fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.52	893.4	(367)
Electrical energy for heat distribution [(3	313) x	0.52	= 18.58	(372)
Total CO2 associated with community systems (3	63)(366) + (368)(372	2) =	911.98	(373)
CO2 associated with space heating (secondary) (3	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneo	ous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		911.98	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	49.73	(378)
CO2 associated with electricity for lighting (3	32))) x	0.52	= 121.98	(379)
Energy saving/generation technologies (333) to (334) as applicatilities 1	ble	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			704.79	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			14.02	(384)
El rating (section 14)			90.09	(385)

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20)12		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49	
	V Disels V Liens C	P	roperty /	Address:	Block V	' - Mid F	loor			
Address :	V, BIOCK V, Ham C	lose, Lon	don, I vv	10						
Ground floor	510115.		Area 5	a (m²) 0.27	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 125.68	(3a)
Total floor area TFA = (1a)	+(1b)+(1c)+(1d)+(1	le)+(1r	1) 5	0.27	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	d)+(3e)+	(3n) =	125.68	(5)
2. Ventilation rate:										
Number of chimneys Number of open flues	main heating 0 + 0 +	secondar heating 0 0	y] + [] + [0 0] = [total 0 0	x	40 = 20 =	m³ per hour 0 0	(6a) (6b)
Number of intermittent fan	S					0	X	10 =	0	(7a)
Number of passive vents					Γ	0	x	10 =	0	(7b)
Number of flueless gas fire	o anges per hou	(7c)								
Infiltration due to chimneys	0	(8)								
Number of storeys in the Additional infiltration Structural infiltration: 0.2	e dw <mark>elling</mark> (ns) 25 for steel or timbe	r frame or	0.35 for	masonr	ry constr	uction	[(9)	-1]x0.1 =	0	(9) (10) (11)
if both types of wall are pre deducting areas of opening If suspended wooden flo	sent, use the value corre s); if equal user 0.35 por, enter 0,2 (unse	esponding to aled) or 0.	the great	er wall area	a (after enter 0				0](12)
If no draught lobby, ente	er 0.05. else enter 0			,					0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration	-			0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, q	50, expressed in cu	ubic metre	s per ho	our per so	quare m	etre of e	envelope	area	4	(17)
If based on air permeability	y value, then (18) = [(17) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)
Air permeability value applies	if a pressurisation test h	as been dor	ne or a deg	ree air pei	rmeability	is being u	sed		r	
Shelter factor				(20) = 1 - [[0.075 x (1	9)] =			4	(19)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)) x (20) =				0.1	(20)
Infiltration rate modified for	monthly wind spee	ed		. , . ,					0.14](=.)
Jan Feb M	Mar Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7	•			. <u> </u>				1	
(22)m= 5.1 5 4	.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)	m ÷ 4	I								
(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]	

Adjust	ed infiltr	ation rat	e (allowi	ing for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m	-			-	
	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul	ate etter	ctive air	change	rate for t	he appli	cable ca	se						0.5	(220)
lf exh	aust air h	eat pump i	using App	endix N. (2	23b) = (23a	i) x Fmv (e	equation (N	(5)) othe	rwise (23b) = (23a)			0.5	(23a)
If bal	anced with	n heat reco	overv: effic	iencv in %	allowing f	or in-use fa	actor (from	n Table 4h) =) (200)			0.5	(230)
a) If	halance	d mech	anical ve	ntilation	with he	at recove		HR) (24a	/ a)m – (21	2h)m + (23h) v ['	1 – (23c)	10.5	(230)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
() b) If	halance		anical ve		without	heat rec		() () () () () () () () () () () () () (1 = (22)	$p_{p} + ($	23h)	0.20	J	
(24b)m=											0	0	1	(24b)
() If			tract ver	L tilation (ventilatio	n from c		ů	Ů	ů	J	
0) 11	if (22b)n	0.30 ex	: (23b), 1	then (24	c) = (23b)); otherv	vise (24	c) = (22b	buiside b) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If	natural if (22b)n	ventilation $= 1$, the	on or wh en (24d)	ole hous m = (22	se positiv b)m othe	ve input v erwise (2	ventilatio 4d)m = (on from l 0.5 + [(2	oft 2b)m² x	0.5]			-	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24d)
Effe	ctive air	change	rate - er	nter (24a	u) or (24b	o) or (240	c) or (24	d) in box	k (25)				1	
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0 <mark>.27</mark>	0.27	0.28		(25)
2 40	ot loopo	a and he	et less i	ooromot	or								,	
		S and he	at 1055			Not Ar	02	ll-vali		ΔΧΠ		k-value		AXK
ELEN		area	(m²)	r	193 1 ²	A ,r	n ²	W/m2	?K	(W/I	K)	kJ/m ² ·l	ĸ	kJ/K
Doo <mark>rs</mark>						1.91	x	1	= [1.91				(26)
Windo	<mark>ws</mark> Type	e 1				2.43	x1/	/[1/(1.2)+	0.04] =	2.78	Fi i			(27)
Windo	ws Type	2				1.44	x1/	/[1/(1.2)+	0.04] =	1.65	F			(27)
Windo	ws Type	e 3				6	x1/	/[1/(1.2)+	0.04] =	6.87	5			(27)
Walls	Type1	30.	1	9.87	,	20.23	x	0.16] = [3.24				(29)
Walls	Type2	35.7	8	1.91		33.87	×	0.15	= [5.09			\exists	(29)
Total a	area of e	lements	, m²			65.88		L	'					(31)
Party v	wall					10.85	x	0	=	0			\neg	(32)
Party f	loor					50.27	,]				L		\exists	(32a)
Party	ceiling					50.27					L L		\dashv	(32b)
* for win	dows and	roof wind	ows, use e	effective wi	indow U-va	alue calcula	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	L as given in	paragraph	 h 3.2	`
** incluc	le the area	as on both	sides of ir	nternal wal	ls and part	titions								
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				21.54	(33)
Heat c	apacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	4494.0	1 (34)
Therm	al mass	parame	ter (TMI	P = Cm -	- TFA) in	∩ kJ/m²K			Indica	tive Value	: Low		100	(35)
For des can be i	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	constructi	ion are not	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						5.69	(36)
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)			(00)	(00)				.
	abric he	at IOSS		marth	.,				(33) +	(30) = - 0.22 · · · ('0E) m >= (E)		27.23	(37)
ventila					y Mari	1	11	۸	(38)m	= 0.33 × (,∠ວ)m x (5)	Dee	1	
	Jan	гер	war	Арг	iviay	Jun	Jui	Aug	Sep	UCI		Dec	J	

(38)m=	12.28	12.13	11.99	11.26	11.11	10.39	10.39	10.24	10.68	11.11	11.41	11.7		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3				
(39)m=	39.5	39.36	39.21	38.49	38.34	37.62	37.62	37.47	37.91	38.34	38.63	38.92		
Heat lo	oss para	imeter (H	HLP), W/	/m²K					(40)m	Average = = (39)m ÷	Sum(39) ₁ (4)	12 /12=	38.45	(39)
(40)m=	0.79	0.78	0.78	0.77	0.76	0.75	0.75	0.75	0.75	0.76	0.77	0.77		
Numbe	er of day	/s in mo	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	0.76	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum if TF if TF	ed occu A > 13.9 A £ 13.9	upancy, 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	-13.9)2)] + 0.(0013 x (⁻	TFA -13.	1 9)	.7		(42)
Annua	averag	je hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		74	.53		(43)
Reduce	the annua e that 125	al average litres per	hot water berson per	usage by : r dav (all w	5% if the a ater use. I	lwelling is hot and co	designed t ld)	to achieve	a water us	se target o	f			
	lan	Eob	Mar		May	lup		Δυσ	Son	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	Sep	Oci	INUV	Dec		
(44)m=	<mark>8</mark> 1.98	79	76.02	73.04	70.06	67.08	67.08	70.06	73.04	76.02	79	81.98		
										Total = Su	m(44) ₁₁₂ =	=	894.34	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	0Tm / 3600) kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)		
(45)m=	121.58	106.33	109.72	95.66	91.79	79.21	73.4	84.22	85.23	99.33	108.42	117.74		
lf instant	aneous w	vater heati	ng at point	t of use (no	o hot water	^r storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1172.63	(45)
(46)m=	18.24	15.95	16.46	14.35	13.77	11.88	11.01	12.63	12.78	14.9	16.26	17.66		(46)
Water	storage	loss:	I	I	ļ									
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr Otherw	nunity h /ise if no	eating a stored	nd no ta	nk in dw er (this ir	velling, e Icludes i	nter 110 nstantar	litres in Neous co	(47) ombi boil	ers) ente	er '0' in (47)			
a) If m	storage	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
Tempe	rature f	actor fro	m Table	2b		(, a.a.j / :					0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If m	anufact	urer's de	eclared o	cylinder l	oss fact	or is not	known:							
Hot wa	iter stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)				0.	02		(51)
Volume	nunity r e factor	from Ta	ble 2a	on 4.3							1	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
Energy	v lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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 Append	хH	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m	_				
(moo	dified by	factor fi	rom Tab I	le H5 if t	here is s	solar wat	ter heatii	ng and a	i cylinde I	r thermo	stat)	r	I	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	176.85	156.26	165	149.15	147.07	132.7	128.67	139.5	138.72	154.6	161.92	173.02		(62)
Solar DH	-IW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or V	VWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter								-	-	'	
(64)m=	176.85	156.26	165	149.15	147.07	132.7	128.67	139.5	138.72	154.6	161.92	173.02		
								Outp	out from wa	ater heate	r (annual)₁	12	1823.47	(64)
Heat g	ains froi	n water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	_
(65)m=	84.65	75.3	80.7	74.6	74.74	69.13	68.63	72.23	71.13	77.25	78.85	83.37	Ī	(65)
inclu	ıde (57)ı	n in calo	ulation	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ate <mark>r is f</mark> r	om com	ı munitv h	eating	
5 Int	ernal da	ins (see	Table F	and 5a				9					3	
Motob		o (Toblo		to										
Metabo	olic gain	S (Table Feb	Mar	Apr	May	Jun		Αυσ	Sen	Oct	Nov	Dec	1	
(66)m =	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9		(66)
Lightin	a gaine		tod in Ar	pondiv			r ()a) a			01.0	01.0	01.0	i i	()
(67)m-	y yains	11.82				159	1 L9a), a	6 45	8 66	10.99	12.83	13.68		(67)
	10.01	11.02	9.01	1.20	J.44	4.55	4.30		0.00		12.05	15.00		(07)
Appila	nces ga	ns (caic					13 OF L1	3a), also 14			404.04		I	(69)
(68)m=	147.94	149.47	145.6	137.37	126.97	117.2	110.67	109.14	113.01	121.24	131.64	141.41	l	(00)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a) I), also se I	e Table	5	r		I	(00)
(69)m=	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49	31.49		(69)
Pumps	and far	ns gains	(Table 5	5a)		r				r	r	r	1	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92	-67.92		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	113.77	112.05	108.47	103.61	100.46	96.02	92.24	97.08	98.8	103.83	109.51	112.06		(72)
Total i	nternal	gains =				(66)	m + (67)m	n <mark>+ (68)m</mark> +	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	323.49	321.81	312.16	296.73	281.34	266.28	256.35	261.14	268.93	284.53	302.45	315.61		(73)
6. So	lar gains	8:												
Solar g	ains are c	alculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	e applicab	le orientat	ion.		

	Jan	Feb	Mar	Арі	' Mag	y	Jun	Jul	Ai	ug Sep		t Nov	Dec			
Utilisa	ation fac	ctor for ga	ains for	living a	area, h1,	m (see Ta	ble 9a)					1	-		
Temp	erature	during h	eating p	periods	in the li	ving	g area f	from Tab	ole 9,	Th1 (°C)					21	(85)
7. Me	an inter	rnal temp	erature	(heati	ng seaso	on)										
(84)m=	415.8	475.04	512.35	530.8	7 532.34	4	510.88	494.05	486	.71 480.82	451.2	22 412.26	395.13			(84)
Total g	ains – i	internal a	nd sola	r (84)n r	n = (73)n	n +	(83)m	, watts	,					-		
(83)m=	92.32	153.23	200.19	234.1	4 251		244.61	237.7	225	.58 211.89	166.6	69 109.81	79.51			(83)
Solar g	ains in	watts, ca	lculated	d for ea	ach mon	th			(83)m	= Sum(74)m	(82)m	1		_		
	L]	L		J	L		1 1			L]	L		` ´
South	0.9x	0.77	×		6	x		40.4	x	0.45	⊢ ×	0.7	=		52.91	(78)
South	0.9x	0.77	x		6	, . x	5	5.42	x	0.45	×	0.7	=		72.58	(78)
South	0.9x	0.77			6	」 ^ x		2.59	」 】 × 】	0.45		0.7	=		108.17	(78)
South	0.9x	0.77	⊢^x		6	」		01.89	」 ^ _ x	0.45	⊢ ^	0.7	\exists		133.45	() (78)
South	0.9x	0.77	=		6	ר ו א ו		04.89	」	0.45	╡ ^ˆ	0.7	=		137.39	(78)
South	0.9x	0.77			6	י נ 1 ג		10.00 N8 01	」 ^ 、	0.45		0.7	=		141 47	
South	0.97	0.77	╡ Û		6	」 ^ 】 ↓		10.55	」 ^ 、	0.40	╡ ၞ	0.7	=		144 70	(⁷⁰⁾
South	0.97	0.77	╡ 、	<u> </u>	6	」^ 1 ~		10.23	」 ^] _	0.45	╡ \$	0.7	=		144.38	(⁷⁰⁾
South	0.9x	0.77	╡ 、		6	」 ^ 1 ~		10.22	」 ^]	0.45	╡ 、	0.7	=		144.29	(78)
South	0.97	0.77	┤		6	」 ×] ↓		0.07] ^] _	0.45		0.7			127.75	
South	0.9X	0.77	└ `		6			6.57]	0.45		0.7	=		100.20	(78)
South		0.77			6			6.75		0.45		0.7			9.9	$= \begin{bmatrix} (\prime \prime) \\ (7 0) \end{bmatrix}$
Southe	asto ov	0.77			2.43			1.49	×	0.45		0.7			16.7	
Southe	asto ou	0.77			1.44] X]		4.07		0.45	×	0.7	=		13.85	
Southe	ast 0.9x	0.77			2.43	X	4	4.07		0.45	×	0.7	=		23.38	
Southe	ast 0.9x	0.77			1.44] X]		9.27	X	0.45	×	0.7			21.77	
Southe	ast 0.9x	0.77	×		2.43	×	6	9.27	×	0.45	×	0.7			36.74	(77)
Southe	astoc	0.77	×		1.44	× 1	9	2.85	X] .	0.45		0.7	= =		29.19	
Southe	asi ().9x	0.77	×		2.43	× 1	9	2.85	X 1	0.45	×	0.7	=		49.25	(77)
Southe	ast 0.9x	0.77	×		1.44	X 1	1	04.39	X	0.45	×	0.7	=		32.81	(77)
Southe	ast 0.9x	0.77	×		2.43	X	1	04.39	×	0.45	×	0.7	=		55.37	(77)
Southe	ast 0.9x	0.77	×		1.44	X	1	13.91	×	0.45	×	0.7	=		35.81	(77)
Southe	ast 0.9x	0.77	×		2.43	×	1	13.91	×	0.45	×	0.7	=		60.42	(77)
Southe	ast 0.9x	0.77	×		1.44	×	1	18.15	×	0.45	×	0.7	=		37.14	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	x	1	18.15	x	0.45	x	0.7	=		62.67	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		1.44	x	1	19.01	x	0.45	x	0.7	=		37.41	(77)
Southe	ast <mark>0.9</mark> x	0.77	×		2.43	x	1	19.01	x	0.45	x	0.7	=		63.13	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		1.44	×	1	06.25	x	0.45	x	0.7	=		33.4	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	x	1(06.25	x	0.45	×	0.7	=		56.36	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		1.44	x	8	5.75	x	0.45	x	0.7	=		26.96	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43	x	8	5.75	x	0.45	x	0.7	=		45.49	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		1.44	x	6	2.67	x	0.45	x	0.7	=		19.7	(77)
Southe	ast <mark>0.9x</mark>	0.77	x		2.43) ×	6	2.67	x	0.45	x	0.7	=		33.25	(77)

Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (8) (8) (9) 19.85 20.1 20.37 20.26 20.99 20.99 20.94 20.7 20.22 19.81 (8) Temperature during heating periods in rest of dwelling from Table 9, h2 (°C) (8) (8) (9) (9) 0.3 0.85 0.79 0.49 0.57 0.41 0.28 0.3 0.47 0.89 0.85 0.91 (8) (9) (9.3 0.85 0.79 0.49 0.57 0.41 0.28 0.3 0.47 0.89 0.85 0.91 (8) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (9) <t< th=""><th>(86)m=</th><th>0.91</th><th>0.87</th><th>0.81</th><th>0.72</th><th>0.6</th><th>0.45</th><th>0.33</th><th>0.35</th><th>0.51</th><th>0.72</th><th>0.86</th><th>0.92</th><th></th><th></th><th>(86)</th></t<>	(86)m=	0.91	0.87	0.81	0.72	0.6	0.45	0.33	0.35	0.51	0.72	0.86	0.92			(86)
(97)me 19.85 20.1 20.37 20.68 20.82 20.99 20.94 20.7 20.26 19.81 (8) Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C) (8) (8) 20.27 20.27 20.27 20.27 20.27 20.28 20.39 20.3 20.3 20.3 20.3 20.29 20.28 20.28 (8) Utilisation factor for gains for rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (8) (8) (9) (8) (14) 10.80 19.47 19.27 19.57 19.2 0.48 0.48 0.48 0.47 0.48 0.48 0.48 0.48	Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(87)m=	19.85	20.1	20.37	20.66	20.85	20.96	20.99	20.99	20.94	20.7	20.26	19.81			(87)
(8)m 20.27 20.28 20.31 19.77 19.23 40.48 49.49 49.49 49.47 19.87 19.23 40.8 49.77 19.23 49.77 19.23 49.77 19.23 49.77 19.23 49.77 19.23 49.77 19.23 4	Temp	erature	durina h	neating c	eriods ir	n rest of	dwellina	from Ta	ble 9. Tl	n2 (°C)						
0.9 0.85 0.79 0.69 0.57 0.41 0.28 0.3 0.47 0.69 0.85 0.91 (8) 0.85 0.79 0.69 0.57 0.41 0.28 0.3 0.47 0.69 0.85 0.91 (8) 18.74 19.08 19.47 19.87 20.12 20.28 20.29 20.29 20.31 19.33 19.32 18.88 (9) 18.74 19.08 19.47 19.87 19.9 20.25 20.47 20.6 20.63 20.67 20.31 19.77 19.23 (9) 19.27 19.57 19.9 20.25 20.47 20.6 20.63 20.67 20.31 19.77 19.23 (9) 0.927 19.57 19.9 20.25 20.47 20.6 20.63 20.67 20.31 19.77 19.23 (9) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9)	(88)m=	20.27	20.27	20.27	20.28	20.29	20.3	20.3	20.3	20.29	20.29	20.28	20.28			(88)
(89)m- 0.3 0.45 0.79 0.69 0.57 0.41 0.28 0.3 0.47 0.69 0.85 0.91 (8) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (9) (main table 9c) (1.4 = L/Wing area + (4) = 0.48 (9) (90)m- 18.74 19.08 19.47 19.87 20.12 20.26 20.29 20.21 19.33 19.32 16.68 (9) (90)m- 19.27 19.57 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (9) (9)m- 19.27 19.57 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (9) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (9) </td <td>Utilisa</td> <td>ation fac</td> <td>tor for g</td> <td>ains for</td> <td>rest of d</td> <td>welling,</td> <td>h2,m (se</td> <td>e Table</td> <td>9a)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)							
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (9) (90) 18.74 19.08 19.47 19.47 20.12 20.28 20.29 20.23 19.93 19.32 18.68 (9) (10) 19.71 19.57 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (9) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (9)	(89)m=	0.9	0.85	0.79	0.69	0.57	0.41	0.28	0.3	0.47	0.69	0.85	0.91			(89)
(90)me 18.74 19.08 19.47 19.87 20.12 20.28 20.29 20.23 19.93 19.32 18.68 (9) ILA LVing area + (4) = 0.48 (9) (14.2 Living area + (4) = 0.48 (9) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (9) <td< td=""><td>Mean</td><td>interna</td><td>l temper</td><td>ature in</td><td>the rest</td><td>of dwelli</td><td>ng T2 (f</td><td>ollow ste</td><td>eps 3 to 7</td><td>7 in Tabl</td><td>e 9c)</td><td></td><td></td><td></td><td></td><td></td></td<>	Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)					
tLA = Living area + (4) = 0.48 (9) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)m = 19.27 19.57 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (9) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (9) 3. Space heating requirement Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti.m=(76)m and re-calculate the utilisation factor for gains, hm: (9) (9) (9, 10) (9, 10) (9)	(90)m=	18.74	19.08	19.47	19.87	20.12	20.26	20.29	20.29	20.23	19.93	19.32	18.68			(90)
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (3) (3) 19.27 19.57 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (3) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (3) 19.77 19.23 (3) 3. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (4) Jui Jui Aug Sep Oct Nov Dec Utilisation factor for gains, hmGm, W = (94)m x (84)m (9) (4) Jui Jui Aug Sep Oct Nov Dec Utilisation factor for gains, hmGm, W = (94)m x (84)m (9)				-		_	-	-		f	LA = Livin	g area ÷ (4	4) =	0.48		(91)
(92)m= 19.27 19.37 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (9) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (9)m= 19.27 19.57 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (9) Sepace heating requirement Sepace heating requirement Sepace heating requirement (9) <t< td=""><td>Mean</td><td>interna</td><td>l temper</td><td>ature (fo</td><td>or the wh</td><td>ole dwe</td><td>lling) = fl</td><td>LA × T1</td><td>+ (1 – fL</td><td>A) × T2</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2						
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (3)me 19.27 19.57 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (9) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Useful gains, hmGm, W = (94)m (64)m (9)me 0.88 0.84 0.78 0.69 0.58 0.43 0.3 0.32 0.48 0.69 0.83 0.9 Useful gains, hmGm, W = (94)m (84)m (9)me 0.759 138 8.7 400.2 367.98 306.83 218.04 149.75 156.22 232.89 313.43 344.07 353.86 Monthly average external temperature from Table 8 (9)me 4.3 4.9 6.5 8.9 11.7 14.6 166 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm, W = ((39)m x ((39)m - (95)m) x (41)m (9)me 591.54 577.37 525.88 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9 (9)me 66.62 119.96 33.28 49.51 21.98 0 0 0 0 43.67 104.74 171.9 Total per year (kWh/year) = Sum(98), = 771.85 (9) Energy requirement in kWh/m ² /year 9) Energy requirement	(92)m=	19.27	19.57	19.9	20.25	20.47	20.6	20.63	20.63	, 20.57	20.31	19.77	19.23			(92)
(93)m= 19.27 19.57 19.9 20.25 20.47 20.6 20.63 20.57 20.31 19.77 19.23 (3) 8. Space heating requirement Set T to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm: (9) (1) (Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate					
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a	(93)m=	19.27	19.57	19.9	20.25	20.47	20.6	20.63	20.63	20.57	20.31	19.77	19.23			(93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Uan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Ulitisation factor for gains, hm: (94)m 0.88 0.84 0.78 0.69 0.58 0.43 0.3 0.32 0.48 0.69 0.83 0.9 Useful gains, hmGm, W = (94)m x (84)m (95)m 367.59 398.67 400.2 367.98 306.83 218.04 149.75 156.22 232.89 313.43 344.07 353.86 Monthly average external temperature from Table 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 Heat loss rate for mean internal temperature, Lm, W = ((39)m × ((30)m - (96)m) (97)m 591.54 577.37 525.58 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9 (98)m 166.62 119.95 93.28 49.51 21.98 0 0 0 0 43.67 104.74 171.9 Total per year (kWhyear) = Sum(98)s.v = 771.65 (9 Space heating requirement for each month, kWh/month = 0.024 × [(97)m - (95)m] × (14)m (98)m 166.62 119.95 93.28 49.51 21.98 0 0 0 0 43.67 104.74 171.9 Total per year (kWhyear) = Sum(98)s.v = 771.65 (9) Space heating requirement in kWh/m ² /year Total per year (kWhyear) = Sum(98)s.v = 15.35 (9) Space heating requirement in kWh/m ² /year 15.35 (9) D. Energy requirements - Community heating scheme Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (3) Fraction of space heat from secondary/supplementary heating trovided by a community scheme. Fraction of space heat from community system 1 – (301) = 1 (3) Fraction of heat from Community heat pump (302) × (303a) = 1 (3) Fraction of heat from Community heat pump (302) × (303a) = 1 (3) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (3) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (3) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (3) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (3) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (3) Fraction of total space hea	8. Spa	ace hea	ting requ	uirement												
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (94)m 0.88 0.78 0.69 0.58 0.43 0.3 0.32 0.48 0.69 0.83 0.9 Useful gains, hmGm, W = (94)m x (84)m (95)m 367.59 398.87 400.2 367.98 306.83 218.04 149.75 156.22 232.89 313.43 344.07 353.86 Monthly average external temperature from Table 8 (96)m 43 4.9 6.5 8.9 11.7 44.6 166.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (93)m= (93)m= (94)m (98)m= 51.54 577.37 525.58 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9 (93)m= (93)m= (95)ms (95)ms (96)m (97)m - (95)m] x (41)m (98)m 166.62 119.95 93.28 49.51 21.98 0 </td <td>Set Ti</td> <td>to the r</td> <td>nean int</td> <td>ernal ter</td> <td>mperatur</td> <td>re obtair</td> <td>ed at ste</td> <td>ep 11 of</td> <td>Table 9t</td> <td>o, so tha</td> <td>t Ti,m=(</td> <td>76)m an</td> <td>d re-calc</td> <td>ulate</td> <td></td> <td></td>	Set Ti	to the r	nean int	ernal ter	mperatur	re obtair	ed at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m: 0.88 0.84 0.78 0.69 0.58 0.43 0.3 0.32 0.48 0.83 0.9 (9 Useful gains, hmGm, W (94)m x (84)m (95)m 387.59 398.97 400.2 367.98 306.83 218.04 149.75 156.22 232.88 313.43 344.07 353.86 (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 (9 Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m – (96)m] (97)m – (95)m] x (41)m (98)ma 166.62 119.95 33.28 49.51 21.98 0 0 0 43.67 104.74 171.9 Value Ital prevant Ital prevant (kWh/year) = Sum(98)s.ve 771.65 (98) 5.8.ve 771.65 (98) Space heat	the ut	ilisation	factor fo	or gains	using Ta	ble 9a										
Utilisation factor for gains, hm: (94)ma 0.88 0.84 0.78 0.69 0.68 0.43 0.3 0.32 0.48 0.69 0.83 0.9 Useful gains, hmGm, W = (94)m x (84)m (95)ma 387.59 398.87 400.2 367.98 306.83 218.04 149.75 156.22 232.89 313.43 344.07 353.86 (96)ma 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (91)max (97)ma 591.54 577.37 525.58 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9 (91)max (98)ma 166.62 119.95 33.28 49.51 21.98 0 0 0 43.67 104.74 171.9 Total per year (kWh/year) = Sum(98)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Utilisa	ation fac	tor for g	ains, hm	1:	0.50	0.40			0.40	0.00	0.00				(04)
Userul gains, miGm, w = (94)m x (54)m (95)m = $\frac{367.59}{398.87}$ $\frac{367.98}{400.2}$ $\frac{367.98}{306.83}$ $\frac{218.04}{149.75}$ $\frac{149.75}{156.22}$ $\frac{232.89}{232.89}$ $\frac{313.43}{344.07}$ $\frac{353.86}{353.86}$ (96)m = $\frac{4.3}{4.3}$ $\frac{4.9}{6.5}$ $\frac{6.5}{8.9}$ $\frac{8.9}{11.7}$ $\frac{14.6}{16.6}$ $\frac{16.4}{14.1}$ $\frac{14.1}{10.6}$ $\frac{7.1}{4.2}$ (97)m = $\frac{591.54}{57.37}$ $\frac{525.58}{525.58}$ $\frac{430.75}{336.37}$ $\frac{225.6}{225.6}$ $\frac{151.49}{516.49}$ $\frac{57.27}{525.58}$ $\frac{581.57}{336.37}$ $\frac{225.6}{225.6}$ $\frac{151.49}{516.49}$ $\frac{771.2}{489.54}$ $\frac{584.9}{584.9}$ (97)m = $\frac{591.54}{57.37}$ $\frac{525.58}{525.8}$ $\frac{43.675}{336.37}$ $\frac{225.6}{225.6}$ $\frac{151.49}{58.37}$ $\frac{245.24}{24}$ $\frac{372.12}{489.54}$ $\frac{489.54}{584.9}$ (98)m = $\frac{166.62}{119.95}$ $\frac{119.85}{93.28}$ $\frac{93.28}{49.51}$ $\frac{21.98}{21.98}$ 0 0 0 43.67 104.74 171.9 (97)m - (95)m] x (41)m $\frac{98}{254}$ $\frac{91.54}{21.98}$ $\frac{92}{21.802}$ $\frac{771.65}{15.35}$ (98) $\frac{92}{29.28}$ $\frac{92}{21.98}$ $\frac{92}{21.98}$ $\frac{92}{21.98}$ $\frac{92}{21.98}$ $\frac{92}{21.98}$ $\frac{92}{22.85}$ $\frac{92}{21.98}$ $\frac{92}{21.98}$ $\frac{92}{21.98}$ $\frac{92}{21.9$	(94)m=	0.88	0.84	0.78	0.69	0.58	0.43	0.3	0.32	0.48	0.69	0.83	0.9			(94)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		i gains,	nmGm	, vv = (9)	4) m x (84	4)m	218.04	140.75	150.00	222.00	212 42	244.07	252.96	1		(05)
(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)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m](97)m= 591.54 577.37 525.58 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9(98)m= 166.62 119.95 93.28 49.51 21.98 0 0 0 0 43.67 104.74 171.9Total per year (kWh/year) = Sum(98) _{1.38.12} = 771.65 (9Space heating requirement in kWh/m²/year9b. Energy requirements - Community heating schemeThis part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from community system 1 - (301) =11The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.Fraction of total space heat from Community heat pump(302) x (303a) =1(31Gator for control and charging method (Table 4c(3)) for community heating system12123334444444444444444444444444444 <tr< td=""><td>(95)m=</td><td>307.59</td><td>398.87</td><td>400.2</td><td>307.98</td><td>300.03</td><td>218.04</td><td>149.75</td><td>100.22</td><td>232.69</td><td>313.43</td><td>344.07</td><td>353.60</td><td></td><td></td><td>(93)</td></tr<>	(95)m=	307.59	398.87	400.2	307.98	300.03	218.04	149.75	100.22	232.69	313.43	344.07	353.60			(93)
(a) Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m](97)m = 591.54 577.37 525.58 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9 (97)m = 591.54 577.37 525.58 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9 (97)m = 591.54 577.37 525.58 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9 (97)m = 591.54 584.9 (97)m = 591.54 584.9 (97)m = 591.54 584.9 582.9			age exte					16.6	16.4	14.1	10.6	71	4.2			(96)
(97)me 591.54 577.37 525.58 436.75 336.37 225.6 151.49 158.37 245.24 372.12 489.54 584.9 Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)me 166.62 119.95 93.28 49.51 21.98 0 0 0 0 43.67 104.74 171.9 Total per year (kWh/year) = Sum(98)s.12 = 771.65 (9) Space heating requirement in kWh/m ² /year 15.35 (9) b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (3) Fraction of space heat from community system $1 - (301) = 1$ 1 (3) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of total space heat from Community heat pump $(302) \times (3038) = 1$ (3) Fraction of total space heat from Community heat pump $(302) \times (3038) = 1$ (3) Exact for control and charging method (Table 4c(3)) for community heating system 1.2 (3)	Heat	4.5	for mor	o.o			$m W_{-}$	-[(30)m	v [(03)m	(96)m	1	7.1	4.2			(00)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m=166.62119.9593.2849.5121.9800043.67104.74171.9Total per year (kWh/year) = Sum(98) ₁₆₀₋₁₂ Space heating requirement in kWh/m²/year9b. Energy requirements - Community heating schemeThis part is used for space heating, space cooling or water heating provided by a community scheme.Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none0(301) =1The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latterincludes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.Fraction of total space heat from Community heat pump(302) × (303a) =1(302) × (303a) =1(302) × (303a) =1(302) × (303a) =1(302) × (303a) =1(302) × (303a) =1(302) × (303a) =1(302) × (303a) =1(302) × (303a) =1(302) × (303a) =1(302) × (303a) = <tr <td=""></tr>	(97)m=	591 54	577 37	525.58	436 75	336.37	225.6	151 49	158.37	245 24	372 12	489 54	584 9			(97)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Space	heatin	a require	ement fo	r each m	range k	//h/mon	h = 0.02	24 x [(97)	m = (95))ml x (4^{\prime})	1)m	001.0			(-)
Total per year (kWh/year) = Sum(98):5912 = 771.65 (91)Space heating requirement in kWh/m²/year15.35 (91)9b. Energy requirements - Community heating schemeThis part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none0 (31)Fraction of space heat from community system 1 - (301) =1 (31)The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.Fraction of total space heat from Community heat pump1 (32) x (303a) =Fractor for control and charging method (Table 4c(3)) for community heating system1 (32) x (303a) =Distribution loss factor (Table 12c) for community heating system1.2 (31)	(98)m=	166.62	119.95	93.28	49.51	21.98	0	0		0	43.67	104.74	171.9			
Space heating requirement in kWh/m²/year 15.35 (9) 9b. Energy requirements - Community heating scheme 0 (3) This part is used for space heating, space cooling or water heating provided by a community scheme. 0 (3) Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (3) Fraction of space heat from community system 1 - (301) = 1 (3) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. 1 (3) Fraction of total space heat from Community heat pump 1 (3) Fraction of total space heat from Community heat pump 1 (3) Fractor for control and charging method (Table 4c(3)) for community heating system 1 (3) Distribution loss factor (Table 12c) for community heating system 1.2 (3)									Tota	l per year	(kWh/year) = Sum(98	8)15,912 =	771.65	;	(98)
9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (3) Fraction of space heat from community system 1 – (301) = 1 (3) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. 1 (3) Fraction of total space heat from Community heat pump (302) × (303a) = 1 (3) Fractor for control and charging method (Table 4c(3)) for community heating system 1 (3) Distribution loss factor (Table 12c) for community heating system 1.2 (3)	Space	e heatin	a require	ement in	kWh/m²	?/vear								15.35		(99)
So. Energy requirements – Community neating scheme This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (3) Fraction of space heat from community system 1 – (301) = 1 (3) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. 1 (3) Fraction of total space heat from Community heat pump (302) x (303a) = 1 (3) Fractor for control and charging method (Table 4c(3)) for community heating system 1 (3) Distribution loss factor (Table 12c) for community heating system 1.2 (3)		5 Houtin	groquire			heation								10.00		()
This part is used for space heating, space cooling of water heating provided by a community scheme. 0 (3) Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (3) Fraction of space heat from community system 1 – (301) = 1 (3) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. 1 (3) Fraction of heat from Community heat pump 1 (3) 1 (3) Fraction of total space heat from Community heat pump (302) x (303a) = 1 (3) Fractor for control and charging method (Table 4c(3)) for community heating system 1 (3) Distribution loss factor (Table 12c) for community heating system 1.2 (3)	90. Ene	ergy rec	luiremer	its – Coi	mmunity	neating	scneme									
Fraction of space heat from community system 1 – (301) = 1 (3) The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. 1 (3) Fraction of heat from Community heat pump 1 (3) Fraction of total space heat from Community heat pump (302) x (303a) = 1 (3) Factor for control and charging method (Table 4c(3)) for community heating system 1 (3) Distribution loss factor (Table 12c) for community heating system 1.2 (3)	Fractio	n of spa	ace heat	from se	tting, spa condary/	supplen/supplen/	ng or wa nentary l	neating ((Table 1	10ed by a 1) '0' if no	a comm one	unity scr	ieme.	0		(301)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump 1 Fraction of total space heat from Community heat pump (302) x (303a) = Factor for control and charging method (Table 4c(3)) for community heating system 1 Distribution loss factor (Table 12c) for community heating system 1.2	Fractio	n of spa	ace heat	from co	, mmunitv	v svstem	$1 - (30^{2})$	1) =	,	,				1		(302)
Implementation Several sources. The procedure allows for CHP and up to four other heat sources, the faiter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community heat pump 1 Fraction of total space heat from Community heat pump 302) x (303a) = Factor for control and charging method (Table 4c(3)) for community heating system 1 Distribution loss factor (Table 12c) for community heating system 1.2	The com	munitu oc		v obtoin b	oot from or	word oou	roop The r	· ,	allows for	CUD and	in to four	other heat	nouroon: f	ha lattar		()
Fraction of heat from Community heat pump 1 (3) Fraction of total space heat from Community heat pump (302) x (303a) = 1 (3) Factor for control and charging method (Table 4c(3)) for community heating system 1 (3) 1 (3) Distribution loss factor (Table 12c) for community heating system 1.2 (3)	includes	boilers, h	eat pumps	s, geotheri	nal and wa	aste heat f	rom powe	r stations.	See Apper	one and t ndix C.		Juner neat	sources, u	le lallel		
Fraction of total space heat from Community heat pump(302) x (303a) =1(302) x (303) x (303) =1(Fractio	n of hea	at from C	Commun	ity heat	pump	·							1		(303a)
Factor for control and charging method (Table 4c(3)) for community heating system 1 (3) Distribution loss factor (Table 12c) for community heating system 1.2 (3)	Fractio	n of tota	al space	heat fro	m Comn	nunity he	eat pump	C			(3	02) x (303a	a) =	1		(304a)
Distribution loss factor (Table 12c) for community heating system 1.2	Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r commu	unity hea	ting syst	tem			1		(305)
	Distribu	ution los	s factor	(Table 1	I2c) for c	commun	ity heatii	ng syste	m					1.2		(306)
Space heating kWh/vear	Space	heating	3										I	kWh/v	/ear	
Annual space heating requirement 771.65	Annual	space	heating	requiren	nent									771.65	5	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	925.98	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1823.47]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2188.16	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307	7e) + (310a)(310e)] =	31.14	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from ou	ıtside		95.83	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	95.83	(331)
Energy for lighting (calculated in Appendix L)	_		235.03	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3</mark>)
Tota <mark>l delivered energy for all uses (</mark> 307) + (309) + (310) + (312) +	(<mark>315) +</mark> (331) + (<mark>33</mark>	32)(237b) =	2 <mark>714.9</mark> 3	(338)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor	Emiss <mark>ions</mark> kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	vo fuels repeat (363) to	(366) for the second fue	208	(367a)
CO2 associated with heat source 1 [(307b)+(31	0b)] x 100 ÷ (367b) x	0.52 =	777.04	(367)
Electrical energy for heat distribution [(31	13) x	0.52 =	16.16	(372)
Total CO2 associated with community systems (36	3)(366) + (368)(37)	2) =	793.2	(373)
CO2 associated with space heating (secondary) (30	9) x	0 =	= 0	(374)
CO2 associated with water from immersion heater or instantaneou	ıs heater (312) x	0.52 =	= 0	(375)
Total CO2 associated with space and water heating (37	(3) + (374) + (375) =		793.2	(376)
CO2 associated with electricity for pumps and fans within dwelling	(331)) x	0.52	49.73	(378)
CO2 associated with electricity for lighting (33	2))) x	0.52 =	121.98	(379)
Energy saving/generation technologies (333) to (334) as applicabl Item 1	e	0.52 x 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =	L	!	586.01	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			11.66	(384)
El rating (section 14)			91.76	(385)

User Details													
Assessor Name:StroSoftware Name:Stroma FSAP 2012Soft	ma Number: ware Version: 1.0.5.49												
Property Addre	ss: Block V - Top Floor												
Address: V, Block V, Ham Close, London, TW10													
Ground floor 52.71	Av. Height(m) Volume(m³) (1a) x 2.5 (2a) = 131.77 (3a)												
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.71	(4)												
Dwelling volume	(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.77 (5)												
2. Ventilation rate:													
main heatingsecondary heatingother heatingNumber of chimneys0+0+0Number of open flues0+0+0	totalm³ per hour=0 $x 40 =$ 0=0 $x 20 =$ 0(6b)												
Number of intermittent fans	0 x 10 = 0 (7a)												
Number of passive vents	0 x 10 = 0 (7b)												
Number of flueless gas fires $0 \times 40 =$													
Air chan Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 ÷ (5) = If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) • (5) =													
Number of storeys in the dwelling (ns) Additional infiltration Structural infiltration: 0.25 for steel or timber frame or 0.35 for mase	$[(9)-1] \times 0.1 = 0 (10)$												
if both types of wall are present, use the value corresponding to the greater wall deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), el	area (after se enter 0 0 (12)												
If no draught lobby, enter 0.05, else enter 0	0 (13)												
Percentage of windows and doors draught stripped	0 (14)												
Window infiltration 0.25 -	$0.2 \times (14) \div 100] = 0$ (15)												
Infiltration rate (8) + (7)	0) + (11) + (12) + (13) + (15) = 0 (16)												
Air permeability value, q50, expressed in cubic metres per hour pe	square metre of envelope area 4 (17)												
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise (18)	= (16) 0.2 (18)												
Air permeability value applies if a pressurisation test has been done or a degree air	permeability is being used												
Shelter factor (20) =	$ -[0.075 \times (19)] = 0.7$ (20)												
Infiltration rate incorporating shelter factor (21) =	$18) \times (20) = 0.14$ (21)												
Infiltration rate modified for monthly wind speed													
Jan Feb Mar Apr May Jun Jul Au	g Sep Oct Nov Dec												
Monthly average wind speed from Table 7													
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7	4 4.3 4.5 4.7												
Wind Factor (22a)m = (22)m \div 4													
(22a)m = 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92	1 1.08 1.12 1.18												

Adjust	ed infiltr	ation rat	e (allowi	ing for sl	helter an	d wind s	peed) =	(21a) x	(22a)m				-	
~ / /	0.18	0.18	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calcul If m	ate ette	<i>CtiVe air</i> al ventila	change	rate for a	the applic	cable ca	se						0.5	(232)
lf exh	aust air h	eat pump	usina App	endix N. (2	23b) = (23a) x Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23b)
If bala	anced with	h heat reco	overv: effic	iencv in %	allowing f	or in-use f	actor (from	n Table 4h) =	, (,			0.5	(220)
a) If	halance	d mech	anical ve	ntilation	with he	at recove	⊃rv (M\/ŀ	HR) (24a) m = (22	2h)m + (23h) x [′	1 – (23c)	10.3	(200)
(24a)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28]	(24a)
b) If	balance	ed mech	i anical ve	entilation	without	heat rec	coverv (N	I //V) (24b))m = (22	I 2b)m + ()	1 23b)		1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(24b)
c) If	whole h	iouse ex	tract ver	ntilation (or positiv	e input v	ventilatio	n from c	utside	1	1	1	1	
,	if (22b)r	n < 0.5 >	‹ (23b), t	hen (24	c) = (23b); otherv	vise (24	c) = (22k	o) m + 0.	5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	ve input	ventilatio	on from I	oft				-	
	if (22b)r	n = 1, th	en (24d) I	m = (22	b)m othe	rwise (2	4d)m = (0.5 + [(2	2b)m² x	0.5]			1	(5 4 1)
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(24d)
Effe	ctive air	change	rate - er	nter (24a	a) or (24b	o) or (240	c) or (24	d) in box	(25)				1	(05)
(25)m=	0.3	0.29	0.29	0.27	0.27	0.25	0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. He	at l <mark>osse</mark>	s and he	eat loss	paramet	er:									
ELEN		G <mark>ros</mark> are <mark>a</mark>	ss (m²)	Openir m	ngs n²	Net Ar A ,r	ea n²	U-valı W/m2	ue K	A X U (W/I	K)	k-value kJ/m²·l	e K	A X k kJ/K
Doo <mark>rs</mark>						1.91	x	1	= [1.91				(26)
Windo	<mark>ws</mark> Type	e 1				2.43	x1,	/[1/(1.2)+	0.04] =	2.78	F			(27)
Windo	ws Type	e 2				5.88	x1/	/[1/(1.2)+	0.04] =	6.73	F			(27)
Windo	ws Type	e 3				2.43	x1,	/[1/(1.2)+	0.04] =	2.78	5			(27)
Walls ⁻	Type1	24.	5	10.7	4	13.76	5 X	0.16		2.2	Ξ r			(29)
Walls ⁻	Type2	27.3	38	1.9		25.47	, x	0.15		3.83			\exists	(29)
Roof		52.7	71	0		52.71	×	0.1		5.27			\exists	(30)
Total a	area of e	elements	, m²			104.5	8		เ					(31)
Party v	wall					24.8	×	0		0				(32)
Party f	loor					52.71		L	I				\dashv	(32a)
* for win	ndows and	l roof wind	ows, use e	effective w	indow U-va	alue calcul	 ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	L as given in	paragraph	 h 3.2	(` `
** incluc	le the area	as on both	sides of ir	nternal wa	lls and part	itions								
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30)	+ (32) =				25.51	(33)
Heat c	apacity	Cm = S	(A x k)						((28)	(30) + (32	2) + (32a).	(32e) =	4051.8	(34)
Therm	al mass	parame	eter (TMI	⊃ = Cm ·	÷ TFA) in	ı kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi can be ı	ign asses: used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	e constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						15.54	(36)
if details	of therma	al bridging	are not kr	nown (36) :	= 0.05 x (3	1)				(00)				 .
	abric he		alaula (-	ا بار به محمد (ا	.,				(33) +	(36) =	05)(5)		41.05	(37)
ventila	ation hea				y 	1	11	Δ	(38)m	= 0.33 × (25)m x (5)	Det	1	
	Jan	l ⊦ep	Iviar	Apr	May	Jun	Jul	Aug	Sep	Uct	INOV	Dec		

