Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:55:16

Project Information:

Assessed By: Zahid Ashraf (STRO001082) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 77.21m² Plot Reference: Site Reference : Hermitage Lane Plot 6

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

19.65 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 12.62 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 59.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 46.8 kWh/m²

OK 2 Fabric U-values

Element Average Highest 0.15 (max. 0.70) External wall 0.15 (max. 0.30) OK Floor 0.12 (max. 0.25) 0.12 (max. 0.70) OK

Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

No cylinder thermostat Hot water controls:

No cylinder

OK

Regulations Compliance Report

7 Law anarmy lights		
7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	3.11m²	
Windows facing: South East	6.1m ²	
Windows facing: North West	4.58m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Floors U-value	0.12 W/m ² K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		Hee	er Details:							
Access at Name.	Zabid Ashraf	036		a Mirros	b a v .		CTDO	001000		
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	•	Stroma Softwa					001082 on: 1.0.5.9		
Contware realise.	O. O		rty Address:		31011.		7 01010	7.0.0.0		
Address :										
1. Overall dwelling dime	ensions:									
Ground floor		A	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)	
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (45)		(1a) x		2.5	(2a) =	193.02	(Sa)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(1n)	77.21	(4)	\	n (O)	(0.)		_	
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	193.02	(5)	
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r	
Number of allignments	heating he	ating		,			40 =	-	_	
Number of chimneys			0] = [0			0	(6a)	
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)	
Number of intermittent fa				Ĺ	0		10 =	0	(7a)	
Number of passive vents	3			L	0	X '	10 =	0	(7b)	
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)	
Air changes per hour										
Infiltration due to chimne	vs_flues and fans = (6a))+(6b)+(7a)+(7b	o)+(7c) =	Г	0		÷ (5) =	0	(8)	
	peen carried out or is intended			ontinue fr			. (0) =	0		
Number of storeys in the	he dwelling (ns)							0	(9)	
Additional infiltration						[(9)	-1]x0.1 =	0	(10)	
	.25 for steel or timber fragressent, use the value correspond			•	uction			0	(11)	
deducting areas of openi		oriding to the g	realer wall are	a (anter						
If suspended wooden	floor, enter 0.2 (unseale	d) or 0.1 (se	ealed), else	enter 0				0	(12)	
If no draught lobby, en								0	(13)	
· ·	s and doors draught stri	pped						0	(14)	
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)	
Infiltration rate	aro avaraged in subject		(8) + (10)	, , ,	, , ,	, ,		0	(16)	
If based on air permeabil	q50, expressed in cubic	-	•	•	etre or e	envelope	area	3	(17)	
	es if a pressurisation test has l				is beina u	sed		0.15	(18)	
Number of sides sheltere			9	,	3			1	(19)	
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			0.92	(20)	
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.14	(21)	
Infiltration rate modified f	for monthly wind speed									
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec			
Monthly average wind sp	peed from Table 7							_		
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7			
Wind Factor (22a)m = (2.	2)m ÷ 4									
<u> </u>	1.23 1.1 1.08	0.95 0.9	5 0.92	1	1.08	1.12	1.18			
					<u> </u>		<u> </u>	J		

0.18	0.17	0.17	0.15	0.15	d wind s 0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calculate effe		•	rate for t	he appli	cable ca	se							
If mechanic												0.5	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(23
a) If balance	ed mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(24
b) If balance	ed mech	anical ve	ntilation	without	heat red	overy (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)r				•	ve input v o); otherv				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r				•	ve input verwise (2				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24d	c) or (24	d) in box	(25)					
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(2
3. Heat losse	s and he	at loss r	naramete	or.									
LEMENT	Gros	·	Openin		Net Ar	ea	U-valı	IE.	AXU		k-value	. A	Χk
	area		m		A ,r		W/m2		(W/I	〈)	kJ/m²-k		/K
Doors					2	X	1.4	=	2.8				(2
Vindows Type	e 1				3.105	x1.	/[1/(1.4)+	0.04] =	4.12				(2
Vindows Type	2				6.097	_x 1,	/[1/(1.4)+	0.04] =	8.08				(2
Vindows Type	e 3				4.579	x1.	/[1/(1.4)+	0.04] =	6.07				(2
loor					77.21	x	0.12	=	9.2652			\neg	(2
Valls Type1	78.2	24	13.78	3	64.46	x	0.15	=	9.67			7 —	(2
Walls Type2	33.8	31	2		31.81	x	0.14	<u> </u>	4.48	T i		ī	(2
Total area of e	elements	, m²			189.20	6							 (3
for windows and	l roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area				s and pan	titions								
abric heat los	•	•	U)				(26)(30)	+ (32) =			ļ	44.49	(3
Heat capacity	•	,						((28)	.(30) + (32	2) + (32a).	(32e) =	9840.85	(3
	•	•		•					tive Value:			100	(3
				construct	ion are not	known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
or design asses	au oi a ue		، اممهما،	using Ap	pendix ł	(14.5	(3
or design asses an be used inste		x Y) cal	culated (5 .							_		
For design assess an be used inste Thermal bridg details of therma	es : S (L al bridging	,		• .	1)			(22)	(26)				1 (0
For design assessan be used inste Thermal bridg details of therma Total fabric he	es : S (L al bridging at loss	are not kn	own (36) =	= 0.05 x (3	1)				(36) =	25)m v (5)	[58.99	(3
For design assessan be used inste Thermal bridg details of therma Total fabric head	es : S (L al bridging at loss at loss ca	are not kn	own (36) =	= 0.05 x (3	· -	1, ,1	Λ	(38)m	= 0.33 × (58.99	(3
For design assessan be used inste Thermal bridged details of thermal fotal fabric head of the details of the de	es : S (L al bridging at loss at loss ca Feb	are not kn alculated Mar	own (36) = monthly Apr	- 0.05 x (3 / May	Jun	Jul 15.07	Aug	(38)m Sep	= 0.33 × (Nov	Dec	58.99	
For design assessan be used instead in the Internal bridge details of thermal fotal fabric here. In the Internal Interna	es : S (L al bridging at loss at loss ca Feb	alculated Mar 17.5	own (36) =	= 0.05 x (3	· -	Jul 15.07	Aug 14.85	(38)m Sep 15.51	= 0.33 × (Oct 16.17	Nov 16.62		58.99	
	es : S (L al bridging at loss at loss ca Feb	alculated Mar 17.5	own (36) = monthly Apr	- 0.05 x (3 / May	Jun		-	(38)m Sep 15.51	= 0.33 × (Nov 16.62	Dec	58.99	(3

Heat loss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.96	0.97	0.98	0.98		
				ı		ı	l		Average =	Sum(40) ₁	12 /12=	0.98	(40)
Number of day	<u> </u>	nth (Tab	le 1a)		ı			ı					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occurring TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		41		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed i			se target o		.19		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea			ctor from	Table 1c x			Į.	!			
(44)m= 105.81	101.97	98.12	94.27	90.42	86.58	86.58	90.42	94.27	98.12	101.97	105.81		
	•	!		!		!	!			m(44) ₁₁₂ =	L	1154.34	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 156.92	137.24	141.62	123.47	118.47	102.23	94.73	108.71	110.01	128.2	139.94	151.97		_
If instantaneous v	water heati	ina at noint	of use (no	n hot water	r storage)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =	- [1513.52	(45)
		· ·	·	ı	· · ·		· · ·	, , , I	40.00	1 00 00	00.0		(46)
(46)m= 23.54 Water storage	20.59 loss:	21.24	18.52	17.77	15.33	14.21	16.31	16.5	19.23	20.99	22.8		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage					4.144								
a) If manufact				or is kno	wn (kVVI	n/day):					0		(48)
Temperature f											0		(49)
Energy lost from b) If manufact		•			or ic not		(48) x (49)) =		1	10		(50)
Hot water stor			-							0.	02		(51)
If community h	-			•		,				<u> </u>	<u></u>		, ,
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	factor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	` , ` `	,								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 cylinder 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 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)
Primary circuit	t loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by		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	loulated	for each	month ((61)m –	(60) ·	365 ~ (41)m							
(61)m= 0	0	0	0	0 0	00) +	0) 0		0	0	0	0	1	(61)
									_				J (59)m + (61)m	(-)
(62)m= 212.2	187.17	196.9	176.96	173.75	155.73		163.	_	163.5	183.48	193.44	207.24	(59)111 + (61)111	(62)
Solar DHW input													I	(/
(add additiona										001111100	mon to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	1	(63)
Output from w	ater hea	ter				Į	<u> </u>				Į		ı	
(64)m= 212.2	187.17	196.9	176.96	173.75	155.73	150.01	163.	.98	163.5	183.48	193.44	207.24	1	
` '						_!		Outp	ut from wa	ater heat	_ I er (annual)₁	l12	2164.36	(64)
Heat gains fro	m water	heating.	kWh/me	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	1)m	ı] + 0.8 x	(46)m	n + (57)m	+ (59)m	. 1	•
(65)m= 96.4	85.58	91.31	83.85	83.61	76.79	75.72	80.3	-	79.37	86.85	89.33	94.75	ĺ	(65)
include (57)	m in calc	culation o	of (65)m	only if c	vlinder	is in the	dwelli	ina (or hot w	ater is t	from com	munity h	ı neating	
5. Internal g					,			J				• •	Jan J	
Metabolic gair	Ì													
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(66)m= 120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.	.39	120.39	120.39	120.39	120.39		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee T	Table 5		•			
(67)m= 19.47	17.29	14.06	10.65	7.96	6.72	7.26	9.4	4	12.67	16.08	18.77	20.01		(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5	-			
(68)m= 213.51	215.73	210.14	198.26	183.25	169.15	159.73	157.	.52	163.1	174.98	189.99	204.09		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a), also	o se	e Table	5	•	•		
(69)m= 35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.0	04	35.04	35.04	35.04	35.04		(69)
Pumps and fa	ns gains	(Table 5	ōa)			•								
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)	-					•			
(71)m= -96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.	31	-96.31	-96.31	-96.31	-96.31		(71)
Water heating	gains (T	able 5)				-	•				-			
(72)m= 129.57	127.34	122.73	116.46	112.38	106.65	101.77	108.	.02	110.24	116.73	124.06	127.35		(72)
Total internal	gains =				(6	6)m + (67)n	n + (68)m +	- (69)m + ((70)m + (71)m + (72))m		
(73)m= 421.66	419.48	406.05	384.48	362.71	341.64	327.88	334.	.09	345.12	366.91	391.94	410.57		(73)
6. Solar gain	s:													
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations t	о со	nvert to th	e applica	ble orienta	tion.		
Orientation:		actor	Area			lux		_	g_ chla Ch	-	FF		Gains	
_	Table 6d		m²			able 6a		1	able 6b		Table 6c		(W)	-
Southeast 0.9x	0.77	X	6.	1	х	36.79	X		0.63	×	0.7	=	68.56	(77)
Southeast 0.9x	0.77	X	6.	1	x	62.67	X		0.63	x	0.7	=	116.78	(77)
Southeast 0.9x	0.77	X	6.	1	x	85.75	X		0.63	x [0.7	=	159.78	(77)
Southeast 0.9x	0.77	X	6.	1	x	106.25	X		0.63	x	0.7	=	197.98	(77)
Southeast 0.9x	0.77	X	6.	1	X	119.01	X		0.63	X	0.7	=	221.76	(77)