(38)m=	12.87	12.72	12.57	11.81	11.65	10.89	10.89	10.74	11.2	11.65	11.96	12.26		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	53.93	53.77	53.62	52.86	52.71	51.95	51.95	51.8	52.25	52.71	53.01	53.32		
Heat lo	oss para	imeter (H	HLP), W/	/m²K					(40)m	Average = = (39)m ÷	Sum(39)1. (4)	12 /12=	52.82	(39)
(40)m=	1.02	1.02	1.02	1	1	0.99	0.99	0.98	0.99	1	1.01	1.01		
Numbe	er of day	s in mo	nth (Tab	le 1a)	-	-	-	-	,	Average =	Sum(40)1.	12 /12=	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)
4. Wa	iter heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assum if TF if TF	ed occu A > 13.9 A £ 13.9	upancy, 9, N = 1 9 N = 1	N + 1.76 x	: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.()013 x (TFA -13.	1. 9)	77	I	(42)
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		76	.24		(43)
Reduce	the annua that 125	al average litres per	hot water	usage by a	5% if the a	lwelling is hot and co	designed t Id)	to achieve	a water us	se target o	f			
notmore					Maria			A	0.00	Ort	New			
Hot wate	Jan er usage i	n litres per	viar day for ea	Apr ach month	Vd,m = fa	ctor from 1	Jui Table 1c x	Aug (43)	Sep	Oct	INOV	Dec		
(44)m=	83.86	80.81	77 76	74 71	71.66	68.61	68 61	71.66	74 71	77.76	80.81	83.86		
()	00.00	00.01	11.10	74.71	/ 1.00	00.01	00.01	71.00		Total = Su	m(44) ₁₁₂ =	00.00	914.85	(44)
Ener <mark>gy</mark> o	content of	hot water	used - cal	lculated mo	onthly = 4.	190 x Vd,r	m x nm x D	0Tm / 3600	kWh/mor	nth (<mark>see Ta</mark>	bles 1b, 1	c, 1d)		
(45)m=	124.36	108.77	112.24	97.85	93.89	81.02	75.08	86.15	87.18	101.6	110.91	120.44		
If instant		votor booti	ng at paint	t of upp /pg	hot wata	r otorogo)	ontor 0 in	hovon (16) to (61)	Tota <mark>l =</mark> Su	m(45) ₁₁₂ =	-	1199.52	(45)
						slorage),				45.04	40.04	40.07		(46)
(46)m= Water	18.65 storage	16.32 loss:	16.84	14.68	14.08	12.15	11.26	12.92	13.08	15.24	16.64	18.07	I	(46)
Storag	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
Otherw	ise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss: urer's de	aclarad l	oss facti	or is kno	wn (k\//	n/dav).					0		(49)
Tompo	ariura f	actor fro	m Tabla	25 1aci			i/uay).					0		(40)
Energy	lost fro	m water	storage	~ k\//h/\/	≏ar			(48) x (49)	. =			10		(43)
b) If m	anufact	urer's de	eclared of	cylinder l	loss fact	or is not	known:	() / ()	, 			10		(00)
Hot wa	ter stor	age loss	factor fr	rom Tabl	le 2 (kW	h/litre/da	ay)				0.	02		(51)
If comr	nunity h	from To	ee secti	on 4.3										(50)
Tempe	rature f	actor fro	m Table	2b							1.	03 6		(52)
Enera	lost fro	m water	storage	e, kWh/ve	ear			(47) x (51)	x (52) x (53) =		03		(54)
Enter	(50) or ((54) in (5	55)	, , . , , .				x / x)		,	1.	03		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er 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 Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)

Primar	y circuit	loss (ar	nnual) fro	om Table			0		(58)					
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m	_				
(mod	dified by	factor fi	rom Tab I	le H5 if t r	here is s	olar wat	ter heatii	ng and a	i cylindei	r thermo	stat)	1	1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	İ	(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	179.64	158.7	167.52	151.35	149.17	134.52	130.36	141.43	140.68	156.88	164.4	175.72		(62)
Solar DH	IW input o	alculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	I .	
(add a	dditiona	l lines if	FGHRS	and/or \	VWHRS	applies	, see Ap	pendix C	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter				-				-	-		
(64)m=	179.64	158.7	167.52	151.35	149.17	134.52	130.36	141.43	140.68	156.88	164.4	175.72		
								Outp	out from wa	ater heate	r (annual)₁	12	1850.36	(64)
Heat g	ains froi	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	-
(65)m=	85.57	76.11	81.54	75.33	75.44	69.74	69.19	72.87	71.78	78	79.67	84.27	ĺ	(65)
inclu	ıde (57)ı	n in calo	ulation	of (65)m	only if c	vlinder is	s in the o	dwellina	or hot w	ate <mark>r is f</mark> r	om com	nunity h	eating	
5 Int	ernal da	ins (see	Table F	and 5a				5				, , , , , , , , , , , , , , , , , , ,	3	
Match		a (Takla												
Metabo	lan	S (Table Feb	Mar	Apr	May	Jun		Αυσ	Sen	Oct	Nov	Dec		
(66)m =	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5		(66)
Lightin	a gaine		tod in Ar	pondiv			r I (0a) a				00.0	00.0	1	()
(67)m-	y yains	12 28		7 56	L, Equal	4.77	5 16	67	8 99	11 42	13 33	14.21	1	(67)
	13.02	12.20	9.99	1.50	5.05	4.77	10 and 4		0.33		10.00	14.21	l l	(07)
Appila	nces ga	Ins (caic				uation L	13 OF L1	3a), also			407.07	4 47 40	1	(69)
(68)m=	154.27	155.87	151.83	143.25	132.4	122.22	115.41	113.81	117.84	126.43	137.27	147.46	i	(00)
Cookin	ig gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se I	e Table	5		1	1	(00)
(69)m=	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	31.85	l	(69)
Pumps	and far	ns gains	(Table 5	5a)			i				r		1	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	l	(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-70.8	-70.8	-70.8	-70.8	-70.8	-70.8	-70.8	-70.8	-70.8	-70.8	-70.8	-70.8		(71)
Water	heating	gains (T	able 5)	-			-	-			-		_	
(72)m=	115.02	113.26	109.6	104.63	101.4	96.85	92.99	97.94	99.7	104.85	110.66	113.26		(72)
Total i	nternal	gains =				(66)	m + (67)m	n + (68)m +	+ (69)m + ((70)m + (7	1)m + (72))m		
(73)m=	332.66	330.95	320.97	304.98	289.01	273.39	263.11	268	276.09	292.25	310.81	324.48		(73)
6. Sol	lar gains	8:												
Solar g	ains are c	alculated	using sola	r flux from	Table 6a a	and associ	iated equa	tions to co	onvert to th	e applicab	le orientat	tion.		

Orientation:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	2.43	x	36.79	×	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	x	5.88	x	36.79	×	0.45	×	0.7	=	47.23	(77)

Southeast 0.9x	0.77	x	2.43	x	3	6.79	x	0.45	x	0.7	=	19.52	(77)
Southeast 0.9x	0.77	×	2.43	x	6	2.67	x	0.45	×	0.7		33.25	(77)
Southeast 0.9x	0.77	×	5.88	x	6	2.67	x	0.45	×	0.7		80.45	(77)
Southeast 0.9x	0.77	×	2.43	x	6	2.67	x	0.45	x	0.7	= [33.25	(77)
Southeast 0.9x	0.77	×	2.43	x	8	5.75	x	0.45	×	0.7	= [45.49	(77)
Southeast 0.9x	0.77	×	5.88	x	8	5.75	x	0.45	×	0.7	=	110.07	(77)
Southeast 0.9x	0.77	×	2.43	x	8	5.75	- x	0.45	x	0.7	= [45.49	(77)
Southeast 0.9x	0.77	×	2.43	x	10	06.25	x	0.45	x	0.7	= [56.36	(77)
Southeast 0.9x	0.77	×	5.88	x	1	06.25	x	0.45	×	0.7		136.38	(77)
Southeast 0.9x	0.77	×	2.43	x	10	06.25	x	0.45	x	0.7	=	56.36	(77)
Southeast 0.9x	0.77	×	2.43	x	1	19.01	x	0.45	×	0.7	=	63.13	(77)
Southeast 0.9x	0.77	×	5.88	x	1	19.01	x	0.45	x	0.7	=	152.76	(77)
Southeast 0.9x	0.77	×	2.43	x	1	19.01	x	0.45	x	0.7	=	63.13	(77)
Southeast 0.9x	0.77	×	2.43	x	1	18.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	×	5.88	x	1	18.15	x	0.45	x	0.7	=	151.65	(77)
Southeast 0.9x	0.77	×	2.43	x	1	18.15	x	0.45	x	0.7	=	62.67	(77)
Southeast 0.9x	0.77	×	2.43	x	1	13.91	x	0.45	x	0.7	=	60.42	(77)
Southeast 0.9x	0.77	×	5.88	X	1	13.91	x	0.45	x	0.7	=	146.21	(77)
Southeast 0.9x	0.77	×	2.43	x	1	13.91	x	0.45	x	0.7		60.42	(77)
Southeast 0.9x	0.77	×	2.43	x	1	04.39] × [0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.7 <mark>7</mark>	×	5.88	x	10	04.39	x	0.45	x	0.7	=	133.99	(77)
Southeast 0.9x	0.77	×	2.43	×	10	04.39	x	0.45	x	0.7	=	55.37	(77)
Southeast 0.9x	0.77	×	2.43	x	9	2.85	x	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	×	5.88	x	9	2.85	x	0.45	x	0.7	=	119.18	(77)
Southeast 0.9x	0.77	×	2.43	x	9	2.85	x	0.45	x	0.7	=	49.25	(77)
Southeast 0.9x	0.77	x	2.43	x	6	9.27	x	0.45	×	0.7	=	36.74	(77)
Southeast 0.9x	0.77	×	5.88	x	6	9.27	x	0.45	x	0.7	=	88.91	(77)
Southeast 0.9x	0.77	×	2.43	x	6	9.27	x	0.45	x	0.7	=	36.74	(77)
Southeast 0.9x	0.77	×	2.43	x	4	4.07	x	0.45	×	0.7	=	23.38	(77)
Southeast 0.9x	0.77	×	5.88	x	4	4.07	x	0.45	x	0.7	=	56.57	(77)
Southeast 0.9x	0.77	x	2.43	x	4	4.07	x	0.45	x	0.7	=	23.38	(77)
Southeast 0.9x	0.77	x	2.43	x	3	1.49	x	0.45	x	0.7	=	16.7	(77)
Southeast 0.9x	0.77	x	5.88	x	3	1.49	x	0.45	×	0.7	=	40.42	(77)
Southeast 0.9x	0.77	×	2.43	×	3	1.49	x	0.45	×	0.7	= [16.7	(77)
Solar gains in	watte calcu	ulated	for each r	nonth			(83)m	- Sum(74)m	(82)m				
(83)m= 86.26	146.94 20	01.05	249.11 2	279.02	277	267.06	244	.74 217.69	162.4	103.32	73.82		(83)
Total gains – ir	nternal and	solar	(84)m = (1	73)m + (83)m	, watts	1	I		1 1			
(84)m= 418.92	477.89 52	22.01	554.09 5	68.02 5	50.39	530.16	512	.74 493.78	454.64	414.13	398.3		(84)
7. Mean inter	nal tempera	ature (heating se	eason)									
Temperature	during heat	ting pe	eriods in tl	he living	area	rom Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for li	ving area,	, h1,m (s	ее Та	ble 9a)							

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Mar

Jan

Feb

(86)m=	0.93	0.91	0.86	0.79	0.68	0.54	0.41	0.44	0.62	0.81	0.9	0.94		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	19.19	19.46	19.84	20.28	20.64	20.87	20.96	20.95	20.8	20.35	19.71	19.15		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.06	20.07	20.07	20.08	20.08	20.1	20.1	20.1	20.09	20.08	20.08	20.07		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.93	0.89	0.85	0.76	0.64	0.48	0.33	0.36	0.56	0.77	0.89	0.93		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to 1	7 in Tabl	e 9c)	-			
(90)m=	17.66	18.05	18.58	19.2	19.68	19.98	20.07	20.06	19.89	19.31	18.41	17.6		(90)
			_		_				f	LA = Livin	g area ÷ (4	4) =	0.58	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA x T1	+ (1 – fL	.A) × T2					
(92)m=	18.54	18.86	19.3	19.82	20.23	20.49	20.58	20.57	20.41	19.91	19.16	18.49		(92)
Apply	adjustn	nent to tl	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.54	18.86	19.3	19.82	20.23	20.49	20.58	20.57	20.41	19.91	19.16	18.49		(93)
8. Spa	ace hea	ting requ	uirement					T 1 1 0		· .	70)			
Set Ti	i to the r	nean int	ernal ter	mperatui using Ta	re obtain	ied at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Αυσ	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm):		Jun			000		1101			
(94)m=	0.91	0.88	0.83	0.76	0.65	0.51	0.37	0.4	0.58	0.77	0.87	0.92		(94)
Us <mark>efu</mark>	ll gains,	hmGm ,	W = (9	4)m x (84	4)m									
(95)m=	<mark>38</mark> 0.44	418.62	433	418.36	368.52	278.08	198.07	205.29	286.32	349.09	361.75	365.23		(95)
Month	nly avera	age exte	rnal terr	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	768.11	750.83	686.58	577.34	449.55	306.02	206.67	215.99	329.93	490.57	639.12	761.84		(97)
Space	e heatin	g require	ement fo	r each n	honth, k\	Wh/mont	th = 0.02	24 x [(97])m – (95)m] x (4′	1)m			
(98)m=	288.43	223.24	188.66	114.47	60.28	0	0	0	0	105.26	199.71	295.07		
								Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	1475.13	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								27.99	(99)
9b. En	ergy rec	luiremer	nts – Coi	mmunity	heating	scheme	•							
This pa	art is use	ed for sp	ace hea	iting, spa	ace cooli	ing or wa	ater heat	ting prov	ided by	a comm	unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary/	supplen	nentary I	neating ((Table 1)	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The com	nmunity so	cheme may	y obtain he	eat from se	everal sour	rces. The p	procedure	allows for	CHP and u	up to four o	other heat	sources; tl	he latter	
Fractio	n of hea	eat pumps at from C	s, geotheri Commun	nal and wa itv heat i	aste heat f oump	rom powei	r stations.	See Appel	ndix C.			[1	
Fractio	n of tota	al snace	heat fro	m Comn	nunity he	at num	`			(3	02) x (303	a) –	1	 (304a)
Fraction of total space heat from Community heat pump $(302) \times (303a) =$													1	(305)
Distrib		s factor	(Table 1	(2c) for c		ity heating	na svete	m	ang sys			l	1.0	
Space	hootin			20,101	Jonnull	ity neall	iy syste					l	L\N/h/vo-	_(000)
Annual	ineating	y heating i	requiren	nent								[1475 13	٦
	space											l	1470.10	

Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1770.15	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1850.36]
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	2220.43	(310a)
Electricity used for heat distribution	0.01 × [(307a)…(307	7e) + (310a)(310e)] =	39.91	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from ou	utside		100.48	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	100.48	(331)
Energy for lighting (calculated in Appendix L)	_		244.15	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-730.07	(33 <mark>3</mark>)
Tota <mark>l delivered energy for</mark> all u <mark>ses (</mark> 307) + (309) + (310) + (312) +	(315) + (331) + (33	32)(237b) =	3 <mark>605.1</mark> 3	(338)
12b. CO2 Emissions – Community heating scheme	Energy	Emission factor	Emissions	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)	kWh/year	kg CO2/kWh (366) for the second fue	kg CO2/year	(367a)
CO2 associated with heat source 1 [(307b)+(31	10b)] x 100 ÷ (367b) x	0.52	995.73	(367)
Electrical energy for heat distribution [(3	13) x	0.52	20.71	(372)
Total CO2 associated with community systems (36	63)(366) + (368)(37	2) =	1016.44	(373)
CO2 associated with space heating (secondary) (30)9) x	0 =	- 0	(374)
CO2 associated with water from immersion heater or instantaneou	us heater (312) x	0.52	- 0	(375)
Total CO2 associated with space and water heating (37	73) + (374) + (375) =		1016.44	(376)
CO2 associated with electricity for pumps and fans within dwelling	j (331)) x	0.52	52.15	(378)
CO2 associated with electricity for lighting (33	32))) x	0.52	126.71	(379)
Energy saving/generation technologies (333) to (334) as applicabl Item 1	le	0.52 × 0.01 =	-378.91	(380)
Total CO2, kg/year sum of (376)(382) =			816.39	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			15.49	(384)
El rating (section 14)			88.8	(385)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 201	2	roportu	Strom Softwa	a Num are Vei	ber: rsion:	174	Versic	on: 1.0.5.49	
Addrose i	Ham Close	London	TW/10	ropeny	Address	. DIUCK F	- iviia - r				
1 Overall dwelling dime	ensions:	LUNUUN	, 10010								
				Are	a(m²)		Av. Hei	aht(m)		Volume(m ³)	
Ground floor				5	54.97	(1a) x	2.	.6	(2a) =	142.92	(3a)
First floor				5	57.52	(1b) x	2.	.9	(2b) =	166.81	(3b)
Second floor					39.48	(1c) x	3.	.3	(2c) =	130.28](3c)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+(1r	I) 1	51.97	(4)		-], ,		
Dwelling volume	, , , , , ,		, (, <u> </u>		(3a)+(3b)+(3c)+(3d)	+(3e)+	.(3n) =	440.01	(5)
2. Ventilation rate:											
	main	Se	econdar	у	other		total			m ³ per hou	
Number of chimneys		"ז + ר	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0	 +	0	- +	0] = [0	×	20 =	0	(6b)
Number of intermittent fa	ins					Ī	0	x '	10 =	0	(7a)
Number of passive vents	;					Ē	0	x ^	10 =	0	(7b)
Number of flueless gas f	ires					Γ	0	X 4	40 =	0	(7c)
									Air ch	anges per bo	
Infiltration due to chimpe	ve flues and f	anc - (6)	a)+(6b)+(7	(a) + (7b) + (7c) -	Г					
If a pressurisation test has b	peen carried out of	r is intende	d, procee	d to (17),	otherwise o	continue fr	0 rom (9) to (1	16)	÷ (5) =	0	(8)
Number of storeys in t	he dwelling (na	6)								0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber f	rame or	0.35 fo	r masoni	y constr	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the va ngs); if equal user	lue corres 0.35	bonding to	the great	ter wall are	a (after					
If suspended wooden	floor, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else e	enter 0								0	(13)
Percentage of window	s and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) +	(15) =		0	(16)
Air permeability value,	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of er	nvelope	area	4	(17)
If based on air permeabi	lity value, then	(18) = [(1	7) ÷ 20]+(8	3), otherw	ise (18) = ((16)				0.2	(18)
Air permeability value applie	es if a pressurisation	on test has	been don	e or a de	gree air pe	rmeability	is being us	ed			_
Number of sides sheltere	ed				(20) - 1	[0 075 v (4	10)1			2	(19)
		4			(20) = 1 - (20)	[0.075 X (1	[9]] =			0.85	(20)
Initiation rate incorpora	ung sheiter fac		I		(21) = (18) x (20) =				0.17	(21)
	Mar Apr	iu speed	lun	hul	Δυα	Son		Nov	Dec	1	
Monthly average wind ar	and from Tabl	• 7	Jun	Jui	I ^{Au} y	l oeb		1100	080	1	
$(22)m = \begin{bmatrix} 51 \\ 51 \end{bmatrix} \begin{bmatrix} 51 \\ 5 \end{bmatrix}$			3.8	3.8	37	4	43	45	<u>4</u> 7	1	
		-1.0	5.0	0.0	5.7		-1.0	-1.0	l [,]	J	

Wind F	actor (2	22a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjust	ed infiltr	ation rat	e (allow	ing for sl	nelter an	nd wind s	speed) =	: (21a) x	(22a)m						
	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2]		
Calcul	ate effe achanic	<i>ctive air</i> al ventila	change	rate for t	he appli	icable ca	ise				-				
lf exh	aust air h	eat pump	usina App	endix N. (2	(23a) = (23a	a) × Fmv (e	equation (N5)) . othe	erwise (23	o) = (23a)			0.	.5](23a)](23b)
lf bala	anced wit	h heat reco	overy: effic	iency in %	allowing	for in-use f	factor (fron	n Table 4ł	ı) =	, , ,			76	5](200)](23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recov	erv (MV	HR) (24;	a)m = (2	2b)m + (23b) × [1 – (23c)) ÷ 100]		
(24a)m=	0.33	0.33	0.33	0.3	0.3	0.28	0.28	0.27	0.29	0.3	0.31	0.32]		(24a)
b) lf	balance	ed mech	anical ve	entilation	without	heat red	covery (l	ч MV) (24I)m = (2	- 2b)m + (23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input	ventilatio	on from	outside	-	-	-			
	if (22b)r	n < 0.5 >	< (23b),	then (24	c) = (23k	o); other	wise (24	c) = (22	b) m + 0	.5 × (23t) 	i	-		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24c)
d) If	natural if (22b)r	ventilation = 1, th	on or wh en (24d)	iole hous m = (22	se positi [.] b)m othe	ve input erwise (2	ventilatie 24d)m =	on from 0.5 + [(2	loft 22b)m² x	0.5]					
(24d) <mark>m=</mark>	0	0	0	0	0	0	0	0	0	0	0	0			(24d
Effe	ctive air	change	rate - e	nter (24a) or (24	o) or (24	c) or (24	ld) in bo	x (25)						
(25)m=	0.33	0.33	0.33	0.3	0.3	0.28	0.28	0.27	0.29	0.3	0.31	0.32]		(25)
3. He	at losse	s and he	eat loss	paramet	er: 🗹										
ELEN		Gros	SS	Openin	igs	Net Ar	rea	U-val	ue	AXU		k-value	э	АX	k
		area	(m²)	r	1 ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙	K	kJ/K	<
Doo <mark>rs</mark>						1.97	×	1	=	1.97					(26)
Windo	ws Type	e 1				10.47	7 x1	/[1/(1.2)+	+ 0.04] =	11.99					(27)
Windo	ws Type	e 2				19.24	4 x1	/[1/(1.2)+	+ 0.04] =	22.03					(27)
Floor 7	Гуре 1					54.97	7 X	0.1	=	5.497		75		4122.75	(28)
Floor 7	Гуре 2					2.55	x	0.1	=	0.255		20		51	(28)
Walls		105.	02	31.6	8	73.34	4 ×	0.16	=	11.73		60		4400.4	(29)
Roof -	Туре1	39.4	48	0		39.48	в х	0.1	=	3.95		9		355.32	(30)
Roof ⁻	Туре2	18.0)4	0		18.04	4 ×	0.1	=	1.8		9		162.36	(30)
Total a	area of e	elements	s, m²			220.0	6								(31)
Party v	wall					150.7	7 X	0	=	0		110		16577	(32)
Interna	al wall *'	e e e e e e e e e e e e e e e e e e e				306.6	6					9		2759.4	(32c)
Interna	al floor					97						18	<u> </u>	1746	(32d)
Interna	al ceiling)				97						9	ĪĪ	873	(32e)
* for win ** inclua	dows and le the are	l roof wind as on both	ows, use e sides of i	effective wi nternal wal	indow U-va Is and par	alue calcul titions	lated using	g formula '	1/[(1/U-val	ue)+0.04] a	as given ir	n paragraph	h 3.2		

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

Heat capacity $Cm = S(A \times k)$

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

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

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

((28)...(30) + (32) + (32a)...(32e) =

 $= (34) \div (4) =$

59.23

31047.23

204.3

(33)

(34)

(35)

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						20.68	(36)
if details	of therma	al bridging	are not kr	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			79.9	(37)
Ventila	tion hea	at loss ca	alculated	d monthly	/			-	(38)m	= 0.33 × (25)m x (5)	_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	48.53	47.92	47.3	44.21	43.6	40.51	40.51	39.89	41.75	43.6	44.83	46.07		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	128.44	127.82	127.2	124.12	123.5	120.42	120.42	119.8	121.65	123.5	124.74	125.97		
		······································		/					(10)~	Average =	Sum(39)1.	12 /12=	123.96	(39)
Heat ic	oss para		TLP, VV		0.04	0.70	0.70	0.70	(40)m	= (39)m ÷	. (4)	0.00	l	
(40)m=	0.85	0.84	0.84	0.82	0.81	0.79	0.79	0.79	0.8	0.81	0.82	0.83		
Numbe	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 /12=	0.82	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
	ied occu	ipancy,	N 1 1 76 v	[1 - oxp	(_0_0003		-130	$(2)1 \pm 0$	1013 v /-	TEA -13	2.	94		(42)
if TF	A £ 13.	9, N = 1	+ 1.70 ×	li - evh	(-0.0000		A - 10.9)2)]+0.0),	11 A -13.	.5)			
Ann <mark>ua</mark>	l averag	je hot wa	ater usag	ge in <mark>litre</mark>	s per da	y Vd,av	erage =	(25 x N)	+ 36		103	3.96		(43)
Reduce	the annua	al average	hot water	usage by a	5% if the a	welling is	designed เ เส	to achieve	a water us	se target o	f			
normore					aler use, i									
11-4-1-1-4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HOL WAL	er usage i	n illies per	ay ior ea		vu,iii = 1a			(43)		i				
(44)m=	114.35	110.2	106.04	101.88	97.72	93.56	93.56	97.72	101.88	106.04	110.2	114.35		- 1
Enerav	content of	hot water	used - cal	culated mo	onthlv = 4.	190 x Vd.r	n x nm x D)))))))))))))))))))) kWh/mor	Total = Su hth (see Ta	m(44) ₁₁₂ = ables 1b. 1	= c. 1d)	1247.51	(44)
(45)m=	169.58	148.32	153.05	133.44	128.03	110.48	102.38	117.48	118.89	138.55	151.24	164.23		
(,										Total = Su	m(45) ₁₁₂ =		1635.68	(45)
lf instan	taneous w	vater heati	ng at point	of use (no	hot water	[.] storage),	enter 0 in	boxes (46,) to (61)					
(46)m=	25.44	22.25	22.96	20.02	19.21	16.57	15.36	17.62	17.83	20.78	22.69	24.64		(46)
Water	storage	loss:												
Storag	e volum	ie (litres)) includir	ng any so	blar or W	/WHRS	storage	within sa	ame ves	sel		210		(47)
If com	munity h	neating a	ind no ta	nk in dw	elling, e	nter 110) litres in	(47)		ar (0) in (47)			
Water	vise ii no		not wate	er (this in	iciuaes i	nstantar	ieous co	niod idmo	ers) ente	er u in (47)			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	53		(48)
Tempe	erature f	actor fro	m Table	2b		,	,				0.	54		(49)
Energy	/ lost fro	om water	storage	. kWh/ve	ear			(48) x (49)) =		0	83		(50)
b) If m	anufact	urer's de	eclared	cylinder l	oss fact	or is not	known:	(,,			0.	00		(00)
Hot wa	ater stor	age loss	factor fi	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If com	munity h	neating s	ee secti	on 4.3										
Volum	e factor	from Ta	ble 2a	Oh								0	,	(52)
Iempe	erature f	actor fro	m I able	20								0		(53)

Energy Enter	/ lost fro (50) or	om water (54) in (5	• storage 55)	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0.	0 83		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			
(56)m=	25.61	23.13	25.61	24.79	25.61	24.79	25.61	25.61	24.79	25.61	24.79	25.61		(56)
If cylinde	er contain	s dedicate	l d solar sto	rage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	1 7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	25.61	23.13	25.61	24.79	25.61	24.79	25.61	25.61	24.79	25.61	24.79	25.61		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)	i	1	()
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m			-			
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	218.46	192.46	201.93	180.73	176.91	157.78	151.25	166.36	166.18	187.42	198.54	213.11		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	: H (negati	ve quantity	(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 (G)		r	r	I	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter										I	
(64)m=	218.46	192.46	201.93	180.73	176.91	157.78	151.25	166.36	166.18	187.42	198.54	213.11		
								Outp	out from wa	ater heate	r (annual)₁	12	2211.14	(64)
Heat g	ains fro	m water	heating	kWh/m	onth 0.2	5 <i>[</i> 0.85	× (45)m	+ (61)m	1] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	95.49	84.63	89.99	82.21	81.67	74.57	73.14	78.16	77.37	85.17	88.12	93.71		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table &	5 and 5a):									
Metab	olic gair	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	29.04	25.79	20.98	15.88	11.87	10.02	10.83	14.08	18.89	23.99	28	29.85		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	r	r		
(68)m=	322.66	326.01	317.57	299.61	276.93	255.62	241.39	238.04	246.47	264.44	287.11	308.42		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equa	tion L15	or L15a)	, also se	e Table	5				
(69)m=	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69		(69)
Pumps	and fa	ns gains	(Table !	ōa)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. e\	aporatic	on (nega	tive valu	es) (Tab	le 5)	-				-			
(71)m=	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49		(71)
Water	heating	gains (T	able 5)											
(72)m=	128.34	125.94	120.95	114.17	109.77	103.58	98.31	105.06	107.46	114.47	122.4	125.95		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	547.1	544.8	526.56	496.72	465.64	436.28	417.58	424.23	439.88	469.96	504.56	531.28		(73)
6. So	lar gain	s:												

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

Orienta	ition:	Access Fa Table 6d	actor		Area m²			Flu Tal	x ole 6a		Т	g_ able 6b		FF Table 6c			Gains (W)	
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	3	6.79	×		0.45	x	0.7		=	154.53	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	6	2.67	×		0.45	x	0.7		=	263.23	(77)
Southea	ast <mark>0.9</mark> x	0.77		x	19.3	24	x	8	5.75] ×		0.45	×	0.7		=	360.16	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	1	06.25	×		0.45	×	0.7		=	446.26	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	1	19.01	x		0.45	×	0.7		=	499.84	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	1	18.15	x		0.45	×	0.7		=	496.23	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	1	13.91	x		0.45	x	0.7		=	478.42	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	1	04.39	x		0.45	×	0.7		=	438.44	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	9	2.85	×		0.45	x	0.7		=	389.98	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	6	9.27	×		0.45	x	0.7		=	290.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	4	4.07	x		0.45	×	0.7		=	185.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	3	1.49	×		0.45	×	0.7		=	132.25	(77)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	1	1.28	×		0.45	x	0.7		=	25.79	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	2	2.97	x		0.45	×	0.7		=	52.49	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	4	1.38	×		0.45	×	0.7		=	94.57	(81)
Northwe	est 0.9x	0.77		x	10.4	47	x	6	57.96	x		0.45	х	0.7		=	155.32	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	х	9	1.35	x		0.45	x	0.7		=	208.78	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	х	9	7.38	j 🖈		0.45	x	0.7		=	2 <mark>22.58</mark>	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	х		91.1	x		0.45	x	0.7		=	2 <mark>08.22</mark>	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	7	2.63	x		0.45	x	0.7		=	165.99	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	5	0.42	×		0.45	x	0.7		=	115.24	(81)
Northwe	est 0.9x	0.77		x	10.4	47	x	2	8.07	x		0.45	x	0.7		=	64.15	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	·	14.2	x		0.45	x	0.7		=	32.45	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	9	9.21] x		0.45	x	0.7		=	21.06	(81)
										-			_					
Solar g	ains in	$\frac{1}{2}$ watts, ca	Icula 454	ted	for each	1 mont	h J	18.81	686 63	(83)n	n = Si	um(74)m 505 22	(82)m	7 217 54	153	31		(83)
Total g	ains –	internal a	nd so	blar	(84)m =	= (73)m	<u> </u>	83)m	. watts	00-	1.45	505.22	000.0	217.04				(00)
(84)m=	727.42	860.52	981.2	29	1098.29	1174.2	5 1	155.08	1104.22	102	8.66	945.1	825.0	3 722.11	684	.59		(84)
		1			1		-			1				- 1	1			. ,
7. Mea	an inte	ernal temp	eratu	ire (a pa	neating priodo in	seaso	n) vina	oroo	from Tok			1 (°C)						
Litiliaa		e during ne	eaun sinn f	y pe			ning m (a			Jie a	, 111	I (C)					21	(65)
Ounsa	luon lan	Eph				a, m,i Mav	, ,			Δ		Sen	Oct	Nov				
(86)m=	1	1	0.99	21 2	0.95	0.84	+	0.64	0.48	0.	53	0.8	0.97	1		1		(86)
				<u> </u>				0.01					0.01	·	<u> </u>			()
Mean	intern	al tempera	ature	In I	iving are			ow ste	ps 3 to 1	(in	able	e 9c)	20.67	20.25	20	10	l	(87)
(67)m=	20.13	20.25	20.4	4	20.00	20.86		20.94	20.95	20	.95	20.9	20.67	20.35	20.	.12		(07)
Temp	erature	e during he	eatin	g pe	eriods ir	rest o	f dv	velling	from Ta	able	9, Th	n2 (°C)	<u> </u>				l	(00)
(88)m=	20.21	20.22	20.2	2	20.24	20.24		20.26	20.26	20	.26	20.25	20.24	20.24	20.	.23		(88)
Utilisa	tion fa	ctor for ga	ains f	or r	est of d	welling	, h2	,m (se	e Table	9a)		,					I	
(89)m=	1	0.99	0.98	3	0.93	0.8		0.58	0.4	0.4	45	0.74	0.96	0.99	1	1		(89)

Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (fe	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	19.02	19.21	19.48	19.84	20.07	20.18	20.19	20.19	20.14	19.83	19.38	19.02		(90)
I									f	iLA = Livin	g area ÷ (4	4) =	0.26	(91)
Moon	intornal	Itompor	atura (fo	r tho wh	olo dwo	lling) – fl	Δ 🗸 Τ1	ı (1 fl	A) v T2			I		
(92)m=	19.31	19.48	19.73	20.06	20 27	20.37	20.38	20.39	20.33	20.04	19.63	19.3		(92)
	adiustn	nent to t	he mear		temper	ature fro	m Table				10.00	10.0		(/
(93)m=	19.31	19.48	19.73	20.06	20.27	20.37	20.38	20.39	20.33	20.04	19.63	19.3		(93)
8 Sp:	ace hea	ting regi	lirement		20121		20.00	20.00			10100			· · ·
Set Ti	i to the r	mean int	ernal ter	mperatu	re obtair	ned at ste	on 11 of	Table 9	h so tha	t Ti m=('	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a				o, so ina	(it ii,iii–(<i>i</i> 0)111 an			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1 <u></u> 1:									I	
(94)m=	1	0.99	0.98	0.93	0.8	0.59	0.41	0.46	0.74	0.95	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m	•							I	
(95)m=	725.24	853.85	959.82	1019.82	942.44	679.99	454.13	474.57	703.39	787.18	716.97	683.1		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8							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)
He <mark>at</mark>	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	19 <mark>27.44</mark>	1863.19	1682.86	1384.65	1058.99	6 95.23	455.75	477.58	758.39	1166.44	1562.79	1902.3		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 × [(97)m – (95)m] x (4 ⁻	1)m			
(98)m=	<mark>89</mark> 4.44	678.2 <mark>8</mark>	537.95	262.68	86.71	0	0	0	0	282.16	608.99	<mark>90</mark> 7.09		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	4 <mark>258.3</mark>	(98)
Space	e heatin	a require	ement in	kWh/m ²	/vear								28.02](99)
		5 1		i du al b										
Shoo	ergy rec	quirether		ividual fi	eating s	ystemis i	nciuaing	micro-c						
Fracti	on of sp	ig. bace hea	at from s	econdar	v/supple	mentarv	svstem						0	(201)
Fracti	on of sr	ace hes	at from m	nain svet	em(s)	,	- ,	(202) = 1	- (201) =				1	$\frac{1}{202}$
Fracti								(204) = (2)	()	(202)1 -			1	
Fracti	on of to	tal neatil	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								333.14	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above))								
	894.44	678.28	537.95	262.68	86.71	0	0	0	0	282.16	608.99	907.09		
(211)m	n = {[(98)m x (20	4)] } x 1	00 ÷ (20)6)									(211)
. ,	268.48	203.6	161.48	78.85	26.03	0	0	0	0	84.7	182.8	272.28		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}		1278.21	(211)
Space	e heatin	a fuel (s	econdar	v) kWh/	month									
= {[(98])m x (20	01)] } x 1	00 ÷ (20)),										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
		I					I	L			L			
								Tota	il (kWh/yea	ar) = Sum(2)	215) _{15,1012}	=	0	(215)
Water	heating	1						Tota	il (kWh/yea	ar) =Sum(2	215) _{15,10} 12	=	0	(215)
Water Output	heating from wa) ater hea	ter (calc	ulated a	bove)			Tota	ıl (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water Output	heating from wa	ater hea 192.46	ter (calc 201.93	ulated a	bove) 176.91	157.78	151.25	Tota 166.36	166.18	ar) =Sum(2 187.42	215) _{15,10} 12	213.11	0	_(215)

(217)m= 282.62 282.62 282.62 282.62 282.62	282.62 282.6	2 282.62	282.62	282.62	282.62	282.62		(217)
Fuel for water heating, kWh/month								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 77.3 68.1 71.45 63.95 62.59	55.83 53.52	58.86	58.8	66.32	70.25	75.4		
		Tota	I = Sum(2)	19a) ₁₁₂ =			782.36	(219)
Annual totals				k	Wh/year		kWh/year	
Space heating fuel used, main system 1					-		1278.21	
Water heating fuel used							782.36	
Electricity for pumps, fans and electric keep-hot								
mechanical ventilation - balanced, extract or po	sitive input fr	om outsid	е			389.19		(230a)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			389.19	(231)
Electricity for lighting							512.88	(232)
Electricity generated by PVs							-730.07	(233)
Total delivered energy for all uses (211)(221) -	+ (231) + (232	2)(237b)	=				2232.57	(338)
12a. CO2 emissions – Individual heating system	ms including r	nicro-CHF)					
	Enerav			Emiss	ion fac	tor	Emissions	
	kWh/yea	ar 🗾		kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.5	19	-	6 <mark>63.39</mark>	(261)
Space heating (secondary)	(215) x			0.5	19		0	(263)
Water heating	(219) x			0.5	19	=	406.04	(264)
Space and water heating	(261) + (262	2) + (263) +	(264) =				1069.44	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	201.99	(267)
Electricity for lighting	(232) x			0.5	19	=	266.18	(268)
Energy saving/generation technologies						•		_
Item 1				0.5	19	=	-378.91	(269)
Total CO2, kg/year			sum o	of (265)(2	271) =	[1158.7	(272)

EI rating (section 14)

(274)

92

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 201	2		Strom Softwa	a Num are Ve	ber: rsion:	1174	Versic	on: 1.0.5.49	
	Ham Close	London	TW/10	ropenty.	Address	BIOCK (, - Ena - ב	нн			
Address :		London	, 10010								
	511510115.			Area	a(m²)		Av Hei	aht(m)		Volume(m ³)	
Ground floor				5	54.97	(1a) x	2	.6	(2a) =	142.92	(3a)
First floor				5	57.52	(1b) x	2	.9	(2b) =	166.81](3b)
Second floor					39.48	(1c) x	3	.3](2c) =	130.28	`_´](3c)
Total floor area TFA = (1	a)+(1b)+(1c)+((1d)+(1e)+(1r) <u> </u>	51 97	(4)				100.20	
Dwelling volume			/ (/	01.01	(3a)+(3b)+(3c)+(3d))+(3e)+	.(3n) =	440.01	(5)
2 Ventilation rate:										440.01	
2. Ventilation rate.	main	Se	econdar	у	other		total			m ³ per hou	•
Number of chimneys		<u>ה</u> + ר] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0	i + F	0		0] = [0	×	20 =	0	(6b)
Number of intermittent fa	ins						0	x	10 =	0	(7a)
Number of passive vents	5					Г	0	x '	10 =	0	(7b)
Number of flueless gas f	ires					Γ	0	X 4	40 =	0	(7c)
									A :		
		(6)	-) - (Ch) - (7	(7b) (70)				Air cr	hanges per no	ur T
Inflitration due to chimne	es, flues and fa	ans = (08 r is intende	d, proceed	a)+(70)+(otherwise o	continue fr	0 rom (9) to (16)	÷ (5) =	0	(8)
Number of storeys in t	he dwelling (ns	6)	.,,	())				- /		0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber f	rame or	0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the va nas): if equal user	lue corres 0.35	bonding to	the great	ter wall are	a (after					_
If suspended wooden	floor, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no draught lobby, en	iter 0.05, else e	enter 0								0	(13)
Percentage of window	s and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	! x (14) ÷ 1	= [00]			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (′	12) + (13) +	(15) =		0	(16)
Air permeability value,	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4	(17)
If based on air permeabi	lity value, then	(18) = [(1	7) ÷ 20]+(8	3), otherw	ise (18) = ((16)				0.2	(18)
Air permeability value applie	es if a pressurisatio	on test has	been don	e or a de	gree air pe	rmeability	is being us	ed			-
Number of sides sheltere	ed				(20) - 1 - 1	[0 075 x (/	10)] -			2	(19)
Infiltration rate incornera	ting chalter for	tor			(20) = 1	(20) = (20)	[0]]=			0.85	
Infiltration rate modified f	ing sheller lac	d spaad	I		(~) - (10	, ∧ (∠0) =				0.17	(21)
Jan Feh	Mar Anr	Mav	Jun	Jul	Αυσ	Sen	Oct	Nov	Dec	1	
Monthly average wind sr	eed from Tabl	, ₽ 7	Carr		1,9					J	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
					1	· ·			L	J	

Wind F	actor (2	22a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjust	ed infiltr	ation rat	e (allow	ing for sł	nelter an	nd wind s	speed) =	: (21a) x	(22a)m						
	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2	1		
Calcul	ate effe	ctive air	change	rate for t	he appli	cable ca	ise		•	•			, 		
lf exh	aust air h	eat nump	using App	endix N (2	(23) = (23)	a) x Emv (equation (I	N5)) othe	erwise (23	(23a) = (23a)			0	.5	_(23a) _(22b)
lf bala	anced with	n heat reco	overv: effic	ciencv in %	allowing f	for in-use f	factor (fron	n Table 4ł	n) =	5) = (200)				.5	_(230) _(230)
a) If	balance	d mech	anical v	entilation	with he	at recov	erv (MV	HR) (24;	′ a)m = (2	2h)m + (23h) x [1 – (23c)	1001	5.5	
(24a)m=	0.33	0.33	0.33	0.3	0.3	0.28	0.28	0.27	0.29	0.3	0.31	0.32]		(24a)
b) If	balance	d mech	ı anical ve	entilation	without	heat red	L Covery (I	u MV) (24I	b)m = (2	1 2b)m + (23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	/e input	ventilatio	on from	outside	1	<u> </u>		1		
i	if (22b)n	n < 0.5 >	< (23b),	then (24	c) = (23k	o); other	wise (24	-c) = (22	b) m + 0	.5 × (23k))		_		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24c)
d) If	natural if (22b)n	ventilation = 1, th	on or wh en (24d)	ole hous m = (22)	se positi [.] b)m othe	ve input erwise (2	ventilatie 24d)m =	on from 0.5 + [(2	loft 22b)m² x	0.5]					
(24d) <mark>m=</mark>	0	0	0	0	0	0	0	0	0	0	0	0			(24d
Effe	ctive air	change	rate - e	nter (24a) or (24	b) or (24	c) or (24	ld) in bo	x (25)			<u> </u>			
(25)m=	0.33	0.33	0.33	0.3	0.3	0.28	0.28	0.27	0.29	0.3	0.31	0.32]		(25)
3 He	at losse	s and he	eat loss	paramet	er.						_				
ELEN		Gros	SS	Openin	igs	Net Ar	rea	U-val	lue	AXU		k-value	Э	АX	k
		area	(m²)	'n	1 ²	А ,	m²	W/m2	2K	(VV/	K)	kJ/m²∙	K	kJ/ł	<
Doo <mark>rs</mark>						1.97	×	1	=	1.97					(26)
Windo	ws Type	e 1				10.47	7 x1	/[1/(1.2)+	+ 0.04] =	11.99					(27)
Windo	ws Type	92				19.24	4 x1	/[1/(1.2)+	+ 0.04] =	22.03					(27)
Floor 7	Гуре 1					54.97	7 X	0.1	=	5.497		75		4122.75	(28)
Floor 7	Гуре 2					2.55	x	0.1	=	0.255		20		51	(28)
Walls		179.	27	31.6	8	147.5	i9 x	0.16	=	23.61		60] [8855.4	(29)
Roof ⁻	Type1	39.4	48	0		39.48	в х	0.1	=	3.95		9		355.32	(30)
Roof -	Type2	18.0)4	0		18.04	4 ×	0.1	=	1.8		9		162.36	(30)
Total a	area of e	lements	s, m²			294.3	31								(31)
Party v	wall					76.49	э <mark>х</mark>	0	=	0		110		8413.899	(32)
Interna	al wall **					306.6	6				i	9	Ξī	2759.4	(32c)
Interna	al floor					97					[18	Ξ ľ	1746	(32d)
Interna	al ceiling	I				97					[9	Ξ Ĕ	873	(32e)
* for win ** inclua	dows and le the area	roof wind as on both	ows, use e sides of i	effective wi nternal wal	indow U-va Is and par	alue calcu titions	lated using	g formula	1/[(1/U-val	ue)+0.04] a	as given in	n paragraph	1 3.2		_

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

Heat capacity $Cm = S(A \times k)$

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

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

 $= (34) \div (4) =$

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

((28)...(30) + (32) + (32a)...(32e) =

71.11

27339.13

179.9

(33)

(34)

(35)

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated (using Ap	pendix l	<						22.84	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			93.95	(37)
Ventila	tion hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	48.53	47.92	47.3	44.21	43.6	40.51	40.51	39.89	41.75	43.6	44.83	46.07		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	142.48	141.87	141.25	138.17	137.55	134.46	134.46	133.85	135.7	137.55	138.78	140.02		
									/	Average =	Sum(39)1.	12 /12=	138.01	(39)
Heat lo	oss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)		1	
(40)m=	0.94	0.93	0.93	0.91	0.91	0.88	0.88	0.88	0.89	0.91	0.91	0.92		_
Numbe	er of day	/s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) ₁ .	12 /12=	0.91	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
			-							-	-			
4. Wa	iter heat	ting enei	rgy requi	rement:								kWh/ye	ear:	
A													I	()
Assum	ed occu A > 13.9	ipancy, i 9. N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	A -13.9	$(2)^{1} + 0.0$)013 x (⁻	TFA -13.	.9)	94		(42)
if TF	A £ 13.9	9, N = 1		[(0.000						,			
Annua	l averag	e hot wa	ater usag	ge in <mark>litre</mark>	es per da	y Vd,av	erage =	(25 x N)	+ 36		103	3.96		(43)
not more	the annua e that 125	litres per l	not water person per	usage by : [.] dav (all w	5% if the d ater use. I	welling is hot and co	designed (ld)	o achieve	a water us	se target o	Ť			
	lan		Mar	A	Max	lum		Aa	Con	Oct	Nevi	Dee		
Hot wate	Jan er usage i	n litres per	dav for ea	Apr ach month	Vd.m = fa	ctor from	Jui Table 1c x	Aug (43)	Sep	Oct	INOV	Dec		
(11)-	114.25	110.2	106.04	101.00	07.72	02.56	02.56	07.72	101.99	106.04	110.2	114.25		
(44)11=	114.55	110.2	100.04	101.00	91.12	93.00	93.00	91.12	101.00		m(44)	114.55	12/7 51	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	1247.51	(++)
(45)m=	169.58	148.32	153.05	133.44	128.03	110.48	102.38	117.48	118.89	138.55	151.24	164.23		
									-	Total = Su	m(45) ₁₁₂ =		1635.68	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46,) to (61)					
(46)m=	25.44	22.25	22.96	20.02	19.21	16.57	15.36	17.62	17.83	20.78	22.69	24.64		(46)
Water	storage	IOSS:	ingludin		lor or M		otorogo	within or					1	(47)
Sioray				iy any su		///IK3	Siorage	(47)	ame ves	501		180		(47)
Otherw	nunity n vise if no	eating a	na no la bot wate	nk in aw ar (this in	velling, e Indes i	nter 110 nstantar		(47) mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:	not wate			nstantai								
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1	.6		(48)
Tempe	erature f	actor fro	m Table	2b							0.	54		(49)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(48) x (49)	=		0.	86		(50)
b) If m	anufact	urer's de	eclared o	ylinder l	oss fact	or is not	known:							
Hot wa	iter stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
	nunity h	from To	ee secti	on 4.3								-	l	
Tempe	e lactor	actor fro	uie ∠a m Tahl≏	2h								0		(52) (53)
· Junpt				_~							'	0		(00)

Energy Enter	/ lost fro (50) or (om water (54) in (5	• storage 55)	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0.	0 86		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylinde	er contain	s dedicate	l d solar sto	rage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	1 7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m			-	-		
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	219.63	193.52	203.1	181.87	178.08	158.92	152.43	167.53	167.32	188.6	199.67	214.28		(62)
Solar DH	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	v) (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 (<u>3)</u>					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter						-					
(64)m=	219.63	193.52	203.1	181.87	178.08	158.92	152.43	167.53	167.32	188.6	199.67	214.28		
								Outp	out from wa	ater heate	r (annual)₁	12	2224.94	(64)
Hea <mark>t g</mark>	<mark>ain</mark> s fro	m water	heating	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m	1	
(65)m=	9 <mark>6.42</mark>	85.48	90.93	83.11	82.61	75.48	74.08	79.1	78.27	86.1	89.03	94.64		(65)
in <mark>clu</mark>	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table {	5 and 5a):									
Metabo	olic gain	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	29.04	25.79	20.98	15.88	11.87	10.02	10.83	14.08	18.89	23.99	28	29.85		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	322.66	326.01	317.57	299.61	276.93	255.62	241.39	238.04	246.47	264.44	287.11	308.42		(68)
Cookin	ng gains	(calcula	Ited in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5	•			
(69)m=	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69		(69)
Pumps	and fai	ns gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49		(71)
Water	heatina	gains (T	able 5)					L		L			I	
(72)m=	129.6	127.2	122.21	115.43	111.03	104.84	99.57	106.32	108.72	115.73	123.66	127.21		(72)
Total i	nternal	qains =		ļ	ļ	(66)	ı m + (67)m	ı + (68)m +	⊦ (69)m + ((70)m + (7	ı 1)m + (72)	m	I	
(73)m=	548.36	546.06	527.82	497.98	466.9	437.54	418.84	425.49	441.14	471.22	505.82	532.54		(73)
6. So	lar gains	S:	I	I	I	I	I		I		I	I	<u> </u>	

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

Orienta	ition:	Access F Table 6d	actor	-	Area m²			Flu Tat	x ble 6a		Т	g_ able 6b		FF Table 6c			Gains (W)	
Southea	ast <mark>0.9</mark> x	0.77		x	19.2	24	x	3	6.79	x		0.45	×	0.7		= [154.53	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	6	2.67	x		0.45	×	0.7		= [263.23	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	8	5.75	x		0.45	×	0.7		= [360.16	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	10	06.25	x		0.45	×	0.7		= [446.26	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	1	19.01	x		0.45	×	0.7		= [499.84	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	1	18.15	x		0.45	×	0.7		= [496.23	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	1	13.91	x		0.45	×	0.7		=	478.42	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	10	04.39	x		0.45	×	0.7		= [438.44	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	9	2.85	x		0.45	×	0.7		=	389.98	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	6	9.27	x		0.45	×	0.7		=	290.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	4	4.07	x		0.45	×	0.7		=	185.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	3	1.49	x		0.45	×	0.7		=	132.25	(77)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	1	1.28	x		0.45	×	0.7		=	25.79	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	2	2.97	x		0.45	×	0.7		=	52.49	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	4	1.38	x		0.45	×	0.7		=	94.57	(81)
Northwe	est 0.9x	0.77		x	10.4	47	x	6	7.96	x		0.45	x	0.7		=	155.32	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	х	9	1.35	x		0.45	x	0.7		= [2 <mark>08.78</mark>	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	х	9	7.38] ×		0.45	x	0.7		=	222.58	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	х	<u> </u>	91.1	x		0.45	x	0.7		=	208.22	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	7	2.63	x		0.45	x	0.7		= [165.99	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	5	0.42	x		0.45	x	0.7		= [115.24	(81)
Northwe	est 0.9x	0.77		x	10.4	47	x	2	8.07	x		0.45	x	0.7		= [64.15	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	Ĺ.	14.2	x		0.45	×	0.7		= [32.45	(81)
Northwe	est <mark>0.9</mark> x	0.77		x	10.4	47	x	9	9.21	x		0.45	x	0.7		= [21.06	(81)
Solar g	ains ir	n watts, ca	alcula	ited	for eac	n mont	h			(83)n	n = Sı	um(74)m .	(82)m					
(83)m=	180.32	315.72	454.	73	601.57	708.62	7	18.81	686.63	604	1.43	505.22	355.0	7 217.54	153.3	31		(83)
Total g	ains –	internal a	and so	olar	(84)m =	: (73)m) + (83)m	, watts	—				-1	r			
(84)m=	728.68	8 861.78	982.	55	1099.55	1175.5	1 1	156.34	1105.48	102	9.92	946.36	826.2	9 723.37	685.8	35		(84)
7. Mea	an inte	ernal temp	beratu	ire (heating	seaso	n)		_							r		_
Temp	eratur	e during h	eatin	g pe	eriods ir	the liv	'ing	area f	from Tal	ole 9), Th'	1 (°C)					21	(85)
Utilisa [tion fa	ictor for g	ains f	or li	ving are	ea, h1,r	n (s T	ee Ta	ble 9a)			0	0.1					
(86)m-	Jan	Feb	IVI	ar 。	Apr	IMay		Jun	JUI		ug 59	Sep			De	C		(86)
(00)11=		0.99	0.90	°	0.95	0.00		0.09	0.52	0.;		0.02	0.97	0.99				(00)
Mean	Intern	al temper	ature	in I	IVING are	a 11 (follo	ow ste	ps 3 to 1	(in 1	able	9C)	20.54	20.17	10.9			(87)
(07)11=	19.91	20.04	20.2	0	20.34	20.77		20.9	20.93	20.	.93	20.04	20.54	20.17	19.0	9		(07)
Temp	eratur	e during h		g pe	eriods ir	rest o	f dv	velling	from Ta	able	9, Th	12 (°C)	00.40	00.40		_]		(00)
(öö)m=	∠0.14	20.14	20.1	4	20.16	20.16		20.18	20.18	20.	.18	20.17	20.16	20.16	20.1	э		(00)
Utilisa r	tion fa	ctor for g	ains f	or r	est of d	welling	, h2	,m (se	e Table	9a)				-i	1			(00)
(89)m=	1	0.99	0.98	B	0.93	0.82		0.62	0.43	0.4	48	0.76	0.95	0.99	1			(89)

(90)m=	interna	rtemper	ature in		or uwein					e 9c)				
	18.64	18.85	19.17	19.58	19.89	20.06	20.09	20.09	20	19.59	19.06	18.64		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.26	(91)
Moon	intornal	Itompor	atura (fa	r tho wh	ala dwal	ling) – fl	Δ ν Τ1	ı (1 fl	Δ) γ Τ2			L		
(92)m=	18.97	19 16	19 45	19.83	20 12	20.28	20.31	$\frac{1}{20.31}$	20.21	19 84	19.34	18.96		(92)
	adiustn	hent to t	ne mear		temper	ature fro	m Table				10.01	10.00		(/
(93)m=	18.97	19 16	19 45	19.83	20.12	20.28	20.31	20.31	20.21	19.84	19.34	18.96		(93)
8 .Sn	ace hea	ting regi	lirement	10.00	20.12	20.20	20.01	20.01	20.21	10.01	10.01	10.00		(/
Set Ti	i to the r	mean int	ernal ter	mperatu	re obtain	ed at st	on 11 of	Table 9	n so tha	t Ti m-('	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	uble 9a		50 11 01		5, 30 tha	(11,111–(r ojin an		ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	<u> </u>										
(94)m=	0.99	0.99	0.97	0.93	0.82	0.63	0.45	0.5	0.77	0.95	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	 4)m									
(95)m=	724.75	851.66	955.35	1017.96	961.2	724	492.36	512.67	725.88	784.03	715.46	683.02		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
He <mark>at I</mark>	loss rate	e for mea	an interr	al tempe	erature,	_m , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	2089.89	2022.54	1828.83	1510.01	1157.87	763.48	498.58	522.94	829.4	12 <mark>70.28</mark>	1699.34	2066.38		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4 ⁻	l)m			
(98)m=	1015.66	786.8 <mark>3</mark>	64 <mark>9.86</mark>	354.28	146.33	0	0	0	0	361.77	708.39	10 <mark>29.22</mark>		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	5052.34	(98)
Space	e heatin	a require	ement in	kWh/m ²	² /vear							[33.25] (99)
												l		
9a. En	ergy rec o bootir	ullemer	its – ind	vidual n	eating sy	/stems i	nciuaing	micro-C						
Fracti	on of sp	i y. bace hea	t from s	econdar	v/supple	mentarv	system					ſ	0	7(201)
Fracti	on of sr	ace hea	t from m	nain evet	om(s)	,,	-,						-	1(201)
Fracti				iain syst	CHUSI			(202) = 1	- (201) =			Ĩ	1	(201)
Fracti	on of to	tai neatii	f					(202) = 1	- (201) =	(202)1		ĺ	1	(201)
Efficie	ency of r	-	ng from	main sys	stem 1			(202) = 1 · (204) = (2	- (201) = 02) × [1 -	(203)] =			1	(201) (202) (204)
		main spa	ng from ace heat	main sys ing syste	stem 1 9m 1			(202) = 1 · (204) = (2	- (201) = 02) × [1 - 1	(203)] =			1 1 378.01	(201) (202) (204) (206)
Efficie	ency of s	nain spa seconda	ng from ace heat ry/supple	main sys ing syste ementar	stem 1 sm 1 y heating	g system	۱, %	(202) = 1 · (204) = (2	- (201) = 02) × [1 - ((203)] =			1 1 378.01 0	(201) (202) (204) (206) (208)
Efficie	ency of s	nain spa seconda Feb	ng from ace heat ry/supple Mar	main sys ing syste ementary Apr	stem 1 sm 1 y heating May	g system Jun	n, % Jul	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - 1 Sep	(203)] = Oct	Nov	Dec	1 1 378.01 0 kWh/ye	(201) (202) (204) (206) (208) ar
Efficie Space	ency of s Jan e heating	main spa seconda Feb g require	ng from ace heat ry/supple Mar yment (c	main sys ing syste ementar Apr alculated	stem 1 em 1 y heating May d above)	g system Jun	n, % Jul	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 Sep	(203)] = Oct	Nov	Dec	1 1 378.01 0 kWh/ye	(201) (202) (204) (206) (208) ar
Efficie Space	Jan Jan heatin 1015.66	nain spa seconda Feb g require 786.83	ng from ace heat ry/suppl Mar ament (c 649.86	main syste ing syste ementar Apr alculateo 354.28	stem 1 em 1 y heating May d above)	g system Jun 0	n, % Jul 0	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - 1 Sep 0	(203)] = Oct 361.77	Nov 708.39	Dec 1029.22	1 1 378.01 0 kWh/ye	(201) (202) (204) (206) (208) ar
Efficie Space (211)m	ency of s Jan e heatin 1015.66 n = {[(98	main spa seconda Feb g require 786.83)m x (20	ng from ace heat ry/suppl- Mar >ment (c 649.86 4)] } x 1	main syste ementar Apr alculated 354.28 00 ÷ (20	stem 1 m 1 y heating May d above) 146.33 16)	g system Jun 0	n, % Jul 0	(202) = 1 · (204) = (2 Aug	- (201) = 02) × [1 - 1 Sep 0	(203)] = Oct 361.77	Nov 708.39	Dec	1 1 378.01 0 kWh/ye	(201) (202) (204) (206) (208) ar
Efficie Space (211)m	ency of s Jan heatin 1015.66 n = {[(98 268.68	main spa seconda Feb g require 786.83)m x (20 208.15	ng from ace heat ry/supple Mar ament (c 649.86 4)] } x 1 171.92	main syste ementar Apr alculated 354.28 00 ÷ (20 93.72	stem 1 em 1 y heating d above) 146.33	g system Jun 0	n, % Jul 0	(202) = 1 · (204) = (2 Aug 0	- (201) = 02) × [1 - 1 Sep 0	(203)] = Oct 361.77 95.7	Nov 708.39 187.4	Dec 1029.22 272.27	1 1 378.01 0 kWh/ye	(201) (202) (204) (206) (208) ar (211)
Efficie Space (211)m	ency of s Jan e heatin 1015.66 n = {[(98 268.68	main spa seconda Feb g require 786.83)m x (20 208.15	ng from ace heat ry/supple Mar ement (c 649.86 4)] } x 1 171.92	main syste ementar Apr alculated 354.28 00 ÷ (20 93.72	stem 1 pm 1 y heating May d above) 146.33 16) 38.71	g system Jun 0	n, % Jul 0	$(202) = 1 \cdot (204) = (2)$ Aug 0 Tota	- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea	(203)] = Oct 361.77 95.7 ar) =Sum(2	Nov 708.39 187.4 211) _{1.510-11}	Dec 1029.22 272.27	1 1 378.01 0 kWh/ye	(201) (202) (204) (206) (208) ar (211)
Efficie Space (211)m	ency of s Jan e heatin 1015.66 n = {[(98 268.68	main spa seconda Feb g require 786.83)m x (20 208.15	ng from ace heat ry/suppli Mar ement (c 649.86 4)] } x 1 171.92	main sys ing syste ementar alculated 354.28 00 ÷ (20 93.72	stem 1 2m 1 y heating May d above) 146.33 16) 38.71 month	g system Jun 0	n, % Jul 0	$(202) = 1 \cdot (204) = (2)$ Aug 0 Tota	- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea	(203)] = Oct 361.77 95.7 ar) =Sum(2	Nov 708.39 187.4 211) _{15,1012}	Dec 1029.22 272.27 =	1 1 378.01 0 kWh/ye 1336.55	(201) (202) (204) (206) (208) (208) ar (211)
Efficie Space (211)m Space = {[(98	ency of s Jan e heatin 1015.66 a = {[(98 268.68 e heatin m x (20	main spa seconda Feb g require 786.83)m x (20 208.15 g fuel (s 01)] } x 1	ng from ace heat ry/suppl- Mar ement (c 649.86 4)] } x 1 171.92 econdar 00 ÷ (20	main syste ementary Apr alculated 354.28 00 ÷ (20 93.72 y), kWh/ 8)	stem 1 3 m 1 y heating May d above) 146.33 16) 38.71 month	g system Jun 0	n, % Jul 0	$(202) = 1 \cdot (204) = (2)$ Aug 0 Tota	- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea	(203)] = Oct 361.77 95.7 ar) =Sum(2	Nov 708.39 187.4 211) _{15,1012}	Dec 1029.22 272.27	1 1 378.01 0 kWh/ye 1336.55	(201) (202) (204) (206) (208) ar (211)
Efficie Space (211)m Space = {[(98) (215)m=	ency of s Jan e heatin 1015.66 n = {[(98 268.68 e heatin)m x (20 0	main spa seconda Feb g require 786.83)m x (20 208.15 g fuel (s 01)] } x 1	ng from ace heat ry/suppli Mar ement (c 649.86 4)] } x 1 171.92 econdar 00 ÷ (20	main sys ing syste ementar alculatee 354.28 00 ÷ (20 93.72 y), kWh/ 8) 0	om 1 om 1 y heating May d above) 146.33 16) 38.71 month 0	g system Jun 0 0	n, % Jul 0	$(202) = 1 \cdot (204) = (2)$ (204) = (2) Aug 0 Tota	- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea	(203)] = Oct 361.77 95.7 ar) =Sum(2	Nov 708.39 187.4 211) _{15,1012} 0	Dec 1029.22 272.27 =	1 1 378.01 0 kWh/ye 1336.55	(201) (202) (204) (206) (208) ar (211)
Efficie Space (211)m Space = {[(98) (215)m=	ency of s Jan e heating 1015.66 a = {[(98 268.68 e heating)m x (20 0	main spa seconda Feb g require 786.83)m x (20 208.15 g fuel (s 01)] } x 1 0	ng from ace heat ry/suppl- ment (c 649.86 4)] } x 1 171.92 econdar 00 ÷ (20 0	main sys ing syste ementar alculated 354.28 00 ÷ (20 93.72 y), kWh/ 8) 0	stem 1 stem 1 y heating May d above) 146.33 16) 38.71 month 0	g system Jun 0 0	n, % Jul 0	(202) = 1 · (204) = (2 Aug 0 Tota 0 Tota	- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea 0 1 (kWh/yea	(203)] = Oct 361.77 95.7 ar) =Sum(2 0 ar) =Sum(2	Nov 708.39 187.4 211) _{15,1012} 0	0 	1 1 378.01 0 kWh/ye 1336.55	(201) (202) (204) (206) (208) ar (211) (211)
Efficie Space (211)m Space = {[(98) (215)m=	ency of s Jan e heatin 1015.66 $n = \{[(98)268.68]e heatin)m x (20)0$	main spa seconda Feb g require 786.83)m x (20 208.15 g fuel (s 01)] } x 1 0	ng from ace heat ry/suppli Mar ement (c 649.86 4)] } x 1 171.92 econdar 00 ÷ (20 0	main sys ing syste ementar alculatee 354.28 00 ÷ (20 93.72 y), kWh/ 8) 0	stem 1 em 1 y heating May d above) 146.33 16) 38.71 month 0	g system Jun 0 0	n, % Jul 0	$(202) = 1 \cdot (204) = (2)$ (204) = (2) Aug 0 Tota 0 Tota	- (201) = 02) × [1 - + Sep 0 1 (kWh/yea 0 1 (kWh/yea	(203)] = Oct 361.77 95.7 ar) =Sum(2 0 ar) =Sum(2	Nov 708.39 187.4 211) _{15,1012} 0 215) _{15,1012}	0 0	1 1 378.01 0 kWh/ye 1336.55	(201) (202) (204) (206) (208) ar (211) (211)
Efficie Space (211)m Space = {[(98) (215)m= Water Output	ency of s Jan e heating 1015.66 a = {[(98 268.68 e heating)m x (20 0 heating from wa	main spa seconda Feb g require 786.83)m x (20 208.15 g fuel (s 01)] } x 1 0	ng from ace heat ry/supple Mar ement (c 649.86 4)] } x 1 171.92 econdar 00 ÷ (20 0 ter (calc	main sys ing syste ementar Apr alculated 354.28 00 ÷ (20 93.72 y), kWh/ 8) 0	stem 1 em 1 y heating May d above) 146.33)6) 38.71 month 0	g system Jun 0 0	n, % Jul 0	$(202) = 1 \cdot (204) = (2)$ (204) = (2) Aug 0 Tota 0 Tota	- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea 0 1 (kWh/yea	(203)] = Oct 361.77 95.7 ar) =Sum(2 0 ar) =Sum(2	Nov 708.39 187.4 211) _{15,1012} 0	0 0	1 1 378.01 0 kWh/ye 1336.55	(201) (202) (204) (206) (208) ar (211) (211) (211)
Efficie Space (211)m Space = {[(98) (215)m= Water Output	ency of s Jan heating 1015.66 $n = {[(98)268.68e heatingm x (20)0heatingfrom wa219.63$	main spa seconda Feb g require 786.83)m x (20 208.15 g fuel (s 208.15 g fuel (s 208.15] x 1 0] u ater hea 193.52	ng from ace heat ry/suppl- ment (c 649.86 4)] } x 1 171.92 econdar 00 ÷ (20 0 ter (calc 203.1	main sys ing syste ementar alculated 354.28 00 ÷ (20 93.72 y), kWh/ 8) 0 ulated al 181.87	stem 1 em 1 y heating May d above) 146.33 06) 38.71 month 0	9 system Jun 0 0	n, % Jul 0 0	(202) = 1 (204) = (2) Aug 0 Tota 0 Tota 167.53	- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea 167.32	(203)] = Oct 361.77 95.7 ar) =Sum(2 0 ar) =Sum(2 188.6	Nov 708.39 187.4 211) _{15,1012} 0 215) _{15,1012}	Dec 1029.22 272.27 = 0 =	1 1 378.01 0 kWh/ye 1336.55 0	(201) (202) (204) (206) (208) ar (211) (211) (215)

(217)m= 282.62 282.62 282.62 282.62 282.6	2 282.62	282.62	282.62	282.62	282.62	282.62	282.62		(217)
Fuel for water heating, kWh/month									
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 77.71 68.47 71.86 64.35 63.07	1 56.23	53.93	59.28	59.2	66.73	70.65	75.82		
			Tota	l = Sum(2)	19a) _{1.12} =			787.24	(219)
Annual totals					k	Wh/year		kWh/year	
Space heating fuel used, main system 1						•		1336.55	7
Water heating fuel used								787.24	Ī
Electricity for pumps, fans and electric keep-	hot								_
mechanical ventilation - balanced, extract o	r positive i	nput fror	n outside	е			389.19		(230a)
Total electricity for the above, kWh/year			sum	of (230a).	(230g) =			389.19	(231)
Electricity for lighting								512.88	(232)
Electricity generated by PVs								-730.07	(233)
Total delivered energy for all uses (211)(22	21) + (231)	+ (232).	(237b)	=				2295.79	(338)
12a. CO2 emissions – Individual heating sy	stems incl	uding mi	cro-CHF)					_
	Er	nergy			Emiss	ion fac	tor	Emissions	
	k٧	Vh/year			kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system 1)	(21	1) x			0.5	19	=	6 <mark>93.67</mark>	(261)
Space heating (secondary)	(21	5) x			0.5	19	=	0	(263)
Water heating	(21	9) x			0.5	19	=	408.58	(264)
Space and water heating	(26	1) + (262)	+ (263) + ((264) =				1102.25	(265)
Electricity for pumps, fans and electric keep-	hot (23	1) x			0.5	19	=	201.99	(267)
Electricity for lighting	(23	2) x			0.5	19	=	266.18	(268)
Energy saving/generation technologies									
Item 1					0.5	19	=	-378.91	(269)
Total CO2, kg/year				sum o	of (265)(271) =		1191.51	(272)
Dwelling CO2 Emission Rate				(272)	÷ (4) =			7.84	(273)

EI rating (section 14)

(274)

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User Details:															
Assessor Name: Software Name:	Stroma FS	Stroma FSAP 2012			Stroma Number: Software Version: Ve					ersion: 1.0.5.49					
A dalaa a a		London		roperty	Address	: BIOCK (2 - Mid -	HII							
Address :		London	, 10010												
	511510115.			Are	a(m²)		Av Hei	aht(m)		Volume(m ³)					
Ground floor				5	54.97	(1a) x	2	.6	(2a) =	142.92	(3a)				
First floor				5	57.52	(1b) x	2	.9](2b) =	166.81](3b)				
Second floor					39.48	(1c) x	3	.3	(2c) =	130.28](3c)				
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ [151.97](4)															
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = [$										440.01	(5)				
2. Ventilation rate:															
	main beating	Se	econdar	у	other		total			m ³ per hou					
Number of chimneys		<u>ה ר</u>	0] + [0] = [0	X 4	40 =	0	(6a)				
Number of open flues	0	_ + _	0	ī + Г	0	_] = [0	×	20 =	0	(6b)				
Number of intermittent fa	ins					Ē	0	x ′	10 =	0	(7a)				
Number of passive vents	5					Ē	0	x ′	10 =	0	(7b)				
Number of flueless gas f	ires					Ē	0	X 4	40 =	0	(7c)				
										anges per bo					
Infiltration due to chimneys flues and fans $-(6a)+(6b)+(7a)+(7b)+(7c) =$															
If a pressurisation test has b	peen carried out or	r is intende	ed, procee	d to (17),	otherwise o	continue fr	rom (9) to (16)	÷ (3) –	0					
Number of storeys in t	he dwelling (na	5)								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								0	(11)						
if both types of wall are p deducting areas of openi	resent, use the va ngs); if equal user	lue corres _i 0.35	ponding to	the great	ter wall are	a (after									
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0									0	(12)					
If no draught lobby, enter 0.05, else enter 0									0	(13)					
Percentage of windows and doors draught stripped									0	(14)					
Window infiltration					0.25 - [0.2 x (14) ÷ 100] =					0	(15)				
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$									0	(16)					
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area								4	(17)						
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$									0.2	(18)					
Air permeability value applie	es if a pressurisatio	on test has	s been dor	e or a de	gree air pe	rmeability	is being us	ed			_				
Number of sides shellered Shelter factor $(20) = 1 - [0.075 \times (10)]$						10)] -			2	(19)					
Infiltration rate incorporating shelter factor					$(23) = (18) \times (20) =$					0.85					
Infiltration rate modified for monthly wind speed									0.17	(21)					
.lan Feh	Mar Anr	Mav	, Jun	.lul	Aug	Sen	Oct	Nov	Dec]					
Monthly average wind sr	peed from Tabl	<u>بالمريم</u>			1 ,					J					
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1					
					1	l .			L	J					
Wind F	actor (2	22a)m =	(22)m ÷	4											
------------------------	------------------------	---------------------------------------	--------------------------	-----------------------------	------------------------------------	------------------------	-----------------------	----------------------	------------------	---------------	-------------	-------------	----------	---------	------------------
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjust	ed infiltr	ation rat	e (allow	ing for sl	nelter an	nd wind s	speed) =	: (21a) x	(22a)m						
	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2]		
Calcul	ate effe achanic	<i>ctive air</i> al ventila	change	rate for t	he appli	icable ca	ise				-				
lf exh	aust air h	eat pump	usina App	endix N. (2	(23a) = (23a	a) × Fmv (e	equation (N5)) . othe	erwise (23	o) = (23a)			0.	.5](23a)](23b)
lf bala	anced wit	h heat reco	overy: effic	iency in %	allowing	for in-use f	factor (fron	n Table 4ł	ı) =	, , ,			76	5](200)](23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recov	erv (MV	HR) (24;	a)m = (2	2b)m + (23b) × [1 – (23c)) ÷ 100]		
(24a)m=	0.33	0.33	0.33	0.3	0.3	0.28	0.28	0.27	0.29	0.3	0.31	0.32]		(24a)
b) lf	balance	ed mech	anical ve	entilation	without	heat red	covery (l	ч MV) (24I)m = (2	- 2b)m + (23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24b)
c) If	whole h	iouse ex	tract ver	ntilation of	or positiv	ve input	ventilatio	on from	outside	-	-	-			
	if (22b)r	n < 0.5 >	< (23b),	then (24	c) = (23k	o); other	wise (24	c) = (22	b) m + 0	.5 × (23t) 	i	-		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24c)
d) If	natural if (22b)r	ventilation = 1, th	on or wh en (24d)	iole hous m = (22	se positi [.] b)m othe	ve input erwise (2	ventilatie 24d)m =	on from 0.5 + [(2	loft 22b)m² x	0.5]					
(24d) <mark>m=</mark>	0	0	0	0	0	0	0	0	0	0	0	0			(24d
Effe	ctive air	change	rate - e	nter (24a) or (24	o) or (24	c) or (24	ld) in bo	x (25)						
(25)m=	0.33	0.33	0.33	0.3	0.3	0.28	0.28	0.27	0.29	0.3	0.31	0.32]		(25)
3. He	at losse	s and he	eat loss	paramet	er: 🗹										
ELEN		Gros	SS	Openin	igs	Net Ar	rea	U-val	ue	AXU		k-value	э	АX	k
		area	(m²)	r	1 ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙	K	kJ/K	<
Doo <mark>rs</mark>						1.97	×	1	=	1.97					(26)
Windo	ws Type	e 1				10.47	7 x1	/[1/(1.2)+	+ 0.04] =	11.99					(27)
Windo	ws Type	e 2				19.24	4 x1	/[1/(1.2)+	+ 0.04] =	22.03					(27)
Floor 7	Гуре 1					54.97	7 X	0.1	=	5.497		75		4122.75	(28)
Floor 7	Гуре 2					2.55	x	0.1	=	0.255		20		51	(28)
Walls		105.	02	31.6	8	73.34	4 ×	0.16	=	11.73		60		4400.4	(29)
Roof -	Туре1	39.4	48	0		39.48	в х	0.1	=	3.95		9		355.32	(30)
Roof ⁻	Туре2	18.0)4	0		18.04	4 ×	0.1	=	1.8		9		162.36	(30)
Total a	area of e	elements	s, m²			220.0	6								(31)
Party v	wall					150.7	7 X	0	=	0		110		16577	(32)
Interna	al wall *'	e e e e e e e e e e e e e e e e e e e				306.6	6					9		2759.4	(32c)
Interna	al floor					97						18	<u> </u>	1746	(32d)
Interna	al ceiling)				97						9	ĪĪ	873	(32e)
* for win ** inclua	dows and le the are	l roof wind as on both	ows, use e sides of i	effective wi nternal wal	indow U-va Is and par	alue calcul titions	lated using	g formula '	1/[(1/U-val	ue)+0.04] a	as given ir	n paragraph	h 3.2		

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

Heat capacity $Cm = S(A \times k)$

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

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

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

((28)...(30) + (32) + (32a)...(32e) =

 $= (34) \div (4) =$

59.23

31047.23

204.3

(33)

(34)

(35)

Thermal bridges : S (L × Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = (33) + (36) = (33) + (36) = (37) Ventilation heat loss calculated monthly (30)m= $(33) + (36) = (33) + (36) = (37)$ Ventilation heat loss calculated monthly (30)m= $(33) + (36) = (33) + (36) = (37)$ (31)m= $(33) + (36) = (33) + (36) = (33) + (36) = (33) + (36) = (36) + $													
if details of themal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 79.9 (37) Ventilation heat loss calculated monthly (39)m= <u>128.44</u> 127.82 <u>127.2</u> <u>124.12</u> <u>123.5</u> <u>120.42</u> <u>120.42</u> <u>120.51</u> <u>32.89</u> <u>41.75</u> <u>43.6</u> <u>44.83</u> <u>46.07</u> (39)m= <u>128.44</u> <u>127.82</u> <u>127.2</u> <u>124.12</u> <u>123.5</u> <u>120.42</u> <u>120.42</u> <u>120.42</u> <u>119.8</u> <u>121.55</u> <u>122.5</u> <u>124.74</u> <u>125.97</u> Heat transfer coefficient, W/K (39)m= <u>128.44</u> <u>127.82</u> <u>127.2</u> <u>124.12</u> <u>123.5</u> <u>120.42</u> <u>120.42</u> <u>120.42</u> <u>119.8</u> <u>121.55</u> <u>122.5</u> <u>124.74</u> <u>125.97</u> Heat loss parameter (HLP), W/m ² K (40)m= <u>0.85</u> <u>0.84</u> <u>0.84</u> <u>0.84</u> <u>0.82</u> <u>0.81</u> <u>0.79</u> <u>0.79</u> <u>0.79</u> <u>0.8</u> <u>0.81</u> <u>0.82</u> <u>0.83</u> Average = Sum(40)													
Total fabric heat loss $(3) + (3b) = $ Ventilation heat loss calculated monthly $(3)m = 0.33 \times (25)m \times (5)$ Ventilation heat loss calculated monthly $(3)m = 0.33 \times (25)m \times (5)$ Ventilation heat loss calculated monthly $(3)m = 0.33 \times (25)m \times (5)$ Ventilation heat loss calculated monthly $(3)m = 0.33 \times (25)m \times (5)$ Ventilation heat loss calculated monthly $(3)m = 0.33 \times (25)m \times (5)$ We have a start or coefficient, W/K $(3)m = (37) + (38)m$ (39)m $(328 \times 127.2 \times 127.2 \times 124.12 \times 123.5 \times 120.42 \times 119.8 \times 121.65 \times 123.5 \times 124.74 \times 125.97$ Heat loss parameter (HLP), W/m ² K $(4)m = (30)m + (4)$ (40)m $0.85 0.84 0.84 0.82 0.81 0.79 0.79 0.79 0.8 0.81 0.82 0.83$ Number of days in month (Table 1a) Vumber of days in month (Table 1a) Vumber of days in month (Table 1a) (41)m $31 \times 28 \times 31 \times 30 \times 31 \times $													
Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m x (5) $ \begin{array}{c c c c c c c c c c c c c c c c c c c $													
$\begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} $													
$ \begin{array}{c} (38)_{m} & 48.53 & 47.92 & 47.3 & 44.21 & 43.6 & 40.51 & 40.51 & 40.51 & 39.89 & 41.75 & 43.6 & 44.83 & 46.07 \\ (39)_{m} & (39)_{m} & (37) + (38)_{m} \\ (39)_{m} & (28.44 & 127.82 & 127.2 & 124.12 & 123.5 & 120.42 & 120.42 & 119.8 & 121.65 & 123.5 & 124.74 & 125.97 \\ & Average & Sum(30)_{\sim,2} / 12 & 123.96 & (39) \\ Heat loss parameter (HLP), W/m?K & (40)_{m} & (39)_{m} + (4) \\ (40)_{m} & 0.85 & 0.84 & 0.84 & 0.82 & 0.81 & 0.78 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ & Average & Sum(40)_{\sim,2} / 12 & 0.82 & (40) \\ Number of days in month (Table 1a) & Average & Sum(40)_{\sim,2} / 12 & 0.82 & (40) \\ Number of days in month (Table 1a) & (41) \\ \hline A Water heating energy requirement. & Wh/year. \\ \hline A Water heating energy requirement. & Wh/year. \\ \hline A Sumed occupancy, N & (42) & (17A - 13.9)(2)] + 0.0013 \times (TFA - 13.9) & (43) & (43) & (43) & (43) & (43) & (44) & (44)_{m} & Apr & Apr & May & Jun & Jul & Aug & Sep & Oct & Nov & Dec & (42) & (42) & (43) & (43) & (44)_{m} & (14)_{m} & Apr & Apr & May & Jun & Jul & Aug & Sep & Oct & Nov & Dec & (42) & (43) & (44)_{m} & (17A + 13.9) & (17A - 13.9)(2)] + 0.0013 \times (TFA - 13.9) & (17A - 13$													
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$ \begin{array}{c} (40)m^{-1} & \overbrace{0.85} & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{Average = Sum(40),v/12=} & 0.82 & (40) \\ \hline \text{Number of days in month (Table 1a)} & \hline \text{Average = Sum(40),v/12=} & 0.82 & (40) \\ \hline \text{Number of days in month (Table 1a)} & \hline \text{Average = Sum(40),v/12=} & 0.82 & (40) \\ \hline \text{(41)m^{-1}} & 31 & 28 & 31 & 30 & 31 & $													
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(41)m= 31 28 31 30 31 30 31 31 30													
4. Water heating energy requirement:KWh/year: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(42)Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ Reduce the annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)(43)Image: Annual average hot water usage in litres per day 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)(43)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(44)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(45)Image: In litres per day for each month Vd, m = (actor from Table 1c x (43)(46)													
4. Water heating energy requirement: kWh/year: Assumed occupancy, N 2.94 (42) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) (42) if TFA ξ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = $(25 x N) + 36$ 103.96 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per day for each month Vd, m = factor from Table 1c x (43) (43) Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) 100.04 110.2 114.35 (44)m= 114.35 110.2 106.04 101.88 97.72 93.56 93.56 97.72 101.88 106.04 110.2 114.35 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) 104.23 117.48 118.89 138.55 151.24 164.23 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) 104 1183.68 (45) 164.64 Water storage loss: 16.04 19.21 16.57 15.36 17.62 17.83 20.78 22.69 24.64 (46) Water s													
$ \frac{1}{128} \text{ defines the rank bridging are not known (36) = 0.05 x (31) \\ \text{tal fabric heat loss calculated monthly (38) = (33) + (36) = (33) + (36) = (33) + (36) = (37) \\ \text{infliation heat loss calculated monthly (38) = 0.33 x (25)m x (5) \\ \hline \text{Jan } Feb & Mar & Apr & May & Jun & Jul & Aug & Sep & Oct & Nov & Dec \\ \hline \text{Jane } 48.63 & 47.92 & 47.3 & 44.21 & 43.6 & 40.51 & 40.51 & 38.89 & 41.75 & 43.6 & 44.83 & 46.07 \\ \hline \text{Jane } 48.63 & 47.92 & 47.3 & 44.21 & 123.5 & 120.42 & 120.42 & 119.8 & 121.66 & 123.5 & 124.74 & 125.97 \\ \hline \text{Jane } 28.44 & 127.82 & 127.2 & 124.12 & 123.5 & 120.42 & 120.42 & 119.8 & 121.66 & 123.5 & 124.74 & 125.97 \\ \hline \text{Last transfer coefficient, W/K } & (39)m = (37) + (38)m \\ \hline \text{June } 0.85 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 0.85 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 0.85 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 0.85 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 0.35 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 0.35 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 0.35 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 0.35 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 0.35 & 0.84 & 0.84 & 0.82 & 0.81 & 0.79 & 0.79 & 0.79 & 0.8 & 0.81 & 0.82 & 0.83 \\ \hline \text{June } 1.91 & 1$													
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be used of a dealed calculation. ermal bridges : S (L x Y) calculated using Appendix K tal fabric heat loss tal fabric heat loss (3) + (3) = (3) + (3) = (3) + (3)													
n be used of a detailed calculation. Termal bridges : S (L × Y) calculated monthy (3) = 0.05 × (3) tall fabric heat loss calculated monthy (3) = 0.05 × (3) tall fabric heat loss calculated monthy (3) = 0.05 × (3) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (5) (3)m = 0.33 × (2)m × (3)m = 0.37 × (3)m (4)m = 0.33 × (2)m × (3)m = 0.37 × (3)m (4)m = 0.31 × 0.28 × 0.24 × 0.24 × 0.24 × 10.42 × 10.42 × 10.48 × 10.25 × 10.4.74 × 10.59 / (4)m (40)m = 0.31 × 0.28 × 0.24 × 0.24 × 0.28 × 0.79 × 0.79 × 0.79 × 0.8 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.79 × 0.79 × 0.8 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.79 × 0.79 × 0.8 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.79 × 0.79 × 0.8 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.82 × 0.88 × 0.44 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.82 × 0.81 × 0.82 × 0.81 × 0.82 × 0.81 × 0													
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$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$													
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Valer storage loss. Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (47) If community heating and no tank in dwelling, enter 110 litres in (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): 1.6 (48)													
Temperature factor from Table 2b 0.54 (49)													
Energy lost from water storage k/Wb/year $(49) \times (49) =$													
$(40) \land (43) = 0.86 \qquad (50)$													
b) If manufacturer's declared cylinder loss factor is not known:													
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community beating see section 4.3 (40) × (49) = 0.86 0 (50) (50) (51)													
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 (40) × (49) = 0.86 (50) (51) 0 (52)													

Energy Enter	/ lost fro (50) or (om water (54) in (5	• storage 55)	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0.	0 86		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylinde	er contain	s dedicate	l d solar sto	rage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	1 7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m			-	-		
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	219.63	193.52	203.1	181.87	178.08	158.92	152.43	167.53	167.32	188.6	199.67	214.28		(62)
Solar DH	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	v) (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 (<u>3)</u>					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter						-					
(64)m=	219.63	193.52	203.1	181.87	178.08	158.92	152.43	167.53	167.32	188.6	199.67	214.28		
								Outp	out from wa	ater heate	r (annual)₁	12	2224.94	(64)
Hea <mark>t g</mark>	<mark>ain</mark> s fro	m water	heating	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m	1	
(65)m=	9 <mark>6.42</mark>	85.48	90.93	83.11	82.61	75.48	74.08	79.1	78.27	86.1	89.03	94.64		(65)
in <mark>clu</mark>	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table {	5 and 5a):									
Metabo	olic gain	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86	146.86		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	29.04	25.79	20.98	15.88	11.87	10.02	10.83	14.08	18.89	23.99	28	29.85		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	322.66	326.01	317.57	299.61	276.93	255.62	241.39	238.04	246.47	264.44	287.11	308.42		(68)
Cookin	ng gains	(calcula	Ited in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5	•			
(69)m=	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69	37.69		(69)
Pumps	and fai	ns gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49	-117.49		(71)
Water	heatina	gains (T	able 5)					L		L			I	
(72)m=	129.6	127.2	122.21	115.43	111.03	104.84	99.57	106.32	108.72	115.73	123.66	127.21		(72)
Total i	nternal	qains =		ļ	ļ	(66)	ı m + (67)m	ı + (68)m +	⊦ (69)m + ((70)m + (7	ı 1)m + (72)	m	I	
(73)m=	548.36	546.06	527.82	497.98	466.9	437.54	418.84	425.49	441.14	471.22	505.82	532.54		(73)
6. So	lar gains	S:	I	I	I	I	I		I		I	I	<u> </u>	