Southeast 0.9x 0.77			1		1				— ı		—
0 11 1	X	6.1	J X	118.15] X]	0.63		0.7	=	220.15	(77)
Courth agent a	X	6.1	J X	113.91	X	0.63	×	0.7	"	212.25	(77)
Southeast 0.9x 0.77	X	6.1	J X	104.39] X]	0.63	×	0.7	=	194.51	(77)
Southeast 0.9x 0.77		6.1	X	92.85	X	0.63		0.7	=	173.01	(77)
Southeast 0.9x 0.77	X	6.1	X	69.27	X	0.63		0.7	=	129.07	(77)
Southeast 0.9x 0.77	X	6.1	X	44.07	X	0.63	×	0.7	=	82.12	(77)
Southeast 0.9x 0.77	X	6.1	X	31.49	X	0.63	×	0.7	=	58.67	(77)
Southwest _{0.9x} 0.77	X	3.11	X	36.79	ļ	0.63	X	0.7	=	34.91	(79)
Southwest _{0.9x} 0.77	X	3.11	X	62.67	<u> </u>	0.63	X	0.7	=	59.47	(79)
Southwest _{0.9x} 0.77	X	3.11	X	85.75	_	0.63	X	0.7	=	81.37	(79)
Southwest _{0.9x} 0.77	X	3.11	X	106.25]	0.63	x	0.7	=	100.83	(79)
Southwest _{0.9x} 0.77	X	3.11	X	119.01]	0.63	X	0.7	=	112.93	(79)
Southwest _{0.9x} 0.77	X	3.11	X	118.15		0.63	x	0.7	= [112.12	(79)
Southwest _{0.9x} 0.77	X	3.11	X	113.91		0.63	x	0.7		108.09	(79)
Southwest _{0.9x} 0.77	X	3.11	X	104.39		0.63	x	0.7	=	99.06	(79)
Southwest _{0.9x} 0.77	X	3.11	x	92.85		0.63	x	0.7	=	88.11	(79)
Southwest _{0.9x} 0.77	X	3.11	x	69.27		0.63	x	0.7	=	65.73	(79)
Southwest _{0.9x} 0.77	X	3.11	x	44.07		0.63	x	0.7	=	41.82	(79)
Southwest _{0.9x} 0.77	х	3.11	x	31.49		0.63	x	0.7	=	29.88	(79)
Northwest 0.9x 0.77	x	4.58	x	11.28	x	0.63	x	0.7	= [15.79	(81)
Northwest 0.9x 0.77	x	4.58	x	22.97	x	0.63	x	0.7	=	32.14	(81)
Northwest 0.9x 0.77	x	4.58	x	41.38	x	0.63	x [0.7	= =	57.91	(81)
Northwest 0.9x 0.77	X	4.58	х	67.96	x	0.63	x	0.7	<u></u>	95.1	(81)
Northwest 0.9x 0.77	x	4.58	x	91.35	x	0.63	x	0.7	= i	127.83	(81)
Northwest 0.9x 0.77	x	4.58	x	97.38	x	0.63	x	0.7	=	136.28	(81)
Northwest 0.9x 0.77	x	4.58	x	91.1	х	0.63	x	0.7	=	127.49	(81)
Northwest 0.9x 0.77	x	4.58	x	72.63	x	0.63	x	0.7	=	101.63	(81)
Northwest 0.9x 0.77	x	4.58	x	50.42	x	0.63		0.7	==i	70.56	(81)
Northwest 0.9x 0.77	x	4.58	X	28.07	X	0.63	x [0.7	-	39.28	(81)
Northwest 0.9x 0.77	x	4.58	X	14.2	X	0.63	x	0.7	=	19.87	(81)
Northwest 0.9x 0.77		4.58	X	9.21	X	0.63	x	0.7	➡ ₌ i	12.89	(81)
			J		1			-			`
Solar gains in watts, ca	alculated	for each mon	th		(83)m	n = Sum(74)m .	(82)m				
(83)m= 119.26 208.39	299.06	393.9 462.5		68.55 447.83	395	.21 331.68	234.08	143.8	101.45		(83)
Total gains – internal a	and solar	(84)m = (73) r	n + (83)m , watts		•		•			
(84)m= 540.92 627.87	705.12	778.38 825.2	3 8	10.18 775.71	729	.29 676.8	600.99	535.74	512.02		(84)
7. Mean internal temp	perature ((heating seas	on)								
Temperature during h	neating p	eriods in the li	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation factor for g	ains for I	iving area, h1	,m (s	ee Table 9a)							
Jan Feb	Mar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.95 0.92	0.88	0.8 0.68		0.53 0.4	0.4	14 0.64	0.83	0.92	0.96		(86)
Mean internal temper	ature in I	iving area T1	(follo	ow steps 3 to 7	7 in T	able 9c)					
(87)m= 19.12 19.4	19.8	20.29 20.66	`	20.88 20.96	20.	<u> </u>	20.31	19.63	19.07		(87)
<u> </u>						1		1			

Ta		ما بمصادريات		مان مام نس		مال مال	. f	hia O Ti	۱۵ (۵C)					
(88)m=	20.09	20.09	eating p	20.1	20.11	20.12	20.12	20.12	20.11	20.11	20.1	20.1		(88)
. ,			ains for i				<u> </u>		20.11	20.11	20.1	20.1		(00)
(89)m=	0.94	0.91	0.86	0.77	0.64	0.47	0.33	0.36	0.58	0.8	0.91	0.95		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to 7	r 7 in Tabl	e 9c)				
(90)m=	17.56	17.97	18.55	19.23	19.73	20.01	20.09	20.08	19.91	19.27	18.32	17.5		(90)
		<u> </u>	<u> </u>				<u> </u>	ļ	1	LA = Livin	g area ÷ (4	1) =	0.41	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lina) = fl	LA × T1	+ (1 – fL	A) x T2			L		
(92)m=	18.2	18.55	19.06	19.66	20.11	20.37	20.45	20.44	20.27	19.69	18.86	18.14		(92)
Apply	adjustn	nent to t	he mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.2	18.55	19.06	19.66	20.11	20.37	20.45	20.44	20.27	19.69	18.86	18.14		(93)
8. Spa	ace hea	ting requ	uirement											
			ternal ter or gains			ed 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	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.92	0.89	0.84	0.76	0.64	0.49	0.35	0.39	0.59	0.79	0.89	0.93		(94)
Usefu	l gains,	hmGm	, W = (94	1)m x (84	4)m		,	r	r	r	r			
(95)m=	499.84	560.43	594.43	590.35	526.41	393.46	275.08	284.93	398.5	474.43	478.52	477.4		(95)
			rnal tem						T					(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)
(97)m=		1047.17	an intern 960.65	811.01	631.78	427.11	284.84	298.05	- (96)m 459.53	683.43	888.86	1059.86		(97)
		l	ement fo					L	L	L	l	1000.00		()
(98)m=	423.48	327.09	272.46	158.88	78.4	0	0	0	0	155.49	295.44	433.35		
, ,		<u> </u>						Tota	l per year	L (kWh/year) = Sum(9	8) _{15,912} =	2144.6	(98)
Space	e heatin	g require	ement in	kWh/m²	/year							ĺ	27.78	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme)							
			ace hea								unity sch	neme.	0	(301)
	-			-		-		1 4510 1	., •	0110		l I		(302)
	-		from co	-	-			,, ,	0115			[1	(302)
includes	boilers, h	eat pump	y obtain he s, geotherr	nal and wa	aste heat f					up to tour (otner neat	sources; tr	ne latter	_
Fractio	n of hea	at from C	Commun	ity boiler	S								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	g											kWh/year	
Annua	space	heating	requirem	nent									2144.6	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	= [2251.83	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308

					٦
Space heating requirement from second	dary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2164.36	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x	(305) x (306) =	2272.58	_](310a)
Electricity used for heat distribution		0.01 × [(307a)(307	(e) + (310a)(310e)] =	45.24	
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 dw mechanical ventilation - balanced, extra	· ,	side		267.87] (330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330l	b) + (330g) =	267.87	(331)
Energy for lighting (calculated in Append	dix L)			343.8	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)			-782.18	(333)
Electricity generated by wind turbine (Ap	opendix M) (negative quantit	y)		0	(334)
12b. CO2 Emissions - Community heat	ina scheme				
· ·					
	<u> </u>	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)		kWh/year	kg CO2/kWh	kg CO2/year](367a
CO2 from other sources of space and w	rater heating (not CHP) If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year](367a)
CO2 from other sources of space and w Efficiency of heat source 1 (%)	rater heating (not CHP) If there is CHP using two	kWh/year fuels repeat (363) to o)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue	94 1039.65	
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1	vater heating (not CHP) If there is CHP using two [(307b)+(310b)	kWh/year fuels repeat (363) to o)] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	94 1039.65 23.48	(367)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution	vater heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) ystems (363)	kWh/year fuels repeat (363) to o)] x 100 ÷ (367b) x) x (366) + (368)(372	kg CO2/kWh (366) for the second fue 0.22 = 0.52 =	94 1039.65 23.48 1063.13	[367] (372)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s	vater heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) ystems (363) condary) (309)	fuels repeat (363) to o)] x 100 ÷ (367b) x o) x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 =	94 1039.65 23.48 1063.13	(367) (372) (373)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (sec	vater heating (not CHP) If there is CHP using two [(307b)+(310t) [(313 ystems (363) condary) (309) sion heater or instantaneous	fuels repeat (363) to o)] x 100 ÷ (367b) x o) x (366) + (368)(372)	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 =	94 1039.65 23.48 1063.13	(367) (372) (373) (374)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (see CO2 associated with water from immers	vater heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) ystems (363) condary) (309) sion heater or instantaneous ater heating (373)	fuels repeat (363) to o)] x 100 ÷ (367b) x) x (366) + (368)(372 x heater (312) x + (374) + (375) =	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 =	94 1039.65 23.48 1063.13 0 1063.13	(367) (372) (373) (374) (375)
CO2 from other sources of space and w Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community s CO2 associated with space heating (see CO2 associated with water from immers Total CO2 associated with space and w	rater heating (not CHP) If there is CHP using two [(307b)+(310t) [(313 ystems (363) condary) (309) sion heater or instantaneous ater heating (373) os and fans within dwelling	fuels repeat (363) to o)] x 100 ÷ (367b) x o) x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0.52 = 0 = 0.22 =	94 1039.65 23.48 1063.13 0 1063.13 139.02	(367) (372) (373) (374) (375) (376)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immersor Total CO2 associated with space and we CO2 associated with electricity for pump	vater heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) ystems (363) condary) (309) sion heater or instantaneous ater heating (373) os and fans within dwelling ng (332)	fuels repeat (363) to o)] x 100 ÷ (367b) x o) x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 = 0.22 = 0.52 =	94 1039.65 23.48 1063.13 0 1063.13 139.02	(367) (372) (373) (374) (375) (376) (378)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community second associated with space heating (second associated with water from immerse Total CO2 associated with space and we CO2 associated with electricity for pumper CO2 associated with electricity for lighting Energy saving/generation technologies	vater heating (not CHP) If there is CHP using two [(307b)+(310b) [(313) ystems (363) condary) (309) sion heater or instantaneous ater heating (373) os and fans within dwelling ng (332)	fuels repeat (363) to o)] x 100 ÷ (367b) x o) x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 = 0.22 = 0.52 = 0.52 =	94 1039.65 23.48 1063.13 0 1063.13 139.02 178.43	[(367)] (372)] (373)] (374)] (375)] (376)] (378)] (379)
CO2 from other sources of space and we Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community source 1 CO2 associated with space heating (see CO2 associated with water from immersor Total CO2 associated with space and wo CO2 associated with electricity for pump CO2 associated with electricity for lighting Energy saving/generation technologies litem 1	rater heating (not CHP) If there is CHP using two [(307b)+(310t) [(313 ystems (363) condary) (309) sion heater or instantaneous ater heating (373) os and fans within dwelling ng (332) (333) to (334) as applicable	fuels repeat (363) to o)] x 100 ÷ (367b) x o) x (366) + (368)(372 x heater (312) x + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fue 0.22 = 0.52 = 0 = 0.22 = 0.52 = 0.52 =	94 1039.65 23.48 1063.13 0 1063.13 139.02 178.43	(372) (373) (374) (375) (376) (378) (379) (380)

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 October 2020

Property Details: Plot 6

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: North East

Overshading: Average or unknown

None

Thermal mass parameter: Indicative Value Low

False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach):6 (Windows fully open)

Overheating Details:

Summer ventilation heat loss coefficient: 382.19 (P1)

Transmission heat loss coefficient: 59

Summer heat loss coefficient: 441.18 (P2)

Overhangs:

Overhangs:

Night ventilation:

Orientation:	Ratio:	Z_overhangs:
South West (SW)	0	1
South East (SE)	0	1
North West (NW)	Λ	1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South West (SW)	1	0.9	1	0.9	(P8)
South East (SE)	1	0.9	1	0.9	(P8)
North West (NW)	1	0.9	1	0.9	(P8)

Solar gains:

Orientation		Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains	
South West (SW)	0.9 x	3.11	119.92	0.63	0.7	0.9	133.01	
South East (SE)	0.9 x	6.1	119.92	0.63	0.7	0.9	261.18	
North West (NW)	0.9 x	4.58	98.85	0.63	0.7	0.9	161.68	
						Total	555.87 (l	P3/P4)

Internal gains:

	June	July	August
Internal gains	475.92	458.34	466.72
Total summer gains	1064.26	1014.21	966.72 (P5)
Summer gain/loss ratio	2.41	2.3	2.19 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	19.71	21.5	21.29 (P7)
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	- 036 11	Strom Softwa					0001082 on: 1.0.5.9	
	F	roperty	Address	Plot 6					
Address: 1. Overall dwelling dime	ansions:								
1. Overall awelling aime	, , , , , , , , , , , , , , , , , , ,	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor				(1a) x		2.5	(2a) =	193.02	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) =	77.21	(4)			-		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	193.02	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		7 + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	-	0	Ī = Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ins			, L	3	x '	10 =	30	(7a)
Number of passive vents	;			Ē	0	x '	10 =	0	(7b)
Number of flueless gas fi	ires			F	0	X 4	40 =	0	(7c)
				L				_	
				_			Air ch	nanges per ho	our —
	ys, flues and fans = (6a)+(6b)+(peen carried out or is intended, proceed			continuo fr	30		÷ (5) =	0.16	(8)
Number of storeys in the		.u 10 (11),	ouror wise t	onunae n	om (5) to	(10)		0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
it both types of wall are p deducting areas of openii	resent, use the value corresponding t ngs); if equal user 0.35	o the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	·							0	(13)
Percentage of windows Window infiltration	s and doors draught stripped		0.25 - [0.2	v (14) ± 1	1001 -			0	(14)
Infiltration rate			(8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metre	es per h					area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18)$	-	•	•		•		0.31	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.0 75 x (1	19)1 =			1	(19) (20)
Infiltration rate incorporate	ting shelter factor		(21) = (18		/1			0.92	(21)
Infiltration rate modified f	•		. , .					0.20	(=./
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7	-						•	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
								J	

0.36	0.35	0.35	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33		
Calculate effe		•	rate for t	he appli	cable ca	se			l				
If mechanicate of the street o			andiv N. (2	2h) _ (22c) Em. (a	auation (VEVV othor	auioo (22h) - (220)			0	(2:
If balanced with		0 11		, ,	,	. `	,, .	,) = (23a)			0	(2:
		•	•	_					2h\m . /	'00k\ f	4 (22.5)	0	(2:
a) If balance		o 0	0	o with he	0		1K) (248	0	0	(230) × [0	+ 100]	(2
b) If balance													(-
24b)m= 0	0	o 0	0	0	0	0	0	0	0	0	0		(2
c) If whole h													•
,				•	•		c) = (22k)		.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft				l	
,				•	•		0.5 + [(2		0.5]			-	
24d)m= 0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(2
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)				•	
25)m= 0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.56		(2
3. Heat losse	s and he	eat loss r	paramete	er:									
LEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	e A	λΧk
	area	-	m		A ,r		W/m2		(W/		kJ/m²-l		J/K
Ooors					2	X	1.4	= [2.8				(2
Vindows Type	: 1				3.105	_x 1	/[1/(1.4)+	0.04] =	4.12				(2
Vindows Type	2				6.097	₇ χ1	/[1/(1.4)+	0.04] =	8.08				(2
Vindows Type	3				4.579	x1	/[1/(1.4)+	0.04] =	6.07				(2
loor					77.21	X	0.12	i	9.2652	<u>=</u> 2 [(2
Valls Type1	78.2	24	13.78	В	64.46	x	0.15	= i	9.67	T i			(2
Valls Type2	33.8	31	2		31.81	x	0.14	= i	4.48	F i			<u> </u>
otal area of e	lements	 , m²			189.2	6							(3
for windows and			ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragraph	3.2	·
* include the area	as on both	sides of in	iternal wal	ls and par	titions								
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				44.49	(3
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	9840.85	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design assess				construct	ion are no	t known pi	ecisely the	indicative	values of	TMP in T	able 1f		
<i>an be used inste</i> Thermal bridge				ıcina Δr	nandiy l	<i>(</i>						445	
details of therma	•	,		• .	•	`						14.5	(3
otal fabric he		are not kin	own (30) -	- 0.00 X (0	'')			(33) +	(36) =			58.99	(3
entilation hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	35.82	35.66	34.92	34.79	34.14	34.14	34.02	34.39	34.79	35.07	35.36		(3
35.98	33.62	00.00											
,					Į.		ļ	(39)m	= (37) + (38)m			
35.98 deat transfer (39)m= 94.97			93.92	93.78	93.13	93.13	93.02	(39)m 93.38	= (37) + (38)m 94.06	94.35		