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

Orienta	ition:	Access F Table 6d	actor	•	Area m²			Flu Tal	x ole 6a		Т	g_ able 6b		FF Table 6c			Gains (W)	
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	3	6.79	×		0.45	x	0.7		=	154.53	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	6	2.67	×		0.45	x	0.7		=	263.23	(77)
Southea	ast <mark>0.9</mark> x	0.77		x	19.2	24	x	8	5.75	×		0.45	x	0.7		=	360.16	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	1	06.25	×		0.45	×	0.7		=	446.26	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	1	19.01	x		0.45	×	0.7		=	499.84	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	1	18.15	x		0.45	×	0.7		=	496.23	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	1	13.91	×		0.45	×	0.7		=	478.42	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	1	04.39	x		0.45	×	0.7		=	438.44	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	9	2.85	×		0.45	×	0.7		=	389.98	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	6	9.27	×		0.45	×	0.7		=	290.92	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.2	24	x	4	4.07	×		0.45	x	0.7		=	185.1	(77)
Southea	ast <mark>0.9x</mark>	0.77		x	19.3	24	x	3	1.49	×		0.45	×	0.7		=	132.25	(77)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	1	1.28	×		0.45	×	0.7		=	25.79	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	2	2.97	x		0.45	×	0.7		=	52.49	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	4	1.38	×		0.45	×	0.7		=	94.57	(81)
Northwe	est 0.9x	0.77		x	10.4	47	x	6	7.96	x		0.45	x	0.7		=	155.32	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	9	1.35	x		0.45	x	0.7		-	208.78	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	х	9	7.38	i 🗴		0.45	x	0.7		=	222.58	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x		91.1	×		0.45	x	0.7		=	208.22	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	7	2.63	×		0.45	x	0.7	Ī	=	165.99	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	5	0.42	×		0.45	x	0.7		=	115.24	(81)
Northwe	est 0.9x	0.77		x	10.4	47	х	2	8.07	×		0.45	x	0.7		=	64.15	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x	· ·	14.2	×		0.45	×	0.7		=	32.45	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	10.4	47	x		9.21	×		0.45	×	0.7		=	21.06	(81)
										•								
Solar g	ains ir	watts, ca	lcula	ted	for each	n mont	h			(83)n	n = Si	um(74)m	.(82)m					(02)
(83)m=	180.32	315.72	454.	73	601.57	708.62		(18.81	686.63	604	1.43	505.22	355.0	7 217.54	153	.31		(83)
	$\frac{1}{200}$			Jiar	(84)m =	= (73)IT	1 + (1 1 1	83)m	, watts	102	0.00	046.26	806.0		605	05		(94)
(84)m=	728.68	861.78	982.:	55	1099.55	1175.5	111	156.34	1105.48	102	9.92	946.36	826.2	9 723.37	685	.85		(04)
7. Mea	an inte	ernal temp	eratu	ire ((heating	seaso	n)											
Temp	erature	e during h	eatin	g pe	eriods ir	the liv	/ing	area	from Tab	ole 9	, Th	1 (°C)					21	(85)
Utilisa	tion fa	ctor for ga	ains f	or li	ving are	ea, h1,i	n (s	see Ta	ble 9a)	<u> </u>					-			
	Jan	Feb	Ma	ar	Apr	May	′	Jun	Jul	A	ug	Sep	Oct	Nov	D	ec		(00)
(86)m=	1	1	0.99	9	0.95	0.84		0.64	0.48	0.	53	0.8	0.97	1	1			(86)
Mean	intern	al tempera	ature	in li	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in ⁻	Table	e 9c)			1			
(87)m=	20.13	20.25	20.4	4	20.68	20.86		20.94	20.95	20	.95	20.9	20.67	20.35	20.	12		(87)
Temp	erature	e during h	eatin	g pe	eriods ir	rest o	f dv	velling	from Ta	able	9, Tł	n2 (°C)						
(88)m=	20.21	0.77 10.2 $9\times$ 0.77 19.2 $9\times$ 0.77 19.2 $9\times$ 0.77 19.2 $9\times$ 0.77 19.2 $9\times$ 0.77 19.2 $9\times$ 0.77 19.2 $9\times$ 0.77 19.2 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77 10.4 $9\times$ 0.77						20.26	20.26	20	.26	20.25	20.24	20.24	20.2	23		(88)
Utilisa	tion fa	ctor for ga	ains f	or r	est of d	welling	, h2	,m (se	e Table	9a)								
(89)m=	1	0.99	0.98	3	0.93	0.8		0.58	0.4	0.	45	0.74	0.96	0.99	1			(89)

Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	19.02	19.21	19.49	19.84	20.07	20.18	20.19	20.19	20.14	19.83	19.38	19.02		(90)
									f	iLA = Livin	g area ÷ (4	4) =	0.26	(91)
Meen	intorno	Itomnor	oturo (fo	r tha wh		lling) fl	I A T4	. (1 fl	A) TO					
(92)m-	10 31	10 48	alure (IC		20.28	1111(y) = 11	20.38	+(1-1)	A) X 12	20.05	19.63	10.3		(92)
		appent to t	he mear			ature fro	m Table	20.00			10.00	10.0		(02)
(93)m-	19 31	19.48	19 73	20.06	20.28	20 37	20.38	20.39	20.33	20.05	19.63	193		(93)
8 Sn	ace hea	ting regi	lirement	20.00	20.20	20.07	20.00	20.00	20.00	20.00	10.00	10.0		()
Sot T	i to the l	mean int	ornal to	mperatu	re obtain	od at st	on 11 of	Table 0	h so tha	t Ti m-(76)m an	d re-calc	ulato	
the ut	ilisation	factor fo	or gains	using Ta	able 9a				0, 30 tha	u 11,111–(<i>r 0)</i> 111 an	u re-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1 <u>.</u> 1:										
(94)m=	1	0.99	0.98	0.93	0.8	0.59	0.41	0.46	0.74	0.95	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (9 [,]	4)m x (8-	4)m						1			
(95)m=	726.48	855.06	960.94	1020.68	942.86	680.07	454.14	474.59	703.68	788.17	718.17	684.34		(95)
Montl	nly aver	age exte	rnal tem	perature	e from Ta	able 8		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 rate	e for me	an interr	al temp	erature,	Lm , W =	- =[(39)m	x [(93)m	– (96)m]				
(97)m=	1927.56	1863.31	1682.98	1384.74	1059.03	695.24	455.75	477.58	758.42	1166.53	1562.91	1902.42		(97)
Spac	e h <mark>eatin</mark>	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=	<mark>89</mark> 3.61	677.5 <mark>5</mark>	537.2	262.12	86.43	0	0	0	0	281.5	608.21	<mark>90</mark> 6.25		
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	4 <mark>2</mark> 52.87	(98)
Space	e heatin	a require	ement in	kWh/m ²	²/vear								27.98	(99)
			ata Ind	ividual b		votomo i	poludino	mioro (
Seco	ergy rec	ullemen	its – mu	ividual fi	eatings	ystems	nciuaing	f micro-c						
Fracti	on of sr	ig. bace hea	at from s	econdar	v/supple	mentarv	v svstem						0	(201)
Fracti	on of sr	aco hos	at from n	nain evet	om(s)	,	-,	(202) = 1	- (201) =				1	
Fracti				12111 3y31				(204) - (2)	02) ~ [1	(202)1				
Fract			ng irom	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								333.14	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g systen	ח, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above))		-						
	893.61	677.55	537.2	262.12	86.43	0	0	0	0	281.5	608.21	906.25		
(211)m	n = {[(98)m x (20	(4)] } x 1	100 ÷ (20)6)			-						(211)
· /	268.24	203.38	161.25	78.68	25.94	0	0	0	0	84.5	182.57	272.03		
								Tota	l (kWh/yea	ar) =Sum(2	1 211) _{15,1012}	=	1276.58	(211)
Space	e heatin	a fuel (s	econdar	v) kWh/	month									
= {[(98)m x (20)1)] } x 1	00 ÷ (20)8)	month									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
				I				Tota	l (kWh/yea	ar) =Sum(2	L 215) _{15,1012}	=	0	(215)
Water	heating	1												
Output	from w	, ater hea	ter (calc	ulated a	bove)									
	219.63	193.52	203.1	181.87	178.08	158.92	152.43	167.53	167.32	188.6	199.67	214.28		
Efficie	ncv of w	ater hea	iter		-	-	-			-		-	282.62	(216)
	·) ·													

(217)m= 282.62 282.62 282.62 282.62 282.62	282.62 282.62	282.62 282.62	282.62	282.62	282.62		(217)
Fuel for water heating, kWh/month							
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 77.71 68.47 71.86 64.35 63.01	56.23 53.93	59.28 59.2	66.73	70.65	75.82		
	I I	Total = Sum(2	19a) ₁₁₂ =			787.24	(219)
Annual totals			k	Wh/year	, ,	kWh/year	
Space heating fuel used, main system 1						1276.58	
Water heating fuel used						787.24	
Electricity for pumps, fans and electric keep-ho	ot						
mechanical ventilation - balanced, extract or p	positive input from	n outside			389.19		(230a)
Total electricity for the above, kWh/year		sum of (230a)	(230g) =			389.19	(231)
Electricity for lighting						512.88	(232)
Electricity generated by PVs						-730.07	(233)
Total delivered energy for all uses (211)(221)) + (231) + (232).	(237b) =				2235.82	(338)
12a. CO2 emissions – Individual heating syst	ems including mi	cro-CHP					_
	Energy		Emiss	ion fac	tor	Emissions	
	kWh/year		kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system 1)	(211) x		0.5	19	-	6 <mark>62.55</mark>	(261)
Space heating (secondary)	(215) x		0.5	19	-	0	(263)
Water heating	(219) x		0.5	19	=	4 <mark>08.58</mark>	(264)
Space and water heating	(261) + (262) -	+ (263) + (264) =				1071.12	(265)
Electricity for pumps, fans and electric keep-ho	ot (231) x		0.5	19	= [201.99	(267)
Electricity for lighting	(232) x		0.5	19	=	266.18	(268)
Energy saving/generation technologies					-		
Item 1			0.5	19	=	-378.91	(269)
Total CO2, kg/year		sum o	of (265)(2	271) =	[1160.39	(272)
Dwelling CO2 Emission Rate		(272)	÷ (4) =		[7.64	(273)

EI rating (section 14)

(274)

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				User D	Details:									
Assessor Name: Software Name:	Stroma FSA	AP 201	2		Strom Softwa	a Num are Vei	ber: rsion:	IТ О	Versic	on: 1.0.5.49				
Address :		London	P TW10	roperty	Address	BIOCK (5 - IVIIQ - F	11 2						
1 Overall dwelling dimen	sions:	London	, 10010											
	310113.			Δre	a(m²)		Av Heid	nht(m)		Volume(m ³)				
Ground floor				5	56.35	(1a) x	2.	6	(2a) =	146.51	(3a)			
First floor				5	57.24	(1b) x	2.5	9](2b) =	166](3b)			
Second floor				5	51.36	(1c) x	3.	3](2c) =	169.49](3c)			
Total floor area TFA = (1a)	+(1b)+(1c)+(²	1d)+(1e	e)+(1r	n) 1	64.95	(4)		-]、、					
Dwelling volume	. , . , .	, (, ,	,		(3a)+(3b)+(3c)+(3d)·	+(3e)+	.(3n) =	481.99	(5)			
2. Ventilation rate:														
	main beating	Se	econdar	у	other		total			m ³ per hour				
Number of chimneys] + [0] + [0] = [0	×	40 =	0	(6a)			
Number of open flues	0	+	0	ī + Г	0	- =	0	×	20 =	0	(6b)			
Number of intermittent fans	6					Ī	0	×	10 =	0	(7a)			
Number of passive vents						Ē	0	x '	10 =	0	(7b)			
Number of flueless gas fire	Imber of intermittent fans 0 $\times 10 =$ Imber of passive vents 0 $\times 10 =$ Imber of flueless gas fires 0 $\times 40 =$ Itration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\times 40 =$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $\div (5) =$ Number of storeys in the dwelling (ns) [(9)-1]x0.1 = Additional infiltration [(9)-1]x0.1 = Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction [(9)-1]x0.1 =													
Number of open flues 0 $+$ 0 $+$ 0 $=$ 0 $x 20 =$ 0 Number of intermittent fansNumber of passive ventsNumber of flueless gas fires0 $x 10 =$ 0 0 $x 40 =$ 0 0 $x 40 =$ 0 Air changes per heInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 Infiltration filtration $(9)+(1)+(7b)+(7c) =$ Structural infiltration $(9)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1)+(1$														
Infiltration due to chimneys	s, flues and fa	ins = (6 is intende	a)+(6b)+(7	a)+(7b)+(d to (17).	(7c) = otherwise (continue fr	0 rom (9) to (1	6)	÷ (5) =	0	(8)			
Number of intermittent fans 0 x 10 = 0 Number of passive vents 0 x 10 = 0 Number of flueless gas fires 0 x 40 = 0 Air changes per hor 0 x 40 = 0 Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c)+(7c) = 0 ÷ (5) = 0 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 0 Number of storeys in the dwelling (ns) 0 0 0 0 Additional infiltration [(9)-1]x0.1 = 0 0 0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 0 0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 0 0 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 0														
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 ÷ (5) = 0 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) ÷ (5) = 0 Number of storeys in the dwelling (ns) (9)-1]x0.1 = 0 (9)-1]x0.1 = 0 Structural infiltration [(9)-1]x0.1 = 0 (10) 0 if both types of wall are present, use the value corresponding to the greater wall area (after 0 0 0														
Air changes Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) = 0 ÷ (5) = If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) ÷ (5) = Number of storeys in the dwelling (ns) [(9)-1]x0.1 = Additional infiltration [(9)-1]x0.1 = Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction [(9)-1]x0.1 =														
if both types of wall are pre- deducting areas of opening	sent, use the valu s); if equal user (ue corres _. 0.35	ponding to	the great	ter wall are	a (after								
If suspended wooden flo	or, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, ente	r 0.05, else e	nter 0								0	(13)			
Percentage of windows	and doors dra	aught st	ripped							0	(14)			
Window infiltration					0.25 - [0.2	x (14) ÷ 1	[00] =			0	(15)			
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) +	(15) =		0	(16)			
Air permeability value, q	50, expresse	d in cub	oic metre	s per ho	our per s	quare m	etre of er	ivelope	area	4	(17)			
If based on air permeability	/ value, then	(18) = [(1	7) ÷ 20]+(8	3), otherw	ise (18) = ((16)				0.2	(18)			
Air permeability value applies	if a pressurisatio	n test has	s been dor	e or a de	gree air pe	rmeability	is being use	ed						
Shelter factor					(20) = 1 -	[0.075 x (1	19)] =			2	(19)			
Infiltration rate incorporation	a shelter fact	or			(21) = (18)) x (20) =	/-			0.85	$\int_{(21)}^{(20)}$			
Infiltration rate modified for	monthly wind	d speed	ł			, , -/				0.17				
Jan Feb M	1ar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]				
Monthly average wind spe	ed from Table	e 7								-				
(22)m= 5.1 5 4	.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]				

Wind F	actor (2	22a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjust	ed infiltr	ation rat	e (allow	ing for sh	elter an	d wind s	speed) =	(21a) x	(22a)m						
	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2			
Calcul	ate effe	ctive air	change	rate for t	he appli	cable ca	se	-	-		-			0.5	
lf exh	aust air h	eat pump	using App	endix N. (2	3b) = (23a	a) x Fmv (e	equation (I	N5)), othe	rwise (23t	(23a) = (23a)				0.5	(23a) (23b)
lf bala	anced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	i) =	()				0.0 	(230)
a) If	balance	d mech	, anical ve	entilation	with he	at recov	erv (MVI	HR) (24a		2b)m + (23b) x [1 – (23c)	100 ± 100	<u></u>	(200)
(24a)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32		1	(24a)
b) If	balance	d mech	anical ve	entilation	without	heat red	covery (N	u MV) (24t)m = (2	1 2b)m + (23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	ouse ex	tract ver	ntilation o	or positiv	/e input v	ventilatio	on from a	outside			•	•		
i	if (22b)n	n < 0.5 ×	(23b), t	then (24d	c) = (23b	o); otherv	wise (24	c) = (22	b) m + 0	.5 × (23t) 		1		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	iole hous	e positiv	ve input	ventilatio	on from	loft 2b)m² v	0.51					
(24d)m=		I = I, uI		$\frac{1}{0}$				0.5 + [(2 0.5)]		0.5]	0	0			(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	a) or (24	c) or (24	d) in bo	(25)		-		l.		
(25)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32]		(25)
3 40	atlosso	s and he		paramete	or.								1		
		Gros	ss	Openin	as	Net Ar	ea	U-val	ue	AXU		k-value	e e e e e e e e e e e e e e e e e e e	A >	< k
		area	(m²)	m	2	A ,r	m²	W/m2	2K	(VV/	K)	kJ/m²-	K	kJ/	K
Doo <mark>rs</mark>						1.97	x	1	=	1.97					(26)
Windo	ws Type	e 1				11.1	x1	/[1/(1.2)+	0.04] =	12.71					(27)
Windo	ws Type	2				19.24	4 x1	/[1/(1.2)+	0.04] =	22.03					(27)
Windo	ws Type	93				2.86	x1	/[1/(1.2)+	0.04] =	3.27					(27)
Floor T	Гуре 1					55.08	3 X	0.1	=	5.508		75		4131	(28)
Floor T	Гуре 2					2.16	x	0.1	=	0.216		20		43.2	(28)
Walls		111.	26	35.1	7	76.09	×	0.16	=	12.17		60		4565.4	(29)
Roof 7	Гуре1	51.3	36	0		51.36	6 X	0.1	=	5.14		9		462.24	(30)
Roof 7	Гуре2	5.8	8	0		5.88	x	0.1	=	0.59		9		52.92	(30)
Roof T	Гуре3	1.2	7	0		1.27	x	0.1	=	0.13		9		11.43	(30)
Total a	rea of e	lements	, m²			227.0	1								(31)
Party v	vall					164.4	4 X	0	=	0		110		18088.4	4 (32)
Interna	al wall **					315.9						9	7	2843.1	(32c)
Interna	al floor					108.6	3				ĺ	18	Ē	1954.8	(32d)
Interna	al ceiling	l				108.6	3				ĺ	9	Ē	977.4	(32e)

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2

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

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

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

63.73 (33)

Heat o	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	33129.89	(34)
Therm	al mass	parame	ter (TMF	- = Cm -	÷ TFA) ir	n kJ/m²K			= (34)	÷ (4) =			200.85	(35)
For des can be	ign assess used inste	ments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	K						19.81	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			83.54	(37)
Ventila	ation hea	at loss ca	alculated	monthl	у				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m=	53.84	53.17	52.49	49.11	48.43	45.05	45.05	44.38	46.41	48.43	49.79	51.14		(38)
	L								(00)	(07) . (1	
Heat t	ranster o	coefficier	nt, VV/K						(39)m	= (37) + (3	38)m I		1	
(39)m=	137.38	136.71	136.03	132.65	131.98	128.6	128.6	127.92	129.95	131.98	133.33	134.68		—
Heat le	oss para	meter (H	HLP), W	/m²K					(40)m	Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	132.48	(39)
(40)m=	0.83	0.83	0.82	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.81	0.82		
Numb	er of day	vs in moi	nth (Tab	le 1a)					,	Average =	Sum(40)1	12 /12=	0.8	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
													, 	
4. Wa	ater heat	ting ener	rgy <mark>requ</mark>	irem <mark>ent</mark> :								kWh/y	ear:	
Assum if TF if TF	ned occu A > 13.9 A £ 13.9	ipancy, l 9, N = 1 9, N = 1	N + 1.76 x	[1 - exp	(-0.0003	849 x (TF	=A -13.9)2)] + 0.(0013 x (TFA -13.	<u>2</u> . 9)	96]	(42)
Annua Reduce not mor	the annua the annua that 125	e hot wa al average litres per j	hot water	ge in litre usage by r day (all w	es per da 5% if the o vater use, l	iy Vd,av Iwelling is not and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	10 f	94.4		(43)
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec]	
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	000				J	
(44)m =	114 84	110.66	106 49	102.31	98 14	93.96	93.96	98 14	102.31	106 49	110.66	114 84	1	
()		110.00	100.10	102.01	00.11	00.00	00.00	00.11	102.01	Total - Su	m(44),		1252 79	(44)
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x D) 7 Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	1202.10	
(45)m=	170.3	148.95	153.7	134	128.58	110.95	102.81	117.98	119.39	139.14	151.88	164.93]	
lf instan	taneous w	ater heatii	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1642.6	(45)
(46)m -	25.55	22.24	22.06	20.1	10.20	16.64	15.42	17.7	17.01	20.97	22.79	24.74	1	(46)
Water	storage	loss:	23.00	20.1	19.29	10.04	15.42	17.7	17.91	20.07	22.70	24.74]	(40)
Storad	ie volum	e (litres)	includir	na anv se	olar or W	/WHRS	storage	within sa	ame ves	sel		180	1	(47)
lf com	munity h	eating a	nd no ta	nk in dw	ellina e	nter 110) litres in	(47)				100	1	()
Other	vise if no	stored	hot wate	er (this in	ncludes i	nstantar	neous co	(+ <i>i</i>) mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:							, 0110	(- /			
a) If n	at at apacity Cn = S[A x k] (28)(32) + (32)(32) = 33129.89 (34) thermal mass parameter (TMP = Cn + TFA) in kJ/m?K = (34) + (4) = (34) + (34) = (34) + (35) + (3													
Tempe	erature f	actor fro	m Table	2b	-	,	.,					54	1	(49)
Energ	v lost fro	m water	storage		ear			(48) x (40)	1 =			00]]	(50)
b) If n	nanufact	urer's de	eclared of	cylinder	loss fact	or is not	known:	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	. –		0.	00	J	(50)

Hot wa	ater stor	age loss	factor fi	rom Tabl	le 2 (kW	h/litre/da	ıy)					0		(51)
If com	munity h	neating s	ee secti	on 4.3									1	
Volum	e factor	from Ta	ble 2a	01-								0		(52)
rempe	erature t	actor fro	m Table	2D								0		(53)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	5)								0.	86	l	(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m 				
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				1	
(mo	, dified by	/ factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi		lculated	for each	month ((61)m –	(60) ± 36	35 v (11))m					•	
(61)m-						$(00) \div 30$			0	0	0	0		(61)
(01)III=														、(01)
l otal r	leat req	uired for	water h	eating ca	alculated	for eac	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61 I)m
(62)m=	220.35	194.15	203.75	182.43	178.62	159.38	152.86	168.03	167.82	189.18	200.31	214.98		(62)
Solar DI	-IW input	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WHRS	applies	, see Ap	pendix C	5)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater he <mark>a</mark>	ter											
(64)m=	<mark>22</mark> 0.35	194.15	203.75	182.43	178.62	159.38	152.86	168.03	167.82	189.18	200.31	214.98		
								Outp	out from wa	ater heate	r <mark>(annual)</mark> ₁	12	2231.86	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	, <mark>kWh</mark> /me	onth 0.2	5 ′ [0.85	<mark>× (45</mark>)m	+ (61)m	n] + 0.8 ×	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	96.66	85.69	91.14	83.3	82.79	75.64	74.22	79.27	78.44	86.3	89.24	94.88		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5 Int	ernal da	ains (see	Table 5	5 and 5a).	-		0				-	J. J. J. J. J. J. J. J. J. J. J. J. J. J	
Matab		o (Toblo		to	/-									
Metab	lan	Feb	<u>), wai</u> Mar		May	lun	hul	Αυσ	Sen	Oct	Nov	Dec		
(66)m =	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79		(66)
Lianhtia			• • • • • •							11110	11110		l	()
	g gains				L, equat		r L9a), a			04.00	00.4	24.00	l	(67)
(67)m=	30.18	26.8	21.8	16.5	12.34	10.41	11.25	14.63	19.63	24.93	29.1	31.02	l	(07)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc I	see Ta	ble 5			I	
(68)m=	336.36	339.85	331.06	312.33	288.7	266.48	251.64	248.15	256.94	275.67	299.31	321.52	l	(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5	-			
(69)m=	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78		(69)
Pumps	and fa	ns gains	(Table \$	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.g. ev	vaporatio	on (nega	tive valu	es) (Tab	le 5)								
(71)m=	-118.23	-118.23	-118.23	-118.23	-118.23	, -118.23	-118.23	-118.23	-118.23	-118.23	-118.23	-118.23		(71)
Wator	heating	naine /T	ahle 51	I	I	I	I				I		I	
(72)m-	120.02	127 51	122 5	115 7	111 22	105.05	00.76	106.54	108.05	115.00	123.05	127 52	1	(72)
(12)11=	129.92	127.51	122.3	110.7	111.20	105.05	99.70	100.54	100.90	115.99	123.95	121.52	ł	(12)

Total	interna	I gains =						(66))m + (67)m	n <mark>+ (6</mark> 8	3)m + (69)m +	+ (70)m +	- (71)m + (1	72)m			
(73)m=	563.8	561.51	542.7	7	511.87	479.64	4	49.28	429.99	436	.65 452.86	483.9	3 519.6	9 547.4	4		(73)
6. Sc	olar gair	าร:															
Solar	gains are	calculated	using s	olar	flux from	Table 6a	a and	lassoc	iated equa	ations	to convert to	the appli	cable orien	tation.			
Orient	ation:	Access F Table 6d	actor		Area m²			Flu Tal	x ble 6a		g_ Table 6t	D	FF Table 6	C		Gains (W)	
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	3	36.79	x	0.45	x	0.7		=	89.15	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	\$2.67	x	0.45	x	0.7		=	151.86	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	35.75	x	0.45	x	0.7		=	207.78	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	06.25	x	0.45	x	0.7		=	257.46	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	19.01	x	0.45	x	0.7		=	288.37	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	18.15	x	0.45	x	0.7		=	286.29	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	13.91	x	0.45	x	0.7		=	276.01	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	04.39	x	0.45	x	0.7		=	252.95	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	9)2.85	x	0.45	x	0.7		=	224.99	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	39.27	x	0.45	x	0.7		=	167.84	(77)
Southe	east 0.9x	0.77		x	11.	1	x	4	4.07	x	0.45	х	0.7		=	106.79	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	х	3	31.49	x	0.45	x	0.7		=	76.3	(77)
South	0.9x	0.77		x	2.8	6	х	4	46.75] x	0.45	x	0.7		=	29.19	(78)
South	0.9x	0.77		x	2.8	6	x	7	'6.57	x	0.45	x	0.7		=	47.8	(78)
South	0.9x	0.77		x	2.8	6	x	9	97.53	x	0.45	x	0.7		=	60.89	(78)
South	0.9x	0.77		x	2.8	6	x	1	10.23	x	0.45	x	0.7		=	68.82	(78)
South	0.9x	0.77		x	2.8	6	x	1	14.87	x	0.45	x	0.7	·	=	71.72	(78)
South	0.9x	0.77		x	2.8	6	x	1	10.55	x	0.45	х	0.7		=	69.02	(78)
South	0.9x	0.77		x	2.8	6	x	1	08.01	x	0.45	x	0.7		=	67.43	(78)
South	0.9x	0.77		x	2.8	6	x	1	04.89	x	0.45	x	0.7	·	=	65.49	(78)
South	0.9x	0.77		x	2.8	6	x	1	01.89	x	0.45	x	0.7		=	63.61	(78)
South	0.9x	0.77		x	2.8	6	x	8	32.59	x	0.45	x	0.7	·	=	51.56	(78)
South	0.9x	0.77		x	2.8	6	x	5	5.42	x	0.45	x	0.7		=	34.6	(78)
South	0.9x	0.77		x	2.8	6	x		40.4	x	0.45	x	0.7	·	=	25.22	(78)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	1	1.28	x	0.45	x	0.7		=	47.39	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	2	2.97	x	0.45	x	0.7	·	=	96.46	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	4	1.38	x	0.45	x	0.7	·	=	173.79	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	6	67.96	x	0.45	x	0.7		=	285.41	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	9)1.35	x	0.45	x	0.7		=	383.65	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	9)7.38	x	0.45	x	0.7		=	409.01	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x		91.1	x	0.45	x	0.7		=	382.62	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	7	'2.63	×	0.45	x	0.7		=	305.03	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	5	50.42	x	0.45	x	0.7		=	211.77	(81)
Northw	/est <mark>0.9x</mark>	0.77		х	19.2	24	x	2	28.07	x	0.45	x	0.7		=	117.88	(81)

Northwestu ₂ sx 0.77 x 10.24 x 0.21 x 0.77 x 0.77 x 10.24 x 0.21 x 0.77 x 0.77 x 10.24 x 0.45 x 0.77 x 0.77 x 10.24 x 0.45 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.27 (63) 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 <th10.23< th=""> 10.23 <th10.23< th=""></th10.23<></th10.23<>	Northw	est 0.9x	0.77	x	19.	24	×「	1	4.2	x	0.45] × [0.7	=	59.63	(81)	
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84) (84)m = (73)m + (83)m , watts (84) (84)m (72)a53 687.63 687.63 (84)m = (73)m + (83)m , watts (84) Channel Internal temperature (heating seeason) Tan Feeb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86) (86)m (86)m (86) (86) (86) (86) (86) (86) (86) (86) (87)m (86) (87) (86) (86) (87) (86) (86) (86) (86) (87) (86) (86) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) </td <td>Northw</td> <td>est 0.9x</td> <td>0.77</td> <td> x</td> <td>19.</td> <td>24</td> <td>хГ</td> <td></td> <td>9.21</td> <td>×</td> <td>0.45</td> <td>=</td> <td>0.7</td> <td></td> <td>38.7</td> <td>(81)</td>	Northw	est 0.9x	0.77	x	19.	24	хГ		9.21	×	0.45	=	0.7		38.7	(81)	
Solar gains in watts, calculated for each month (8)m = Sun(74)m(82)m (8)m (63)m (15.73, 28.13, 44.24, 101.06, 1743.74, 1743.27, 28.07, 28.34, 90.36, 337.28, 201.01, 140.22, (84) (83) (164)m (73)m + (63)m, (73)m +		L					L										
column Biological Processing Procesing Processing Processing Processing Processing Processin	Solar	nains in	watts c	alculated	l for eac	h month				(83)m = S	um(74)m	(82)m					
Total gains - internal and solar (84)m = (73)m + (83)m, watts (64)m (73)m + (83)m, watts (64)m (64)m T28.55 857.65 985.16 1123.56 1156.06 1060.12 953.23 821.21 720.7 687.62 (64) 7. Mean Internal tomperature (heating periods in the living area from Table 9, Th1 (°C) 21 (65) (66) Utilisation factor for gains for living area, 11,m (see Table 9a) (67)m 20.1 20.22 20.41 20.86 20.85 0.82 0.88 1 (66) Mean internal temperature in living area 11 (follow steps 310.7 in Table 9c) (67)m 20.1 20.22 20.41 20.86 20.85 20.85 20.82 20.25 20.24 (68) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (60)m 1 0.99 0.84 0.85 0.59 4.1 0.48 0.77 0.97 1 1 (69) (60)m 1.99 0.84 0.85 0.59 0.41 0.46 0.77 0.97 1 1 (69) (60)m 1.99 1.94 1.98 20.02 20.27 20.3	(83)m=	165.73	296.13	442.47	611.69	743.74	76	4.32	726.07	623.47	500.36	337.28	201.01	140.22		(83)	
(B4)m 728.53 857.63 965.16 1123.66 123.63 1156.06 1060.12 953.23 821.21 720.7 687.62 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Using area, h1, m (see Table 9a) Man internal temperature in living area, 11 (nollow steps 3 to 7 in Table 9c) (87)m= (87)m= 20.4 20.66 20.84 20.96 20.82 20.24 20.33 20.03 (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (87)m= 20.3 20.22 20.22 20.22 20.22 20.22 20.24 (88) Using area, h1, m (see Table 9a) (87)m 1 1 (89)m 1 1 (89)m 1 1 (89)m (80) (77) 1 1 (89) (81) (81) (82) (92) (92) 20.22 20.22 20.25 20.24 (82) (93) (93) (93) (93)	Total g	lains – i	nternal a	and solar	. (84)m =	i = (73)m ·	ı + (8	3)m	watts						1		
2. Mean internal temperature (heating season) 21 (85) 2. 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) 30 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86) (80)me 1 0.98 0.95 0.68 0.85 0.82 0.98 1 (86) (80)me 1 0.98 0.95 0.85 0.20.9 20.85 20.80 20.64 20.33 20.09 (87) (87)me 20.1 20.22 20.41 20.66 20.85 20.94 20.95 20.82 20.22 20.25 20.24 (86) (87)me 20.22 20.23 20.23 20.25 20.24 (86) (87)	(84)m=	729.53	857.63	985.16	1123.56	1223.38	12	, 13.6	1156.06	1060.12	953.23	821.21	720.7	687.62		(84)	
2. Mean internal temperature (theating season) 21 (65) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (66) Utilisation factor for gains for living area, h1,m (see Table 9a) (66) (66) Mean internal temperature in living area at 11 (follow steps 3 to 7 in Table 9c) (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (68) (80)me 20.1 20.22 20.41 20.68 20.84 20.85 20.84 20.35 20.25 20.25 20.25 20.24 (68) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (68) (68) (68) (67) Temperature during heating periods in rest of dwelling 12 (follow steps 3 to 7 in Table 9, 10.77 1 1 (68) (69)me 1 0.99 0.84 0.87 0.27 0.27 20.25 20.25 20.24 (68) (90)me 1 0.99 0.84 0.87 0.27 0.26 20.25 20.27 20.27 20.27 20.27 20.27 20.27 20.27 20.27 20.27 20.27 20.27 20.21 <t< td=""><td></td><td></td><td></td><td></td><td><i>(</i>1 <i>· ·</i> · ·</td><td></td><td></td><td></td><td></td><td></td><td>I</td><td>l</td><td></td><td></td><td>i</td><td>. ,</td></t<>					<i>(</i> 1 <i>· ·</i> · ·						I	l			i	. ,	
Temperature during heating pendos in the living area from Table 9. 21 [65] Utilisation factor for gains for living area, h1, m (see Table 9a) Juin Feb Mar Apr May Juin Juin Aug Sep Oct Nov Dec (66)mm 1 1 0.99 0.96 0.85 0.65 0.49 0.55 0.82 0.98 1 1 (66) (67)mm 20.12 20.22 20.41 20.85 20.95 20.92 20.25 20.22 20.25 20.22 20.25 20.25 20.27 20.27 20.26 20.25 20.22 20.24 (68) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (69)mm 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.7 1 1 (69) (69)mm 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (69) (69) (1.4 1.8.9 (90) (1.4 1.8.9 (91) (1.4 1.8.9 (92) (92	7. Me	an inter	nal temp	perature	(heating	season)									<u> </u>	
Utilisation factor for gains for living area, h1,m (see Table 9a) (66) (86)m= 1 1 0.99 0.96 0.85 0.49 0.55 0.82 0.98 1 1 (66) (87)m= 20.1 20.22 20.41 20.66 20.85 20.94 20.95 20.89 20.64 20.33 20.09 (87) Temperature during heating periods in rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.94 0.83 0.59 0.44 0.77 0.97 1 1 (89) (89)m= 1 0.99 0.94 0.83 0.59 0.41 0.46 0.77 0.97 1 1 (89) (80)m= 1 0.99 0.94 0.83 0.59 0.41 0.46 0.77 0.97 1 1 (89) (80)m= 1 0.99 0.94 0.83 0.59 0.41 0.46 0.77 0.97 1 1 (89) (80)m= 1 0.99 0.94 0.83 0.23 20.17 20.22 20.14	Temp	erature	during h	neating p	eriods ir	h the livi	ng a	area f	rom lab	ble 9, Th	1 (°C)				21	(85)	
Jan Feb Mar Apr May Jun Jun Jun Aug Sep Oct Nov Dec 1 1 0.99 0.96 0.85 0.49 0.55 0.82 0.98 1 1 (66) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (67) (67) (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C) (68) (68) (68) (80)me 20.22 20.23 20.25 20.25 20.27 20.27 20.26 20.25 20.24 (68) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (69)me 1 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.87 1 1 (69) (90)me 1.9.9 1.9.17 19.45 19.82 20.03 20.37 20.39 20.31 10.59 19.27 (9.3) Mean internal temperature (for the whole dwelling) = fLAx T1 + (1 - fLA) x T2 (90)me (91)me<	Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	i (se	e Ta	ble 9a)						1		
(80)m= 1 1 0.99 0.86 0.65 0.49 0.55 0.82 0.98 1 1 (66) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (77)m= 20.1 20.22 20.41 20.66 20.85 20.95 20.95 20.92 20.23 20.09 (67) Temperature during heating periods in rest of dwelling, h2, m (see Table 9a) (89)m= 20.22 20.23 20.25 20.27 20.27 20.27 20.27 20.25 20.25 20.24 (88) (90)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (89) (90)m= 1.9.9 19.17 19.45 19.82 20.08 20.19 20.27 20.27 20.27 20.27 20.27 (91) Mean internal temperature (for the whole dwelling) = fLAx T1 + (1 - fLA) x T2 (90) (62) (91) (92) (92) (92) (92) (93) 3.2.32 20.01 19.59 19.27 Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)		Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (67) (69)m= 20.1 20.22 20.41 20.66 20.95 20.95 20.89 20.64 20.33 20.09 (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C) (88) (88) (89) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89) (89) (81) 0.59 0.41 0.46 0.77 0.97 1 1 (99) 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (90) (89) (81) 0.59 0.41 0.46 0.77 0.97 1 1 (90) (90) (11) 1 <td< td=""><td>(86)m=</td><td>1</td><td>1</td><td>0.99</td><td>0.96</td><td>0.85</td><td>0</td><td>.65</td><td>0.49</td><td>0.55</td><td>0.82</td><td>0.98</td><td>1</td><td>1</td><td></td><td>(86)</td></td<>	(86)m=	1	1	0.99	0.96	0.85	0	.65	0.49	0.55	0.82	0.98	1	1		(86)	
(87)m= 20.1 20.22 20.41 20.66 20.85 20.94 20.95 20.83 20.64 20.33 20.09 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (8)m= 20.22 20.23 20.25 20.25 20.27 20.27 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (89) (89)m= 1 1.9.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (89) (90)m= 1.9.17 1.9.45 19.82 20.08 0.11 2.02 20.21 20.31 1.9.59 19.27 (92) (91) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92) (93)# 2.924 20.33 20.01 19.59 19.27 (92) Appl adjustiment to the mean internal temperature from Table 4e, wh	Mean	interna	l temper	ature in	living are	ea T1 (fo	ollov	w ste	ps 3 to 7	in Tabl	e 9c)						
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88) (88)m= 20.22 20.23 20.25 20.25 20.27 20.27 20.27 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (99) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90) (91) 1LA + Living area +(4) = 0.25 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) 20.37 20.37 20.33 20.01 19.59 19.27 (92) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (93) 20.37 20.33 20.01 19.59 19.27 (92) Mapta adjustment to the mean internal temperature from Table 4e, where appropriate (93) 6 Space heating requirement (94) 19.68 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (4)A Apr May Jun Jun Aug	(87)m=	20.1	20.22	20.41	20.66	20.85	20).94	20.95	20.95	20.89	20.64	20.33	20.09		(87)	
Temperature of the unity periods in reads of dwelling, 12 0.27 20.27 20.27 20.25	Temr		urina h	Deating n	eriods ir	n rest of	dwe	alling	from Ta	hle 9 T	h2 (°ር)				I		
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) Utilisation factor for gains for rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (69) (90) re 1 0.99 0.94 0.81 0.25 0.41 0.46 0.77 0.97 1 1 (69) (90) re 18.99 19.17 19.45 19.82 20.02 20.21 20.22 20.14 19.8 19.35 18.99 (90) (90) re 19.27 19.43 19.69 20.32 20.37 20.39 20.33 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) 19.27 (92) (93) 19.27 (94) (93) 19.27 (93) (93) 19.27 (93) (93) Septe heating requirement Store heating requirement (93) 20.37 20.39 20.33 20.01 19.59 19.27 (93) Utilisation factor for gains using Table 9a	(88)m=	20.22	20.23	20.23	20.25	20.25	20).27	20.27	20.27	20.26	20.25	20.25	20.24		(88)	
Utilisation factor for gains for rest of dwelling, h2, m (see Table 9a) (89) (89)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90) TLA = Living area + (4) = 0.25 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) (92) (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) (93) Shace heating requirement (94) 19.69 20.32 20.27 20.39 20.33 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature form Table 4e, where appropriate (93) (93) 3.5 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm: (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (95) (96) (97) (96) </td <td>(</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>· ·</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>i</td> <td>``</td>	(· ·							i	``	
(B) ma 1 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (B9) Mean internal temperature in the rest of dwelling T2 (follow steps, 3 to 7 in Table 9c) (90) (1LA = Lving area = (4) = (91) (90)ma 19.35 19.17 19.45 19.82 20.03 20.19 20.2 20.14 19.85 19.35 18.99 (90) (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) (93)ma 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (93) 3. Space heating requirement (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (93) (94) (94) (95) (95) 19.27 (93) (94) (94) (95) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96) (96)	Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,r	m (se	e Table	9a)						(00)	
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (60) (90)m 18.89 19.17 19.45 19.82 20.08 20.19 20.2 20.21 20.14 19.83 19.35 18.99 (60) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2 (92) 14.4 ± 100 area + (4) = 0.25 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2 (92) (93) 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (93) 3. Space heating requirement (90) 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (93) 6. Space heating requirement (93)m 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (93) 6. Space heating requirement to the mean internal temperature from Table 4e, where appropriate (93)m (94) Useful gains, hm3 (94) Useful gains, hm3 (94) 0.6	(89)m=	1	1	0.99	0.94	0.81	0	.59	0.41	0.46	0.77	0.97	1	1		(89)	
(90)m= 18.99 19.17 18.45 19.82 20.08 20.19 20.2 20.2 20.14 19.8 19.35 18.99 (90) ILA = Living area + (4) = 0.25 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2 (92) (92)m= 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.38 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) 3 20.01 19.59 19.27 (93) Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, inm: (94) 19.99 0.98 0.61 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m 727.9 852.76 <t< td=""><td>Me<mark>an</mark></td><td>interna</td><td>l temper</td><td>ature in</td><td><mark>the r</mark>est</td><td>of dwell</td><td>ing</td><td>T2 (fo</td><td>ollow ste</td><td>ps 3 to</td><td>7 in Tabl</td><td>e 9<mark>c)</mark></td><td></td><td></td><td></td><td></td></t<>	Me <mark>an</mark>	interna	l temper	ature in	<mark>the r</mark> est	of dwell	ing	T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9 <mark>c)</mark>					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(90)m=	18.99	19.17	19.45	19. <mark>8</mark> 2	20.08	20	0.19	20.2	20.2	20.14	19.8	19.35	18.99		(90)	
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) Int 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 0.32 20.37 20.39 20.33 20.01 19.59 19.27 (93) 8 . Space heating requirement Sep to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (94) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94) (94) Useful gains, hmGm, W = (94)m x (84)m (95) (95) (96) (96) (97) (96) (96) (96) (97) (96) (97) (97) (96) (97) (97) (96) (97) (97) (96) (97) (97) (96) (97) (97) (97) (96) (97) (97) (96) (97) (96) (97) (96)											f	i <mark>LA =</mark> Livin	ig area ÷ (4	4) =	0.25	(91)	
(g) m 19.27 19.43 19.69 20.32 20.37 20.33 20.01 19.59 19.27 Apply adjustment to the mean internal temperature from Table 4e, where appropriate (g) m 19.27 19.43 19.69 20.32 20.37 20.39 20.33 20.01 19.59 19.27 (g) (g) m 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (g) (g) m 19.27 19.43 19.69 20.03 20.27 20.39 20.39 20.33 20.01 19.59 19.27 (g) (g) m 19.27 19.43 19.69 20.03 20.27 20.39 20.33 20.01 19.59 19.27 (g) (g) m 10.37 19.49 10.60 20.37 20.39 20.33 20.01 19.59 19.27 (g) (g) Useful gains, hmGm, W = (94)m X W Jun Jul Aug Sep 0.77 485.07 506.36 737.35 792.46 716.94 686.5 (g)	Mean	interna	l temper	ature (fo	r the wh	ole dwe	llinc	n) = fl	$A \times T1$	+ (1 – fL	A) \times T2						
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (3)me 19.27 19.43 19.69 20.37 20.39 20.39 20.31 20.01 19.59 19.27 (93) 8. Space heating requirement Exercise the utilisation factor for gains using Table 9a (93) (93) (93) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)me 1 0.99 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)me 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)me (96)me (96)me (96)me (96)me (96)me (96)me (97)me (95)mix ((110)m (96) (97)me (95)mix ((12)mm (96) (97)me (96)me (98).53 100.2 0 0 <td< td=""><td>(92)m=</td><td>19.27</td><td>19.43</td><td>19.69</td><td>20.03</td><td>20.27</td><td>20</td><td>).37</td><td>20.39</td><td>20.39</td><td>20.33</td><td>20.01</td><td>19.59</td><td>19.27</td><td></td><td>(92)</td></td<>	(92)m=	19.27	19.43	19.69	20.03	20.27	20).37	20.39	20.39	20.33	20.01	19.59	19.27		(92)	
(9)m= 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.39 20.31 20.01 19.59 19.27 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94) 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m = 2056.35 198.625 <td< td=""><td>Apply</td><td>∟ ∕adiustn</td><td>nent to t</td><td>r he mear</td><td>interna</td><td>temper</td><td>atur</td><td>e fro</td><td>m Table</td><td>4e. whe</td><td>ere appro</td><td>opriate</td><td></td><td></td><td>1</td><td></td></td<>	Apply	∟ ∕adiustn	nent to t	r he mear	interna	temper	atur	e fro	m Table	4e. whe	ere appro	opriate			1		
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m - (96)m] (97)m - (95)m] x (41)m (98)m = 98.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 98.87 Total per year (kWh/year)	(93)m=	19.27	19.43	19.69	20.03	20.27	20	0.37	20.39	20.39	20.33	20.01	19.59	19.27		(93)	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate Lan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m = 1 0.99 0.88 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m = 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m = 2056.35 193.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98) 129 (99	8. Sp	ace hea	tina rea	uirement									<u> </u>				
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sun(98), ss.12 = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Set T	i to the i	mean int	ternal ter	nperatu	re obtair	ned	at ste	ep 11 of	Table 9	b. so tha	t Ti.m=(76)m an	d re-calc	culate		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m = 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m = 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m = (96.53 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m 98.37<	the ut	tilisation	factor fo	or gains	using Ta	ible 9a			-p e.		e, ee	(
Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m 98 98.87 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 98.87 Total per year (kWh/year) = Sum(98) ₁₋₄₈₋₁₂ = 4783.91 (98) Space heating req		Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(94)m= 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m - (96)m] (97)m = 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98) 98.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Space heating requirement in kWh/m²/year 29 (99) 98.8.37 761.71 613.83	Utilisa	ation fac	tor for g	ains, hm	:										-		
Useful gains, hmGm , W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = $0.024 \times x [(97)m - (95)m] \times (41)m$ (98) (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 334.23 682.87 998.87 (98) Space heating requirement in kWh/m²/year 29 (99) (99) (99) (99) (99) (99) (99) (99) (99) (91) (92) (92) (93) (93) (93)	(94)m=	1	0.99	0.98	0.94	0.81	C).6	0.42	0.48	0.77	0.96	0.99	1		(94)	
(95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 98.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₈₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: 29 (99) Space heating: <td colspace="" from="" heat="" seconda<="" td=""><td>Usefu</td><td>ıl gains,</td><td>hmGm</td><td>, W = (94</td><td>4)m x (84</td><td>4)m</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td>	<td>Usefu</td> <td>ıl gains,</td> <td>hmGm</td> <td>, W = (94</td> <td>4)m x (84</td> <td>4)m</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m										
Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98)h. 59.12 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	(95)m=	727.9	852.76	968.47	1054.46	996.12	72	5.07	485.07	506.36	737.35	792.46	716.94	686.5		(95)	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98)h_m.69.12 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Month	nly aver	age exte	ernal tem	perature	e from Ta	able	8							•		
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] $(97)m = 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07$ (97) Space heating requirement for each month, kWh/month = $0.024 x [(97)m - (95)m] x (41)m$ (98)m = 988.37 761.71 613.88 303.78 100.2 0 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 98. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system	(96)m=	4.3	4.9	6.5	8.9	11.7	1.	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)	
(97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Heat	loss rate	e for me	an intern	al tempe	erature,	Lm	, W =	=[(39)m >	x [(93)m	– (96)m]					
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	(97)m=	2056.35	1986.25	1793.59	1476.37	1130.79	74	2.64	487	510.2	809.05	1241.7	1665.36	2029.07		(97)	
(98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Space	e heatin	g require	ement fo	r each n	honth, k	Wh/	mont	h = 0.02	4 x [(97)m – (95)m] x (4	1)m				
Total per year (kWh/year) = Sum(98)15912 = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) 5 Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	(98)m=	988.37	761.71	613.88	303.78	100.2		0	0	0	0	334.23	682.87	998.87			
Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) 5 Space heating: 0 (201)										Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	4783.91	(98)	
9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Space	e heatin	g require	ement in	kWh/m ²	/year									29	(99)	
Space heating: 0 (201)	9a En	erav rec	uiremer	nts – Indi	vidual b	eating s	vste	ems i	ncluding	micro-C	(HP)						
Fraction of space heat from secondary/supplementary system 0 (201)	Snac	e heatir	ומ: ומ:	no- ma		ouung 0			Joraaniy		~~~)						
	Fracti	ion of sp	ace hea	at from s	econdar	y/supple	mei	ntary	system						0	(201)	