40	Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
Number of days in month (Table 1a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec			<u> </u>		1.21	1.21	1.21	1.2	` '	·	T	1.22		
Number of days in month (Table 1a) Aun Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(1)										<u> </u>	<u> </u>	1.22	(40)
### A. Water heating energy requirement: ### A. Water showed here an unable usage in litres per day for each month vid. me leator from Table 1 to achieve a water use target of not most most be for achieve a water use target of not most most be for achieve a water use target of not most most be for achieve a water use target of not most most be for achieve a water use target of not most most be for achieve a water use target of not most most be for achieve a water use target of not most most be for achieve a water use target of not most most water for achieve a water use target of not most most water for achieve a water use target of not most most water for achieve a water use target of not most most water for achieve a water for achieve a water use target of not most most be for achieve a water for for for for for for for for for fo	Number of day	s in mo	nth (Tabl	le 1a)							(),			` ′
### Assumed occupancy, N ### Assumed occupa	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water use, hot and cold to the control of the twelve usage in litres per day for each month Vd.m = factor from Table 15 x (43). (44)m=	(41)m= 31	28	31	30	31	30	31	31		31	30	31		(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water use, hot and cold to the control of the twelve usage in litres per day for each month Vd.m = factor from Table 15 x (43). (44)m=	LI									ļ	•			
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 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day fell water use, hot and cold to the control of the twelve usage in litres per day for each month Vd.m = factor from Table 15 x (43). (44)m=	1 Motor boot	ina ono	rav roqui	romonti								Is\A/b/s	ori.	
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2] + 0.0013 x (TFA -13.9) if TFA E 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water usa target of not more that 125 fixes per person per day (all vester usa, not and cot) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	4. Water neat	ing ene	rgy requi	rement.								KVVII/ye	al.	
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) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	if TFA > 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		41		(42)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec										se target o		.19		(43)
Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43)	not more that 125	litres per	person per	day (all w	ater use, l	hot and co	ld)							
Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Total = Sum(44)e 1154.34 (44) Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)me 156.92 137.24 141.62 123.47 118.47 102.23 94.73 108.71 110.01 128.2 139.94 151.97 151.52 (45) If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) (46)me 0 0 0 0 0 0 0 0 0		litres per			<u></u>		Table 1c x		•	ļ				
Total = Sum(44). u =	(44)m= 105.81	101.97	98.12	94.27	90.42	86.58	86.58	90.42	94.27	98.12	101.97	105.81		
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) (45)me	()										<u> </u>	l	1154.34	(44)
Total = Sum(45)u = 1513.52 (45)	Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	Tm / 3600						`
# instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) ### Vater storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel	(45)m= 156.92	137.24	141.62	123.47	118.47	102.23	94.73	108.71	110.01	128.2	139.94	151.97		
# instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) ### Vater storage loss: Storage volume (litres) including any solar or WWHRS storage within same vessel	` ' <u> </u>		<u> </u>			l .			-	I Total = Su	ım(45) ₁₁₂ =	 =	1513.52	(45)
Water storage loss: (47) Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47) If community heating and no tank in dwelling, enter 110 litres in (47) (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) (48) Water storage loss: 0 (48) a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) Temperature factor from Table 2b 0 (50) Energy lost from water storage, kWh/year (48) x (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: 0 (51) Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 0 (52) Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) 0 (53) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)m = (56)m where (H11) is from Ap	If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)			, ,			
Storage volume (litres) including any solar or WWHRS storage within same vessel 0	(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = O (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Water storage	loss:	ļ			<u>[</u>	<u>[</u>			!	!	<u>[</u>		
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): Cemperature factor from Table 2b Cenergy lost from water storage, kWh/year (48) × (49) = 0 (50) (49) Energy lost from water storage, kWh/year (48) × (49) = 0 (50) (51) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) (51) If community heating see section 4.3 Volume factor from Table 2a (52) Temperature factor from Table 2b (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Storage volume	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): $0 \qquad (48)$ Temperature factor from Table 2b $0 \qquad (49)$ Energy lost from water storage, kWh/year $(48) \times (49) = 0 \qquad 0 \qquad (50)$ b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) $0 \qquad (51)$ If community heating see section 4.3 Volume factor from Table 2a $0 \qquad (52)$ Temperature factor from Table 2b $0 \qquad (53)$ Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0 \qquad (54)$ Enter (50) or (54) in (55) $0 \qquad (55)$ Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ $(56)m = 0 \qquad 0$	If community h	eating a	ınd no ta	nk in dw	velling, e	nter 110	litres in	(47)						
a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/year (48) × (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Temperature factor from Table 2b	_													
Energy lost from water storage, kWh/year (48) × (49) = 0 (50) (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) 0 (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a) If manufacti	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) O (51) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m= O O O O O O O O O O O O O	Temperature fa	actor fro	m Table	2b								0		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0 (55) Vater storage loss calculated for each month $((56)m = (55) \times (41)m)$ (56) $m = 0$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			_	-				(48) x (49)	=			0		(50)
If community heating see section 4.3 Volume factor from Table 2a	•			-										(=4)
Volume factor from Table 2a $0 \qquad (52)$ Temperature factor from Table 2b $0 \qquad (53)$ Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0 \qquad (54)$ Enter (50) or (54) in (55) $0 \qquad (55)$ Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ $(56)m = 0 \qquad 0$		-			e z (KVV	n/iitre/aa	ıy)					0		(51)
Temperature factor from Table 2b $0 \qquad (53)$ Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0 \qquad (54)$ Enter (50) or (54) in (55) $0 \qquad (55)$ Water storage loss calculated for each month $((56)m = (55) \times (41)m)$ $(56)m = 0 \qquad 0$	•	_		311 4.3								0		(52)
Energy lost from water storage, kWh/year $ (47) \times (51) \times (52) \times (53) = 0 $ (54) Enter (50) or (54) in (55) $ 0 $ (55) $ 0 $ (55) $ 0 $ (55) $ 0 $ (56) $ 0 $ (56) $ 0 $ (76) $ 0 $ (77) $ 0 $ (78) $ 0 $ (79) $ 0 $ (70)				2b							_			
Enter (50) or (54) in (55) Water storage loss calculated for each month ((56)m = $(55) \times (41)$ m (56)m = $(55) \times (41)$ m (57)m = $(55) \times (41)$ m (58) Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = $(58) \div 365 \times (41)$ m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	•				ar			(47) v (51)	v (52) v (53) -				, ,
Water storage loss calculated for each month $ ((56)m = (55) \times (41)m) $ $ (56)m = 0 0 0 0 0 0 0 0 0 0$	0,		•	, KVVII/ y (sai			(47) X (01)	/ X (02) X (00) =	-			
(56)m=	` , , ,	, ,	,	or each	month			((56)m = (55) v (41):	m		0		(00)
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$, else $(57)m = (56)m$ where $(H11)$ is from Appendix H (57)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						T _					1 -	I _		(50)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (58)			-									-	ix H	(56)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	-	•	•			59)m = ((58) ÷ 36	55 × (41)	m					
(59)m= 0 0 0 0 0 0 0 0 0 0 0 0 (59)	-				,	•	. ,	, ,		r thermo	stat)			
	(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	0	0) 0		0	0	0	0]	(61)
	uired for	water he	eating ca	Lalculated	L I for eac	h month	(62)ı	— m =	0.85 × (′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 133.38	`	120.38	104.95	100.7	86.9	80.52	92.	_	93.51	108.97	118.95	129.17]	(62)
Solar DHW input	: calculated	using App	endix G or	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	.	
(add additiona												-		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from v	vater hea	ter			•						•	•	-	
(64)m= 133.38	116.66	120.38	104.95	100.7	86.9	80.52	92.	4	93.51	108.97	118.95	129.17]	
					=			Outp	out from wa	ater heate	er (annual) ₁	I12	1286.49	(64)
Heat gains fro	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	5 × (45)m	+ (6	1)m	n] + 0.8 x	((46)m	+ (57)m	+ (59)m	n]	
(65)m= 33.35	29.16	30.09	26.24	25.18	21.72	20.13	23.	.1	23.38	27.24	29.74	32.29]	(65)
include (57)m in cald	culation of	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	jains (see	Table 5	and 5a):										
Metabolic gai	ns (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.	.39	120.39	120.39	120.39	120.39		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equat	ion L9 c	or L9a), a	lso s	ee 7	Table 5				_	
(67)m= 19.47	17.29	14.06	10.65	7.96	6.72	7.26	9.4	4	12.67	16.08	18.77	20.01]	(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5		-	_	
(68)m= 213.51	215.73	210.14	198.26	183.25	169.15	159.73	157.	.52	163.1	174.98	189.99	204.09]	(68)
Cooking gain	s (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5			-	
(69)m= 35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.0	04	35.04	35.04	35.04	35.04]	(69)
Pumps and fa	ans gains	(Table 5	5a)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)									
(71)m= -96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.	31	-96.31	-96.31	-96.31	-96.31]	(71)
Water heating	g gains (T	able 5)			-						-		_	
(72)m= 44.82	43.4	40.45	36.44	33.84	30.17	27.06	31.0	05	32.47	36.62	41.3	43.4		(72)
Total interna	l gains =	1			(66	s)m + (67)m	n + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m		
(73)m= 336.91	335.53	323.77	304.46	284.17	265.16	253.17	257.	.12	267.35	286.8	309.18	326.62]	(73)
6. Solar gair	ns:												_	
Solar gains are		•				·	tions t	to co	nvert to th	e applica		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ux ible 6a		т.	g_ able 6b	т	FF able 6c		Gains (W)	
							, ,	1	able ob	_ '	able oc		. ,	-
Southeast 0.9x		X	6.	1	X	36.79	X		0.63	_ ×	0.7	=	68.56	<u> </u> (77)
Southeast 0.9x		X	6.			62.67	X		0.63	x	0.7	=	116.78	<u> </u> (77)
Southeast 0.9x	<u> </u>	X	6.	1	X	85.75	X		0.63	_ ×	0.7	=	159.78	<u> </u> (77)
Southeast 0.9x		X	6.	1	X	106.25	X		0.63	×	0.7	=	197.98	(77)
Southeast 0.9x	0.77	X	6.	1	X ·	119.01	X		0.63	X	0.7	=	221.76	(77)

Southeast 0.9x 0.77 x 6.1 x 118.15 x 0.63 x 0.7 = 220.15 Southeast 0.9x 0.77 x 6.1 x 113.91 x 0.63 x 0.7 = 212.25 Southeast 0.9x 0.77 x 6.1 x 104.39 x 0.63 x 0.7 = 194.51 Southeast 0.9x 0.77 x 6.1 x 92.85 x 0.63 x 0.7 = 173.01 Southeast 0.9x 0.77 x 6.1 x 69.27 x 0.63 x 0.7 = 129.07 Southeast 0.9x 0.77 x 6.1 x 44.07 x 0.63 x 0.7 = 82.12 Southeast 0.9x 0.77 x 6.1 x 31.49 x 0.63 x 0.7 = 58.67 Southeast 0.9x 0.77 x 6.1 x 31.49 x 0.63 x 0.7 = 58.67	[(77)](77)](77)](77)](77)](77)
Southeast 0.9x 0.77 x 6.1 x 104.39 x 0.63 x 0.7 = 194.51 Southeast 0.9x 0.77 x 6.1 x 92.85 x 0.63 x 0.7 = 173.01 Southeast 0.9x 0.77 x 6.1 x 69.27 x 0.63 x 0.7 = 129.07 Southeast 0.9x 0.77 x 6.1 x 44.07 x 0.63 x 0.7 = 82.12 Southeast 0.9x 0.77 x 6.1 x 31.49 x 0.63 x 0.7 = 58.67 Southwest 0.9x 0.77 x 3.11 x 36.79 0.63 x 0.7 = 34.91	(77) (77) (77) (77)
Southeast 0.9x 0.77 x 6.1 x 92.85 x 0.63 x 0.7 = 173.01 Southeast 0.9x 0.77 x 6.1 x 69.27 x 0.63 x 0.7 = 129.07 Southeast 0.9x 0.77 x 6.1 x 44.07 x 0.63 x 0.7 = 82.12 Southeast 0.9x 0.77 x 6.1 x 31.49 x 0.63 x 0.7 = 58.67 Southwest 0.9x 0.77 x 3.11 x 36.79 0.63 x 0.7 = 34.91	(77) (77) (77)
Southeast 0.9x 0.77 x 6.1 x 69.27 x 0.63 x 0.7 = 129.07 Southeast 0.9x 0.77 x 6.1 x 44.07 x 0.63 x 0.7 = 82.12 Southeast 0.9x 0.77 x 6.1 x 31.49 x 0.63 x 0.7 = 58.67 Southwest 0.9x 0.77 x 3.11 x 36.79 0.63 x 0.7 = 34.91	(77) (77)
Southeast 0.9x 0.77 x 6.1 x 44.07 x 0.63 x 0.7 = 82.12 Southeast 0.9x 0.77 x 6.1 x 31.49 x 0.63 x 0.7 = 58.67 Southwest 0.9x 0.77 x 3.11 x 36.79 0.63 x 0.7 = 34.91	(77)
Southeast 0.9x 0.77 x 6.1 x 31.49 x 0.63 x 0.7 = 58.67 Southwest 0.9x 0.77 x 3.11 x 36.79 0.63 x 0.7 = 34.91] `
Southwest _{0.9x} 0.77 x 3.11 x 36.79 0.63 x 0.7 = 34.91	(77)
	(77)
	(79)
Southwest _{0.9x} 0.77 x 3.11 x 62.67 0.63 x 0.7 = 59.47	(79)
Southwest _{0.9x} 0.77 x 3.11 x 85.75 0.63 x 0.7 = 81.37	(79)
Southwest _{0.9x} 0.77 x 3.11 x 106.25 0.63 x 0.7 = 100.83	(79)
Southwest _{0.9x} 0.77 x 3.11 x 119.01 0.63 x 0.7 = 112.93	(79)
Southwest _{0.9x} 0.77 x 3.11 x 118.15 0.63 x 0.7 = 112.12	(79)
Southwest _{0.9x} 0.77 x 3.11 x 113.91 0.63 x 0.7 = 108.09	(79)
Southwest _{0.9x} 0.77 x 3.11 x 104.39 0.63 x 0.7 = 99.06	(79)
Southwest _{0.9x} 0.77 x 3.11 x 92.85 0.63 x 0.7 = 88.11	(79)
Southwest _{0.9x} 0.77 x 3.11 x 69.27 0.63 x 0.7 = 65.73	(79)
Southwest _{0.9x} 0.77 x 3.11 x 44.07 0.63 x 0.7 = 41.82	(79)
Southwest _{0.9x} 0.77 x 3.11 x 31.49 0.63 x 0.7 = 29.88	(79)
Northwest 0.9x 0.77 x 4.58 x 11.28 x 0.63 x 0.7 = 15.79	(81)
Northwest 0.9x 0.77 x 4.58 x 22.97 x 0.63 x 0.7 = 32.14	(81)
Northwest 0.9x 0.77 x 4.58 x 41.38 x 0.63 x 0.7 = 57.91	(81)
Northwest 0.9x 0.77 x 4.58 x 67.96 x 0.63 x 0.7 = 95.1	(81)
Northwest 0.9x 0.77 x 4.58 x 91.35 x 0.63 x 0.7 = 127.83	(81)
Northwest 0.9x 0.77 x 4.58 x 97.38 x 0.63 x 0.7 = 136.28	(81)
Northwest 0.9x 0.77 x 4.58 x 91.1 x 0.63 x 0.7 = 127.49	(81)
Northwest 0.9x 0.77 x 4.58 x 72.63 x 0.63 x 0.7 = 101.63	(81)
Northwest 0.9x 0.77 x 4.58 x 50.42 x 0.63 x 0.7 = 70.56	(81)
Northwest 0.9x 0.77 x 4.58 x 28.07 x 0.63 x 0.7 = 39.28	(81)
Northwest 0.9x 0.77 x 4.58 x 14.2 x 0.63 x 0.7 = 19.87	(81)
Northwest 0.9x	(81)
5.2.	1(- /
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
(83)m= 119.26 208.39 299.06 393.9 462.52 468.55 447.83 395.21 331.68 234.08 143.8 101.45	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 456.18 543.93 622.84 698.36 746.68 733.71 700.99 652.32 599.03 520.87 452.98 428.07	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(86)m= 0.97 0.95 0.92 0.86 0.77 0.64 0.51 0.56 0.74 0.89 0.95 0.97	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 18.42 18.73 19.2 19.79 20.33 20.71 20.88 20.85 20.55 19.84 19.02 18.36	(87)

Tomr	oroturo	durina h	ootina n	ariada ir	root of	ومزالوييط	from To	hia O T	h2 (0C)					
(88)m=	19.9	19.9	neating p	19.91	19.91	19.92	19.92	19.92	19.91	19.91	19.91	19.9		(88)
		<u> </u>	<u> </u>				<u> </u>	<u> </u>	19.91	19.91	19.91	19.9		(00)
		<u>_</u>	ains for i			· ·	i							(00)
(89)m=	0.96	0.94	0.91	0.84	0.73	0.57	0.41	0.45	0.68	0.87	0.95	0.97		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	le 9c)				
(90)m=	17.55	17.85	18.31	18.89	19.39	19.74	19.86	19.85	19.61	18.96	18.15	17.49		(90)
									f	fLA = Livin	g area ÷ (4	4) =	0.41	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	A × T1	+ (1 – fl	A) x T2			•		
(92)m=	17.91	18.21	18.67	19.26	19.77	20.13	20.28	20.26	19.99	19.32	18.51	17.85		(92)
			he mean											
(93)m=	17.91	18.21	18.67	19.26	19.77	20.13	20.28	20.26	19.99	19.32	18.51	17.85		(93)
	ace hea	L	uirement											
			ernal ter		re obtain	ed at ste	en 11 of	Table 9	h so tha	ıt Ti m=(¹	76)m an	d re-calc	ulate	
			or gains	•		ou at ou	5P 11 01	1 4510 01	o, oo ina	(<i>i</i> 0)111 a11	a ro care	diato	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.95	0.93	0.89	0.82	0.72	0.58	0.44	0.49	0.69	0.85	0.93	0.96		(94)
Usefu	ıl gains,	hmGm	, W = (94	1)m x (84	4)m									
(95)m=	433.87	504.35	553.8	574.43	538.57	427.52	311.63	318.4	410.68	444.79	421.68	409.78		(95)
Montl	hly aver	age exte	rnal tem	perature	from Ta	able 8	•	•						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1292.21	1261.57	1152.28	972.94	757.2	515.34	342.62	358.64	549.99	817.65	1072.75	1287.6		(97)
_														
Spac	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			
Spac (98)m=	e heatin 638.6	g require 508.86	ement fo 445.27	r each n 286.93	nonth, k\ 162.66	Wh/mon	th = 0.02	24 x [(97))m – (95 0	m] x (4 ⁻	1)m 468.77	653.1		
-								0	0	 	468.77		3441.6	(98)
(98)m=	638.6	508.86	445.27	286.93	162.66			0	0	277.41	468.77			=
(98)m=	638.6 e heatin	508.86 g require	445.27 ement in	286.93 kWh/m²	162.66			0	0	277.41	468.77		3441.6 44.57	(98)
(98)m= Space 8c. S	e heatin	508.86 g require	445.27 ement in quiremen	286.93 kWh/m²	162.66 ² /year	0		0	0	277.41	468.77			=
(98)m= Space 8c. S	e heatin	508.86 g require	445.27 ement in uirement July and	286.93 kWh/m² t August.	162.66 ² /year See Tal	0 ble 10b	0	0 Tota	0 Il per year	277.41 (kWh/year	468.77) = Sum(9	8)15,912 =		=
(98)m= Spac 8c. S Calcu	e heatin pace co	g require	ement in uiremen July and Mar	kWh/m² t August. Apr	162.66 Pyear See Tal	0 ble 10b Jun	Jul	0 Tota	0 ll per year	277.41 (kWh/year	468.77) = Sum(9 Nov	8) _{15,912} =		=
(98)m= Spac 8c. S Calcu	e heatin pace co plated fo Jan loss rate	g require oling rec r June, Feb e Lm (ca	ement in uiremen July and Mar Ilculated	kWh/m² t August. Apr using 28	162.66 Pyear See Tal May 5°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug and exte	0 Il per year Sep ernal ten	277.41 (kWh/year Oct	468.77 Sum(9) Nov e from T	8) _{15,912} = Dec able 10)		(99)
(98)m= Space 8c. S Calcu Heat (100)m=	e heatin pace co llated fo Jan loss rate	g require coling recorder June, coling Feb e Lm (call	ement in quirement July and Mar lculated	kWh/m² t August. Apr	162.66 Pyear See Tal	0 ble 10b Jun	0 Jul	0 Tota	0 ll per year	277.41 (kWh/year	468.77) = Sum(9 Nov	8) _{15,912} =		=
Space 8c. S Calcu Heat (100)m= Utilisa	e heatin pace co plated fo Jan loss rate o ation face	g require oling rec r June, Feb e Lm (ca	ement in uirement July and Mar Juluted 0 pss hm	kWh/m² t August. Apr using 25	162.66 See Tat May S°C inter	0 ble 10b Jun nal temp 875.47	Jul perature 689.2	O Total Aug and exter	0 old per year Sep ernal ten 0	277.41 (kWh/year Oct nperatur 0	468.77 Sum(9) Nov e from T	8) _{15,912} = Dec Table 10)		(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m=	e heatin pace co plated fo Jan loss rate 0 ation face	g require r June, c Feb e Lm (ca	ement in quirement July and Mar lculated 0 pss hm 0	kWh/m² t August. Apr using 25	See Tal May 5°C inter	0 Die 10b Jun rnal temp 875.47	Jul perature	0 Tota Aug and exte	0 Il per year Sep ernal ten	277.41 (kWh/year Oct	468.77 Sum(9) Nov e from T	8) _{15,912} = Dec able 10)		(99)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu	e heatin pace co plated fo Jan loss rate o ation face	g require oling rec r June, Feb e Lm (ca 0 ctor for lo	ement in July and Mar Iculated 0 pss hm 0	kWh/m² t August. Apr using 25 0 100)m x	See Tab May 5°C inter 0	0 ble 10b Jun nal temp 875.47	Jul perature 689.2	O Total Aug and exter 706.92	Sep ernal ten	Oct nperatur 0	468.77 Nov e from T 0	Dec fable 10)		(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin pace co llated fo Jan loss rate 0 ation face ul loss, h	g require r June, c Feb e Lm (ca 0 ctor for lo	ement in quirement July and Mar July and 0 pss hm 0 Vatts) = (kWh/m² t August. Apr using 25 0 100)m x	See Tate May 0 0 0 (101)m 0	0 Die 10b Jun rnal temp 875.47 0.74	Jul perature 689.2 0.81	0 Tota Aug and exte 706.92 0.78	Sep ernal ten 0	277.41 (kWh/year Oct nperatur 0	468.77 Sum(9) Nov e from T	8) _{15,912} = Dec Table 10)		(100)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	e heatin pace co plated fo Jan loss rate o ation face o ul loss, h	g require coling recorder June, where I continue to the contin	ement in July and Mar Iculated 0 oss hm 0 Vatts) = (0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	See Tab May 5°C inter 0 (101)m 0 cable we	0 Die 10b Jun nal temp 875.47 0.74 651.98	Jul perature 689.2 0.81 556.41 egion, se	0 Tota Aug and exte 706.92 0.78	Sep ernal ten 0 0 10)	Oct nperatur 0	Nov e from T 0	Dec able 10) 0		(100) (101) (102)
Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	e heatin pace co plated fo Jan loss rate 0 ation face 1 0 ul loss, h 0 (solar g	g require r June, v Feb e Lm (ca 0 ctor for lo 0 nmLm (V 0 gains ca	ement in Quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli	See Tate May 5°C inter 0 0 (101)m 0 cable we	0 Jun rnal temp 875.47 0.74 651.98 eather re	Jul perature 689.2 0.81 556.41 egion, se 907.06	0 Tota Aug and exte 706.92 0.78 551.72 ee Table 851.68	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	Nov Nov O O O O	Dec Table 10) 0 0	44.57	(100)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace co pare de la lated for loss rate or loss rate or loss, had loss cooling e cooling	g require oling rec r June, v Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 g require	ement in quirement July and Mar Julculated 0 oss hm 0 Vatts) = (0 lculated 0 ement fo	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tak May 5°C inter 0 (101)m 0 cable we	0 Jun rnal temp 875.47 0.74 651.98 eather re	Jul perature 689.2 0.81 556.41 egion, se 907.06	0 Tota Aug and exte 706.92 0.78 551.72 ee Table 851.68	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	Nov Nov O O O O	Dec Table 10) 0 0	44.57	(100) (101) (102)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace co llated fo Jan loss rate 0 ation face 0 ul loss, h 0 s (solar g 0 e cooling 04)m to	g require oling rec r June, v Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca 0 g require	ement in Quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tak May S°C inter 0 (101)m 0 cable we 0 whole co	0 Jun rnal temp 875.47 0.74 651.98 eather re	Jul perature 689.2 0.81 556.41 egion, se 907.06	0 Tota Aug and exte 706.92 0.78 551.72 ee Table 851.68	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	Nov Nov O O O O	Dec Table 10) 0 0	44.57	(100) (101) (102)
Space Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	e heatin pace co llated fo Jan loss rate 0 ation face 0 ul loss, h 0 s (solar g 0 e cooling 04)m to	g require coling recovery r June, very Feb e Lm (ca color for locator for loca	ement in July and Mar Iculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tak May S°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun nal temp 875.47 0.74 651.98 eather re 947.1	Jul perature 689.2 0.81 556.41 egion, see 907.06 continue	0 Tota Aug and exter 706.92 0.78 551.72 ee Table 851.68 ous (kW	0 0 0 0 0 0 0 0 0 0	277.41 (kWh/year Oct nperatur 0 0 24 x [(10)	Nov e from T 0 0 0 0 0 0 0 0 0	Dec able 10) 0 0 102)m];	44.57	(100) (101) (102)
Space Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face 0 ul loss, h 0 s (solar g 0 e cooling 04)m to	g require coling recorder June, where I can be considered as a considered	ement in July and Mar Iculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tak May S°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun nal temp 875.47 0.74 651.98 eather re 947.1	Jul perature 689.2 0.81 556.41 egion, see 907.06 continue	0 Tota Aug and exter 706.92 0.78 551.72 ee Table 851.68 ous (kW	0 1 10 0 10 0 10 0 10	Oct nperatur 0 0 24 x [(10	Nov Nov e from T 0 0 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m];	44.57 x (41)m	(100) (101) (102) (103)
Space Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face 0 ul loss, h 0 s (solar (0 e cooling 04)m to d fraction	g require r June, v Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require zero if (ement in July and Mar Iculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tak May S°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun nal temp 875.47 0.74 651.98 eather re 947.1	Jul perature 689.2 0.81 556.41 egion, see 907.06 continue	0 Tota Aug and exter 706.92 0.78 551.72 ee Table 851.68 ous (kW	0 1 10 0 10 0 10 0 10	277.41 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(Nov Nov e from T 0 0 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m];	44.57 x (41)m 696.53	(100) (101) (102) (103)
Space Space 8c. S Calcu Heat (100)m= Utilisa (101)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face of solar grade of the cooling of the	g require r June, v Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require zero if (ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo (104)m <	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tak May S°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun nal temp 875.47 0.74 651.98 eather re 947.1	Jul perature 689.2 0.81 556.41 egion, see 907.06 continue	0 Tota Aug and exter 706.92 0.78 551.72 ee Table 851.68 ous (kW	0 1 10 0 10 0 10 0 10	277.41 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(Nov Nov e from T 0 0 0 0 0 0 104)	8) _{15,912} = Dec Table 10) 0 0 102)m];	44.57 x (41)m 696.53	(100) (101) (102) (103)
Space Sc. S Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Interm	e heatin pace co lated fo Jan loss rate 0 ation face of solar grade of the cooling of the	g require oling rec r June, Feb e Lm (ca 0 ctor for lo 0 mmLm (V 0 gains ca 0 g require zero if (0 n actor (Ta	ement in July and Mar July and Obss hm O Vatts) = (0 Iculated 0 ement for (104)m < 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole com	ole 10b Jun nal temp 875.47 0.74 651.98 eather re 947.1 dwelling,	0 Jul Derature 689.2 0.81 556.41 Egion, see 907.06 Continue 260.88	0 Tota Aug and exte 706.92 0.78 551.72 ee Table 851.68 ous (kW	0 10 0 0 10 0 10 0 10 10 10 10 10 10	277.41 (kWh/year Oct nperatur 0 0 0 24 x [(10 0 1 5 5 5 6 5 6 6 6 6 6	Nov Sum(9 Nov From T 0	Dec able 10) 0 0 102)m] x	44.57 x (41)m 696.53	(100) (101) (102) (103)