Fracti	on of s	bace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								360.15	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above)	1	1 1			1	-	1	
	988.37	761.71	613.88	303.78	100.2	0	0	0	0	334.23	682.87	998.87		
(211)m	n = {[(98	3)m x (20	(4)] } x 1	00 ÷ (20)6)							077.05	1	(211)
	274.43	211.5	170.45	84.35	27.82	0	0	U Tota	0 L (k\Wb/yea	92.8	189.61	277.35	4000.0	7(211)
Space = {[(98 (215)m=	e heatin)m x (20	ng fuel (s 01)] } x 1 0	econdar 00 ÷ (20 0	y), kWh/ 8) 0	month 0	0	0	0	0	0	0	0		
l								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,101}	2=	0	(215)
Water	heating	9												
Output	from w	1												
Efficier	220.35	282.62	(216)											
(217)m=	282.62	202.02	(217)											
Fuel fo	r water													
(219)m	<u> = (64)</u>	m x 100) ÷ (217)	m		50.00	54.00		50.00	00.04	70.07	70.00	1	
(219)m=	/7.97	68.7	72.09	64.55	63.2	56.39	54.09	59.45	59.38	66.94	70.87	76.06	700.00	
Annua	l totals							i ota	- 00m(2	k	Wh/vea	r	kWh/vear	(219)
Space	heating	g fuel use	ed, main	system	1						, you	•	1328.3	7
Water	heating	fuel use	d										789.69	ī
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t								
mech	anical v	ventilation	n - balan	nced, ext	ract or p	ositive ii	nput fron	n outside	9			521.88		(230a)
Total e	electricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			521.88	(231)
Electric	city for I	ighting		-									532.96	(232)
Electric	city gen	erated b	y PVs										-730.07	(233)
Total d	lelivered	d energy	for all u	ses (211)(221)) + (231)	+ (232).	(237b)	=				2442.76	(338)
12a. (CO2 em	nissions -	– Individ	ual heati	ing syste	ems inclu	uding mi	cro-CHP						
						En	orav			Emico	ion fac	tor	Emissions	
						k۷	/h/year			kg CO	2/kWh		kg CO2/yea	ar
Space	heating) (main s	ystem 1)		(21	1) x			0.5	19	=	689.39	(261)
Space	heating	g (second	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating					(219	9) x			0.5	19	=	409.85	(264)
Space	and wa	iter heati	ng			(26	1) + (262)	+ (263) + (2	264) =				1099.24	(265)
Electric	city for a	oumps. fa	- ans and	electric	keep-ho	t (23 ⁻	1) x			0.5	19	=	270.86] (267)
	,									0.0	10		210.00	

Electricity for lighting	(232)	x	[0.519	=	276.61	(268)
Energy saving/generation technologies Item 1			[0.519	=	-378.91	(269)
Total CO2, kg/year			sum of ((265)(271) =		1267.79	(272)
Dwelling CO2 Emission Rate			(272) ÷	(4) =		7.69	(273)
El rating (section 14)						92	(274)



				User D	Details:						
Assessor Name: Software Name:	Stroma FS	AP 201	2	ronortu (Strom Softwa	a Num are Vei	ber: rsion:		Versic	on: 1.0.5.49	
	Ham Close	London		горепу	Address	BIOCK P	1 - IVIIQ - F	113			
Address : 1 Overall dwelling dimer		London	1, 19910								
	1310113.			Δre	a(m²)		Av Heir	nht(m)		Volume(m ³)	
Ground floor					56.35	(1a) x	2.0	6	(2a) =	146.51	(3a)
First floor					57.24	(1b) x	2.9	9](2b) =	166](3b)
Second floor					51.36	(1c) x	3:	3](2c) =	169.49	_` ´](3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1r) 1	64 95	(4)](==)	100.10	
Dwelling volume	/ (-/ (-/ (- / (-	/ (,	01.00	(3a)+(3b)+(3c)+(3d)-	+(3e)+	(3n) =	481 99	1 (5)
2 Ventilation rate:										401.00	
2. Vertilation fate.	m ³ per hour										
Number of chimneys] + ["] + [0] = [0	x	40 =	0	(6a)
Number of open flues	0		0	ī + Г	0] = [0	x:	20 =	0	(6b)
Number of intermittent fan	s					- L	0	x	10 =	0	(7a)
Number of passive vents						Г	0	x '	10 =	0	(7b)
Number of flueless gas fire	es					Ē	0	X 4	40 =	0	(7c)
									Air ch	nanges per hou	Jr
Infiltration due to chimney	s, flues and fa	ans = (6)	a)+(6b)+(7	a)+(7b)+((7c) =		0 rom (9) to (1	6)	÷ (5) =	0	(8)
Number of storevs in the	e dwellina (ns	()	u, procee	<i>i</i> i i i i i i i i i i i i i i i i i i			0111 (0) 10 (1	0)		0	(9)
Additional infiltration	5.	/						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or	timber	frame or	0.35 fo	r masoni	ry constr	ruction			0	(11)
if both types of wall are pre deducting areas of opening	esent, use the va gs); if equal user	lue corres 0.35	ponding to	the great	ter wall are	a (after					_
If suspended wooden flo	oor, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else e	enter 0								0	(13)
Percentage of windows	and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	! x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) +	(15) =		0	(16)
Air permeability value, o	50, expresse	d in cub	oic metre	s per ho	our per s	quare m	etre of en	velope	area	4	(17)
If based on air permeabilit	y value, then	(18) = [(1	7) ÷ 20]+(8	3), otherw	ise (18) = ((16)				0.2	(18)
Air permeability value applies	if a pressurisatio	on test has	s been dor	e or a de	gree air pe	rmeability	is being use	ed			
Number of sides sheltered	ł									2	(19)
Shelter factor					(20) = 1 -	[U.U75 X (1	[9)] =			0.85	(20)
Intiltration rate incorporation	ng shelter fac	tor			(21) = (18) x (20) =				0.17	(21)
Infiltration rate modified fo	r monthly win	d speed	1	11	۸	0.07		Next	Dec	1	
	viar Apr		Jun	JUI	l Aug	Sep	UCT	INOV	Dec	J	
ivionthly average wind spe	ed from Tabl		0.0	2.0	0.7	4		4 5	4 7	1	
(22)III= 0.1 5 2	+.9 4.4	4.3	3.8	ა.ზ	3.1	4	4.3	4.5	4./	l	

Wind F	actor (2	22a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjust	ed infiltr	ation rat	e (allow	ing for sh	elter an	d wind s	speed) =	(21a) x	(22a)m						
	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2			
Calcul	ate effe	ctive air	change	rate for t	he appli	cable ca	se	-	-		-			0.5	
lf exh	aust air h	eat pump	using App	endix N. (2	3b) = (23a	a) x Fmv (e	equation (I	N5)), othe	rwise (23t	(23a) = (23a)				0.5	(23a) (23b)
lf bala	anced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	i) =	()				0.0 	(230)
a) If	balance	d mech	, anical ve	entilation	with he	at recov	erv (MVI	HR) (24a		2b)m + (23b) x [1 – (23c)	100 ± 100	<u></u>	(200)
(24a)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32		1	(24a)
b) If	balance	d mech	anical ve	entilation	without	heat red	covery (N	u MV) (24t)m = (2	2b)m + (23b)		1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	ouse ex	tract ver	ntilation o	or positiv	/e input v	ventilatio	on from a	outside			•	•		
i	if (22b)n	n < 0.5 ×	(23b), t	then (24d	c) = (23b	o); otherv	wise (24	c) = (22	b) m + 0	.5 × (23t) 		1		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	iole hous	e positiv	ve input	ventilatio	on from	loft 2b)m² v	0.51					
(24d)m=		I = I, uI		$\frac{1}{0}$				0.5 + [(2 0.5)]		0.5]	0	0			(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	a) or (24	c) or (24	d) in bo	(25)		-		l.		
(25)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32]		(25)
3 40	atlosso	s and he		paramete	or.								1		
		Gros	ss	Openin	as	Net Ar	ea	U-val	ue	AXU		k-value	e e e e e e e e e e e e e e e e e e e	A >	< k
		area	(m²)	m	2	A ,r	m²	W/m2	2K	(VV/	K)	kJ/m²-	K	kJ/	K
Doo <mark>rs</mark>						1.97	x	1	=	1.97					(26)
Windo	ws Type	e 1				11.1	x1	/[1/(1.2)+	0.04] =	12.71					(27)
Windo	ws Type	2				19.24	4 x1	/[1/(1.2)+	0.04] =	22.03					(27)
Windo	ws Type	93				2.86	x1	/[1/(1.2)+	0.04] =	3.27					(27)
Floor T	Гуре 1					55.08	3 X	0.1	=	5.508		75		4131	(28)
Floor T	Гуре 2					2.16	x	0.1	=	0.216		20		43.2	(28)
Walls		111.	26	35.1	7	76.09	×	0.16	=	12.17		60		4565.4	(29)
Roof 7	Гуре1	51.3	36	0		51.36	6 X	0.1	=	5.14		9		462.24	(30)
Roof 7	Гуре2	5.8	8	0		5.88	x	0.1	=	0.59		9		52.92	(30)
Roof T	Гуре3	1.2	7	0		1.27	x	0.1	=	0.13		9		11.43	(30)
Total a	rea of e	lements	, m²			227.0	1								(31)
Party v	vall					164.4	4 X	0	=	0		110		18088.4	4 (32)
Interna	al wall **					315.9						9	7	2843.1	(32c)
Interna	al floor					108.6	3				ĺ	18	Ē	1954.8	(32d)
Interna	al ceiling	l				108.6	3				ĺ	9	Ē	977.4	(32e)

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2

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

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

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

63.73 (33)

Heat o	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	33129.89	(34)	
Therm	al mass	parame	ter (TMF	- = Cm -	÷ TFA) ir	n kJ/m²K			= (34)	÷ (4) =			200.85	(35)	
For des can be	ign assess used inste	ments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are no	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	K						19.81	(36)	
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)									
Total f	abric he	at loss							(33) +	(36) =			83.54	(37)	
Ventila	ation hea	at loss ca	alculated	monthl	у				(38)m	= 0.33 × (25)m x (5)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]		
(38)m=	53.84	53.17	52.49	49.11	48.43	45.05	45.05	44.38	46.41	48.43	49.79	51.14		(38)	
	L								(00)	(07) . (1		
Heat t	ranster o	coefficier	nt, VV/K						(39)m	= (37) + (3	38)m I		1		
(39)m=	137.38	136.71	136.03	132.65	131.98	128.6	128.6	127.92	129.95	131.98	133.33	134.68		—	
Heat le	oss para	meter (H	HLP), W	/m²K					(40)m	Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	132.48	(39)	
(40)m=	0.83	0.83	0.82	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.81	0.82			
Numb	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)	
													, 		
4. Wa	ater heat	ting ener	rgy <mark>requ</mark>	irem <mark>ent</mark> :								kWh/y	ear:		
Assum if TF if TF	$\frac{ Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{31 28 31 30 31 30 31 30 31 30 31 30 31 30 31}$ (41) Water heating energy requirement: sumed 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 mual average hot water usage in litres per day Vd, average = (25 x N) + 36 duce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of (43)														
Annua Reduce not mor	I averag the annua e that 125	e hot wa al average litres per j	hot water	ge in litre usage by r day (all w	es per da 5% if the o vater use, l	iy Vd,av Iwelling is not and co	erage = designed t ld)	(25 x N) to achieve	+ 36 a water us	se target o	10 f	94.4		(43)	
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec]		
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	000				J		
(44)m =	114 84	110.66	106 49	102.31	98 14	93.96	93.96	98 14	102.31	106 49	110.66	114 84	1		
()		110.00	100.10	102.01	00.11	00.00	00.00	00.11	102.01	Total - Su	m(44),		1252 79	(44)	
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	1202.10		
(45)m=	170.3	148.95	153.7	134	128.58	110.95	102.81	117.98	119.39	139.14	151.88	164.93]		
lf instan	taneous w	ater heatii	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)	Total = Su	m(45) ₁₁₂ =	-	1642.6	(45)	
(46)m -	25.55	22.24	22.06	20.1	10.20	16.64	15.42	17.7	17.01	20.97	22.79	24.74	1	(46)	
Water	storage	loss:	23.00	20.1	19.29	10.04	15.42	17.7	17.91	20.07	22.70	24.74]	(40)	
Storad	ie volum	e (litres)	includir	na anv se	olar or W	/WHRS	storage	within sa	ame ves	sel		180	1	(47)	
lf com	munity h	eating a	nd no ta	nk in dw	ellina e	nter 110) litres in	(47)				100	1	()	
Other	vise if no	stored	hot wate	er (this in	ncludes i	nstantar	neous co	(+ <i>i</i>) mbi boil	ers) ente	er '0' in (47)				
Water	storage	loss:							, 0110	(- /				
a) If n	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1	.6]	(48)	
Temp	erature f	actor fro	m Table	2b	-	,	.,					54	1	(49)	
Energ	v lost fro	m water	storage	k\//h/v/	ear			(48) x (40)	1 =			00]]	(50)	
b) If n	nanufact	urer's de	eclared of	cylinder	loss fact	or is not	known:	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	. –		0.	00	J	(50)	

Hot wa	ater stor	age loss	factor fi	rom Tabl	le 2 (kW	h/litre/da	ıy)					0		(51)
If com	munity h	neating s	ee secti	on 4.3									ı	
Volum	e factor	from Ta	ble 2a	01-								0		(52)
rempe	erature t	actor fro	m Table	ZD								0		(53)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	5)								0.	86	l	(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m 				
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	3					•		0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				1	
(mo	, dified by	/ factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi		lculated	for each	month ((61)m –	(60) ± 30	35 v (11))m					•	
(61)m-						$(00) \div 30$			0	0	0	0		(61)
(01)III=														、(01)
l otal r	leat req	uired for	water h	eating ca	alculated	for eac	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61 I)m
(62)m=	220.35	194.15	203.75	182.43	178.62	159.38	152.86	168.03	167.82	189.18	200.31	214.98		(62)
Solar DI	-IW input	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WHRS	applies	, see Ap	pendix C	5)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater he <mark>a</mark>	ter											
(64)m=	<mark>22</mark> 0.35	194.15	203.75	182.43	178.62	159.38	152.86	168.03	167.82	189.18	200.31	214.98		
								Outp	out from wa	ater heate	r <mark>(annual)</mark> ₁	12	2231.86	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	, <mark>kWh</mark> /me	onth 0.2	5 ′ [0.85	<mark>× (45</mark>)m	+ (61)m	n] + 0.8 ×	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	96.66	85.69	91.14	83.3	82.79	75.64	74.22	79.27	78.44	86.3	89.24	94.88		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5 Int	ernal da	ains (see	Table 5	5 and 5a).	-		0				-	J. J. J. J. J. J. J. J. J. J. J. J. J. J	
Matab		o (Toblo		to	/-									
Metab	lan	Feb	<u>), wai</u> Mar		May	lun	hul	Αυσ	Sen	Oct	Nov	Dec		
(66)m =	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79		(66)
Lianhtia			• • • • • •							11110	11110		l	()
	g gains				L, equat		r L9a), a			04.00	00.4	24.00	l	(67)
(67)m=	30.18	26.8	21.8	16.5	12.34	10.41	11.25	14.63	19.63	24.93	29.1	31.02	l	(07)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc I	see Ta	ble 5			I	
(68)m=	336.36	339.85	331.06	312.33	288.7	266.48	251.64	248.15	256.94	275.67	299.31	321.52	l	(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5	-			
(69)m=	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78		(69)
Pumps	and fa	ns gains	(Table \$	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.g. ev	vaporatio	on (nega	tive valu	es) (Tab	le 5)								
(71)m=	-118.23	-118.23	-118.23	-118.23	-118.23	, -118.23	-118.23	-118.23	-118.23	-118.23	-118.23	-118.23		(71)
Wator	heating	naine /T	ahle 5)	I	I	I	I				I		I	
(72)m-	120.02	127 51	122 5	115 7	111 22	105.05	00.76	106.54	108.05	115.00	123.05	127 52	1	(72)
(12)11=	129.92	127.51	122.3	110.7	111.20	105.05	99.70	100.54	100.90	115.99	123.95	121.52	ł	(12)

Total	interna	I gains =						(66))m + (67)m	n <mark>+ (6</mark> 8	3)m + (69)m +	+ (70)m +	- (71)m + (1	72)m			
(73)m=	563.8	561.51	542.7	7	511.87	479.64	4	49.28	429.99	436	.65 452.86	483.9	3 519.6	9 547.4	4		(73)
6. Sc	olar gair	าร:															
Solar	gains are	calculated	using s	olar	flux from	Table 6a	a and	lassoc	iated equa	ations	to convert to	the appli	cable orien	tation.			
Orient	ation:	Access F Table 6d	actor		Area m²			Flu Tal	x ble 6a		g_ Table 6t	D	FF Table 6	C		Gains (W)	
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	3	36.79	x	0.45	x	0.7		=	89.15	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	\$2.67	x	0.45	x	0.7		=	151.86	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	35.75	x	0.45	x	0.7		=	207.78	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	06.25	x	0.45	x	0.7		=	257.46	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	19.01	x	0.45	x	0.7		=	288.37	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	18.15	x	0.45	x	0.7		=	286.29	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	13.91	x	0.45	x	0.7		=	276.01	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	04.39	x	0.45	x	0.7		=	252.95	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	9)2.85	x	0.45	x	0.7		=	224.99	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	39.27	x	0.45	x	0.7		=	167.84	(77)
Southe	east 0.9x	0.77		x	11.	1	x	4	4.07	x	0.45	х	0.7		=	106.79	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	х	3	31.49	x	0.45	x	0.7		=	76.3	(77)
South	0.9x	0.77		x	2.8	6	х	4	46.75] x	0.45	x	0.7		=	29.19	(78)
South	0.9x	0.77		x	2.8	6	x	7	'6.57	x	0.45	x	0.7		=	47.8	(78)
South	0.9x	0.77		x	2.8	6	x	9	97.53	x	0.45	x	0.7		=	60.89	(78)
South	0.9x	0.77		x	2.8	6	x	1	10.23	x	0.45	x	0.7		=	68.82	(78)
South	0.9x	0.77		x	2.8	6	x	1	14.87	x	0.45	x	0.7	·	=	71.72	(78)
South	0.9x	0.77		x	2.8	6	x	1	10.55	x	0.45	х	0.7		=	69.02	(78)
South	0.9x	0.77		x	2.8	6	x	1	08.01	x	0.45	x	0.7		=	67.43	(78)
South	0.9x	0.77		x	2.8	6	x	1	04.89	x	0.45	x	0.7	·	=	65.49	(78)
South	0.9x	0.77		x	2.8	6	x	1	01.89	x	0.45	x	0.7		=	63.61	(78)
South	0.9x	0.77		x	2.8	6	x	8	32.59	x	0.45	x	0.7	·	=	51.56	(78)
South	0.9x	0.77		x	2.8	6	x	5	5.42	x	0.45	x	0.7		=	34.6	(78)
South	0.9x	0.77		x	2.8	6	x		40.4	x	0.45	x	0.7	·	=	25.22	(78)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	1	1.28	x	0.45	x	0.7		=	47.39	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	2	2.97	x	0.45	x	0.7	·	=	96.46	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	4	1.38	x	0.45	x	0.7	·	=	173.79	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	6	67.96	x	0.45	x	0.7		=	285.41	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	9)1.35	x	0.45	x	0.7		=	383.65	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	9)7.38	x	0.45	x	0.7		=	409.01	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x		91.1	x	0.45	x	0.7		=	382.62	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	7	'2.63	×	0.45	x	0.7		=	305.03	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	5	50.42	x	0.45	x	0.7		=	211.77	(81)
Northw	/est <mark>0.9x</mark>	0.77		х	19.2	24	x	2	28.07	x	0.45	x	0.7		=	117.88	(81)

Northwestu ₂ sx 0.77 x 10.24 x 0.21 x 0.77 x 0.77 x 10.24 x 0.21 x 0.77 x 0.77 x 10.24 x 0.45 x 0.77 x 0.77 x 10.24 x 0.45 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.24 x 0.77 x 0.77 x 10.27 (63) 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 10.23 <th10.23< th=""> 10.23 <th10.23< th=""></th10.23<></th10.23<>	Northw	est 0.9x	0.77	x	19.	24	×「	1	4.2	x	0.45] × [0.7	=	59.63	(81)	
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84) (84)m = (73)m + (83)m , watts (84) (84)m (72)a53 687.63 687.63 (84)m = (73)m + (83)m , watts (84) Channel Internal temperature (heating seeason) Tan Feeb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86) (86)m (86)m (86) (86) (86) (86) (86) (86) (86) (86) (87)m (86) (87) (86) (86) (87) (86) (86) (86) (86) (87) (86) (86) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) </td <td>Northw</td> <td>est 0.9x</td> <td>0.77</td> <td> x</td> <td>19.</td> <td>24</td> <td>хГ</td> <td></td> <td>9.21</td> <td>×</td> <td>0.45</td> <td>=</td> <td>0.7</td> <td></td> <td>38.7</td> <td>(81)</td>	Northw	est 0.9x	0.77	x	19.	24	хГ		9.21	×	0.45	=	0.7		38.7	(81)	
Solar gains in watts, calculated for each month (8)m = Sun(74)m(82)m (8)m (63)m (15.73, 28.13, 44.24, 101.06, 1743.74, 1743.27, 28.07, 28.34, 90.36, 337.28, 201.01, 140.22, (84) (83) (164)m (73)m + (63)m, (73)m +		L					L										
column Biological Processing Procesing Processing Processing Processing Processing Processin	Solar	nains in	watts c	alculated	l for eac	h month				(83)m = S	um(74)m	(82)m					
Total gains - internal and solar (84)m = (73)m + (83)m, watts (64)m (73)m + (83)m, watts (64)m (64)m T28.55 857.65 985.16 1123.56 1156.06 1060.12 953.23 821.21 720.7 687.62 (64) 7. Mean Internal tomperature (heating periods in the living area from Table 9, Th1 (°C) 21 (65) (66) Utilisation factor for gains for living area, 11,m (see Table 9a) (67)m 20.1 20.22 20.41 20.86 20.85 0.82 0.88 1 (66) Mean internal temperature in living area 11 (follow steps 310.7 in Table 9c) (67)m 20.1 20.22 20.41 20.86 20.85 20.85 20.82 20.25 20.24 (68) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (60)m 1 0.99 0.84 0.85 0.59 4.1 0.48 0.77 0.97 1 1 (69) (60)m 1.99 0.84 0.85 0.59 0.41 0.46 0.77 0.97 1 1 (69) (60)m 1.99 1.94 1.98 20.02 20.27 20.3	(83)m=	165.73	296.13	442.47	611.69	743.74	76	4.32	726.07	623.47	500.36	337.28	201.01	140.22		(83)	
(B4)m 728.53 857.63 965.16 1123.66 123.63 1156.06 1060.12 953.23 821.21 720.7 687.62 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9. Th1 (°C) 21 (85) Using area, h1, m (see Table 9a) Man internal temperature in living area, 11 (nollow steps 3 to 7 in Table 9c) (87)m= (87)m= 20.4 20.66 20.84 20.96 20.82 20.24 20.33 20.03 (67) Temperature during heating periods in rest of dwelling from Table 9. (87)m= 20.1 20.22 20.22 20.22 20.22 20.22 20.22 20.24 (88) Using area, h1, m (see Table 9a) (87)m= 1 1 (89) (97) 1 1 (89) (91) 20.22 20.24 20.25 20.25 20.24 (80) (81) (87)m= 1 0.99 0.44 0.81 0.50 0.41 0.85 1.1	Total g	lains – i	nternal a	and solar	. (84)m =	i = (73)m ·	ı + (8	3)m	watts						1		
2. Mean internal temperature (heating season) 21 (85) 2. 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) 30 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86) (80)me 1 0.98 0.95 0.68 0.85 0.82 0.98 1 (86) (80)me 1 0.98 0.95 0.65 0.82 0.98 1 (86) (80)me 1 0.98 0.95 0.85 0.20.8 20.88 20.64 20.33 20.29 (87) (87)me 20.1 20.22 20.41 20.85 20.27 20.27 20.27 20.27 20.22 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90) (91) 1 (92) (92) 20.1 20.8 20.1 1.9.59 19.27 (90)me 1.9.43 19.46 20.32 20.37 20.33 20.33 20.31 19.59 19.27 (92) (91) (92) (91)	(84)m=	729.53	857.63	985.16	1123.56	1223.38	12	, 13.6	1156.06	1060.12	953.23	821.21	720.7	687.62		(84)	
2. Mean internal temperature (theating season) 21 (65) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (66) Utilisation factor for gains for living area, h1,m (see Table 9a) (66) (66) Mean internal temperature in living area at 11 (follow steps 3 to 7 in Table 9c) (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (68) (80)me 20.1 20.22 20.41 20.68 20.84 20.85 20.84 20.35 20.25 20.25 20.25 20.24 (68) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (68) (68) (68) (67) Temperature during heating periods in rest of dwelling 12 (follow steps 3 to 7 in Table 9, 10.77 1 1 (68) (69)me 1 0.90 0.84 0.87 0.27 0.27 20.25 20.25 20.24 (68) (90)me 1 0.90 0.84 0.87 0.27 0.26 20.25 20.24 (68) (90)me 1 0.90 0.84 0.81 0.59 0.41 0.81 18.35 18.99					<i>(</i> 1 <i>· ·</i> · ·						.	ļ			i	. ,	
Temperature during heating pendos in the living area from Table 9. 21 [65] Utilisation factor for gains for living area, h1, m (see Table 9a) Juin Feb Mar Apr May Juin Juin Aug Sep Oct Nov Dec (66)mm 1 1 0.99 0.96 0.85 0.65 0.49 0.55 0.82 0.98 1 1 (66) (67)mm 20.12 20.22 20.41 20.85 20.95 20.92 20.25 20.22 20.25 20.25 20.27 20.27 20.26 20.25 20.22 (67) Temperature during heating periods in rest of dwelling, from Table 9. Th2 (°C) (68) (69) 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.7 1 1 (69) (69) (1.4 1.8.9 (1.5) 1.8.9 (90) (1.4 1.8.9 (90) (1.4 1.8.9 (91) (1.4 1.8.9 (92) (92) (93) (1.4 1.4.0 (1.4 1.8.9 (93) (1.4 1.4.1 (1.5)	7. Me	an inter	nal temp	perature	(heating	season)									<u> </u>	
Utilisation factor for gains for living area, h1,m (see Table 9a) (66) (86)m= 1 1 0.99 0.96 0.85 0.49 0.55 0.82 0.98 1 1 (66) (87)m= 20.1 20.22 20.41 20.66 20.85 20.94 20.95 20.89 20.64 20.33 20.09 (87) Temperature during heating periods in rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.94 0.83 0.59 0.44 0.77 0.97 1 1 (89) (89)m= 1 0.99 0.94 0.83 0.59 0.41 0.46 0.77 0.97 1 1 (89) (80)m= 1 0.99 0.94 0.83 0.59 0.41 0.46 0.77 0.97 1 1 (89) (80)m= 1 0.99 0.94 0.83 0.59 0.41 0.46 0.77 0.97 1 1 (89) (80)m= 1 0.99 0.94 0.83 0.23 20.17 20.22 20.14	Temp	erature	during h	neating p	eriods ir	h the livi	ng a	area f	rom lab	ble 9, Th	1 (°C)				21	(85)	
Jan Feb Mar Apr May Jun Jun Jun Aug Sep Oct Nov Dec 1 1 0.99 0.96 0.85 0.49 0.55 0.82 0.98 1 1 (66) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (67) (67) (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C) (68) (68) (68) (80)me 20.22 20.23 20.25 20.25 20.27 20.27 20.26 20.25 20.24 (68) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (69)me 1 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.87 1 1 (69) (90)me 1.9.9 1.9.17 19.45 19.82 20.03 20.37 20.39 20.31 10.59 19.27 (9.3) Mean internal temperature (for the whole dwelling) = fLAx T1 + (1 - fLA) x T2 (90)me (91)me<	Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	i (se	e Ta	ble 9a)						1		
(80)m= 1 1 0.99 0.86 0.65 0.49 0.55 0.82 0.98 1 1 (66) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (77)m= 20.1 20.22 20.41 20.66 20.85 20.95 20.95 20.92 20.23 20.09 (67) Temperature during heating periods in rest of dwelling, h2, m (see Table 9a) (89)m= 20.22 20.23 20.25 20.27 20.27 20.27 20.27 20.25 20.25 20.24 (88) (90)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (89) (90)m= 1.9.9 19.17 19.45 19.82 20.08 20.19 20.27 20.27 20.27 20.27 20.27 20.27 (91) (91) Mean internal temperature (for the whole dwelling) T2 (follow steps 3 to 7 in Table 9c) (92) (93) (94) 1.9.5 19.27 (92) 4.91 1.9.5 19.27 (92) (92) (91) Mean internal temperature (for the whole dwelling) T2 (follow steps 2 0.33 <		Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (67) (69)m= 20.1 20.22 20.41 20.66 20.95 20.95 20.89 20.64 20.33 20.09 (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (*C) (88) (88) (89) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89) (89) (81) 0.59 0.41 0.46 0.77 0.97 1 1 (99) 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (90) (89) (81) 0.59 0.41 0.46 0.77 0.97 1 1 (90) (90) (11) 1 <td< td=""><td>(86)m=</td><td>1</td><td>1</td><td>0.99</td><td>0.96</td><td>0.85</td><td>0</td><td>.65</td><td>0.49</td><td>0.55</td><td>0.82</td><td>0.98</td><td>1</td><td>1</td><td></td><td>(86)</td></td<>	(86)m=	1	1	0.99	0.96	0.85	0	.65	0.49	0.55	0.82	0.98	1	1		(86)	
(87)m= 20.1 20.22 20.41 20.66 20.85 20.94 20.95 20.83 20.64 20.33 20.09 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (8)m= 20.22 20.23 20.25 20.25 20.27 20.27 20.26 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (8)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (89) (8)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (89) (90) 1 0.99 0.94 0.81 0.59 0.12 20.22 20.21 20.11 1.9.8 19.35 1.8.9 (90) (90) 1.4 19.62 20.03 20.27 20.33 20.01 1.9.59 1.9.27 (92) (90) 1.9.27 40.33 19.69 20.03 <t< td=""><td>Mean</td><td>interna</td><td>l temper</td><td>ature in</td><td>living are</td><td>ea T1 (fo</td><td>ollov</td><td>w ste</td><td>ps 3 to 7</td><td>in Tabl</td><td>e 9c)</td><td></td><td></td><td></td><td></td><td></td></t<>	Mean	interna	l temper	ature in	living are	ea T1 (fo	ollov	w ste	ps 3 to 7	in Tabl	e 9c)						
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88) (88)m= 20.22 20.23 20.25 20.25 20.27 20.27 20.27 20.25 20.24 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (99) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90) (91) 1LA + Living area +(4) = 0.25 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) 20.37 20.37 20.33 20.01 19.59 19.27 (92) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (93) 20.37 20.33 20.01 19.59 19.27 (93) Mean internal temperature to the mean internal temperature from Table 4e, where appropriate (93) (93) 20.33 20.01 19.59 19.27 (93) Set To to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (94)	(87)m=	20.1	20.22	20.41	20.66	20.85	20).94	20.95	20.95	20.89	20.64	20.33	20.09		(87)	
Temperature of the unity periods in reads of dwelling, 12 0.27 20.27 20.27 20.25	Temr		urina h	Deating n	eriods ir	n rest of	dwe	alling	from Ta	hle 9 T	h2 (°ር)				I		
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) Utilisation factor for gains for rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (69) (90) re 1 0.99 0.94 0.81 0.25 0.41 0.46 0.77 0.97 1 1 (69) (90) re 18.99 19.17 19.45 19.82 20.02 20.21 20.22 20.14 19.8 19.35 18.99 (90) (90) re 19.27 19.43 19.69 20.32 20.37 20.39 20.33 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) 19.27 (92) (93) 19.27 (94) (93) 19.27 (93) (93) 19.27 (93) (93) Septe heating requirement Store heating requirement (93) 20.37 20.39 20.33 20.01 19.59 19.27 (93) Set T is the mean internal temperature tobtained at step 11 of Table 9b	(88)m=	20.22	20.23	20.23	20.25	20.25	20).27	20.27	20.27	20.26	20.25	20.25	20.24		(88)	
Utilisation factor for gains for rest of dwelling, h2, m (see Table 9a) (89) (89)m= 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90) TLA = Living area + (4) = 0.25 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) (92) (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) (93) Shace heating requirement (94) 19.69 20.32 20.27 20.39 20.33 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature form Table 4e, where appropriate (93) (93) 3.5 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm: (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (95) (96) (97) (96) </td <td>(</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>· ·</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>i</td> <td>``</td>	(· ·							i	``	
(B) ma 1 1 0.99 0.94 0.81 0.59 0.41 0.46 0.77 0.97 1 1 (B9) Mean internal temperature in the rest of dwelling T2 (follow steps, 3 to 7 in Table 9c) (90) (1LA = Lving area = (4) = (91) (90)ma 19.35 19.17 19.45 19.82 20.03 20.19 20.2 20.14 19.85 19.35 18.99 (90) (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) (93)ma 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (93) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, using Table 9a (94) Useful gains, hmGm, W = (94)m x (84)m (95) (96) (97)<	Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,r	m (se	e Table	9a)						(00)	
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (60) (90)m 18.89 19.17 19.45 19.82 20.08 20.19 20.2 20.21 20.14 19.83 19.35 18.99 (60) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 – fLA) x T2 (92) 11.27 19.43 19.69 20.32 20.37 20.39 20.33 20.01 19.59 19.27 (93) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 19.27 (93) (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (94) Useful gains, hmCm, W = (94)m x (84)m (95)me 10.57 0.96 0.99 1 (94) Useful gains, hmCm, W = (94)m x (84)m (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature from Table 8 (96)m (97)m 205.53 1241.7 1665.36 202.9.07 (97) <td>(89)m=</td> <td>1</td> <td>1</td> <td>0.99</td> <td>0.94</td> <td>0.81</td> <td>0</td> <td>.59</td> <td>0.41</td> <td>0.46</td> <td>0.77</td> <td>0.97</td> <td>1</td> <td>1</td> <td></td> <td>(89)</td>	(89)m=	1	1	0.99	0.94	0.81	0	.59	0.41	0.46	0.77	0.97	1	1		(89)	
(90)m= 18.99 19.17 18.45 19.82 20.08 20.19 20.2 20.2 20.14 19.8 19.35 18.99 (90) ILA = Living area + (4) = 0.25 (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2 (92) (92)m= 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.38 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) 3 20.01 19.59 19.27 (93) Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, inm: (94) 19.99 0.98 0.61 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m 727.9 852.76 <t< td=""><td>Me<mark>an</mark></td><td>interna</td><td>l temper</td><td>ature in</td><td><mark>the r</mark>est</td><td>of dwell</td><td>ing</td><td>T2 (fo</td><td>ollow ste</td><td>ps 3 to</td><td>7 in Tabl</td><td>e 9<mark>c)</mark></td><td></td><td></td><td></td><td></td></t<>	Me <mark>an</mark>	interna	l temper	ature in	<mark>the r</mark> est	of dwell	ing	T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9 <mark>c)</mark>					
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(90)m=	18.99	19.17	19.45	19. <mark>8</mark> 2	20.08	20	0.19	20.2	20.2	20.14	19.8	19.35	18.99		(90)	
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (92) Int 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 0.32 20.37 20.39 20.33 20.01 19.59 19.27 (93) 8 . Space heating requirement Sep to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (94) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94) (94) Useful gains, hmGm, W = (94)m x (84)m (95) (95) (96) (96) (97) (96) (96) (96) (97) (96) (97) (97) (96) (97) (97) (96) (97) (97) (96) (97) (97) (96) (97) (97) (97) (96) (97) (97) (96) (97) (96) (97) (96)											f	i <mark>LA =</mark> Livin	ig area ÷ (4	4) =	0.25	(91)	
(g) m 19.27 19.43 19.69 20.32 20.37 20.33 20.01 19.59 19.27 Apply adjustment to the mean internal temperature from Table 4e, where appropriate (g) m 19.27 19.43 19.69 20.32 20.37 20.39 20.33 20.01 19.59 19.27 (g) (g) m 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.33 20.01 19.59 19.27 (g) (g) m 19.27 19.43 19.69 20.03 20.27 20.39 20.39 20.33 20.01 19.59 19.27 (g) (g) m 19.27 19.43 19.69 20.03 20.27 20.39 20.33 20.01 19.59 19.27 (g) (g) m 10.37 19.49 10.60 20.37 20.39 20.33 20.01 19.59 19.27 (g) (g) Useful gains, hmGm, W = (94)m X W Jun Jul Aug Sep 0.77 485.07 506.36 737.35 792.46 716.94 686.5 (g)	Mean	interna	l temper	ature (fo	r the wh	ole dwe	llinc	n) = fl	$A \times T1$	+ (1 – fL	A) \times T2						
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (3)me 19.27 19.43 19.69 20.37 20.39 20.39 20.31 20.01 19.59 19.27 (93) 8. Space heating requirement Exercise the utilisation factor for gains using Table 9a (93) (93) (93) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)me 1 0.99 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)me 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)me (96)me (96)m (97)me (95.35 198.25 1733.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement fore	(92)m=	19.27	19.43	19.69	20.03	20.27	20).37	20.39	20.39	20.33	20.01	19.59	19.27		(92)	
(9)m= 19.27 19.43 19.69 20.03 20.27 20.37 20.39 20.39 20.31 20.01 19.59 19.27 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94) 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m = 2056.35 198.625 <td< td=""><td>Apply</td><td>∟ ∕adiustn</td><td>nent to t</td><td>r he mear</td><td>interna</td><td>temper</td><td>atur</td><td>e fro</td><td>m Table</td><td>4e. whe</td><td>ere appro</td><td>opriate</td><td></td><td></td><td>1</td><td></td></td<>	Apply	∟ ∕adiustn	nent to t	r he mear	interna	temper	atur	e fro	m Table	4e. whe	ere appro	opriate			1		
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Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate Lan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m = 1 0.99 0.88 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m = 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m = 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m = 2056.35 193.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98) 129 (99	8. Sp	ace hea	tina rea	uirement									<u> </u>				
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Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m 98 98.87 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 98.87 Total per year (kWh/year) = Sum(98) ₁₋₄₈₋₁₂ = 4783.91 (98) Space heating req		Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(94)m= 1 0.99 0.98 0.94 0.81 0.6 0.42 0.48 0.77 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m - (96)m] (97)m = 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98) 98.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Space heating requirement in kWh/m²/year 29 (99) 98.8.37 761.71 613.83	Utilisa	ation fac	tor for g	ains, hm	:										-		
Useful gains, hmGm , W = (94)m x (84)m (95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = $0.024 \times x [(97)m - (95)m] \times (41)m$ (98) (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 334.23 682.87 998.87 (98) Space heating requirement in kWh/m²/year 29 (99) (99) (99) (99) (99) (99) (99) (99) (99) (91) (92) (92) (93) (93) (93)	(94)m=	1	0.99	0.98	0.94	0.81	C).6	0.42	0.48	0.77	0.96	0.99	1		(94)	
(95)m= 727.9 852.76 968.47 1054.46 996.12 725.07 485.07 506.36 737.35 792.46 716.94 686.5 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 98.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₈₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: 29 (99) Space heating: <td colspace="" from="" heat="" seconda<="" td=""><td>Usefu</td><td>ıl gains,</td><td>hmGm</td><td>, W = (94</td><td>4)m x (84</td><td>4)m</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td>	<td>Usefu</td> <td>ıl gains,</td> <td>hmGm</td> <td>, W = (94</td> <td>4)m x (84</td> <td>4)m</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m										
Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98)h. 59.12 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	(95)m=	727.9	852.76	968.47	1054.46	996.12	72	5.07	485.07	506.36	737.35	792.46	716.94	686.5		(95)	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98)h_m.69.12 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Month	nly aver	age exte	ernal tem	perature	e from Ta	able	8							•		
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m - (96)m] $(97)m = 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07$ (97) Space heating requirement for each month, kWh/month = $0.024 x [(97)m - (95)m] x (41)m$ (98)m = 988.37 761.71 613.88 303.78 100.2 0 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 98. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system	(96)m=	4.3	4.9	6.5	8.9	11.7	1.	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)	
(97)m= 2056.35 1986.25 1793.59 1476.37 1130.79 742.64 487 510.2 809.05 1241.7 1665.36 2029.07 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Heat	loss rate	e for me	an intern	al tempe	erature,	Lm	, W =	=[(39)m >	x [(93)m	– (96)m]					
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	(97)m=	2056.35	1986.25	1793.59	1476.37	1130.79	74	2.64	487	510.2	809.05	1241.7	1665.36	2029.07		(97)	
(98)m= 988.37 761.71 613.88 303.78 100.2 0 0 0 334.23 682.87 998.87 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Space	e heatin	g require	ement fo	r each n	honth, k	Wh/	mont	h = 0.02	4 x [(97)m – (95)m] x (4	1)m				
Total per year (kWh/year) = Sum(98)15912 = 4783.91 (98) Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) 5 Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	(98)m=	988.37	761.71	613.88	303.78	100.2		0	0	0	0	334.23	682.87	998.87			
Space heating requirement in kWh/m²/year 29 (99) 9a. Energy requirements – Individual heating systems including micro-CHP) 5 Space heating: 0 (201)										Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	4783.91	(98)	
9a. Energy requirements – Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201)	Space	e heatin	g require	ement in	kWh/m ²	/year									29	(99)	
Space heating: 0 (201)	9a En	erav rec	uiremer	nts – Indi	vidual b	eating s	vste	ems i	ncluding	micro-C	(HP)						
Fraction of space heat from secondary/supplementary system 0 (201)	Snac	e heatir	ומיוסיוופו ומי	no- ma		ouung 0			Joraaniy		~~~)						
	Fracti	ion of sp	ace hea	at from s	econdar	y/supple	mei	ntary	system						0	(201)	