Space cooling requirement for month = (104)m × (105) × (106)m												_				
(107)m= 0	0	0	0	0	53.12 65.22 55.79 0 0 0 0											
Total = Sum(107) =												174.13	(107)			
Space cooling	requiren	ment in k	:Wh/m²/y	/ear				(107)) ÷ (4) =			2.26	(108)			
8f. Fabric Ene	rgy Effici	iency (ca	alculated	only un	der spec	cial cond	litions, s	ee sectio	on 11)							
8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11) Fabric Energy Efficiency (99) + (108) =												46.83	(109)			

SAP Input

Property Details: Plot 6

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 08 July 2020
Date of certificate: 28 October 2020

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown
No related party
Indicative Value Low

Water use <= 125 litres/person/day: False

PCDF Version: 466

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 77.21 m² 2.5 m

Living area: 31.45 m² (fraction 0.407)

Front of dwelling faces: North East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
NE	Manufacturer	Solid			
SW	Manufacturer	Windows	double-glazed	Yes	
SE	Manufacturer	Windows	double-glazed	Vac	

SW Manufacturer Windows double-glazed Yes
SE Manufacturer Windows double-glazed Yes
NW Manufacturer Windows double-glazed Yes

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
NE	mm	0	0	1.4	2	1
SW	16mm or more	0.7	0.63	1.4	3.105	1
SE	16mm or more	0.7	0.63	1.4	6.097	1
NW	16mm or more	0.7	0.63	1.4	4.579	1

Name: NE	Type-Name:	Location: Corridor Wall	Orient: North East	Width: 0	Height: 0
SW		External Wall	South West	0	0
SE		External Wall	South East	0	0
NW		External Wall	North West	0	0

Overshading: Average or unknown

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
External Wall	78.243	13.78	64.46	0.15	0	False	N/A
Corridor Wall	33.806	2	31.81	0.15	0.43	False	N/A
Ground Floor	77.21			0.12			N/A

Internal Elements
Party Elements

Thermal bridges:

SAP Input

User-defined (individual PSI-values) Y-Value = 0.0766 Thermal bridges: Length Psi-value Other lintels (including other steel lintels) 0.294 E2 7.495 24.6 0.049 E4 Jamb 37.983 E5 Ground floor (normal) 0.153 Party floor between dwellings (in blocks of flats) 34.031 0.067 E7 Corner (normal) 11.8 0.083 E16 Exposed floor (inverted) 3.951 0.136 E21 Corner (inverted internal area greater than external area) 2.95 -0.072 E17 5.9 0.108 E25 Staggered party wall between dwellings [Approved] E3 1.8 0.04

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

6.193

6.193

Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid

0.16

0

A LI LULI CL T

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 1
Pressure test: 3

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 94 Piping>=1991, pre-insulated, low temp, variable flow

Р1

Р3

Ground floor

Intermediate floor between dwellings (in blocks of flats)

Central heating pump: 2013 or later Design flow temperature: Unknown

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and at least two room

thermostats

Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

Water code: 901
Fuel :mains gas
No hot water cylinder
Solar panel: False

Others:

Electricity tariff: Standard Tariff
In Smoke Control Area: Unknown
Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

SAP Input

Installed Peak power: 0.95

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		User_[Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 6					
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor		_	a(m²)	l(10) v	Av. He		_	Volume(m ³	<u>`</u>
	\ \(\lambda \)			(1a) x		2.5	(2a) =	193.02	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	77.21	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	193.02	(5)
2. Ventilation rate:								2	
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0	=	0)	(40 =	0	(6a)
Number of open flues	0 + 0	7 + [0	 =	0	>	(20 =	0	(6b)
Number of intermittent fa	ins				3	,	(10 =	30	(7a)
Number of passive vents	;			F	0	<u> </u>	c 10 =	0	(7b)
Number of flueless gas fi					0		(40 =	0	(7c)
				L					(, o)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.16	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise (continue fi	rom (9) to	(16)			
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	.25 for steel or timber frame of	vr ∩ 25 fc	r macan	n, concti	ruction	[(9	9)-1]x0.1 =	0	(10)
	resent, use the value corresponding			•	luction			0	(11)
deducting areas of opening	ngs); if equal user 0.35			·					_
•	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	1001 =			0	(14)
Infiltration rate			(8) + (10)			+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic meti	es per h	our per s	quare m	etre of e	envelop	e area	5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20]$	(8), otherw	vise (18) =	(16)				0.41	(18)
	es if a pressurisation test has been de	one or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0 075 x (*	19\1 –			1	(19)
Infiltration rate incorporat	ting shelter factor		(23) = (18)	`	10/] –			0.92	(20)
Infiltration rate modified f	•		(=:) (:0)				0.38	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1	1	1 .2	1	1	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	1	1		1	
Wind Factor $(22a)m = (22a)m $		1	Т	ı	1	1	1	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.48	ration rate	0.46	0.41	0.4	0.36	0.36	0.35	0.38	0.4	0.42	0.44		
Calculate effe	ctive air	change i					0.00	0.00	0.1	0.12			
If mechanic												0	(23
If exhaust air h		0		, ,	,	. `	,, .	,) = (23a)			0	(23
If balanced wit		-	-	_								0	(23
a) If balance	1					• `	- 	``	 		`	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance						- `		<u> </u>	<u> </u>				(0.4
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				-	-				E (22h	`			
$\frac{11(220)1}{(24c)m=0}$	$m < 0.5 \times 10^{-6}$	0	nen (240	0	o), otherv	0 vise (24)	0) = (221	0	5 × (230	0	0		(24
d) If natural		اــــــــا				_			U	0	U		(2)
	m = 1, the								0.5]				
(24d)m= 0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24
Effective air	change	rate - en	ter (24a	or (24b	o) or (240	c) or (24	d) in box	(25)					
(25)m= 0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25
2 Heatlesed		ot loss v											
3. Heat losse		·			NI - 1 A -		11 -1		A 37 11			^	V I
ELEMENT	Gros area	_	Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-k		X k J/K
Doors		` '			2	x	1		2	$\stackrel{'}{\Box}$			(26
Nindows Type	e 1				3.105		 /[1/(1.4)+	0.04] =	4.12	=			(27
Windows Type					6.097	╡.	/[1/(1.4)+	L	8.08	=			(27
Windows Type					4.579	= .	/[1/(1.4)+	L	6.07	=			(27
Floor					77.21	=	0.13		10.0373	<u>-</u>			(28
Walls Type1	78.2	, <u>,</u>	12.70			=		믁 ;		<u>'</u>		╡╠	(29
Walls Type1			13.78	<u>}</u>	64.46	=	0.18	⁼	11.6				=
vvalis i ypez	33.8		2		31.81	=	0.18	= [5.73				(29
		, 111~											
Total area of e			ffootivo wi	ndow II ve	189.20		, formula 1	/[/1/	00.0041	a airan in	naraaranb		(31
Total area of e	d roof windo				lue calcul		formula 1.	/[(1/U-valu	e)+0.04] a	s given in	paragraph	3.2	(31
Total area of e	d roof windd as on both	sides of in	ternal wali		lue calcul	ated using	formula 1.		e)+0.04] a	s given in	paragraph	47.64	
Fotal area of e * for windows and ** include the are Fabric heat los	d roof windo as on both ss, W/K =	sides of in = S (A x	ternal wali		lue calcul	ated using		+ (32) =	e)+0.04] a .(30) + (32		[(33
Fotal area of each for windows and the include the area Fabric heat lost Heat capacity	d roof windo as on both ss, W/K = Cm = S(sides of in = S (A x (A x k)	ternal wali U)	s and part	lue calcula iitions	ated using		+ (32) = ((28)		2) + (32a).	[47.64	(33)
Fotal area of e	d roof windo as on both ss, W/K = Cm = S(s parame	sides of in = S (A x (A x k) eter (TMF	ternal wall U) P = Cm ÷	s and part	alue calcula itions kJ/m²K	ated using	(26)(30)	+ (32) = ((28) Indica	.(30) + (32 tive Value:	2) + (32a). Medium	(32e) = [47.64 9840.85	(33)
For all area of estate the area of the area of estate the area of estate the area of estate the area of estate o	d roof windo as on both ss, W/K = Cm = S(s parame sments who ead of a det	sides of in = S (A x (A x k) ter (TMF) ere the detailed calculations	ternal wall U) P = Cm ÷ tails of the	s and part - TFA) in	alue calcula itions kJ/m²K ion are not	ated using	(26)(30)	+ (32) = ((28) Indica	.(30) + (32 tive Value:	2) + (32a). Medium	(32e) = [47.64 9840.85	(33)
Fotal area of each for windows and the include the area fabric heat loss feat capacity. Thermal mass for design assess than be used instead for the fact of the fa	d roof windo as on both ss, W/K = Cm = S(s parame sments whead of a det es : S (L	sides of in S (A x k) Ster (TMF) Here the delatiled calculus (x Y) calculus	ternal wall U) P = Cm ÷ tails of the lation. culated t	s and part - TFA) in constructi	alue calculations kJ/m²K fon are not	ated using	(26)(30)	+ (32) = ((28) Indica	.(30) + (32 tive Value:	2) + (32a). Medium	(32e) = [47.64 9840.85	(33)
Fotal area of ear for windows and it include the area fabric heat loss the area capacity. Thermal mass for design assession be used instead for thermal bridger of the fatalls of the remainstance of the fatalls of the remains for the remains fatalls of the remains for the remains fatalls of the remains fatalls are a second fatalls of the remains fatalls are a second fat	d roof windo as on both ss, W/K = Cm = S(s parame sments who ead of a det es : S (L al bridging	sides of in S (A x k) Ster (TMF) Here the delatiled calculus (x Y) calculus	ternal wall U) P = Cm ÷ tails of the lation. culated t	s and part - TFA) in constructi	alue calculations kJ/m²K fon are not	ated using	(26)(30)	+ (32) = ((28) Indicative	.(30) + (32 tive Value: values of	2) + (32a). Medium	(32e) = [47.64 9840.85 250 13.06	(33)
Fotal area of estate for windows and the include the area fabric heat loss for deal mass for design assess for the fabric fotal fabric hear for the fabric hear fotal fabric hear for a fabric hear for a fabric hear for a fabric hear for a fabric fa	d roof windo as on both ss, W/K = Cm = S(s parame sments whead of a det es : S (L al bridging eat loss	sides of in S (A x k) Ster (TMF) There the detailed calculus X Y) calculate not known	ternal wall U) P = Cm ÷ tails of the lation. culated to	TFA) in constructiusing Ap	alue calculations kJ/m²K fon are not	ated using	(26)(30)	(28) Indicate indicative	.(30) + (32 tive Value: values of (36) =	2) + (32a). Medium TMP in Ta	(32e) = [able 1f	47.64 9840.85 250	(33)
Total area of e * for windows and ** include the are Fabric heat los Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation hea	d roof windd as on both ss, W/K = Cm = S(s parame sments wh ead of a det es : S (L al bridging eat loss at loss ca	sides of in S (A x k) Ster (TMF) ere the detailed calculated are not known alculated	ternal wall U) $P = Cm \div tails of the ulation. culated ulated ula$	TFA) in constructions and part	alue calculatitions a kJ/m²K fon are not pendix h	ated using	(26)(30)	(28) Indicative indicative (33) + (38)m	.(30) + (32) tive Value: values of (36) = = 0.33 × (2) + (32a). Medium TMP in Ta	(32e) = [able 1f	47.64 9840.85 250 13.06	(33)
Total area of e	d roof windo as on both ss, W/K = Cm = S(s parame sments who ead of a det es : S (L al bridging eat loss at loss ca	sides of in S (A x k) Ster (TMF) Here the dealer tailed calculated Mar	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	s and part TFA) in constructi using Ap 0.05 x (3	alue calcula itions kJ/m²K fon are not pendix k 1)	ated using known pr	(26)(30) ecisely the	(33) + (38)m Sep	.(30) + (32 tive Value: values of (36) = = 0.33 × (100)	2) + (32a). Medium TMP in Ta 25)m x (5) Nov	(32e) = [47.64 9840.85 250 13.06	(33 (34 (35 (36 (36
Total area of e * for windows and ** include the are. Fabric heat lose Heat capacity Thermal mass For design assess can be used instea Thermal bridg if details of therma Total fabric head Ventilation head Jan (38)m= 39.13	d roof windo as on both ss, W/K = Cm = S(s parame sments who ead of a det es : S (L al bridging eat loss at loss ca Feb	sides of in S (A x k) Ster (TMF) Here the deletailed calculated are not known alculated Mar 38.57	ternal wall U) $P = Cm \div tails of the ulation. culated ulated ula$	TFA) in constructions and part	alue calculatitions a kJ/m²K fon are not pendix h	ated using	(26)(30)	(33) + (38)m Sep 36.33	.(30) + (32 tive Value: values of (36) = = 0.33 × (Oct 37.03	2) + (32a). Medium TMP in Ta 25)m x (5) Nov 37.52	(32e) = [able 1f	47.64 9840.85 250 13.06	(33 (34 (35 (36 (37
Total area of e	d roof windo as on both ss, W/K = Cm = S(s parame sments who ead of a det es : S (L al bridging eat loss at loss ca Feb	sides of in S (A x k) Ster (TMF) Here the deletailed calculated are not known alculated Mar 38.57	ternal wall U) P = Cm ÷ tails of the ulation. culated u own (36) =	s and part TFA) in constructi using Ap 0.05 x (3	alue calcula itions kJ/m²K fon are not pendix k 1)	ated using known pr	(26)(30) ecisely the	(33) + (38)m Sep 36.33	.(30) + (32 tive Value: values of (36) = = 0.33 × (100)	2) + (32a). Medium TMP in Ta 25)m x (5) Nov 37.52	(32e) = [47.64 9840.85 250 13.06	(31 (33 (34 (35) (36) (37) (38)