Fracti	on of s	bace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								360.15	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above)	1	1 1			1	-	1	
	988.37	761.71	613.88	303.78	100.2	0	0	0	0	334.23	682.87	998.87		
(211)m	n = {[(98	3)m x (20	(4)] } x 1	00 ÷ (20)6)							077.05	1	(211)
	274.43	211.5	170.45	84.35	27.82	0	0	U Tota	0 L (k\Wb/yea	92.8	189.61	277.35	4000.0	7(211)
Space = {[(98 (215)m=	e heatin)m x (20	ng fuel (s 01)] } x 1 0	econdar 00 ÷ (20 0	y), kWh/ 8) 0	month 0	0	0	0	0	0	0	0		
l								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,101}	2=	0	(215)
Water	heating	9												
Output	from w	1												
Efficier	220.35	282.62	(216)											
(217)m=	282.62	202.02	(217)											
Fuel fo	r water													
(219)m	<u> = (64)</u>	m x 100) ÷ (217)	m		50.00	54.00		50.00	00.04	70.07	70.00	1	
(219)m=	/7.97	68.7	72.09	64.55	63.2	56.39	54.09	59.45	59.38	66.94	70.87	76.06	700.00	
Annua	l totals							i ota	- 00m(2	k	Wh/vea	r	kWh/vear	(219)
Space	heating	g fuel use	ed, main	system	1						, you	•	1328.3	7
Water	heating	fuel use	d										789.69	ī
Electric	city for p	oumps, fa	ans and	electric	keep-ho	t								
mech	anical v	ventilation	n - balan	nced, ext	ract or p	ositive ii	nput fron	n outside	9			521.88		(230a)
Total e	electricit	y for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =			521.88	(231)
Electric	city for I	ighting		-									532.96	(232)
Electric	city gen	erated b	y PVs										-730.07	(233)
Total d	lelivered	d energy	for all u	ses (211)(221)) + (231)	+ (232).	(237b)	=				2442.76	(338)
12a. (CO2 em	nissions -	– Individ	ual heati	ing syste	ems inclu	uding mi	cro-CHP						
						En	orav			Emico	ion fac	tor	Emissions	
						k۷	/h/year			kg CO	2/kWh		kg CO2/yea	ar
Space	heating) (main s	ystem 1)		(21	1) x			0.5	19	=	689.39	(261)
Space	heating	g (second	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating					(219	9) x			0.5	19	=	409.85	(264)
Space	and wa	iter heati	ng			(26	1) + (262)	+ (263) + (2	264) =				1099.24	(265)
Electric	city for a	oumps. fa	- ans and	electric	keep-ho	t (23 ⁻	1) x			0.5	19	=	270.86] (267)
	,									0.0	10		210.00	

Electricity for lighting	(232)	x	[0.519	=	276.61	(268)
Energy saving/generation technologies Item 1			[0.519	=	-378.91	(269)
Total CO2, kg/year			sum of ((265)(271) =		1267.79	(272)
Dwelling CO2 Emission Rate			(272) ÷	(4) =		7.69	(273)
El rating (section 14)						92	(274)



				User D	Details:						
Assessor Name: Software Name:	Stroma FS	AP 201	2		Strom Softwa	a Num are Vei	ber: rsion:		Versic	on: 1.0.5.49	
	Ham Close	London	P TW10	горепу	Address	BIOCK P	\ - End - \ \ \ \ \ \ \ \ \ \ \	HIZ			
Address :	nam Close,	London	, 10010								
	511510115.			Are	a(m²)		Av Hei	aht(m)		Volume(m ³)	
Ground floor					56.35	(1a) x	2	.6	(2a) =	146.51	(3a)
First floor					57 24	(1b) x	2	9](2b) =	166](3b)
Second floor					51.36	(1c) x		3	(2c) =	169.49](3c)
Total floor area TFA = (1	a)+(1b)+(1c)+(1c)+(1c)+(1c)+(1c)+(1c)+(1c)+(1c	(1d)+(1e	e)+(1r)) <u> </u>	64 95	(4)		.0](==)	100.40	
Dwelling volume	a) (12) (10) ((10) (10	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	·/	04.95	(") (3a)+(3b)+(3c)+(3d))+(3e)+	.(3n) =	481.00	
						() (, (, (,		-()	461.99	(3)
2. Ventilation fate.	main	se	econdar	у	other		total			m ³ per hour	•
Number of chimneys		n +] + [0	7 = [0	X 4	40 =	0	(6a)
Number of open flues	0		0] + [0] = [0	×	20 =	0	(6b)
Number of intermittent fa	ans					- с Г	0	x '	10 =	0	(7a)
Number of passive vents	6					Ē	0	× ′	10 =	0	(7b)
Number of flueless gas f	ires					Γ	0	X 4	40 =	0	(7c)
		(0)			7.)				Air cr	hanges per ho	ur ¬
Infiltration due to chimne	eys, flues and fa	ans = (b r is intende	a)+(bb)+(7	a)+(7b)+((1C) = otherwise (continue fr	0 rom (9) to (*	16)	÷ (5) =	0	(8)
Number of storeys in t	he dwelling (ns	6)	,							0	(9)
Additional infiltration	Ū (,						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or	timber t	frame or	0.35 fo	r masoni	ry constr	ruction			0	(11)
if both types of wall are p deducting areas of openi	present, use the va	lue corres 0.35	ponding to	the great	ter wall are	a (after					_
If suspended wooden	floor, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
lf no draught lobby, er	iter 0.05, else e	enter 0								0	(13)
Percentage of window	s and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2	! x (14) ÷ 1	= [00]			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) +	(15) =		0	(16)
Air permeability value,	q50, expresse	ed in cub	oic metre	s per ho	our per s	quare m	etre of er	nvelope	area	4	(17)
If based on air permeabi	lity value, then	(18) = [(1	7) ÷ 20]+(8	B), otherw	ise (18) = ((16)				0.2	(18)
Air permeability value applie	es if a pressurisatio	on test has	s been dor	e or a de	gree air pe	rmeability	is being us	ed			-
Number of sides sheltere	ed				(20) - 1 -	[0 075 x (1	10)] -			2	(19)
Infiltration rate incorners	ting chalter for	tor			$(20) = 1^{-1}$	(0.070 x (1	[0]] =			0.85	
Infiltration rate modified	for monthly win		4		(21) - (10	, ^ (20) =				0.17	(21)
Jan Feb	Mar Apr	Mav	Jun	Jul	Αυα	Sep	Oct	Νον	Dec	1	
Monthly average wind sr	eed from Tabl	e 7	1 - •		19	1 244	<u> </u>		1 200	J	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	1	
			I		I	I			I	J	

Wind F	actor (2	22a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2			
Calcul	ate effe	ctive air	change	rate for t	he appli	cable ca	se	-	-		-			<u> </u>	
lf exh	aust air h	eat pump	usina App	endix N. (2	3b) = (23a	a) × Fmv (e	equation (N5)) . othe	rwise (23t	o) = (23a)				0.5	(23a)
If bala	anced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =	, , ,				75 65	(200)
a) If	balance	d mech	anical ve	entilation	with he	at recov	erv (MV	HR) (24a	a)m = (2	2b)m + (23b) × [1 – (23c)	÷ 100)]	
(24a)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32			(24a)
b) If	balance	d mech	anical ve	entilation	without	heat red	covery (l	u MV) (24t)m = (2	2b)m + (23b)	1	1		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	/e input v	ventilatio	on from o	outside		•	-			
i	if (22b)n	n < 0.5 ×	(23b), 1	then (24a	c) = (23b	o); other	wise (24	c) = (22	b) m + 0	.5 × (23k) I		1		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24c)
d) If	natural	ventilatio	on or wh	ole hous $-(22)$	e positiv	ve input	ventilatio	on from	loft 2b)m² v	0.51					
(24d)m=	0	0				0		0.5 + [(2			0	0			(24d
Effe	L ctive air	change	rate - er	nter (24a) or (24t) or (24	L c) or (24	d) in bo	(25)				1		
(25)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32]		(25)
3 Ho	at losse	s and he	atloss	naramete	ar.								•		
		Gros	SS	Openin	as	Net Ar	ea	U-val	ue	AXU		k-value	e e e e e e e e e e e e e e e e e e e	A >	(k
		area	(m²)	m	2	A ,r	m²	W/m2	2K	(VV/	K)	kJ/m²-	K	kJ/	K
Doo <mark>rs</mark>						1.97	x	1	=	1.97					(26)
Windo	ws Type	e 1				11.1	x1	/[1/(1.2)+	0.04] =	12.71					(27)
Windo	ws Type	2				19.24	4 <mark>x</mark> 1	/[1/(1.2)+	0.04] =	22.03					(27)
Windo	ws Type	93				2.86	x1	/[1/(1.2)+	0.04] =	3.27					(27)
Floor 7	ype 1					55.08	3 x	0.1	=	5.508		75		4131	(28)
Floor T	ype 2					2.16	x	0.1	=	0.216		20		43.2	(28)
Walls		188.	93	35.1	7	153.7	6 x	0.16	=	24.6		60		9225.6	(29)
Roof 7	Гуре1	51.3	36	0		51.36	3 X	0.1	=	5.14		9		462.24	(30)
Roof 7	Гуре2	5.8	8	0		5.88	x	0.1	=	0.59		9		52.92	(30)
Roof T	Гуре3	1.2	7	0		1.27	x	0.1	=	0.13		9		11.43	(30)
Total a	rea of e	lements	, m²			304.6	8								(31)
Party v	vall					86.77	7 X	0	=	0		110		9544.69	9 (32)
Interna	al wall **					315.9	9				i	9	Ē	2843.1	(32c)
Interna	al floor					108.6	6				Ì	18		1954.8	(32d)
Interna	al ceiling	ļ				108.6	6				Ì	9	Ē	977.4	(32e)

* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2

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

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

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

76.16 (33)

Heat c	at capacity Cm = S(A × K) ((28)(30) + (32) + (32a)(32e) = 29246.39 (34) symal mass parameter (TMP = Cm + TFA) in KJ/m ² K = (34) + (4) = (177.3 (35) design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 bused instead of addated cacuustation. symal bridges : S (L × Y) calculated using Appendix K 20.7 (36) tatils of thermal bridging are not known (36) = 0.05 × (31) at fabric heat loss calculated monthly (38) = 0.05 × (31) at fabric heat loss calculated monthly (38) = 0.05 × (31) at fabric heat loss calculated monthly (38) = 0.05 × (31) at transfer coefficient, W/K (38) = 0.33 × (25)m × (5) m = 10.7 150.03 149.35 145.97 145.29 141.91 141.91 141.24 143.27 145.28 146.85 146 Average = Sum(30),, 172 145.8 (39) at loss parameter (HLP), W/m ² K (40)m = (39)m + (31) m = 0.91 0.91 0.88 0.88 0.86 0.86 0.86 0.87 0.88 0.89 0.9 Average = Sum(40),, 172 0.88 (40) mber of days in month (Table 1a) Weter heating energy requirement: WW/Wear sumed occupancy, N f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2)) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f TFA > 13.9, N = 1 + 1.76 × (1 - exp(-0.000349 × (TFA - 13.9)2) + 0.0013 × (TFA - 13.9) f														
Therm	al mass	parame	177.3	(35)											
For des can be t	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	e construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f			
Therm	$\begin{aligned} & \text{at capacity } Cm = S(A \times k) & (22)(30) + (32) + (32a)(32a) = \underbrace{29246.39}_{177.3} (35) \\ & \text{ermal mass parameter (TMP = Cm + TFA) in kJ/m²K & = (34) + (4) = \underbrace{177.3}_{177.3} (35) \\ & \text{-} design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 \\ & \text{the used instead of a detailed calculation.} \\ & \text{ermal bridges : S (L \times Y) calculated using Appendix K & 20.7 (36) \\ & \text{stalks of thermal bridging are not known (36) = 0.05 \times (31) \\ & \text{talks of thermal bridging are not known (36) = 0.05 \times (31) \\ & \text{talks of thermal bridging are not known (36) = 0.05 \times (31) \\ & \text{talks of thermal bridging are not known (36) = 0.05 \times (31) \\ & \text{tal fabric heat loss } & (33) + (35) = \underbrace{96.86}_{377} & (37) \\ & \text{ntilation heat loss calculated monthly } & (30m = 0.33 \times (25)m \times 6) \\ & \text{measure coefficient, W/K} & (30m = (37) + (38)m \\ & \text{measure coefficient, W/K} & (39m = (37) + (38)m \\ & \text{measure coefficient, W/K} & (39m = (37) + (38)m \\ & \text{measure coefficient, W/K} & (40m = (39m + (4)) \\ & \text{measure coefficient, W/K} & (40m = (39m + (4)) \\ & \text{measure coefficient, W/K} & (40m = (39m + (4)) \\ & \text{measure coefficient, W/K} & (40m = (39m + (4)) \\ & \text{measure for days in month (Table 1a)} \\ & \text{measure for days in month (Table 1a)} & \text{Average = Sum(39)}, 12e & (40) \\ & \text{muser of days in month (Table 1a)} & \text{Max}_{\text{a a 3 a 3 1 3 0 3 1 3 1 3 0 3 1 3 0 3 1 } \\ & \text{measure for coupancy, N} & (41) \\ & \text{Water heating energy requirement:} & \text{WWh/year:} \\ & \text{sumed occupancy, N} & (42) & \text{measure average in litters per day Vd, average = (25 \times N) + 36 \\ & \text{dot a the annual average hot water use part use brid (20) \\ & \text{motor tha 125 litters per reson per day Vd, average = (25 \times N) + 36 \\ & \text{dot a the annual average hot water uses, hot and coloid \\ & \text{motor tha 125 litters per reson per day (Mar each month Vd, m = factor from Table 1c \times (43) \\ & \text{max} & \text{max} & \text{max} & \text{max} & \text{max} & \text{max} & \text{max} & \text{max} & \text{max} & \text{max} & \text{max} & \text{max} $														
if details	of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)									
Total f	eat capacity Cm = S(A x k) ((28)(30) + (32) + (32)(32e) = 292469 (34) hermal mass parameter (TMP = Cm + TFA) in kJ/m ² K = (34) + (4) = (177.3) (35) x design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 in be used instead of a detailed calculation. hermal bridges : S (L x Y) calculated using Appendix K 20.7 (36) details of thermal bridging are not known (38) = 0.05 x (31) total fabric heat loss (33) + (36) = 9696 (37) total fabric heat loss (33) + (36) = 9696 (37) entilation heat loss calculated monthly (38) m = 0.33 x (25)m x (5) $\frac{1}{20.7} \frac{1}{50.7} \frac{1}{150.03} \frac{1}{149.35} \frac{1}{145.29} \frac{1}{140.55} \frac{1}{45.29} \frac{1}{44.34} \frac{4}{4.3.27} \frac{1}{45.29} \frac{1}{46.45} \frac{1}{48} \frac{4}{4.34} \frac{4}{4.3} \frac{1}{4.7.3} (38) eat transfer coefficient, W/K (39)m = (37) + (38)m 9)m = 150.7 150.03 \frac{1}{49.35} \frac{1}{45.29} \frac{1}{45.29} \frac{1}{41.91} \frac{1}{41.91} \frac{1}{41.21} \frac{1}{41.3.27} \frac{1}{45.29} \frac{1}{46.65} \frac{1}{48} \frac{1}{40.00} \frac{1}{1$														
Ventila	ation hea	at loss ca	alculated	d monthly	у				(38)m	= 0.33 × (25)m x (5)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]		
(38)m=	53.84	53.17	52.49	49.11	48.43	45.05	45.05	44.38	46.41	48.43	49.79	51.14		(38)	
									(20)	(07) . (1		
Heat t	ransfer o		nt, vv/k	I					(39)m	= (37) + (38)m		1		
(39)m=	150.7	150.03	149.35	145.97	145.29	141.91	141.91	141.24	143.27	145.29	146.65	148			
Heatle		motor (l	יאי ים ור	/m21					(40)m	Average =	Sum(39)	12 /12=	145.8	(39)	
(40)			[], v		0.00	0.00	0.00	0.00	(40)	= (39)III ÷	. (4)	0.0	1		
(40)m=	0.91	0.91	0.91	0.88	0.88	0.86	0.86	0.86	0.87	0.88	0.89	0.9			
$(40)m= \begin{array}{ c c c c c c c c c c c c c c c c c c c$															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)	
													·		
4. Wa	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 41)m= 31 28 31 30 31 30 31 30 31 30 31 (41 4. Water heating energy requirement: kWh/year:														
Assum if TF if TF Annua	$\frac{1}{10} \frac$														
Reduce not mor	the annua e that 125	al average litres per	hot water person pe	usage by r day (all w	5% if the c ater use, l	lwelling is hot and co	designed t ld)	to achieve	a water us	se target o	f		1		
	lan	Feb	Mar	Anr	May	lun	lul	Διια	Sen	Oct	Nov	Dec	1		
Hot wat	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	Ocp	000	1100	000	J		
(44)m-	11/ 9/	110.66	106.40	102.21	09.14	02.06	02.06	09.14	102.21	106.40	110.66	11/ 9/	1		
(44)11=	114.04	110.00	100.49	102.31	90.14	93.90	93.90	90.14	102.51	Totol - Su	m(11)	114.04	1252.70		
Energy	content of	hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	1252.79	(44)	
(45)m=	170.3	148.95	153.7	134	128.58	110.95	102.81	117.98	119.39	139.14	151.88	164.93	1		
						ļ				I Total = Su	I m(45) ₁₁₂ =	!	1642.6	(45)	
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)						
(46)m=	25.55	22.34	23.06	20.1	19.29	16.64	15.42	17.7	17.91	20.87	22.78	24.74]	(46)	
Water	storage	loss:	1	1	1		1						1		
Storag	je volum	e (litres)) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		180]	(47)	
If com	munity h	eating a	and no ta	ank in dw	velling, e	nter 110) litres in	(47)					4		
Otherv	vise if no	stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)				
Water	storage	loss:							·	·					
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1	.6]	(48)	
Tempe	erature f	actor fro	m Table	2b							0.	54	i	(49)	
Enera	v lost fro	m water	storage	, kWh/ve	ear			(48) x (49)) =			86	1	(50)	
b) If m	nanufact	urer's de	eclared of	cylinder	loss fact	or is not	known:					~~	J	()	

Hot wa	vater storage loss factor from Table 2 (kWh/litre/day) munity heating see section 4.3 me factor from Table 2a perature factor from Table 2b gy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 0 0 0 0 0 0 0													
If com	munity h	neating s	ee secti	on 4.3									ı	
Volum	e factor	from Ta	ble 2a	01-				0		(52)				
rempe	erature t	actor fro	m Table	2D								0		(53)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	5)								0.	86	l	(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m 				
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m				1	
(mo	, dified by	/ factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi		lculated	for each	month ((61)m –	(60) ± 36	35 v (11))m					•	
(61)m-						$(00) \div 30$			0	0	0	0		(61)
(01)III=														、(01)
l otal r	leat req	uired for	water h	eating ca	alculated	for eac	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61 I)m
(62)m=	220.35	194.15	203.75	182.43	178.62	159.38	152.86	168.03	167.82	189.18	200.31	214.98		(62)
Solar DI	-IW input	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	I lines if	FGHRS	and/or \	WHRS	applies	, see Ap	pendix C	5)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater he <mark>a</mark>	ter											
(64)m=	<mark>22</mark> 0.35	194.15	203.75	182.43	178.62	159.38	152.86	168.03	167.82	189.18	200.31	214.98		
								Outp	out from wa	ater heate	r <mark>(annual)</mark> ₁	12	2231.86	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	, <mark>kWh</mark> /me	onth 0.2	5 ′ [0.85	<mark>× (45</mark>)m	+ (61)m	n] + 0.8 ×	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	96.66	85.69	91.14	83.3	82.79	75.64	74.22	79.27	78.44	86.3	89.24	94.88		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5 Int	ernal da	ains (see	Table 5	5 and 5a).	-		0				-	J. J. J. J. J. J. J. J. J. J. J. J. J. J	
Matab		o (Toblo		to	/-									
Metab	lan	Feb	<u>), wai</u> Mar		May	lun	hul	Αυσ	Sen	Oct	Nov	Dec		
(66)m =	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79	147 79		(66)
Lianhtia			• • • • • •							11110	11110		l	()
	g gains				L, equat		r L9a), a			04.00	00.4	24.00	l	(67)
(67)m=	30.18	26.8	21.8	16.5	12.34	10.41	11.25	14.63	19.63	24.93	29.1	31.02	l	(07)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc I	see Ta	ble 5			1	
(68)m=	336.36	339.85	331.06	312.33	288.7	266.48	251.64	248.15	256.94	275.67	299.31	321.52	l	(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5	-			
(69)m=	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78		(69)
Pumps	and fa	ns gains	(Table \$	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.g. ev	vaporatio	on (nega	tive valu	es) (Tab	le 5)								
(71)m=	-118.23	-118.23	-118.23	-118.23	-118.23	, -118.23	-118.23	-118.23	-118.23	-118.23	-118.23	-118.23		(71)
Wator	heating	naine /T	ahle 51	I	I	I	I				I		I	
(72)m-	120.02	127 51	122 5	115 7	111 22	105.05	00.76	106.54	108.05	115.00	123.05	127 52	1	(72)
(12)11=	129.92	127.51	122.3	110.7	111.20	105.05	99.70	100.54	100.90	115.99	123.95	121.52	ł	(12)

Total	interna	I gains =						(66))m + (67)m	n <mark>+ (6</mark> 8	3)m + (69)m +	+ (70)m +	- (71)m + (1	72)m			
(73)m=	563.8	561.51	542.7	7	511.87	479.64	4	49.28	429.99	436	.65 452.86	483.9	3 519.6	9 547.4	4		(73)
6. Sc	olar gair	าร:															
Solar	gains are	calculated	using s	olar	flux from	Table 6a	a and	lassoc	iated equa	ations	to convert to	the appli	cable orien	tation.			
Orient	ation:	Access F Table 6d	actor		Area m²			Flu Tal	x ble 6a		g_ Table 6t	D	FF Table 6	C		Gains (W)	
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	3	36.79	x	0.45	x	0.7		=	89.15	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	\$2.67	x	0.45	x	0.7		=	151.86	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	35.75	x	0.45	x	0.7		=	207.78	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	06.25	x	0.45	x	0.7		=	257.46	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	19.01	x	0.45	x	0.7		=	288.37	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	18.15	x	0.45	x	0.7		=	286.29	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	13.91	x	0.45	x	0.7		=	276.01	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	1	04.39	x	0.45	x	0.7		=	252.95	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	9)2.85	x	0.45	x	0.7		=	224.99	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	x	6	39.27	x	0.45	x	0.7		=	167.84	(77)
Southe	east 0.9x	0.77		x	11.	1	x	4	4.07	x	0.45	х	0.7		=	106.79	(77)
Southe	east <mark>0.9x</mark>	0.77		x	11.	1	х	3	31.49	x	0.45	x	0.7		=	76.3	(77)
South	0.9x	0.77		x	2.8	6	х	4	46.75] x	0.45	x	0.7		=	29.19	(78)
South	0.9x	0.77		x	2.8	6	x	7	'6.57	x	0.45	x	0.7		=	47.8	(78)
South	0.9x	0.77		x	2.8	6	x	9	97.53	x	0.45	x	0.7		=	60.89	(78)
South	0.9x	0.77		x	2.8	6	x	1	10.23	x	0.45	x	0.7		=	68.82	(78)
South	0.9x	0.77		x	2.8	6	x	1	14.87	x	0.45	x	0.7	·	=	71.72	(78)
South	0.9x	0.77		x	2.8	6	x	1	10.55	x	0.45	х	0.7		=	69.02	(78)
South	0.9x	0.77		x	2.8	6	x	1	08.01	x	0.45	x	0.7		=	67.43	(78)
South	0.9x	0.77		x	2.8	6	x	1	04.89	x	0.45	x	0.7	·	=	65.49	(78)
South	0.9x	0.77		x	2.8	6	x	1	01.89	x	0.45	x	0.7		=	63.61	(78)
South	0.9x	0.77		x	2.8	6	x	8	32.59	x	0.45	x	0.7	·	=	51.56	(78)
South	0.9x	0.77		x	2.8	6	x	5	5.42	x	0.45	x	0.7		=	34.6	(78)
South	0.9x	0.77		x	2.8	6	x		40.4	x	0.45	x	0.7	·	=	25.22	(78)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	1	1.28	x	0.45	x	0.7		=	47.39	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	2	2.97	x	0.45	x	0.7	·	=	96.46	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	4	1.38	x	0.45	x	0.7	·	=	173.79	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	6	67.96	x	0.45	x	0.7		=	285.41	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	9)1.35	x	0.45	x	0.7		=	383.65	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	9)7.38	x	0.45	x	0.7		=	409.01	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x		91.1	x	0.45	x	0.7		=	382.62	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	7	'2.63	×	0.45	x	0.7		=	305.03	(81)
Northw	/est <mark>0.9x</mark>	0.77		x	19.2	24	x	5	50.42	x	0.45	x	0.7		=	211.77	(81)
Northw	/est <mark>0.9x</mark>	0.77		х	19.2	24	x	2	28.07	x	0.45	x	0.7		=	117.88	(81)

Northwe	est <mark>0.9x</mark>	0.77	×	19.	24	x [14.2	x	0.45	 × [0.7	=	59.63	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	19.	24	×	ç	9.21	x	0.45	_ × [0.7	=	38.7	(81)
	Ŀ					-									
Solar c	ains in	watts. ca	alculated	l for eac	h month				(83)m = S	um(74)m .	(82)m				
(83)m=	165.73	296.13	442.47	611.69	743.74	76	64.32	726.07	623.47	500.36	337.28	201.01	140.22		(83)
Total g	ains – i	nternal a	and solar	[.] (84)m =	= (73)m ·	<u>ا</u> + (8	33)m	, watts						1	
(84)m=	729.53	857.63	985.16	1123.56	1223.38	12	13.6	1156.06	1060.12	953.23	821.21	720.7	687.62		(84)
7 Mo	on intor	nal tomr	oratura	(hoating	concon							I			
Tomp		during b			season) na r	aroa f	rom Tok		1 (%C)				24	(95)
Litilian		during i	oine for l						ле <u>э</u> , тп	1(0)				21	(00)
Utilisa					a, m,m	i (se			A	Can	Oct	Nex	Dee	I	
(0.0)	Jan	Feb	Mar	Apr	iviay	<u>`</u>	Jun	Jui	Aug	Sep	Oct	NOV	Dec		(00)
(86)m=	1	0.99	0.99	0.95	0.86	0	.69	0.53	0.59	0.84	0.97	1	1		(00)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollo	w ste	ps 3 to 7	in Tabl	e 9c)		-			
(87)m=	19.89	20.02	20.24	20.53	20.77	2	0.9	20.93	20.93	20.83	20.52	20.15	19.88		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dw	elling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	20.16	20.16	20.16	20.18	20.18	2	0.2	20.2	20.2	20.19	20.18	20.18	20.17		(88)
Litilioc	tion for	tor for a		root of d	volling	L			00)					1	
(80)m-						12,1			9a)	0.79	0 96	0.99	1		(89)
(03)11-	'	0.33	0.90	0.94	0.05		.02	0.44	0.5	0.79	0.90	0.33			(00)
Mean	interna	l temper	ature in	the rest	of dwelli	ing	T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9 <mark>c)</mark>				
(90)m=	18.64	18.84	19.15	19. <mark>5</mark> 9	19.91	20	0.08	20.11	20.11	20.01	19.58	19.05	18.64		(90)
										f	LA = Livin	g area ÷ (4	1) =	0.25	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling	g) = fl	$A \times T1$	+ (1 – fL	A) × T2					
(92)m=	18.95	19.13	19.42	19. <mark>8</mark> 2	20.12	2	0.29	20.32	20.32	20.21	19.81	19.33	18.95		(92)
Apply	adjustr	nent to t	he mear	internal	temper	atu	re fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.95	19.13	19.42	19.82	20.12	20	0.29	20.32	20.32	20.21	19.81	19.33	18.95		(93)
8. Spa	ace hea	ting requ	uirement			-									
Set Ti	i to the i	mean int	ernal ter	mperatui	e obtair	ned	at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a							-			
	Jan	Feb	Mar	Apr	May	ļ ,	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										1	
(94)m=	1	0.99	0.98	0.93	0.83	0	.63	0.45	0.51	0.79	0.96	0.99	1		(94)
Usefu	Il gains,	hmGm	, W = (94	4)m x (84	4)m									I	
(95)m=	726.51	849.93	963.18	1049.67	1009.98	76	5.39	520.99	541.49	753.09	787.66	714.68	685.45		(95)
Month	nly aver	age exte	ernal tem	perature	e from Ta	able	8					r		I	()
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93)m	– (96)m]	i		I	()
(97)m=	2207.94	2134.93	1929.95	1593.87	1223.84	80	07.22	527.62	553.15	875.48	1338.66	1792.87	2182.32		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/	mont	:h = 0.02	24 x [(97])m – (95)m] x (4	1)m		ı	
(98)m=	1102.19	863.52	719.28	391.83	159.11		0	0	0	0	409.94	776.3	1113.67		_
									Tota	l per year	(kWh/yea) = Sum(9	8)15,912 =	5535.84	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year									33.56	(99)
9a. En	er <u>gy rec</u>	quir <u>emer</u>	nts <u>– Ind</u> i	vid <u>ual h</u>	eat <u>ing s</u>	y <u>st</u> e	em <u>s i</u>	ncl <u>udina</u>	mi <u>cro-C</u>	CHP)					
Space	e heatii	ng:													
Fracti	on of sp	ace hea	at from s	econdar	y/supple	me	ntary	system						0	(201)

Fracti	on of s	bace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1								403.65	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above)	-		_			T	1	
	1102.19	863.52	719.28	391.83	159.11	0	0	0	0	409.94	776.3	1113.67		
(211)m	$1 = \{[(98)] \\ 273.06 \end{bmatrix}$	B)m x (20	4)] } x 1	00 ÷ (20)6) 39.42	0	0	0	0	101 56	102 32	275.9]	(211)
	213.00	213.35	170.2	57.07	33.42	0	0	Tota	l (kWh/yea	ar) = Sum(2)	211), 540 4		1371 46	(211)
Space = {[(98	e heatin)m x (20	ng fuel (s 01)] } x 1	econdar 00 ÷ (20	y), kWh/ 8)	month								1	
(215)m=	0	0	0	0	0	0	0	0 Tota	0 L (k\Wb/yea	0	0	-		(215)
Wator	hostin	~						Tota	r (itter#you	(2) –Oum(2	- 10715,101	2	0	(213)
Output	from w													
	220.35	214.98												
Efficier	ncy of w		282.62	(216)										
(217)m=	282.62	282.62		(217)										
Fuel fo	or water h = (64)													
(219)m=	77.97	68.7	72.09	64.55	63.2	56.39	54.09	59.45	59.38	66.94	70.87	76.06		
								Tota	l = Sum(2'	19a) ₁₁₂ =			789.69	(219)
Ann <mark>ua</mark>	l totals		1							k\	Wh/yea	r	kWh/year	ㄱ
Space	neating) fuel use	a, main	system	1								1371.46	4
Water	heating	fuel use	d										789.69	
Electric	city for p	oumps, fa	ans and	electric	keep-ho	ot								
mech	anical v	rentilation	n - balan	iced, ext	ract or p	ositive ii	nput fror	n outside	9			521.88		(230a)
Total e	lectricit	y for the	above, l	(Wh/yea	r			sum	of (230a).	(230g) =			521.88	(231)
Electric	city for I	ighting											532.96	(232)
Electric	city gen	erated by	y PVs										-730.07	(233)
Total d	lelivered	d energy	for all u	ses (211)(221)) + (231)	+ (232).	(237b)	=				2485.92	(338)
12a. (CO2 en	nissions -	– Individ	ual heati	ing syste	ems inclu	uding mi	cro-CHP						
						En	erav			Emiss	ion fac	tor	Emissions	
						kW	/h/year			kg CO	2/kWh		kg CO2/ye	ar
Space	heating	g (main s	ystem 1)		(211	1) x			0.5	19	=	711.79	(261)
Space	heating	g (second	dary)			(21	5) x			0.5	19	=	0	(263)
Water	heating					(219	9) x			0.5	19	=	409.85	(264)
Space	and wa	iter heati	ng			(26	1) + (262)	+ (263) + (264) =	L	I		1121.64	(265)
Electric	city for a	oumps. fa	ans and	electric	keep-ho	ot (23 ⁻	1) x			0.5	19	=	270.86	 (267)
	,					- · · · · ·				0.5			210.00	

Electricity for lighting	(232)	x	[0.519	=	276.61	(268)
Energy saving/generation technologies			_				
Item 1				0.519	=	-378.91	(269)
Total CO2, kg/year			sum of ((265)(271) =		1290.19	(272)
Dwelling CO2 Emission Rate			(272) ÷	(4) =		7.82	(273)
EI rating (section 14)						92	(274)



				User D	Details:										
Assessor Name: Software Name:	Stroma FS	AP 201	2	ronortu (Strom Softwa	a Num are Vei	ber: rsion:		Versic	on: 1.0.5.49					
	Ham Close	London	P TW10	горепу	Address	BIOCK F	Iviia - i	115							
Address : 1 Overall dwelling dime		London	, 10010												
	13013.			Are	a(m²)		Av Hei	aht(m)		Volume(m ³)					
Ground floor					50.66	(1a) x	2	.6	(2a) =	131.72	(3a)				
First floor					57 24	(1b) x	2	9](2b) =	166] (3b)				
Second floor					57.24	(1c) x		3	(2c) =	188.89](3c)				
Total floor area TFA = (1)	a)+(1b)+(1c)+	(1d)+(1e	e)+(1r)) <u> </u>	65 14	(4)		.0](==)	100.00					
Dwelling volume	a) · (10) · (10) ·	(10).(10	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	·/	05.14	(3a)+(3b)+(3c)+(3d)	+(3e)+	.(3n) =	496.6					
						(00) (00) · (00) · (00,			486.6	(5)				
2. Ventilation rate:	main heatingsecondary heatingothertotalnber of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $\times 40 =$ nber of open flues 0 $+$ 0 $+$ 0 $=$ 0 $\times 20 =$														
Number of chimneys	mber of chimneysheatingheating 0 + 0 + 0 = 0 $x 40 =$ mber of open flues 0 + 0 + 0 = 0 $x 20 =$														
Number of open flues	0	 _ + _	0	」 +	0	」 ∟] = [0	x	20 =	0](6b)				
Number of intermittent fa	ns		-			л г Г	0	x ²	10 =	0	(7a)				
Number of passive vents							0	×	10 =	0	(7b)				
Number of flueless gas fi	res					L L	0	X 4	40 =	0](7c)				
						L									
									Air ch	hanges per ho	ur				
Infiltration due to chimney	ys, flues and f	ans = (6)	a)+(6b)+(7	a)+(7b)+((7c) =		0	16)	÷ (5) =	0	(8)				
Number of storevs in the	een carried out of ne dwelling (ng	r is intende s)	ea, procee	a to (17),	otherwise (continue fr	om (9) to (16)		0					
Additional infiltration	io awoning (n	~)						[(9)	-11x0.1 =	0	(10)				
Structural infiltration: 0	.25 for steel or	timber f	frame or	0.35 fo	r masoni	ry constr	ruction	L(-)		0	(11)				
if both types of wall are pr	resent, use the va	lue corres	ponding to	the great	ter wall are	a (after				-					
If suspended wooden f	loor, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)				
If no draught lobby, en	ter 0.05, else e	enter 0	,	,	,.					0	(13)				
Percentage of windows	s and doors dr	aught st	ripped							0	(14)				
Window infiltration					0.25 - [0.2	2 x (14) ÷ 1	= [00]			0	(15)				
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) +	(15) =		0	(16)				
Air permeability value,	q50, expresse	ed in cub	oic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4	(17)				
If based on air permeabil	ity value, then	(18) = [(1	7) ÷ 20]+(8	3), otherw	ise (18) = ((16)				0.2	(18)				
Air permeability value applie	s if a pressurisatio	on test has	s been dor	e or a de	gree air pe	rmeability	is being us	ed			_				
Number of sides sheltere	d				(20) - 1	[0 075 x (4	10)] -			2	(19)				
Sheller lactor	ing aboltor for	40.0			$(20) = 1^{-1}$	[0.075 x (1	[9]] =			0.85	(20)				
Infiltration rate incorporat	or monthly wir		1		(21) = (10	,				0.17	(21)				
	Mar Anr	Mav	Jun	Jul	Aug	Sen	Oct	Nov	Dec	ן					
Monthly average wind on		م 7			1 / 149					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	1					
				0.0	1 0.7				L	J					

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltr	ation rat	e (allow	ing for sl	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2		
Calcul	ate effe	ctive air	change	rate for t	he appli	cable ca	ise	•		•	•			
II Me				ondiv NL (2	(22) = (22)) v Emv (aquation (nuico (22)	(22a)		l	0.5	(23a)
li exil				$\frac{1}{2}$	(23a) = (23a)	a) × FIIIV (e	equation (n Toblo 4b		0) = (23a)		l	0.5	(23b)
									i) = -) (0			(00-)	75.65	(23c)
a) If						at recov		$\frac{HR}{1}$ (248	a)m = (2)	20)m + ((Z3D) × [1 - (23C)	÷ 100]	(242)
(24a)m=	0.34	0.33	0.33	0.31	0.3	0.20	0.28	0.20	0.29	0.3	(00%)	0.32		(24a)
D) IT	balance	ea mecha	anical ve			neat red	covery (i	VIV) (240 1	p)m = (2)	2b)m + ((230)			(24b)
(240)m=		0	0		0		0	0		0	0	0		(240)
c) If	whole h		tract ver	tilation o	or positiv	/e input v	ventilatio	on from (22)	outside	E (22)	~)			
(24c)m-		1 < 0.5	(230),		C) = (23L)			C = (22)	$\frac{1}{1}$) 			(24c)
(۲۰۰۷) الـ		Ventileti					Ventileti	on from		Ů	0	0		(= ,
a) II	naturai if (22b)r	n = 1, th	on or wr en (24d)	m = (22)	b)m othe	ve input erwise (2	ventilati 24d)m =	on from 0.5 + [(2	22b)m² x	0.5]				
(24d) <mark>m=</mark>	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - ei	nter (24a) or (24) or (24	c) or (24	d) in bo	x (25)	-				
(25)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32		(25)
													_	
3. He	at losse	s and he	eat loss	paramet	er:									
ELEN		Gros	ss (m²)	Openin	igs 1 ²	Net Ar A.r	rea m²	U-val W/m2	ue 2K	A X U (W/	K)	k-value kJ/m²·ł	: <	A X k kJ/K
Doors		u. eu	,			3.08	x	1		3.08				(26)
Windo	ws Type	e 1				12.59	а х1	/[1/(1.2)+	- 0.04] =	14.42	-			(27)
Windo	ws Type	, 2				16.5	~ 7	/[1/(1.2)+	- 0.041 =	18.97				(27)
Floor J	Tvne 1	-				50.66				5.066		75		(28)
Floor						0.00		0.1		0.000				24.0 (20)
	ype z					6.59		0.1	=	0.659		20		31.8 (20)
Valls		107.	07	32.2	4	74.83	3 ×	0.16	=	11.97		60		189.8 (29)
ROOT		57.2	25	0		57.25	5 ×	0.1	=	5.73		9	51	15.25 (30)
I otal a	irea of e	elements	s, m²			221.5	7							(31)
Party v	vall					168.7	2 X	0	=	0		110	18	559.2 <mark>(32</mark>)
Interna	al wall **	r				304.9	Э					9	27	744.1 (32c)
Interna	al floor					104.4	8					18	18	80.64 (32d)
Interna	al ceiling)				104.4	8				[104.48	109	916.07 (32e)
* for win	dows and	l roof wind	lows, use e	effective wi	indow U-va	alue calcul	lated using	g formula 1	1/[(1/U-val	ue)+0.04] a	as given in	n paragraph	3.2	-

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

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	59.89	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	43036.36	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	= (34) ÷ (4) =	260.61	(35)