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.29	1.29	1.29	1.27	1.27	1.25	1.25	1.25	1.26	1.27	1.27	1.28		
						ı	ı	,	Average =	Sum(40) ₁	12 /12=	1.27	(40)
Number of day	1	nth (Tab	le 1a)	1	ı			ı	1				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13.		41		(42)
Annual average Reduce the annual not more that 125	, al average	hot water	usage by	5% if the α	lwelling is	designed t	` ,		se target o		.39		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x							
(44)m= 100.52	96.87	93.21	89.56	85.9	82.25	82.25	85.9	89.56	93.21	96.87	100.52		
						_	- /			m(44) ₁₁₂ =		1096.62	(44)
Energy content of													
(45)m= 149.07	130.38	134.54	117.3	112.55	97.12	90	103.27	104.51	121.79	132.95	144.37		(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1437.84	(45)
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage	loss:					<u> </u>	<u> </u>						
Storage volum	ne (litres) includir	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
Temperature f					(, , .					0		(49)
Energy lost fro				ear			(48) x (49)) =			0		(50)
b) If manufact		_	-		or is not	known:	. , , , ,				•		(==)
Hot water stor	•			le 2 (kW	h/litre/da	ay)					0		(51)
If community he Volume factor	_		on 4.3								0		(52)
Temperature f			2b								0		(53)
Energy lost fro				ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		_	,				, , , ,	, , , ,	,		0		(55)
Water storage	loss cal	culated t	or each	month			((56)m = ((55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	 e 3	-	-	-	-	-		0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combiless	ام مغمل بمام	fo., o.o.b		(C4)	(00) . 0	CE (44	\							
Combi loss of (61)m= 0	calculated 0	or each	montn ((61)m =	(60) ÷ 3	05 × (41)m 0	Το	0	0	0]	(61)	
	!	<u> </u>					ļ	_ <u>l</u>	<u> </u>	<u> </u>	<u> </u>	(F0)m + (61)m	` '	
(62)m= 126.7		114.36	99.7	95.67	82.55	76.5	87.78		103.52	113	122.71	(59)m + (61)m	(62)	
Solar DHW inpu						ļ							(02)	
(add addition									ii continbu	lion to wate	er rieatiriy)			
(63)m= 0	0	0	0	0	0	0	0	T 0	0	0	0]	(63)	
Output from	 water hea	Ll ter				ļ			<u> </u>	<u> </u>	<u> </u>	I	, ,	
(64)m= 126.7		114.36	99.7	95.67	82.55	76.5	87.78	88.83	103.52	113	122.71]		
	-1						Oı	_ itput from w	ater heate	er (annual)	l12	1222.17	(64)	
Heat gains fi	rom water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)	m] + 0.8 :	x [(46)m	+ (57)m	+ (59)m	1	•	
(65)m= 31.68		28.59	24.93	23.92	20.64	19.12	21.95	1	25.88	28.25	30.68	<u> </u>	(65)	
include (5	7)m in cald	culation o	of (65)m	only if c	vlinder i	s in the	dwellin	a or hot w	ater is f	rom com	munity h	ı neating		
·	•				,						,			
	5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts													
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(66)m= 120.3	9 120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39	120.39		(66)	
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		1		ı		
(67)m= 19.47	7 17.29	14.06	10.65	7.96	6.72	7.26	9.44	12.67	16.08	18.77	20.01		(67)	
Appliances of	gains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), als	so see Ta	ble 5	•	•	•		
(68)m= 213.5	1 215.73	210.14	198.26	183.25	169.15	159.73	157.52	163.1	174.98	189.99	204.09		(68)	
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also	see Table	5	•	•	•		
(69)m= 35.0 ⁴	35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.04]	(69)	
Pumps and f	fans gains	(Table 5	ia)					•				•		
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)	
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-		-			
(71)m= -96.3	1 -96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.31		(71)	
Water heating	ng gains (T	able 5)				-		-	-	-	-			
(72)m= 42.58	3 41.23	38.43	34.62	32.15	28.66	25.7	29.5	30.84	34.79	39.24	41.23		(72)	
Total intern	al gains =	:			(66)m + (67)m	n + (68)m	n + (69)m +	(70)m + (7	71)m + (72))m			
(73)m= 334.6	7 333.36	321.75	302.64	282.47	263.65	251.81	255.57	265.72	284.97	307.11	324.45		(73)	
6. Solar gai	ns:													
Solar gains ar		•	r flux from	Table 6a		•	tions to	convert to th	ne applical		tion.			
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF		Gains		
					Га	Die ba	, –	Table ob	_ '	able 6c		(W)	,	
Southeast 0.9		X	6.	1	x ;	36.79	X	0.63	X	0.7	=	68.56	(77)	
Southeast 0.9		X	6.	1	x (62.67	X	0.63	x	0.7	=	116.78	(77)	
Southeast 0.9	0	X	6.	1	x	35.75	x	0.63	x	0.7	=	159.78	(77)	
Southeast 0.9		X	6.	1	x 1	06.25	x	0.63	X	0.7	=	197.98	(77)	
Southeast 0.9	0.77	х	6.	1	X 1	19.01	x	0.63	Х	0.7	=	221.76	(77)	