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

can be l	$be used instead of a detailed calculation.$ $prmal bridges : S (L x Y) calculated using Appendix K 19.88 (36)$ $tails of thermal bridging are not known (36) = 0.05 x (31)$ $(33) + (36) = 79.77 (37)$ $(33) + (36) = 79.77 (37)$ $(38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) m \times (5)$ $Im = 1000 \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} (38) = 0.33 \times (25) \text{ Loss calculated monthly} $														
Therm	al bridg	əs : S (L	x Y) cal	culated	using Ap	pendix l	<						19.88	(36)	
if details	$\begin{array}{c c c c c c c c c c c c c c c c c c c $														
Total f	abric he	at loss							(33) +	(36) =			79.77	(37)	
Ventila	ation hea	at loss ca	alculated	monthl	Ý	-		-	(38)m	= 0.33 × (25)m x (5)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	54.36	53.67	52.99	49.58	48.9	45.48	45.48	44.8	46.85	48.9	50.26	51.63		(38)	
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	134.12	133.44	132.76	129.35	128.66	125.25	125.25	124.57	126.62	128.66	130.03	131.39			
Heat lo	oss para	meter (H	HP) W	/m²K					(40)m	Average = = (39)m ÷	Sum(39)₁. (4)	12 /12=	129.18	(39)	
(40)m=	0.81	0.81	0.8	0.78	0.78	0.76	0.76	0.75	0.77	0.78	0.79	0.8			
(,										Average =	Sum(40)1		0.78	(40)	
Numb	er of day	/s in moi	nth (Tab	le 1a)						0					
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)	
	4. Water heating energy requirement: kWh/year:														
4. Wa	4. Water heating energy requirement: kWh/year:														
A	4. Water heating energy requirement: kWh/year: Assumed occupancy, N 2.96 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) (42														
if TF	4. Water heating energy requirement: kWh/year: 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 (42)														
if TF	4. Water heating energy requirement: kWh/year: 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 (42)														
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36	no torgot o	104	1.41		(43)	
not mor	e that 125	litres per j	person pe	r day (all w	ater use, I	hot and co	ld)	o acriieve	a water ut	se largel o					
	lan	Feb	Mar	Apr	May	lun	lul	Aug	Sen	Oct	Nov	Dec			
Hot wat	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	Ocp	000	1100	Dee			
(44)m=	114.85	110.67	106.49	102.32	98.14	93.96	93.96	98.14	102.32	106.49	110.67	114.85			
(,										Total = Su	m(44) ₁₁₂ =		1252.86	(44)	
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D) 7 Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)			
(45)m=	170.31	148.96	153.71	134.01	128.58	110.96	102.82	117.99	119.4	139.14	151.89	164.94			
										Total = Su	m(45) ₁₁₂ =		1642.7	(45)	
lf instan	taneous w	ater heatii	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46,) to (61)						
(46)m=	25.55	22.34	23.06	20.1	19.29	16.64	15.42	17.7	17.91	20.87	22.78	24.74		(46)	
Storag	storage	1055: Do (litros)	includir	na anv si	alar or M		storada	within sa	mavas	مما		100	1	(47)	
lf com	munity h	e (illies)	nd no ta	ing arry so ank in dw	velling e	ntor 110	litras in	(17)		301		180		(47)	
Otherv	vise if no	o stored	hot wate	er (this in	icludes i	nstantar	eous co	(+7) mbi boil	ers) ente	er '0' in (47)				
Water	storage	loss:		(,		,				
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1	.6		(48)	
Tempe	erature f	actor fro	m Table	2b							0.	54		(49)	
Energ	y lost fro	m water	· storage	, kWh/ye	ear			(48) x (49)	=		0.	86		(50)	
b) If m	nanufact	urer's de	eclared of	cylinder l	oss fact	or is not	known:						1		
Hot wa	ater stor	age loss	tactor fr	om Tabl	e 2 (kW	n/litre/da	iy)					0		(51)	
Volum	e factor	from Ta	ble 2a	011 4.3								n		(52)	
Tempe	erature f	actor fro	m Table	2b								0		(53)	

Energy Enter	/ lost fro (50) or	om water (54) in (5	• storage 55)	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0.	0 86		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylinde	er contain	s dedicate	l d solar sto	rage, (57)	n = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	1 7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m					_	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	220.36	194.16	203.76	182.44	178.63	159.39	152.87	168.03	167.83	189.19	200.32	214.99		(62)
Solar DH	-IW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (<u>3)</u>					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter				-							
(64)m=	220.36	194.16	203.76	182.44	178.63	159.39	152.87	168.03	167.83	189.19	200.32	214.99		
								Outp	out from wa	ater heate	r <mark>(annual)</mark> ₁	12	2231.96	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	kWh/m	onth 0.2	5 [′] [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	96.67	85.69	91.15	83.3	82.79	75.64	74.22	79.27	78.44	86.3	89.25	94.88		(65)
in <mark>clu</mark>	<mark>ide</mark> (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table {	5 and 5a):									
Metab	olic gair	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	30.74	27.3	22.21	16.81	12.57	10.61	11.46	14.9	20	25.39	29.64	31.6		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	336.56	340.05	331.25	312.52	288.86	266.64	251.79	248.29	257.09	275.83	299.48	321.71		(68)
Cookir	ng gains	(calcula	Ited in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5	•			
(69)m=	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78		(69)
Pumps	s and fa	ns gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	, aporatic	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-118.24	-118.24	-118.24	-118.24	-118.24	, -118.24	-118.24	-118.24	-118.24	-118.24	-118.24	-118.24		(71)
Water	heating	gains (T	able 5)											
(72)m=	129.93	127.52	122.51	115.7	111.28	105.05	99.76	106.54	108.95	116	123.96	127.53		(72)
Total i	internal	gains =	:	I	I	(66)	um + (67)m	u + (68)m +	⊷ + (69)m + ((70)m + (7	ı 1)m + (72)	m	I	
(73)m=	564.57	562.21	543.3	512.37	480.05	449.64	430.35	437.08	453.39	484.56	520.42	548.17		(73)
6. So	lar gains	S:	1	1							1			

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

Orienta	ation:	Access F Table 6d	actor		Area m²			Flu Tal	x ble 6a		Ta	g_ Ible 6b		FF Table 6c			Gains (W)	
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	1	1.28	×		0.45	×	0.7		=	40.81	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	2	22.97	x		0.45	×	0.7		=	83.07	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	4	1.38	x		0.45	×	0.7		=	149.67	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	6	67.96	x		0.45	×	0.7		=	245.81	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	9	91.35	x		0.45	×	0.7		=	330.41	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	g	97.38	x		0.45	×	0.7		=	352.25	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	9	91.1	x		0.45	×	0.7		=	329.53	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	7	2.63	x		0.45	×	0.7		=	262.7	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	5	50.42	x		0.45	×	0.7		=	182.38	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	2	28.07	x		0.45	×	0.7		=	101.52	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x		14.2	x		0.45	×	0.7		=	51.35	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	16.	57	x	9	9.21	x		0.45	×	0.7		=	33.33	(75)
Southw	est <mark>0.9x</mark>	0.77		x	12.	59	x	3	86.79]		0.45	×	0.7		=	101.12	(79)
Southw	est <mark>0.9x</mark>	0.77		x	12.	59	x	6	62.67]		0.45	×	0.7		=	172.25	(79)
Southw	est <mark>0.9x</mark>	0.77		x	12.	59	x	8	35.75]		0.45	×	0.7		=	235.68	(79)
Southw	est _{0.9x}	0.77		x	12.	59	x	1	06.25			0.45	×	0.7			292.01	(79)
Southw	est <mark>o.9x</mark>	0.77		x	12.	59	x	1	19.01]		0.45	×	0.7		-	<mark>3</mark> 27.08	(79)
Southw	est <mark>0.9x</mark>	0.77		x	12.	59	х	1	18.15	İ /		0.45	×	0.7		=	3 <mark>24.72</mark>	(79)
Southw	est <mark>0.9x</mark>	0.77		x	12.	59	x	1	13.91	j /		0.45	×	0.7		=	313.06	(79)
Southw	est <mark>0.9x</mark>	0.77		x	12.	59	x	1	04.39			0.45	x	0.7		=	286.9	(79)
Southw	est <mark>0.9x</mark>	0.77		x	12.	59	x	g	92.85			0.45	x	0.7		=	2 <mark>55.19</mark>	(79)
Southw	est _{0.9x}	0.77		x	12.	59	x	6	9.27]		0.45	×	0.7		=	190.37	(79)
Southw	est <mark>0.9</mark> x	0.77		x	12.	59	x	4	4.07]		0.45	×	0.7		=	121.12	(79)
Southw	est <mark>0.9x</mark>	0.77		x	12.	59	x	3	31.49]		0.45	×	0.7		=	86.54	(79)
Solar g	jains ir	n watts, ca	alcula	ted	for eac	n mont	h			(83)n	n = Sui	m(74)m	(82)m					
(83)m=	141.93	3 255.32	385.3	35	537.82	657.49	6	76.97	642.59	549	9.6	437.57	291.8	9 172.47	119	.87		(83)
Total g	ains –	internal a	and so	olar	(84)m =	= (73)m	ı + (83)m	, watts									
(84)m=	706.5	817.53	928.0	65	1050.19	1137.5	4 1	126.61	1072.94	986	6.68	890.95	776.4	6 692.89	668	.04		(84)
7. Me	an inte	ernal temp	peratu	ire (heating	seaso	n)											
Temp	eratur	e during h	neatin	g pe	eriods ir	n the liv	ving	area	from Tab	ole 9	, Th1	(°C)					21	(85)
Utilisa	ation fa	ctor for g	ains f	or li	ving are	ea, h1,ı	n (s	ee Ta	ble 9a)	-								_
	Jan	Feb	Ma	ar	Apr	May	′	Jun	Jul	A	ug	Sep	Oct	t Nov	D	ec		
(86)m=	1	1	1		0.98	0.9		0.69	0.51	0.5	58	0.87	0.99	1	1			(86)
Mean	intern	al temper	ature	in l	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in T	Table	9c)						
(87)m=	20.29	20.38	20.5	2	20.72	20.89		20.95	20.96	20.	.96	20.92	20.71	20.47	20.2	29		(87)
Temp	eratur	0.77 x 12.59 0.77 x				n rest o	f dv	velling	from Ta	able	9, Th	2 (°C)						
(88)m=	20.24	20.25	20.2	5	20.27	20.27		20.29	20.29	20.	.29	20.28	20.27	20.26	20.2	26		(88)
Utilisa	ation fa	0.9x 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59 $0.9x$ 0.77 x 12.59				welling	, h2	,m (se	e Table	9a)								
(89)m=	1	1	1		0.97	0.86	Τ	0.62	0.43	0.4	49	0.82	0.99	1	1			(89)

Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	19.26	19.4	19.61	19.92	20.14	20.23	20.23	20.24	20.19	19.91	19.55	19.27		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.19	(91)
Maan	interne		atura (fa			lline ar) fl	A T4	. (4 4	A) T O			l		
	10.46		$\frac{10.79}{10.79}$	$\frac{1}{20.07}$		(100) = 10		+(1 - 1L)	$A \times IZ$	20.06	10.72	10.46		(92)
(92)III=	odiuota	19.00	19.70		20.20	20.30		20.37	20.33	20.00	19.72	19.40		(52)
Apply	10.46							20 27			10.72	10.46		(93)
(33)III-	13.40	ting rog	uiromont	20.07	20.20	20.30	20.37	20.57	20.33	20.00	19.72	19.40		(00)
Set Ti	to the r	ung requ		mporatu	ro obtoin	od at at	on 11 of	Table 0	h an tha	+ Ti m_(76)m.on	d ro oolo		
the ut	ilisation factor for gains using Table 9a										u re-caic	ulate		
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for a	ains, hm	1 <u>···</u>										
(94)m=	1	1	0.99	0.97	0.86	0.63	0.44	0.5	0.82	0.99	1	1		(94)
Usefu	l gains,	hmGm	. W = (9 [,]	۱ 4)m x (8	4)m	I	I		1		1			
(95)m=	706.2	816.46	923.7	1018.66	983.14	711.96	471.62	493.41	730.04	765.07	692.03	667.85		(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8		!						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
He <mark>at I</mark>	oss rate	e for mea	an interr	al tempo	erature,	Lm, W =	- =[(39)m	x [(93)m	– (96)m	1				
(97)m=	2032.75	1958.87	1763.38	1444.96	1103.62	722	472.25	494.91	788.4	12 <mark>16.76</mark>	1641.03	2005.07		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Nh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	<mark>98</mark> 6.95	767.7	62 <mark>4.73</mark>	306.93	89.64	0	0	0	0	336.05	683.28	<mark>99</mark> 4.89		
						r		Tota	l per year	(kWh/yeai) = Sum(9	8)15,912 =	4790.18	(98)
Space	heatin	a require	ement in	k\//h/m	2/vear								29.01	 (99)
Opdot	moatin	groquir		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	, your								2.3.01	_(00)
9a. En	ergy rec	uiremer	nts – Ind	ividual h	eatings	ystems į	ncluding	i micro-C	(HP)					
Space heating:													0	7(201)
Fracti						mentary	System	(202) = 1	(201) -					
Fracti	on or sp	ace nea	at from m	nain syst	em(s)			$(202) = 1^{-1}$	- (201) =	(222)]			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								349.59	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above	ı)							,	
	986.95	767.7	624.73	306.93	89.64	0	0	0	0	336.05	683.28	994.89		
(211)m	= {[(98)m x (20	4)] } x 1	100 - (20)6)									(211)
(211)	282.31	219.6	178.7	87.8	25.64	0	0	0	0	96.13	195.45	284.58		()
						-	-	Tota	l (kWh/yea	ar) =Sum(2	211),	=	1370 21	7(211)
Snoo	bootin	a fuol (o	ooondor		month				Ì.	, ,	/10,1012		1070.21	
Space _ {[(98]} _) m x (20	y iuei (S)1)] \ x 1	$00 \div (20)$	у), күүн/)8)	monun									
(215)m =	0				0	0	0	0	0	0	0	0		
(2.0)	Ĵ					Ů	Ů	Tota	l (kWh/vea	ar) =Sum(2	215)	=	0	7(215)
Mater	hoot!								(, , , , , , , , , , , , , , , , , , , ,	° ≠15,1012		0	
Output	from w	j ater heo	ter (calo	ulated a	hoval									
Saipul	220.36	194.16	203.76	182.44	178.63	159.39	152.87	168.03	167.83	189.19	200.32	214.99		
Efficier	ncy of w	ater hea	iter	ļ	I	I	I	I	I	L	I	I	282.62	(216)
	-												-	` ´
(217)m= 282.62 282.62	282.62 2	282.62 28	2.62	282.62	282.62	282.62	282.62	282.62	282.62	282.62		(217)		
--	--	-------------------------------------	-------	--	---	-------------	----------------------------	--	--	-------------------------	--	---	--	--
Fuel for water heating,	kWh/mon	th							-	-	-			
$(219)m = (64)m \times 100$ (219)m = 77.97 68.7) ÷ (217)m 72.09	64.55 6	3.2	56.4	54.09	59.45	59.38	66.94	70.88	76.07				
	12100		0.2		0	Tota	I = Sum(2	19a) ₁₁₂ =	10.00		789.72] (219)		
Annual totals								k	Wh/year		kWh/year			
Space heating fuel use	d, main sy	stem 1									1370.21	7		
Water heating fuel use	d										789.72	Ī		
Electricity for pumps, fa	ans and el	ectric kee	p-hot	:								_		
mechanical ventilation - balanced, extract or positive input from outside 526.87 (230a) Total electricity for the above, kWh/year sum of (230a)(230g) = 526.87 (231)														
Total electricity for the	526.87	(231)												
Electricity for lighting	ectricity for lighting ectricity generated by PVs													
Electricity generated by	y PVs										-730.07	(233)		
Total delivered energy	2499.64	(338)												
Iectricity generated by PVs -730.07 (233) Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 2499.64 (338) 12a. CO2 emissions – Individual heating systems including micro-CHP														
otal delivered energy for all uses (211)(221) + (231) + (232)(237b) = 2499.64 (338) 12a. CO2 emissions – Individual heating systems including micro-CHP														
				-				_ .			- · ·			
				En kW	ergy /h/vear			Emiss	ion fac 2/kWh	tor	Emissions	ar		
Space heating (main s	vstem 1)			En kW (211	ergy /h/year I) x			Emiss kg CO	ion fac 2/kWh	tor =	Emissions kg CO2/yea	ar 1(261)		
Space heating (main s	ystem 1) larv)			En kW (211 (215	ergy /h/year I) x 5) x			Emiss kg CO	ion fac 2/kWh 19	tor =	Emissions kg CO2/yea 711.14	ar](261)](263)		
Space heating (main s Space heating (second Water heating	ystem 1) lary)			En kW (211 (215 (215	ergy /h/year I) x 5) x			Emiss kg CO2 0.5	ion fac 2/kWh 19 19	tor = =	Emissions kg CO2/yea 711.14 0	ar](261)](263)](264)		
Space heating (main sy Space heating (second Water heating Space and water heating	ystem 1) lary)			En kW (211 (215 (215) (215) (264	ergy /h/year 1) x 5) x 9) x	+ (263) + (264) =	Emiss kg CO 0.5 0.5	ion fac 2/kWh 19 19 19	tor = = =	Emissions kg CO2/yea 711.14 0 409.87	ar (261) (263) (264) (265)		
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa	ystem 1) lary) ng	ectric kee	-hot	En kW (211 (215 (215) (264) (264)	ergy /h/year 1) x 5) x 9) x 1) + (262)	+ (263) + (264) =	Emiss kg CO 0.5 0.5	ion fac 2/kWh 19 19 19	tor = = =	Emissions kg CO2/yea 711.14 0 409.87 1121 273.45	ar (261) (263) (264) (265) (267)		
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa	ystem 1) lary) ng ans and el	ectric kee	p-hot	En kW (211 (215 (215) (215) (215) (215) (215) (215) (215) (215) (215) (215) (217) (2	ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x 2) x	+ (263) + (264) =	Emiss kg CO 0.5 0.5 0.5	ion fac 2/kWh 19 19 19	tor = = = =	Emissions kg CO2/yea 711.14 0 409.87 1121 273.45 281.77	ar (261) (263) (264) (265) (265) (267) (268)		
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa Electricity for lighting Energy saving/generat	ystem 1) lary) ng ans and el	ectric kee	p-hot	En kW (211 (215 (215) (215) (215) (232)	ergy /h/year 1) x 5) x 2) x 1) + (262) 1) x 2) x	+ (263) + (264) =	Emiss kg CO 0.5 0.5 0.5	ion fac 2/kWh 19 19 19 19 19	tor = = = =	Emissions kg CO2/yea 711.14 0 409.87 1121 273.45 281.77	ar (261) (263) (264) (265) (267) (268)		
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa Electricity for lighting Energy saving/generat Item 1	ystem 1) lary) ans and el ion techno	ectric kee ologies	p-hot	En kW (211 (215 (215 (215 (237 (237))))))))))))))))))))))))))))))))))))	ergy /h/year 1) x 5) x 2) x 1) + (262) 1) x 2) x	+ (263) + (264) =	Emiss kg CO 0.5 0.5 0.5	ion fac 2/kWh 19 19 19 19 19	tor = = = =	Emissions kg CO2/yea 711.14 0 409.87 1121 273.45 281.77	ar](261)](263)](264)](265)](267)](268)](269)		
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa Electricity for lighting Energy saving/generat Item 1 Total CO2, kg/year	ystem 1) lary) ans and el ion techno	<mark>ec</mark> tric kee ologies	p-hot	En kW (211 (215 (215 (215 (237 (237	ergy /h/year 1) x 5) x 2) x 1) + (262) 2) x	+ (263) + (264) = sum o	Emiss kg CO 0.5 0.5 0.5 0.5 f (265)(2	ion fac 2/kWh 19 19 19 19 19 19 19 19 19 271) =	tor = = = =	Emissions kg CO2/yea 711.14 0 409.87 1121 273.45 281.77 -378.91 1297.31	ar] (261)] (263)] (264)] (265)] (267)] (268)] (269)] (272)		
Space heating (main sy Space heating (second Water heating Space and water heating Electricity for pumps, fa Electricity for lighting Energy saving/generat Item 1 Total CO2, kg/year Dwelling CO2 Emissio	ystem 1) lary) ans and el ion technc on Rate	<mark>ec</mark> tric kee ologies	p-hot	En kW (211 (215 (215 (215 (232	ergy /h/year 1) x 5) x 2) x 1) + (262) 1) x 2) x	+ (263) + (264) = sum o (272) -	Emiss kg CO 0.5 0.5 0.5 0.5 f (265)(2 ÷ (4) =	ion fac 2/kWh 19 19 19 19 19 19 19 19 19 271) =	tor = = = =	Emissions kg CO2/yea 711.14 0 409.87 1121 273.45 281.77 -378.91 1297.31 7.86	ar] (261)] (263)] (264)] (265)] (267)] (268)] (269)] (272)] (273)		

				User D	etails:								
Assessor Name: Software Name:	Stroma FS	AP 201	2		Strom Softwa	a Num are Vei	ber: rsion:		Versic	on: 1.0.5.49			
	Ham Close	London	TW/10	roperty.	Address	BIOCK L	Ena - I	611					
Address :		London	, 10010										
				Area	a(m²)		Av Hei	aht(m)		Volume(m ³)			
Ground floor				5	50.66	(1a) x	2	.6	(2a) =	131.72	(3a)		
First floor				5	7 24	(1b) x	2	9	(2b) =	166	 ∏(3b)		
Second floor					7 24	(1c) x		3	(2c) =	188.89](3c)		
Total floor area TFA = (1	a)+(1b)+(1c)+(′1d)+(1e)+(1r		65 14	(4)](=0)	100.00			
Dwelling volume	a) · (· b) · (· b) · ((10) (10))(00.14	(3a)+(3b)+(3c)+(3d)	+(3e)+	.(3n) =	496.6			
2. Ventilation rate: main secondary other total n													
2. Ventilation rate: main secondary other total heating heating Number of chimneys 40 =													
Number of chimneys	0	(6a)											
Number of open flues	0		0	」 <u>「</u>] + 「	0	」 L] = [0	x	20 =	0	(6b)		
Number of intermittent fa	ins					л Г Г	0	x ·	10 =	0	(7a)		
Number of passive vents							0	× '	10 =	0	(7b)		
Number of flueless gas fi	ires						0	X 4	40 =	0](7c)		
						_			Air ch	hanges per ho	ur ¬		
Infiltration due to chimne	ys, flues and fa	ans = (68 ; is intende	a)+(6b)+(7	a)+(7b)+(7c) = otherwise (continue fr	0	16)	÷ (5) =	0	(8)		
Number of storevs in t	he dwellina (na	s)	a, procee	10 (11), (011 (0) 10 (1	.0)		0	(9)		
Additional infiltration	5,0	/						[(9)	-1]x0.1 =	0	(10)		
Structural infiltration: 0	.25 for steel or	timber f	rame or	0.35 fo	r masoni	y constr	ruction			0	(11)		
if both types of wall are p	resent, use the va	lue corres	oonding to	the great	er wall are	a (after							
If suspended wooden t	floor, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)		
If no draught lobby, en	ter 0.05, else e	enter 0								0	(13)		
Percentage of window	s and doors dr	aught sti	ripped							0	(14)		
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)		
Infiltration rate					(8) + (10)	+ (11) + (1	12) + (13) +	(15) =		0	(16)		
Air permeability value,	q50, expresse	d in cub	ic metre	s per ho	our per s	quare m	etre of er	nvelope	area	4	(17)		
If based on air permeabil	lity value, then	(18) = [(17	7) ÷ 20]+(8	3), otherw	ise (18) = (16)				0.2	(18)		
Air permeability value applie	es if a pressurisation	on test has	been don	e or a deg	gree air pe	rmeability	is being us	ed			_		
Number of sides sheltere	ed				(00) 4	0.075 (4				2	(19)		
	de la chestra de la	1			(20) = 1 -	[U.U75 X (1	[9]] =			0.85	(20)		
Initiation rate incorporat	ung sneiter fac				(21) = (18) x (20) =				0.17	(21)		
		May	lun		Δυσ	Son		Nov	Dec	1			
Monthly average wind an	wai Api		Jun	Jui	I Aug	l oeh		INUV	Dec]			
$(22)m = \begin{bmatrix} 5 \\ 5 \end{bmatrix} \begin{bmatrix} 5 \\ 5 \end{bmatrix}$			2.8	2.8	37	А	43	4.5	A 7	1			
		-1.0	5.0	0.0	J		7.5	-1.0	l	J			

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	e (allow	ing for sl	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2		
Calcula	ate effe	ctive air	change	rate for t	he appli	cable ca	ise							
II ME	echanica			ondiv N (2	(26) - (22)		oquation (N5)) otho	nuico (22k	(220)			0.5	(23a
If bala	aust all fi			$\frac{1}{2}$.50) – (258	ior in-use f	equation (n Table 4h) –) – (23a)			0.5	(230
a) If					with ho	of room			$(2)^{-1}$	2h)m i (22h) v [1 (220)	· 1001) (230
a) II (24a)m-									$\frac{1}{10.29}$	20)m + (0 3	230) × [1 - (230)	÷ 100]	(24a
(24a)III-						hoot rov	0.20		$\frac{0.23}{2}$	0.5 2b)m / (226)	0.52		(2-14
D) II								VIV) (240 0	D = (2)	20)m + (0	230)	0		(24h
(240)III-							Ventileti	n from (0	0	0		(210
c) ii	if (22b)r	n < 0.5	(23b)	then (24)	c) = (23t)). other	ventilatio wise (24	(22)	(1) m + 0	5 x (23t	b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c
d) If	natural	I ventilatio	I on or wh	L Iole hous	L se positiv	I ve input	I ventilati	n from	L loft	I	I			
i a	if (22b)r	n = 1, th	en (24d)	m = (22)	b)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effe	<mark>ctiv</mark> e air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	ld) in bo	x (25)					
(25)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32		(25)
3 He	at losse	s and he	eat loss i	paramet	er.								_	
		Gros	SS	Openin	as	Net Ar	ea	U-val	ue	AXU		k-value	<u>,</u>	AXk
		area	(m²)	r	η ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²-l	<	kJ/K
Doo <mark>rs</mark>						3.08	x	1	=	3.08				(26)
Windov	ws Type	e 1				12.59	⊋ x1	/[1/(1.2)+	0.04] =	14.42				(27)
Window	ws Type	e 2				16.57	7 x1	/[1/(1.2)+	0.04] =	18.97				(27)
Floor T	ype 1					50.66	6 x	0.1	=	5.066		75	3	799.5 (28)
Floor T	ype 2					6.59	x	0.1	=	0.659	- i	20		31.8 (28)
Walls		86.8	36	32.2	4	54.62	2 X	0.16	=	8.74	= i	60	 3	277.2 (29)
Roof		57.2	25	0		57.25	5 X	0.1	=	5.73	= 1	9		15.25 (30)
Total a	rea of e	elements	s, m²			201.3	6					-		(31)
Partv v	vall		,			81.86	<u> </u>	0		0		110		004 6 (32)
Interna	al wall **	r				304.0								744.1 (320
Interna	al floor					104.4					l	10		380 64 (324
Interna	al ceiling	1										104.40		
* for win	dows and) I roof wind	lows use 4	effective w	indow I I-ve		o lated usini	n formula 1	/[(1/ -vəli	ue)+0 ∩41 ≤	as aiven ir	104.48	1^{10}	310.07 (320
	aono anu		- <i>uoc</i> c					, on a land	, I I I O Val	, , , , , , , , , , , , , , , , , , ,	so given ll	, paragraph	0.2	

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

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	56.66	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	32269.16	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	= (34) ÷ (4) =	195.4	(35)

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

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	əs : S (L	x Y) cal	culated u	using Ap	pendix l	<						20.7	(36)
if details	of therma	al bridging	are not kri	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			77.36	(37)
Ventila	tion hea	at loss ca	alculated	I monthly	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	54.36	53.67	52.99	49.58	48.9	45.48	45.48	44.8	46.85	48.9	50.26	51.63		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	131.72	131.04	130.35	126.94	126.26	122.85	122.85	122.16	124.21	126.26	127.62	128.99		
										Average =	Sum(39)1.	12 /12=	126.77	(39)
Heat lo	oss para	imeter (F	HLP), W/	m²K		r			(40)m	= (39)m ÷	(4)		1	
(40)m=	0.8	0.79	0.79	0.77	0.76	0.74	0.74	0.74	0.75	0.76	0.77	0.78		- 1
Numbe	er of day	/s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	0.77	(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)
													1	
4 Wa	ater hea	tina ener	rav reau	rement.								kWh/ve	ear:	
			gy loqu											
Assum		ipancy,	N	14	(0 0000	40 (тг	- 40.0		040/		2.	96		(42)
if TF	A > 13. A f 13.	9, $N = 1$ 9, $N = 1$	+ 1.76 x	[1 - exp	(-0.0003	549 X (11	-A -13.9)2)] + 0.0	JU13 X (IFA -13.	9)			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		104	4.41		(43)
Reduce	the annua	al average	hot water	usage by :	5% if the c	welling is	designed t	to achieve	a water us	se target o	f			
not more	e that 125	litres per j	berson pel	day (all w	ater use, i	not and co								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from	able 1c x	(43)						
(44)m=	114.85	110.67	106.49	102.32	98.14	93.96	93.96	98.14	102.32	106.49	110.67	114.85		
Enorm	contont of	botwator	upod ool	ouloted m	onthly _ 1	100 v Vd r	n v nm v F	Tm / 2600	kW/b/mor	Total = Su	m(44) ₁₁₂ =	= 0.1d)	1252.86	(44)
Energy					$\int dx = 4.$								1	
(45)m=	170.31	148.96	153.71	134.01	128.58	110.96	102.82	117.99	119.4	139.14	151.89	164.94		
lf instan	taneous v	ater heati	na at point	of use (no	o hot water	^r storaae).	enter 0 in	boxes (46) to (61)	l otal = Su	m(45) ₁₁₂ =	-	1642.7	(45)
(46)m -	25 55	22.34	23.06	20.1	10.20	16.64	15 / 2	177	17.01	20.87	22.78	24 74	1	(46)
Water	storage	loss:	25.00	20.1	19.29	10.04	13.42	17.7	17.51	20.07	22.70	24.74		(40)
Storag	e volum	e (litres)	includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If com	munity h	eating a	ind no ta	nk in dw	velling, e	nter 110	litres in	(47)					1	
Otherv	vise if no	stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:												
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1	.6		(48)
Tempe	erature f	actor fro	m Table	2b							0.	54		(49)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		0.	86		(50)
b) If m	nanufact	urer's de	eclared of	ylinder l	oss fact	or is not	known:						1	
Hot wa	ater stor	age loss	tactor fr	om Tabl	e 2 (kW	n/litre/da	iy)					0		(51)
Volum	numity f	from Ta	ee seull ble 2a	011 4.3								0	1	(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
											Ľ	-	1	()

Energy Enter	/ lost fro (50) or	om water (54) in (5	• storage 55)	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0.	0 86		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylinde	er contain	s dedicate	l d solar sto	rage, (57)	n = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	1 7)m = (56)	m where (H11) is fro	m Append	l lix H	
(57)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(moo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m					_	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)	m
(62)m=	220.36	194.16	203.76	182.44	178.63	159.39	152.87	168.03	167.83	189.19	200.32	214.99		(62)
Solar DH	-IW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (<u>3)</u>					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter				-							
(64)m=	220.36	194.16	203.76	182.44	178.63	159.39	152.87	168.03	167.83	189.19	200.32	214.99		
								Outp	out from wa	ater heate	r <mark>(annual)</mark> ₁	12	2231.96	(64)
Hea <mark>t g</mark>	ains fro	m water	heating	kWh/m	onth 0.2	5 [′] [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	96.67	85.69	91.15	83.3	82.79	75.64	74.22	79.27	78.44	86.3	89.25	94.88		(65)
in <mark>clu</mark>	<mark>ide</mark> (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table {	5 and 5a):									
Metab	olic gair	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	30.74	27.3	22.21	16.81	12.57	10.61	11.46	14.9	20	25.39	29.64	31.6		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	336.56	340.05	331.25	312.52	288.86	266.64	251.79	248.29	257.09	275.83	299.48	321.71		(68)
Cookir	ng gains	(calcula	Ited in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5	•			
(69)m=	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78	37.78		(69)
Pumps	s and fa	ns gains	(Table	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	, aporatic	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-118.24	-118.24	-118.24	-118.24	-118.24	, -118.24	-118.24	-118.24	-118.24	-118.24	-118.24	-118.24		(71)
Water	heating	gains (T	able 5)											
(72)m=	129.93	127.52	122.51	115.7	111.28	105.05	99.76	106.54	108.95	116	123.96	127.53		(72)
Total i	internal	gains =	:	I	I	(66)	um + (67)m	u + (68)m +	⊷ + (69)m + ((70)m + (7	ı 1)m + (72)	m	I	
(73)m=	564.57	562.21	543.3	512.37	480.05	449.64	430.35	437.08	453.39	484.56	520.42	548.17		(73)
6. So	lar gains	S:	1	1							1			

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

Orienta	ition:	Access F Table 6d	actor		Area m²			Flu Tal	x ole 6a		Т	g_ able 6b		FF Table 6c			Gains (W)	
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x	1	1.28	x		0.45	×	0.7		=	31.01	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x	2	2.97	×		0.45	×	0.7		=	63.12	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x	4	1.38] ×		0.45	× ٦	0.7		=	113.72	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x	6	7.96	j ×		0.45	- ×	0.7		=	186.77	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x	9	1.35] ×		0.45	×	0.7		=	251.05	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x	9	7.38] ×		0.45	×	0.7		=	267.65	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x		91.1	x		0.45	×	0.7		=	250.38	(75)
Northea	st <mark>0.9</mark> x	0.77		x	12.	59	x	7	2.63] ×		0.45	×	0.7		=	199.6	(75)
Northea	st <mark>0.9</mark> x	0.77		x	12.	59	x	5	0.42	Ī×		0.45	×	0.7		=	138.57	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x	2	8.07	x		0.45	×	0.7		=	77.14	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x		14.2	_ x		0.45	×	0.7		=	39.02	(75)
Northea	st <mark>0.9x</mark>	0.77		x	12.	59	x		9.21] ×		0.45	×	0.7		=	25.32	(75)
Southwe	est <mark>0.9</mark> x	0.77		x	16.	57	x	3	6.79	Ī		0.45	×	0.7		=	133.09	(79)
Southwe	est <mark>0.9x</mark>	0.77		x	16.	57	x	6	2.67	Ī		0.45	×	0.7		=	226.7	(79)
Southwe	est <mark>0.9</mark> x	0.77		x	16.	57	x	8	5.75	Ī		0.45	×	0.7		=	310.18	(79)
Southwe	esto.9x	0.77		x	16.	57	x	10	06.25	1		0.45	x	0.7		=	384.33	(79)
Southwe	est <mark>0.9</mark> x	0.77		x	16.	57	х	1	19.01	1		0.45	x	0.7		- 1	430.48	(79)
Southwe	est <mark>0.9x</mark>	0.77		x	16.	57	х	1	18.15	i /		0.45	x	0.7		=	427.37	(79)
Southwe	est <mark>0.9x</mark>	0.77		x	16.	57	x	1	13.91]/		0.45	x	0.7		=	412.03	(79)
Southwe	est <mark>0.9x</mark>	0.77		x	16.	57	x	10	04.39]		0.45	x	0.7		=	377.6	(79)
Southwe	est <mark>0.9x</mark>	0.77		x	16.	57	x	9	2.85			0.45	x	0.7		=	335.86	(79)
Southwe	est _{0.9x}	0.77		x	16.	57	x	6	9.27]		0.45	x	0.7		=	250.55	(79)
Southwe	est <mark>0.9</mark> x	0.77		x	16.	57	x	4	4.07]		0.45	x	0.7		=	159.41	(79)
Southwe	est <mark>0.9</mark> x	0.77		x	16.	57	x	3	31.49]		0.45	x	0.7		=	113.9	(79)
Solar g	ains ir	n watts, ca	alcula	ted	for eac	n mont	<u>h</u>			(83)r	n = S	um(74)m .	(82)m					
(83)m=	164.1	289.82	423.	9	571.09	681.53	6	95.01	662.4	57	7.2	474.43	327.6	9 198.43	139	.22		(83)
l otal g	ains –	internal a	nd sc	lar	(84)m =	= (73)m	+ (83)m	, watts	1								(2.1)
(84)m=	728.67	852.03	967.2	21	1083.46	1161.58	8 1	144.65	1092.76	101	4.28	927.82	812.2	5 718.84	687	.39		(84)
7. Me	an inte	ernal temp	eratu	re ((heating	seaso	n)											_
Temp	eratur	e during h	eating	g pe	eriods ir	the liv	ving	area	from Tal	ble 9), Th	1 (°C)					21	(85)
Utilisa	tion fa	ctor for ga	ains f	or li	ving are	ea, h1,r	n (s	see Ta	ble 9a)	-				-1	-			
	Jan	Feb	Ma	ar	Apr	Мау	′	Jun	Jul		ug	Sep	Oct	t Nov	D	ес		(00)
(86)m=	1	1	0.99)	0.96	0.86		0.66	0.49	0.	55	0.82	0.97	1	1			(86)
Mean	intern	al tempera	ature	in l	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in ⁻	Table	e 9c)						
(87)m=	20.13	20.25	20.4	3	20.67	20.85		20.94	20.95	20	.95	20.9	20.66	20.35	20.	12		(87)
Temp	eratur	e during h	eating	g pe	eriods ir	n rest o	f dv	velling	from Ta	able	9, Tł	n2 (°C)			-			
(88)m=	20.26	20.26	20.2	6	20.28	20.28		20.3	20.3	20	.31	20.29	20.28	3 20.28	20.3	27		(88)
Utilisa	tion fa	ctor for ga	ains f	or r	est of d	welling	, h2	,m (se	e Table	9a)								
(89)m=	1	1	0.99	,	0.94	0.82		0.6	0.41	0.	47	0.76	0.97	1	1			(89)

Mean	interna	l temper	ature in	the rest	of dwelli	ing T2 (fo	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	19.06	19.23	19.5	19.86	20.11	20.22	20.23	20.24	20.18	19.85	19.41	19.06		(90)
			•	•					f	LA = Livin	g area ÷ (4	4) =	0.19	(91)
Moon	intorno	Itompor	oturo (fo	r tho wh		lling) – fl	Δ	. (1 fl	A) v T2			ļ		
(92)m-	10 26	10 42	19 67	20.01	20 25	1111(y) = 11	_A X I I	+(1-1)	A) X 12	20	19.59	19.26		(92)
		oont to t	he mear			ature fro	m Table	20.07			10.00	15.20		(02)
(93)m-	19.26	19.42	19.67	20.01	20.25	20.35	20.37	20.37	20 31	20	19 59	19.26		(93)
8 Sn	ace hea	ting reg	uirement	20.01	20.20	20.00	20.01	20.07	20.01	20	10.00	10.20		()
Sot T	i to the i	moon int	ornal to	mperatu	re obtain	od at st	on 11 of	Table 0	h so tha	t Ti m_(76)m an	d re-calc	ulato	
the ut	ilisation	factor fo	or gains	using Ta	able 9a		50 11 01		0, 30 tha	(II,III–(r ojin an	u ie-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1 <u>.</u> 1:										
(94)m=	1	0.99	0.98	0.94	0.82	0.6	0.42	0.47	0.76	0.96	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (9	4)m x (8-	4)m									
(95)m=	726.8	846.61	949.69	1016.29	950.54	690.31	461	481.54	709.21	780.69	714.54	686.11		(95)
Montl	nly aver	age exte	rnal tem	perature	e from Ta	able 8		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 rate	e for me	an interr	al temp	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1970.26	1902.86	1717.31	1410.63	1078.94	706.93	462.74	484.83	771.34	1187.24	1593.56	1942.29		(97)
Spac	e h <mark>eatin</mark>	g require	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	•		
(98)m=	9 <mark>2</mark> 5.13	709.8	57 <mark>1.11</mark>	283.92	95.53	0	0	0	0	30 <mark>2.48</mark>	632.9	<mark>93</mark> 4.59		
								Tota	l per year	(kWh/yea) = Sum(9	8)15,912 =	4455.47	(98)
Space	e heatin	a require	ement in	kWh/m ²	²/vear								26.98	(99)
			ata Ind	ividual b		voto mo i	adudina	mioro (
Seco	ergy rec	ullemen	its – inu	ividual fi	eatings	ystemis i	nciuaing	f micro-c						
Fracti	on of sc	ig. bace hea	at from s	econdar	v/supple	mentarv	svstem						0	(201)
Fracti	on of sr	aco hos	at from n	nain evet	om(s)	,	-,	(202) = 1	- (201) =				1	
Fracti				12111 3y31				(204) - (2)	02) ~ [1	(202)1 -				
Fract			ng irom	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								341.97	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g requir	ement (c	alculate	d above))		-						
	925.13	709.8	571.11	283.92	95.53	0	0	0	0	302.48	632.9	934.59		
(211)m	n = {[(98)m x (20)4)]}x1	00 ÷ (20)6)									(211)
()	270.53	207.56	167	83.03	27.93	0	0	0	0	88.45	185.07	273.29		. ,
			1		1	1		I Tota	l I (kWh/yea	ar) =Sum(2	1 211) _{15.1012}	,=	1302.87	(211)
Snac	e heatin	a fuel (s	econdar	v kWh	month									
= {[(98)m x (20)1)]}x1	$00 \div (20)$)), (((())))8)	monar									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
			1		1	1		I Tota	l II (kWh/yea	ar) =Sum(2	1 215) _{15.1012}	,=	0	(215)
Wator	heating	1											-	
Output	from w	, ater hea	ter (calc	ulated a	bove)									
	220.36	194.16	203.76	182.44	178.63	159.39	152.87	168.03	167.83	189.19	200.32	214.99		
Efficie	ncy of w	ater hea	iter	-	-								282.62	(216)

(217)m= 282.62 282.62 282.6	2 282.62	282.62	282.62	282.62	282.62	282.62	282.62	282.62	282.62		(217)
Fuel for water heating, kWh/	month										
$(219)m = (64)m \times 100 \div (27)$ (219)m = 77.97 68.7 72.0	7)m 9 64.55	63.2	56.4	54.09	59.45	59.38	66.94	70.88	76.07		
					Tota	l = Sum(2)	19a) ₁₁₂ =			789.72	(219)
Annual totals							k	Wh/year	•	kWh/year	```````````````````````````````````
Space heating fuel used, ma	in system	1						-		1302.87	
Water heating fuel used										789.72]
Electricity for pumps, fans a	nd electric	keep-ho	t								_
mechanical ventilation - ba	anced, ext	ract or p	ositive i	nput fror	n outside	е			526.87		(230a)
Total electricity for the above	e, kWh/yea	ır			sum	of (230a).	(230g) =			526.87	(231)
Electricity for lighting										542.91	(232)
Electricity generated by PVs										-730.07	(233)
Total delivered energy for al	uses (211)(221)	+ (231)	+ (232).	(237b)	=				2432.3	(338)
12a. CO2 emissions – Indiv	ridual heat	ing syste	ems inclu	uding mi	cro-CHF	þ					
			En	erav			Emiss	ion fac	tor	Emissions	
			k٧	/h/year			kg CO	2/kWh		kg CO2/yea	ar
Space heating (main system	1)		(21	1) x			0.5	19	-	6 <mark>76.19</mark>	(261)
Space heating (secondary)			(21	5) x			0.5	19	=	0	(263)
Water heating			(21	9) x			0.5	19	=	409.87	(264)
Space and water heating			(26	1) + (262)	+ (263) + ((264) =				1086.06	_ (265)
Electricity for pumps, fans an	nd <mark>elec</mark> tric	keep-ho	t (23 ⁻	1) x			0.5	19	=	273.45	_](267)
Electricity for lighting			(23	2) x			0.5	19	=	281.77](268)
Energy saving/generation te	chnologies	5									_
Item 1	-						0.5	19	=	-378.91	(269)
Total CO2, kg/year						sum o	f (265)(271) =		1262.36	(272)
Dwelling CO2 Emission Ra	te					(272)	÷ (4) =			7.64	(273)

EI rating (section 14)

(274)

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				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012	2		Stroma Softwa	a Num are Ver	ber: sion:		Versic	on: 1.0.5.49	
			Р	roperty ,	Address:	Block H	I - End -	HT 4			
Address :	Ham Close,	London,	TW10								
1. Overall dwelling dime	ensions:										
				Area	a(m²)		Av. Hei	ght(m)	٦	Volume(m ³	·)
Ground floor				5	2.62	(1a) x	2.	.8	(2a) =	147.34	(3a)
First floor					62	(1b) x	:	3	(2b) =	186	(3b)
Second floor					62	(1c) x	;	3	(2c) =	186	(3c)
Third floor				4	4.77	(1d) x	3.	69	(2d) =	165.2	(3d)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)	+(1r	1) 22	21.39	(4)			_		
Dwelling volume						(3a)+(3b))+(3c)+(3d)	+(3e)+	(3n) =	684.54	(5)
2. Ventilation rate:					_		_				
	main heating	se he	condar eating	у	other		total			m ³ per hou	r
Number of chimneys	0	+	0	+	0] = [0	×	40 =	0	(6a)
Number of open flues	0	+	0] + [0] = [0	x	20 =	0	(6b)
Number of intermittent fa	ans						0	x	10 =	0	(7a)
Number of passive vents	6					Ē	0	X	10 =	0	(7b)
Number of flueless gas f	ïres					Ē	0	×	40 =	0	(7c)
									Air ch	hanges per ho	our
Infiltration due to chimne	eys, flues and fa	ans = <mark>(6</mark> a))+(6b)+(7	a)+(7b)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has b	been carried out of	is intended	l, procee	d to (17), d	otherwise c	continue fro	om (9) to (*	16)			–
Number of storeys in t	ne dwelling (ne	5)						[(0)	11-0 1	0	(9)
Structural infiltration: 0) 25 for steel o	timber fr	ame or	0.35 fo	r masonr	v constr	uction	[(9)	-1]XU.1 =	0	(10)
if both types of wall are p	present, use the va	lue corresp	onding to	the great	er wall area	a (after	Gotton			0	(11)
deducting areas of openi	ings); if equal user floor, optor 0,2	0.35 (upooolo	d) or 0	1 (00010	d) alaa	ontor O					
If no draught lobby en	1001, effet 0.2	(unseale	u) 01 0.	i (Seale	u), eise					0	(12)
Percentage of window	iter 0.00, eise o	aught stri	nned							0	(13)
Window infiltration	3 414 40013 41	augint stil	ppcu		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, expresse	d in cubi	c metre	s per ho	our per so	quare m	etre of ei	nvelope	area	4	(17)
If based on air permeabi	lity value, then	(18) = [(17) ÷ 20]+(8	3), otherwi	ise (18) = (16)		·		0.2	(18)
Air permeability value applie	es if a pressurisation	on test has	been don	e or a deg	gree air per	rmeability	is being us	ed			
Number of sides sheltere	ed				(00)	0.075 (4	0.1			2	(19)
Shelter factor	1 I . I	1			(20) = 1 - [U.U75 X (1	9)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor			(21) = (18)	x (20) =				0.17	(21)
Infiltration rate modified	tor monthly wir	id speed				-		• •		1	
Jan Feb	war Apr	May	Jun	Jul	Aug	Sep	Oct	NOV	Dec		

Month	ly avera	ge wind	speed f	rom Tabl	e 7										
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]		
Wind F	- actor (2	22a)m =	(22)m ÷	4				-			-	-	-		
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjust	ed infiltr	ation rat	e (allow	ing for sł	nelter an	d wind s	speed) =	: (21a) x	(22a)m		i				
Calcul	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2			
lf me	ace ene	al ventila	ation:		ne appli	Lable La	36							0.5	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (I	N5)) , othe	rwise (23	b) = (23a)				0.5	(23b)
If bala	anced wit	h heat reco	overy: effic	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				· ·	75.65	(23c)
a) If	balance	ed mech	anical ve	entilation	with hea	at recov	ery (MV	HR) (24a	a)m = (2	22b)m + (23b) × [1 – (23c)	÷ 100)]	
(24a)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32]		(24a)
b) If	balance	ed mech	anical ve	entilation	without	heat red	covery (I	MV) (24t	o)m = (2	2b)m + (23b)		_		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	nouse ex	tract ver	ntilation of	or positiv	e input	ventilatio	on from o	outside	_ /					
	if (22b)r	n < 0.5 >	< (23b), 1 I	then (24)	c) = (23b); other	wise (24	c) = (22	o) m + C).5 × (23k) 		1		(0.4.)
(24c)m=					0	0			0	0	0	0			(240)
d) If	natural if (22b)r	ventilation $n = 1$, th	on or wh en (24d)	tole hous $m = (22)$	se positiv	rwise (2	ventilatio 24d)m =	on from 1 0.5 + [(2	oft 2b)m² x	(0.5]					
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24d)
Effe	ctive air	change	rate - ei	nter (24a) or (24b) or (24	c) or (24	ld) in bo	x (25)				1		
(25)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32			(25)
3 He	atiosse	es and he	at loss	naramet	ər:			•				•			
FLEN		Gros	SS	Openin	as	Net Ar	ea	U-val	ue	AXU		k-value	e	А	Xk
		area	(m²)	'n	0 1 ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙	K	kJ	/K
Doors						2.31	X	1	=	2.31					(26)
Windo	ws Type	e 1				15.36	3 x1	/[1/(1.2)+	0.04] =	17.59					(27)
Windo	ws Type	e 2				23.25	5 x1	/[1/(1.2)+	0.04] =	26.62					(27)
Floor 7	Гуре 1					52.62	<u>2</u> X	0.1	=	5.262		75		3946.5	5 (28)
Floor 7	Гуре 2					9.38	x	0.1	=	0.938		20		187.6	(28)
Walls		275.	36	40.9	2	234.4	4 ×	0.16	=	37.51		60		14066.	4 (29)
Roof ⁻	Type1	44.7	77	0		44.77	7 X	0.1	=	4.48		9		402.93	3 (30)
Roof ⁻	Туре2	17.2	23	0		17.23	3 X	0.1	=	1.72		9		155.0	7 (30)
Total a	area of e	elements	s, m²			399.3	6								(31)
Party v	wall					114.9	6 ×	0	=	0		110		12645.	6 (32)
Interna	al wall *	ŧ				501			_		[9		4509	(32c)
Interna	al floor					168.7	7				Ī	18		3037.8	6 (32d)
Interna	al ceiling	9				168.7	7				Ì	104.48		17633.()9 <mark>(32e)</mark>
* for win	dows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	n formula 1	/[(1/U-val	lue)+0.041 a	as aiven in	paragraph	1 3.2		

e) ıg /[(зg

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

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

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

(33) 96.43

Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	56584.05	(34)
Therm	al mass	parame	ter (TMI	- = Cm -	÷ TFA) ir	n kJ/m²K			= (34)	÷ (4) =			255.59	(35)
For des can be t	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	e construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	ĸ						26.11	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			122.54	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	у				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec]	
(38)m=	76.47	75.51	74.55	69.75	68.79	63.99	63.99	63.03	65.91	68.79	70.71	72.63		(38)
									(20)	(27) . (1	
Heat t	ransfer o		nt, vv/k						(39)m	= (37) + (38)m		1	
(39)m=	199.01	198.05	197.09	192.29	191.33	186.53	186.53	185.57	188.45	191.33	193.25	195.17		
Hootk	acc para	motor (k	/// (D IL	/m2k					(40)m	Average = $(20)m^{-1}$	Sum(39)	12 /12=	192.05	(39)
(40)			[], v		0.00	0.04	0.04	0.04	(40)	= (39)11 ÷	. (4)	0.00	1	
(40)m=	0.9	0.89	0.89	0.87	0.00	0.84	0.84	0.84	0.85	0.00	0.87	0.00	0.07	
Numb	er of day	vs in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1	12 /12=	0.87	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
													·	
4. Wa	ater heat	ting ener	rgy <mark>requ</mark>	irem <mark>ent</mark> :								kWh/y	ear:	
Assum if TF if TF Annua	ned occu A > 13.9 A £ 13.9 I averag	ipancy, 1 9, N = 1 9, N = 1 9, N = 1	N + 1.76 x ater usa	: [1 - exp ge in litre	(-0.0003 es per da	849 x (TF ay Vd,av	=A -13.9) erage =)2)] + 0.((25 x N))013 x (⁻ + 36	TFA -13.	3. 9)	03 6.16]	(42)
Reduce not mor	the annua e that 125	al average litres per	hot water person pe	usage by r day (all w	5% if the c /ater use, l	lwelling is hot and co	designed t ld)	to achieve	a water us	se target o	f			
	Jan	Feb	Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec]	
Hot wat	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					J	
(44)m=	116 77	112 53	108.28	104 03	99 79	95 54	95 54	99 79	104 03	108.28	112 53	116 77	1	
(,										Total - Su	m(44),		1273.87	(44)
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x D) 7 Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)	1210.01	
(45)m=	173.17	151.45	156.29	136.26	130.74	112.82	104.54	119.97	121.4	141.48	154.43	167.71	1	
(-)						_			· ·	Total = Su	m(45)1_12 =		1670.25	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)				1010.20	
(46)m=	25.98	22.72	23.44	20.44	19.61	16.92	15.68	17.99	18.21	21.22	23.17	25.16]	(46)
Water	storage	loss:	1	I	I	1		1			1	1	J	
Storag	je volum	e (litres)	includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		180]	(47)
If com	munity h	eating a	ind no ta	ank in dw	velling, e	nter 110) litres in	(47)					-	
Otherv	vise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:												
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1	.6]	(48)
Tempe	erature f	actor fro	m Table	2b							0.	54]	(49)
Energy	y lost fro	m water	· storage	e, kWh/ye	ear			(48) x (49)) =		0.	86	i	(50)
b) If m	nanufact	urer's de	eclared	cylinder	loss fact	or is not	known:				L		1	

Hot wa	ater stor	age loss	factor fr	om Tabl	le 2 (kW	h/litre/da	ıy)					0		(51)
If com	munity h	heating s	ee secti	on 4.3									I	
Volum	e factor	from Ta	ble 2a m Toblo	2h								0		(52)
-		actor ITO	m rable	20								0		(53)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	5)								0.	86		(55)
Water	storage	loss cal	culated	for each	month	-	-	((56)m = (55) × (41)ı	m	-	-		
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylinde	er contain	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 Append	ix H	
(57)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Primar	v circuit	loss (ar	nual) fro	om Table				•				0		(58)
Primar	v circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m			-	ļ	
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heati	ng and a	cylinde	r thermo	stat)			
、 (59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	, 22.51	23.26		(59)
Combi		laulated	for each	month ((61)m –	(60) · 30	55 v (11))m			1			
(61)m-						$(00) \div 30$			0	0	0	0		(61)
(01)III-											(10)	(53)	(50)	(01)
i otal r	leat req	uired for	water h	eating ca	alculated	for eac	n montn	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61 _.)m
(62)m=	223.22	196.66	206.33	184.69	180.79	161.25	154.59	170.01	169.83	191.52	202.87	217.75		(62)
Solar DI	HW input	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	ddi <mark>tiona</mark>	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (5)	_				
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	fr <mark>o</mark> m w	ater he <mark>a</mark>	ter											
(64)m=	223.22	196.66	20 <mark>6.33</mark>	184.69	180.79	161.25	154.59	170.01	169.83	191.52	202.87	217.75		
								Outp	out from wa	ater heate	r (annual)₁	12	22 <mark>59.51</mark>	(64)
Hea <mark>t g</mark>	ains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)m	n] + 0.8 ×	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	97.62	86.52	92	84.05	83.51	76.26	74.8	79.93	79.11	87.08	90.09	95.8		(65)
inclu	ude (57)	n in calo	culation	of (65)m	only if c	vlinder i	s in the o	dwellina	or hot w	ater is fr	om com	munitv h	eating	
5 Int		aine (soc	Table 5	Sand 5a).	,							g	
5. III	ennar ga			anu ba)-									
Metab	olic gain	is (Table	5), Wat	ts A m r	Max	lun	11	A	Car	Oct	Next	Dee		
(00)	Jan	Feb	iviar	Apr	May	Jun	Jui	Aug	Sep	Oct	INOV	Dec		(66)
(66)m=	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49		(00)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				1	
(67)m=	35.78	31.78	25.85	19.57	14.63	12.35	13.34	17.35	23.28	29.56	34.5	36.78		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-	-		
(68)m=	390.95	395	384.78	363.02	335.54	309.72	292.47	288.42	298.64	320.4	347.88	373.7		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)), also se	e Table	5				
(69)m=	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15		(69)
Pumps	and fai	ns gains	(Table 5	5a)									I	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	se.a.ev	aporatio	n (nega	tive valu	es) (Tah	le 5)	1	1			1		I	
(71)m=	-121,19	-121.19	-121.19	-121.19	-121.19	-121.19	-121.19	-121.19	-121.19	-121.19	-121.19	-121.19		(71)
Wator	heating		able 5)										l	× /
(72)m	124.0	yanıs (1	102.00	116 74	112.04	105.04	100 50	107 40	100.00	117.04	105 40	100 70		(72)
(12)11=	131.2	120.75	123.00	110.74	112.24	105.91	100.53	107.43	109.00	117.04	120.13	120.70	l	(14)

Total i	(66)	m + (67)n	n + (68	B)m +	(69)m + (70)m +	(71)m + (72))m								
(73)m=	626.38	623.98	602.73	567.77	530.86	49	96.43	474.8	481	.64	500.24	535.4	5 575.96	607.68		(73)
6. Sol	ar gains	3:														
Solar g	ains are o	calculated	using sola	ar flux from	Table 6a	and	assoc	iated equa	ations	to cor	nvert to th	e applic	able orientat	tion.		
Orienta	ation: A	Access F Fable 6d	actor	Area m²	l		Flu Tal	x ole 6a		Та	g_ able 6b		FF Table 6c		Gains (W)	
Northea	ast 0.9x	0.77	x	23	.25	x	1	1.28	x		0.45	x	0.7	=	57.26	(75)
Northea	ast 0.9x	0.77	x	23	.25	x	2	2.97	x		0.45	×	0.7	=	116.56	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	23	.25	x	4	1.38	x		0.45	x	0.7	=	210.01	(75)
Northea	ast 0.9x	0.77	x	23	.25	x	6	57.96	x		0.45	×	0.7	=	344.9	(75)
Northea	ast 0.9x	0.77	x	23	.25	x	g	1.35	x		0.45	×	0.7	=	463.61	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	23	.25	x	g	7.38	x		0.45	x	0.7	=	494.26	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	23	.25	x	ļ	91.1	x		0.45	x	0.7	=	462.37	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	23	.25	x	7	2.63	x		0.45	×	0.7	=	368.61	(75)
Northea	ast 0.9x	0.77	x	23	.25	x	5	60.42	x		0.45	×	0.7	=	255.9	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	23	.25	x	2	8.07	x		0.45	×	0.7	=	142.45	(75)
Northea	ast 0.9x	0.77	x	23	.25	x		14.2	X		0.45	x	0.7	=	72.05	(75)
Northea	ast <mark>0.9x</mark>	0.77	X	_23	.25	x	ļ	9.21	x		0.45	x	0.7	_	46.77	(75)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	3	6.79] /		0.45	x	0.7	=	123.37	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	6	62.67]		0.45	x	0.7	=	2 <mark>10.14</mark>	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	8	5.75]		0.45	×	0.7	=	287.53	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	1	06.25			0.45	x	0.7	=	3 <mark>56.26</mark>	(79)
Southw	est _{0.9x}	0.77	x	15	.36	x	1	19.01]		0.45	×	0.7	=	3 <mark>99.04</mark>	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	1	18.15]		0.45	×	0.7	=	396.16	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	1	13.91]		0.45	×	0.7	=	381.94	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	1	04.39]		0.45	×	0.7	=	350.02	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	g	2.85]		0.45	x	0.7	=	311.33	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	6	9.27]		0.45	×	0.7	=	232.25	(79)
Southw	est <mark>0.9x</mark>	0.77	x	15	.36	x	4	4.07]		0.45	×	0.7	=	147.77	(79)
Southw	est <mark>0.9x</mark>	0.77	X	15	.36	x	3	31.49]		0.45	x	0.7	=	105.58	(79)
0.1		- 11		1.6	1				(0.0)	_		(00)				
501ar g	180.64	326.71	497.54	701.16	862.66	1	90.42	844.31	(83)m 718	1 = St	567.24	(82)m 374.7	1 219.82	152.34	1	(83)
Total q	ains – i	nternal a	nd sola	r (84)m :	= (73)m	+ (8	33)m	, watts					1		J	
(84)m=	807.02	950.69	1100.28	1268.93	1393.52	13	86.85	1319.11	1200	0.27	1067.48	910.1	6 795.78	760.03]	(84)
7. Me	an inter	nal temr	perature	(heating	n seasor	ן ו				,			•		, 	
Temp	erature	durina h	eating r	periods i	n the livi	na	area	from Tal	ble 9	. Th1	1 (°C)				21	(85)
Utilisa	ation fac	tor for a	ains for	living ar	ea, h1,m	า (s	ee Ta	ble 9a)		,	(-)					
	Jan	Feb	Mar	Apr	May	,-	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.95		0.8	0.61	0.6	69	0.94	1	1	1	1	(86)
Mean	interna	I temper	ature in	Iivina ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)					
(87)m=	20.13	20.22	20.38	20.6	20.81	2	0.93	20.95	20.	95	20.86	20.6	20.33	20.13]	(87)
															-	

Temp	erature	during h	neating p	periods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)						
(88)m=	20.17	20.17	20.18	20.19	20.2	20.22	20.22	20.22	20.21	20.2	20.19	20.18		(88)	1
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)							
(89)m=	1	1	1	0.99	0.92	0.72	0.51	0.58	0.9	0.99	1	1		(89)	1
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)					
(90)m=	18.98	19.11	19.35	19.69	19.97	20.13	20.15	20.16	20.06	19.69	19.29	18.99		(90)	1
				<u> </u>					f	iLA = Livin	g area ÷ (4	l) =	0.35	(91)	1
Mean	interna	l temper	ature (fc	or the wh	ole dwel	lina) = fl	LA x T1	+ (1 – fL	A) x T2			L			
(92)m=	19.38	19.5	19.71	20.01	20.26	20.41	20.43	20.43	20.34	20.01	19.65	19.39		(92))
Apply	adjustn	nent to t	he mear	internal	l tempera	ature fro	m Table	4e, whe	ere appro	opriate					
(93)m=	19.38	19.5	19.71	20.01	20.26	20.41	20.43	20.43	20.34	20.01	19.65	19.39		(93)	1
8. Sp	ace hea	ting req	uirement	t											
Set T	i to the i	mean int	ernal ter	mperatur	re obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m and	d re-calc	ulate		
the ut	lisation	Tactor Id	Mor			lun	lul	Aug	Son	Oct	Nov	Doo			
l Itilisa	Jan ation fac	tor for a	ains hr	<u> Api</u>	iviay	Jun	Jui	Aug	Sep		INUV	Dec			
(94)m=	1	1	1	0.99	0.93	0.74	0.54	0.61	0.91	0.99	1	1		(94)	
Usefu	L Il gains.	hmGm	L W = (9	ا 4)m x (84	4)m										
(95)m=	806.86	950.11	1097.51	1250.63	1289.54	10 <mark>29.29</mark>	709.31	735.85	966.61	904.69	795.36	759.93		(95))
Month	nly avera	age ex <mark>te</mark>	ernal terr	perature	from Ta	able 8		7-							
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)	1
Heat	los <mark>s rate</mark>	e for me	an interr	al tempe	erature, l	_m , W =	=[(39)m :	x [(93)m	– (96)m]					
(97)m=	30 <mark>01.29</mark>	2891.62	2602.93	2135.84	1638.46	1084.04	715.05	748.39	1175.02	17 <mark>99.68</mark>	2426.13	2963.73		(97)	I
Space	e heatin	g requir	ement fo	<mark>r eac</mark> h m	nonth, kv	Wh/mont	th = 0.02	24 x [(97)) <mark>m – (9</mark> 5)m] x (4	1)m				
(98)m=	1632.66	1304.7	1120.03	637.35	259.59	0	0	0	0	665.88	1174.15	1639.63			
								Tota	l per year	(kWh/year	[•]) = Sum(98	B) _{15,912} =	8433.9	9 <mark>(98)</mark>)
Space	e heatin	g require	ement in	ı kWh/m²	?/year							[38.1	(99)	1
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)			-			
Spac	e heatir	ng:													
Fracti	on of sp	ace hea	at from s	econdary	y/supple	mentary	system						0	(201	1)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202	2)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		Ī	1	(204	4)
Efficie	ency of I	main spa	ace heat	ing syste	em 1							ĺ	446.94	4 (206	3)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %					ĺ	0	(208	3)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kW	h/year	
Space	e heatin	g require	ement (c	alculate	d above))									
	1632.66	1304.7	1120.03	637.35	259.59	0	0	0	0	665.88	1174.15	1639.63			
(211)m	n = {[(98)m x (20)4)] } x 1	100 ÷ (20										(211	1)
· /	365.29	291.92	250.6	142.6	58.08	0	0	0	0	148.99	262.71	366.85			
			L		¶			Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1887.0)4 (211	1)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							L			
= {[(98)m x (20)1)]}x`1	00 ÷ (20)8)											
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0			
								Tota	l (kWh/yea	ar) = Sum(2)	215) _{15,1012}	=	0	(215	5)

Water heating

Output from water heater (calculated above)								
223.22 196.66 206.33 184.69 180.79 1	161.25 154.59	170.01	169.83	191.52	202.87	217.75		_
Efficiency of water heater							282.62	(216)
(217)m= 282.62 282.62 282.62 282.62 282.62 2	282.62 282.62	282.62	282.62	282.62	282.62	282.62		(217)
Fuel for water heating, kWh/month								
(219) m = (64) m $\times 100 \div (217)$ m (219) m = 78.98 69.58 73.01 65.35 63.97	57.05 54.7	60.15	60.09	67.77	71.78	77.05		
		Tota	l = Sum(2 ⁻	19a) ₁₁₂ =			799.47	(219)
Annual totals				k	Wh/yea	r	kWh/year] '
Space heating fuel used, main system 1							1887.04	
Water heating fuel used							799.47	
Electricity for pumps, fans and electric keep-hot								
mechanical ventilation - balanced, extract or pos	sitive input fro	m outside	Э			897.77		(230a)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			897.77	(231)
Electricity for lighting							631.97	(232)
Electricity generated by PVs							-730.07	(233)
Tota <mark>l delivered energy</mark> for all u <mark>ses (211)(221) +</mark>	(231) + (232)	(237b)	=				3486.18	(338)
12a. CO2 emissions – Individual heating system	s including m	icro-CHP						_
	Freezer			E ucline		4	Emissions	
	kWh/year			kg CO	2/kWh	tor	kg CO2/yea	ar
Space heating (main system 1)	(211) x			0.5	19	=	979.37	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.5	19	=	414.93	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =			. [1394.3	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	465.94	(267)
Electricity for lighting	(232) x			0.5	19	=	327.99	(268)
Energy saving/generation technologies						ľ		
Item 1				0.5	19	=	-378.91	(269)
Total CO2, kg/year			sum o	f (265)(2	271) =		1809.33	(272)
Dwelling CO2 Emission Rate			(272) -	÷ (4) =			8.17	(273)
El rating (section 14)							91	(274)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012	D	roperty	Stroma Softwa	a Num are Ver	ber: sion:		Versio	on: 1.0.5.49	
Address :	Ham Close.	London.	TW10		Address.	DIOCKU					
1. Overall dwelling dime	ensions:	,									
				Area	a(m²)		Av. Heig	ght(m)		Volume(m ³)
Ground floor				5	2.62	(1a) x	2.	8	(2a) =	147.34	(3a)
First floor					62	(1b) x	3	3	(2b) =	186	(3b)
Second floor					62	(1c) x		3	(2c) =	186	(3c)
Third floor				4	4.77	(1d) x	3.6	69	(2d) =	165.2	(3d)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+	(1n) 22	21.39	(4)			J		
Dwelling volume						(3a)+(3b))+(3c)+(3d)	+(3e)+	.(3n) =	684.54	(5)
2. Ventilation rate:											
	main heating	sec he	ondary ating	У	other		total			m ³ per hou	r
Number of chimneys	0	+	0	+	0] = [0	× •	40 =	0	(6a)
Number of open flues	0] + [0] + [0	=	0	x :	20 =	0	(6b)
Number of intermittent fa	ns						0	X	10 =	0	(7a)
Number of passive vents						Ē	0	X	10 =	0	(7b)
Number of flueless gas fi	res					Ē	0	X •	40 =	0	(7c)
									Air ch	hanges per ho	our
Infiltration due to chimne	ys, flues and fa	ans = (6a)	+(6b)+(7	a)+(7b)+(7c) =		0		÷ (5) =	0	(8)
If a pressurisation test has b	been carried out of	r is intended	proceed	d to (17), d	otherwise c	continue fro	om (9) to (1	6)			
Additional infiltration	ne uwening (na	»)						[(9)]	-11x0 1 –	0	(9)
Structural infiltration: 0	.25 for steel or	timber fra	ame or	0.35 foi	r masonr	y constr	uction	[(0)	11/0.1 -	0	(11)
if both types of wall are pl	resent, use the va	lue correspo	onding to	the great	er wall area	a (after					
If suspended wooden f	floor, enter 0.2	(unseale	d) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else e	enter 0	,	·	,.					0	(13)
Percentage of windows	s and doors dr	aught stri	oped							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, expresse	ed in cubic	metre	s per ho	our per so	quare m	etre of er	nvelope	area	4	(17)
If based on air permeabil	lity value, then	(18) = [(17)	÷ 20]+(8	3), otherwi	se (18) = (16)				0.2	(18)
Air permeability value applie	es if a pressurisatio	on test has b	een don	e or a deg	gree air per	rmeability	is being us	ed			- .
Number of sides sheltere Shelter factor	a				(20) = 1 - [[0.075 x (1	9)] =			2	(19)
Infiltration rate incorporat	ting shelter fac	tor			(21) = (18)) x (20) =				0.03	(21)
Infiltration rate modified f	or monthly wir	nd speed								L	` ´
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	

Month	ly avera	ge wind	speed f	rom Tab	e 7										
(22)m=	5.1	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7			
Wind F	actor (2	22a)m =	(22)m ÷	4				-			-	-			
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18			
Adjust	ed infiltr	ation rat	e (allow	ing for sł	nelter an	d wind s	speed) =	: (21a) x	(22a)m		i		•		
Caloul	0.22	0.21	0.21	0.19	0.18	0.16	0.16	0.16	0.17	0.18	0.19	0.2			
lf me	ace ene	al ventila	ation:		ne appli	Lable La	36							0.5	(23a)
lf exh	aust air h	eat pump	using App	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (I	N5)) , othe	rwise (23	b) = (23a)				0.5	(23b)
If bala	anced wit	h heat reco	overy: effic	ciency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				7	75.65	(23c)
a) If	balance	ed mech	anical ve	entilation	with hea	at recov	ery (MV	HR) (24a	a)m = (2	22b)m + (23b) × [1 – (23c)	÷ 100)]	
(24a)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32			(24a)
b) If	balance	ed mech	anical ve	entilation	without	heat red	covery (I	MV) (24t	o)m = (2	2b)m + (23b)		_		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	nouse ex	tract ver	ntilation of	or positiv	e input	ventilatio	on from o	outside	_ /					
	if (22b)r	n < 0.5 >	< (23b), 1 I	then (24	c) = (23b); other	wise (24	c) = (22	o) m + C).5 × (23k) 		1		(0.4-)
(24c)m=				0	0	0			0	0	0	0			(240)
d) If	natural if (22b)r	ventilation $n = 1$, th	on or wh en (24d)	nole hous m = (22)	se positiv	rwise (2	ventilatio 24d)m =	on from 1 0.5 + [(2	oft 2b)m² x	(0.5]					
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0]		(24d)
Effe	ctive air	change	rate - ei	nter (24a) or (24t) or (24	c) or (24	ld) in bo	x (25)				1		
(25)m=	0.34	0.33	0.33	0.31	0.3	0.28	0.28	0.28	0.29	0.3	0.31	0.32			(25)
3 He	atiosse	es and he	at loss	naramet	or.			•				•			
FLEN		Gros	SS	Openin	as	Net Ar	ea	U-val	ue	AXU		k-value	e	A	Xk
		area	(m²)	'n	0 1 ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙	K	kJ	′K
Doors						2.31	X	1	=	2.31					(26)
Windo	ws Type	e 1				15.36	3 x1	/[1/(1.2)+	0.04] =	17.59					(27)
Windo	ws Type	e 2				23.25	5 x1	/[1/(1.2)+	0.04] =	26.62					(27)
Floor 7	Гуре 1					52.62	<u>2</u> X	0.1	=	5.262		75		3946.5	(28)
Floor 7	Гуре 2					9.38	x	0.1	=	0.938		20		187.6	(28)
Walls		152	.7	40.9	2	111.7	8 X	0.16	=	17.88		60		6706.8	(29)
Roof ⁻	Type1	44.7	77	0		44.77	7 X	0.1	=	4.48		9		402.93	(30)
Roof ⁻	Туре2	17.2	23	0		17.23	3 X	0.1	=	1.72		9		155.07	(30)
Total a	area of e	elements	s, m²			276.7	7								(31)
Party v	wall					237.6	2 X	0	=	0		110		26138.	2 (32)
Interna	al wall *	ŧ				501			_		[9		4509	(32c)
Interna	al floor					168.7	7				Ī	18		3037.8	6 (32d)
Interna	al ceiling	9				168.7	7				Ì	104.48		17633.0	9 (32e)
* for win	dows and	l roof wind	ows. use e	effective wi	ndow U-va	alue calcul	ated using	n formula 1	/[(1/U-val	lue)+0.041 a	as aiven in	paragraph	1 3.2		

e) nμ ıg /[(is gi ay

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

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

(33) 76.8

Heat o	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	62717.05	(34)
Therm	al mass	parame	eter (TMF	⁻ = Cm +	- TFA) ir	n kJ/m²K			= (34)	÷ (4) =			283.29	(35)
For des can be	ign assess used inste	ments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion are no	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						24.59	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			101.4	(37)
Ventila	ation hea	at loss ca	alculated	monthl	у				(38)m	= 0.33 × (25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m=	76.47	75.51	74.55	69.75	68.79	63.99	63.99	63.03	65.91	68.79	70.71	72.63	1	(38)
Loot t									(20)m	_ (27) + ('	20)m]	
				474.44	470.40	405.00	405.00	404.40	(39)	= (37) + (.)		474.00	1	
(39)m=	177.86	176.9	175.94	171.14	170.18	165.38	165.38	164.42	167.3	170.18	172.1	174.02	170.0	
Heat le	oss para	meter (H	HLP), W	/m²K					(40)m	Average = = (39)m ÷	Sum(39)₁ (4)	12 /12=	170.9	(39)
(40)m=	0.8	0.8	0.79	0.77	0.77	0.75	0.75	0.74	0.76	0.77	0.78	0.79		
Numb	er of day	vs in moi	nth (Tab	le 1a)					,	Average =	Sum(40)1	12 /12=	0.77	(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	1	(41)
													1	
4. Wa	ater heat	ting ener	rav reau	irement:								kWh/y	ear:	
if TF if TF Annua	A > 13.9 A ± 13.9 A ± 13.9 A ± 13.9	9, N = 1 9, N = 1 9, N = 1 1e hot wa	+ 1.76 x	: [1 - exp	(-0.0003	49 x (TF y Vd,av	FA -13.9)2)] + 0.0 (25 x N)	0013 x (+ 36	TFA -13.	3. 9) 	.03 6.16]	(42)
not mor	e that 125	litres per	person pe	r day (all w	ater use, l	not and co	ld)	o acmeve	a water us	se largel o				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Hot wat	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)		•		•	-	
(44)m=	116.77	112.53	108.28	104.03	99.79	95.54	95.54	99.79	104.03	108.28	112.53	116.77]	
Enerav	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd.r	n x nm x D)) Tm / 3600	-) kWh/mor	Total = Su hth (see Ta	1 m(44) ₁₁₂ = ables 1b. 1	= c. 1d)	1273.87	(44)
(45)m-	172 17	151 /5	156.20	126.26	120.74	112.92	104.54	110.07	121.4	141 48	154 42	167 71	1	
(45)11=	173.17	151.45	150.29	130.20	130.74	112.02	104.54	119.97	121.4	141.40	154.45	107.71	4070.05	(45)
lf instan	ntaneous w	ater heatii	ng at point	of use (no	o hot water	• storage),	enter 0 in	boxes (46,) to (61)	i otal = Su	m(45) ₁₁₂ =	=	1670.25	(43)
(46)m=	25.98	22.72	23.44	20.44	19.61	16.92	15.68	17.99	18.21	21.22	23.17	25.16		(46)
Water	storage	loss:											-	
Storag	ge volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If com Otherv Water	munity h wise if no storage	eating a stored loss:	and no ta hot wate	ink in dw er (this ir	velling, e ncludes i	nter 110 nstantar) litres in neous co	(47) ombi boil	ers) ente	er '0' in (47)			
a) If n	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1	.6]	(48)
Tempe	erature f	actor fro	m Table	2b							0.	54]	(49)
Energ b) If n	y lost fro nanufact	m water urer's de	r storage eclared o	, kWh/ye cylinder l	ear loss fact	or is not	known:	(48) x (49)) =		0.	86]	(50)

Hot wa	ater stor	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
If com	munity h	heating s	ee secti	on 4.3									I	
Volum	e factor	from Tal	ble 2a m Tabla	2 h								0		(52)
rempe	erature i	actor no	miable	20								0		(53)
Energy	y lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	5)								0.	86	l	(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(56)
If cylind	er contain	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=	26.78	24.19	26.78	25.92	26.78	25.92	26.78	26.78	25.92	26.78	25.92	26.78		(57)
Prima	v circuit	loss (an	nual) fro	om Table	3							0		(58)
Prima	v circuit	loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m		L		ł	
(mo	dified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month ((61)m –	(60) - 36	55 x (41))m					I	
(61)m-									0	0	0	0	1	(61)
Totol k			veter b				o month	(62)m		(45)m +	(46)~	(F7)m i	(EQ) m + (61	()
Total r			water ne	eating ca				(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61 I	(co)
(62)m=	223.22	196.66	206.33	184.69	180.79	161.25	154.59	170.01	169.83	191.52	202.87	217.75		(62)
Solar DI	HW 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 a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (5)	_				
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater he <mark>a</mark>	ter								_	-		
(64)m=	223.22	196.6 <mark>6</mark>	206.33	184.69	180.79	161.25	154.59	170.01	169.83	191.52	202.87	217.75		
								Outp	but from wa	ater heater	<mark>(annual)</mark> ₁	12	2259.51	(64)
Heat g	ains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)m	n] + 0.8 ×	(<mark>46)m</mark>	+ (57)m	+ (59)m]	
(65)m=	97.62	86.52	92	84.05	83.51	76.26	74.8	79.93	79.11	87.08	90.09	95.8		(65)
inclu	ude (57)	m in calo	ulation	of (65)m	only if c	vlinder i	s in the c	dwellina	or hot w	ater is fr	om com	munitv h	eating	
5 In	tornal ar	aine (soc	Table 5	Sand 5a	\.	,								
5. 11	iemai ya)-									
Metab	olic gair	is (Table	5), Wat	ts A m r	Max	lun	11	A	Car	Oct	Next	Dee	1	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jui	Aug	Sep	Oct	NOV	Dec		(66)
(66)m=	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	151.49	l	(00)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				1	
(67)m=	35.78	31.78	25.85	19.57	14.63	12.35	13.34	17.35	23.28	29.56	34.5	36.78		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5		-		
(68)m=	390.95	395	384.78	363.02	335.54	309.72	292.47	288.42	298.64	320.4	347.88	373.7		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5			'	
(69)m=	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15	38.15		(69)
Pumps	s and fa	ns dains	(Table 5	5a)									1	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
		I anoratio	n (nega	tive valu	L es) (Tah	L Je 5)		I		I			ł	
(71)m-	-121 10	-121 10	-121 10	-121 10	-121 10	-121 10	-121 10	-121 10	-121 10	-121 10	-121 10	-121 10	1	(71)
Motor	hosting			1	1	1	121.10	1	121.10	1.21.10	121.10	121.10	l	X* */
vvater	neating	gains (1		440 74	446.04	405.04	400 50	407.40	400.00	447.04	405.40	400 70	I	(70)
(72)m=	131.2	128.75	123.66	116.74	112.24	105.91	100.53	107.43	109.88	117.04	125.13	128.76		(72)

Total i	nternal	gains =					(66)	m + (67)n	า + (68	3)m + ((69)m + (70)m +	(71)m + (72))m		
(73)m=	626.38	623.98	602.73	567.77	530.86	496	6.43	474.8	481.	.64	500.24	535.4	5 575.96	607.68		(73)
6. So	lar gain	s:														
Solar g	ains are	calculated	using sola	r flux from	Table 6a	and a	associ	ated equa	ations t	to con	vert to the	e applic	able orientat	tion.		
Orienta	ation: /	Access F Table 6d	actor	Area m²			Flu Tal	x ble 6a		Ta	g_ ble 6b		FF Table 6c		Gains (W)	
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	1	1.28	x		0.45	x	0.7	=	37.83	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	2	2.97	x		0.45	×	0.7	=	77.01	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	4	1.38	x		0.45	×	0.7	=	138.74	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	6	7.96	x		0.45	×	0.7	=	227.86	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	9	1.35	x		0.45	×	0.7	=	306.28	(75)
Northea	ast <mark>0.9</mark> x	0.77	x	15.	36	x	9	7.38	x		0.45	x	0.7	=	326.53	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	ę	91.1	x		0.45	x	0.7	=	305.46	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	7	2.63	x		0.45	x	0.7	=	243.52	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	5	0.42	x		0.45	×	0.7	=	169.06	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	×	2	8.07	x		0.45	×	0.7	=	94.11	(75)
Northea	ast 0.9x	0.77	x	15.	36	×	,	14.2	X		0.45	x	0.7	=	47.6	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	15.	36	x	ę	9.21	x		0.45	x	0.7	_	30.9	(75)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	x	3	6.79			0.45	x	0.7	=	186.74	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	×	6	2.67]		0.45	x	0.7	=	318.09	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	×	8	5.7 <mark>5</mark>			0.45	x	0.7	=	435.23	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	×	1(06.25			0.45	x	0.7	=	5 <mark>39.27</mark>	(79)
Southw	est _{0.9x}	0.77	x	23.	25	×	1	19.01]		0.45	x	0.7	=	604.02	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	×	1.	18.15]		0.45	x	0.7	=	599.65	(79)
Southw	est <mark>0.9x</mark>	0.77	X	23.	25	×	1	13.91]		0.45	x	0.7	=	578.13	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	×	1(04.39]		0.45	x	0.7	=	529.82	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	x	9	2.85]		0.45	x	0.7	=	471.26	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	×	6	9.27]		0.45	×	0.7	=	351.56	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	×	4	4.07]		0.45	x	0.7	=	223.67	(79)
Southw	est <mark>0.9x</mark>	0.77	x	23.	25	×	3	1.49]		0.45	x	0.7	=	159.81	(79)
Solar	naine in	watte or		l for ooo	h month				(82)m	- 5.0	m(74)m	(82)m				
(83)m=	224.57	395.1	573.97	767.12	910.31	926	6.18	883.59	773.	.34	640.32	445.6	7 271.28	190.71]	(83)
Total g	l Jains – i	nternal a	nd solar	I r (84)m =	I = (73)m	1 + (8	3)m	, watts							1	
(84)m=	850.96	1019.08	1176.7	1334.89	1441.17	142	, 22.62	1358.39	1254	1.97 ⁻	1140.56	981.1	2 847.23	798.39]	(84)
7. Me	an inter	rnal temp	oerature	(heating	season	ı)										
Temp	erature	during h	eating p	eriods i	n the livi	ng a	irea f	rom Tal	ole 9,	, Th1	(°C)				21	(85)
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,m	ı (se	e Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May	J	lun	Jul	A	ug	Sep	Oct	Nov	Dec]	
(86)m=	1	1	1	0.99	0.92	0.	72	0.53	0.6	6	0.89	1	1	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fe	ollov	v ste	ps 3 to 7	7 in T	able	9c)					
(87)m=	20.32	20.41	20.54	20.73	20.89	20	.96	20.97	20.9	96	20.92	20.72	20.49	20.32]	(87)

Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	20.25	20.25	20.26	20.28	20.28	20.3	20.3	20.3	20.29	20.28	20.27	20.27		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	n2,m (se	e Table	9a)						
(89)m=	1	1	1	0.98	0.89	0.65	0.45	0.51	0.84	0.99	1	1		(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=	19.31	19.44	19.65	19.94	20.15	20.24	20.25	20.25	20.21	19.93	19.58	19.32		(90)
		•		•					f	LA = Livin	g area ÷ (4	ł) =	0.35	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	lina) = fl	LA x T1	+ (1 – fL	A) x T2			L.		
(92)m=	19.66	19.78	19.96	20.22	20.41	20.49	20.5	20.5	20.46	20.2	19.9	19.67		(92)
Apply	adjustr	nent to t	he mear	internal	l tempera	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.66	19.78	19.96	20.22	20.41	20.49	20.5	20.5	20.46	20.2	19.9	19.67		(93)
8. Sp	ace hea	ting req	uirement											
Set T	i to the i	mean int	ternal ter	mperatui	re obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	Jan	Feb	Mar		Mav	Jun	Jul	Αμα	Sen	Oct	Nov	Dec		
Utilisa	ation fac	tor for a	ains. hm	יק <u>רי ן</u> ו:	Iviay	Juli	- 00i	Aug		000	1407	Dee		
(94)m=	1	1	1	0.98	0.9	0.67	0.47	0.54	0.85	0.99	1	1		(94)
Us <mark>efu</mark>	L gains,	hmGm	, W = (9	4)m x (84	4)m									
(95)m=	<mark>85</mark> 0.87	1018.61	1173.79	1311.1	1295.13	9 <mark>5</mark> 9.37	644	672.26	974.86	97 <mark>3.8</mark> 1	846.91	798.34		(95)
Mo <mark>nt</mark> ł	nly aver	age exte	ernal tem	perature	e from Ta	able 8		7						
(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	los <mark>s rate</mark>	e for me	an interr	al tempe	erature, l	_m , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	2732.22	2631.94	2368.23	1936.68	1482	974.64	644.86	674.35	1063.53	1634.46	2202.65	2691.38		(97)
Sp <mark>ace</mark>	e heatin	g requir	ement fo	<mark>or eac</mark> h n	nonth, <mark>kl</mark>	Nh/mon	t <mark>h = 0</mark> .02	24 x [(97)) <mark>m – (9</mark> 5)m] x (4 ⁻	l)m			
(98)m=	1399.73	1084.16	888.67	450.42	139.03	0	0	0	0	491.53	976.13	1408.42		
								Tota	l per year	(kWh/year) = Sum(98	8)15,912 =	6838.08	3 (98)
Space	e heatin	g requir	ement in	kWh/m ²	/year								30.89	(99)
9a. En	ergy red	quiremer	nts – Ind	ividual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Spac	e heatii	ng:			, .							r		
Fracti	ion of sp	bace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	bace hea	at from m	nain syst	em(s)			(202) = 1 -	– (201) =				1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 – ((203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								444.71	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heating	g system	ח, %						0	(208)
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWł	n/year
Space	e heatin	g requir	ement (c	alculate	d above)									
	1399.73	1084.16	888.67	450.42	139.03	0	0	0	0	491.53	976.13	1408.42		
(211)m	n = {[(98)m x (20	04)]	00 ÷ (20	06)									(211)
	314.75	243.79	199.83	101.28	31.26	0	0	0	0	110.53	219.5	316.71		
		-		-				Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1537.60	õ (211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							•		
= {[(98)m x (20	01)] } x 1	00 ÷ (20	(8)										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	I (kWh/yea	ar) =Sum(2	215) _{15,10} 12	=	0	(215)

Water heating

Output from water heater (calculated above)								
223.22 196.66 206.33 184.69 180.79	161.25 154.59	170.01	169.83	191.52	202.87	217.75		
Efficiency of water heater							282.62	(216)
(217)m= 282.62 282.62 282.62 282.62 282.62	282.62 282.62	282.62	282.62	282.62	282.62	282.62		(217)
Fuel for water heating, kWh/month								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 78.98 69.58 73.01 65.35 63.97	57.05 54.7	60.15	60.09	67.77	71.78	77.05		
		Tota	I = Sum(2'	19a) ₁₁₂ =			799.47	(219)
Annual totals				k	Wh/yea	ا	kWh/yea	`´´
Space heating fuel used, main system 1					•		1537.66	
Water heating fuel used						[799.47	
Electricity for pumps, fans and electric keep-hot								
mechanical ventilation - balanced, extract or po	sitive input fro	m outside)			897.77		(230a)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =		[897.77	(231)
Electricity for lighting						[631.97	(232)
Electricity generated by PVs							-730.07	(233)
Total delivered energy for all uses (211)(221) -	+ (231) + (232)	(237b)	=				3136.8	(338)
12a. CO2 emissions – Individual heating system	ns including m Energy	icro-CHP		Emiss	ion fac	tor	Emissions	5
	kWh/year			kg CO	2/kWh		kg <mark>CO2/</mark> ye	ar
Space heating (main system 1)	(211) x			0.5	19	=	798.05	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.5	19	=	414.93	(264)
Space and water heating	(261) + (262)	+ (263) + (2	264) =			[1212.97	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	465.94	(267)
Electricity for lighting	(232) x			0.5	19	=	327.99	(268)
Energy saving/generation technologies Item 1				0.5	19	=	-378.91	(269)
Total CO2, kg/year			sum o	f (265)(2	271) =	[1628	(272)
Dwelling CO2 Emission Rate			(272) ·	÷ (4) =		[7.35	(273)
El rating (section 14)						[92	(274)