Southeast _{0.9x}	0.77	x	6.1	1 x	118.15	1 x	0.63	x [0.7		220.15	(77)
Southeast 0.9x	0.77		6.1] ^] x	113.91] ^] x	0.63	^ L	0.7		212.25	(77)
Southeast 0.9x	0.77	= ^	6.1] ^] x	104.39] ^] x	0.63	^ L	0.7		194.51	(77)
Southeast 0.9x	0.77		6.1] ^] x	92.85] ^] x	0.63	^ L	0.7		173.01	(77)
Southeast 0.9x	0.77		6.1] ^] _x	69.27] ^] x	0.63	^ [x [0.7		129.07	$=$ $\binom{(77)}{(77)}$
Southeast 0.9x		^ ^] ^] x] ^] x		^ [x [-		= (77)
Southeast 0.9x	0.77	=	6.1	<u>]</u>	44.07] 1	0.63	≓ ¦	0.7	=	82.12	= `
Southwest _{0.9x}	0.77	×	6.1	」× 1、	31.49]	0.63	× [0.7	=	58.67	$=$ $\frac{(77)}{(70)}$
Southwest _{0.9x}	0.77	X	3.11] X] ,,	36.79] 1	0.63	× [0.7		34.91	(79)
Southwest _{0.9x}	0.77	X	3.11] X]	62.67]]	0.63	× [0.7	=	59.47	(79)
Southwest _{0.9x}	0.77	X	3.11] X]	85.75] 1	0.63	X [0.7	=	81.37	(79)
<u> </u>	0.77	X	3.11] X	106.25] 1	0.63	× [0.7	=	100.83	(79)
Southwesto.9x	0.77	×	3.11] X]	119.01]	0.63	× [0.7	=	112.93	(79)
Southwesto.9x	0.77	×	3.11] X]	118.15] 1	0.63	× [0.7	=	112.12	(79)
Southwest _{0.9x}	0.77	×	3.11	X	113.91]	0.63	×	0.7	=	108.09	(79)
Southwest _{0.9x}	0.77	×	3.11	X	104.39]	0.63	× [0.7	=	99.06	(79)
Southwest _{0.9x}	0.77	X	3.11	X	92.85]	0.63	x [0.7	=	88.11	(79)
Southwest _{0.9x}	0.77	Х	3.11	X	69.27]	0.63	X	0.7	=	65.73	(79)
Southwest _{0.9x}	0.77	Х	3.11	X	44.07	_	0.63	x [0.7	=	41.82	(79)
Southwest _{0.9x}	0.77	X	3.11	X	31.49	_	0.63	X	0.7	=	29.88	(79)
Northwest _{0.9x}	0.77	X	4.58	X	11.28	X	0.63	X	0.7	=	15.79	(81)
Northwest _{0.9x}	0.77	X	4.58	X	22.97	X	0.63	x	0.7	=	32.14	(81)
Northwest 0.9x	0.77	X	4.58	X	41.38	X	0.63	X	0.7	=	57.91	(81)
Northwest _{0.9x}	0.77	X	4.58	X	67.96	X	0.63	X	0.7	=	95.1	(81)
Northwest 0.9x	0.77	X	4.58	X	91.35	X	0.63	X	0.7	=	127.83	(81)
Northwest _{0.9x}	0.77	X	4.58	X	97.38	X	0.63	x	0.7	=	136.28	(81)
Northwest 0.9x	0.77	X	4.58	X	91.1	X	0.63	X	0.7	=	127.49	(81)
Northwest 0.9x	0.77	X	4.58	X	72.63	X	0.63	x	0.7	=	101.63	(81)
Northwest 0.9x	0.77	X	4.58	X	50.42	X	0.63	x	0.7	=	70.56	(81)
Northwest _{0.9x}	0.77	X	4.58	X	28.07	X	0.63	x	0.7	=	39.28	(81)
Northwest 0.9x	0.77	X	4.58	X	14.2	X	0.63	x	0.7	=	19.87	(81)
Northwest _{0.9x}	0.77	х	4.58	X	9.21	X	0.63	x	0.7	=	12.89	(81)
Solar gains in w			for each mon	$\overline{}$			n = Sum(74)m	(82)m			•	
` ′		299.06	393.9 462.5		68.55 447.83	395	.21 331.68	234.08	143.8	101.45		(83)
Total gains – int			` ' ' ' '	`	<u> </u>			1	1	i	ı	
(84)m= 453.94	541.76	620.81	696.54 744.9	9 7	32.2 699.64	650	.77 597.41	519.04	450.92	425.9		(84)
7. Mean interna	al tempe	rature (heating seaso	on)								
Temperature d	luring hea	ating pe	eriods in the li	ving	area from Tal	ole 9	, Th1 (°C)				21	(85)
Utilisation factor	or for gai	ns for li	ving area, h1	,m (s	ee Table 9a)					,	<u> </u>	_
Jan	Feb	Mar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.96 0.89		0.75 0.58	0.6	0.87	0.98	1	1		(86)
Mean internal t	temperat	ure in li	ving area T1	(follo	w steps 3 to 7	7 in T	able 9c)					
(87)m= 19.56	19.74	20.02	20.39 20.7	1 2	20.92 20.98	20.	97 20.82	20.39	19.91	19.53		(87)
											-	

Т		ما يمينان ما		ا ماماد		م منال مبيام	f===== T=	hia O T	LO (0C)					
	19.85	19.85	neating p	19.87	19.87	19.88	19.88	19.88	19.87	19.87	19.86	10.06		(88)
(88)m=			<u>.</u>						19.67	19.67	19.00	19.86		(00)
	ation fac	<u>_</u>	ains for i			· ` `		9a)	,			1		
(89)m=	1	0.99	0.98	0.95	0.85	0.65	0.45	0.5	0.8	0.97	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	le 9c)				
(90)m=	18.54	18.72	19	19.37	19.67	19.84	19.87	19.87	19.77	19.39	18.9	18.53		(90)
							=	=	1	fLA = Livin	g area ÷ (4	4) =	0.41	(91)
Mean	interna	l temner	ature (fo	r the wh	ole dwel	lling) – fl	Δ ν Τ1	+ (1 – fl	A) × T2			'		
(92)m=	18.96	19.14	19.42	19.79	20.09	20.28	20.32	20.32	20.2	19.8	19.31	18.94		(92)
			he mean					ļ						, ,
(93)m=	18.96	19.14	19.42	19.79	20.09	20.28	20.32	20.32	20.2	19.8	19.31	18.94		(93)
	ace hea		uirement											, ,
			ternal ter		re obtain	ed at ste	ep 11 of	Table 9	b. so tha	t Ti.m=(76)m an	d re-calc	ulate	
			or gains	•			- F		o, oo	, (. 0,	a . c ca. c		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	0.99	0.98	0.95	0.86	0.69	0.5	0.56	0.82	0.97	0.99	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m				_					
(95)m=	452.46	537.69	609.23	659.89	641.05	504.67	351.92	364.93	490	501.25	447.9	424.86		(95)
Month	hly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	_			
(97)m=	1463.29	1417.2	1282.31	1066.52	820.4	548.52	359.76	377.74	591.88	898.78	1199.65	1454.96		(97)
0														
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	4 x [(97)m – (95)m] x (4	1)m			
(98)m=	e heatin 752.05	g require 591.03	500.77	r each n 292.77	nonth, k\ 133.44	Wh/mon	th = 0.02 0	24 x [(97])m — (95 0)m] x (4 ⁻	1)m 541.26	766.39		
-		i i	1					0	<u> </u>	295.76	541.26	ļ	3873.48	(98)
(98)m=	752.05	591.03	1	292.77	133.44			0	0	295.76	541.26	ļ	3873.48	(98)
(98)m=	752.05 e heatin	591.03	500.77 ement in	292.77 kWh/m²	133.44			0	0	295.76	541.26	ļ		= ` ` `
(98)m= Space 8c. S	752.05 e heatin	591.03 g require	500.77 ement in quiremen	292.77 kWh/m²	133.44 ?/year	0		0	0	295.76	541.26	ļ		= ` ` `
(98)m= Space 8c. S	752.05 e heatin pace co	591.03 g require	500.77 ement in quirement July and	292.77 kWh/m² t August.	133.44 ² /year See Tal	0 ble 10b	0	0 Tota	0 al per year	295.76 (kWh/year	541.26 r) = Sum(9	8)15,912 =		= ` ` `
(98)m= Space 8c. Si Calcu	e heatin pace coulated fo Jan	g require	ement in quiremen July and Mar	kWh/m² t August. Apr	133.44 Pyear See Tal May	0 ble 10b Jun	Jul	0 Tota	0 al per year	295.76 (kWh/year	541.26 r) = Sum(9 Nov	8) _{15,912} =	50.17	= ` ` `
(98)m= Space 8c. Si Calcu	e heatin pace co plated fo Jan loss rate	g require	500.77 ement in quirement July and	kWh/m² t August. Apr	133.44 Pyear See Tal May	0 ble 10b Jun	Jul	0 Tota	0 al per year	295.76 (kWh/year	541.26 r) = Sum(9 Nov	8) _{15,912} =	50.17	= ` ` `
(98)m= Space 8c. Si Calcu Heat (100)m=	e heatin pace coulated fo Jan loss rate	g require oling rec r June, Feb e Lm (ca	ement in quirement July and Mar llculated	kWh/m² t August. Apr using 28	133.44 E/year See Tat May 5°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug	0 al per year Sep	295.76 (kWh/year	541.26 r) = Sum(9 Nov e from T	8) _{15,912} = Dec able 10)	50.17	(99)
(98)m= Space 8c. Si Calcu Heat (100)m=	e heatin pace co plated fo Jan loss rate o ation face	g require coling recording	ement in quirement July and Mar llculated	kWh/m² t August. Apr using 28	133.44 E/year See Tat May 5°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug	0 al per year Sep	295.76 (kWh/year	541.26 r) = Sum(9 Nov e from T	8) _{15,912} = Dec able 10)	50.17	(99)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m=	e heatin pace coulated fo Jan loss rate 0 ation face	g require r June, c Feb e Lm (ca	ement in quirement July and Mar llculated 0 pss hm	kWh/m² t August. Apr using 25	133.44 See Tal May 5°C inter 0	0 Die 10b Jun rnal temp 907.96	Jul perature 714.78	O Total Aug and exter 732.5	0 ol per year Sep ernal ten	295.76 (kWh/year Oct nperatur 0	541.26 r) = Sum(9 Nov e from T	8) _{15,912} = Dec Table 10)	50.17	(100)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m=	e heatin pace co plated fo Jan loss rate o ation face	g require r June, c Feb e Lm (ca	ement in quirement July and Mar liculated 0 pss hm 0	kWh/m² t August. Apr using 25	133.44 See Tal May 5°C inter 0	0 Die 10b Jun rnal temp 907.96	Jul perature 714.78	O Total Aug and exter 732.5	0 ol per year Sep ernal ten	295.76 (kWh/year Oct nperatur 0	541.26 r) = Sum(9 Nov e from T	8) _{15,912} = Dec Table 10)	50.17	(100)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin pace coulated fo Jan loss rate 0 ation face ul loss, h	g require r June, v Feb e Lm (ca 0 ttor for lo	ement in quirement July and Mar llculated 0 pss hm 0 Vatts) = (kWh/m² t August. Apr using 25 0 100)m x	See Tale May 5°C inter 0 (101)m	0 ole 10b Jun onal temp 907.96 0.84	Jul perature 714.78 0.91	0 Tota Aug and exte 732.5	Sep ernal ten 0	Oct nperatur 0	541.26 Nov e from T 0	8) _{15,912} = Dec Table 10) 0	50.17	(100)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	e heatin pace couldated fo Jan loss rate 0 ation face 1 0 ul loss, h 0 (solar o	g require r June, v Feb e Lm (ca 0 ttor for lo	ement in quirement July and Mar liculated 0 oss hm 0 Vatts) = (kWh/m² t August. Apr using 25 0 100)m x	See Tale May 5°C inter 0 (101)m	0 ole 10b Jun onal temp 907.96 0.84	Jul perature 714.78 0.91	0 Tota Aug and exte 732.5	Sep ernal ten 0	Oct nperatur 0	541.26 Nov e from T 0	8) _{15,912} = Dec Table 10) 0	50.17	(100)
Space Space Space Space Space Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace coulated fo Jan loss rate 0 ation face 1 0 ation face (solar quadrate) e cooling	g require r June, v Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for the following f	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tale May 5°C inter 0 (101)m 0 cable we 0 whole co	0 ole 10b Jun onal temp 907.96 0.84 763.5 eather re	Jul perature 714.78 0.91 647.92 egion, se 905.7	0 Tota Aug and exte 732.5 0.88 644.72 ee Table 850.12	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	S41.26 Nove from T 0 0	8) _{15,912} = Dec Table 10) 0 0	50.17	(100) (101) (102)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	e heatin pace coulated fo Jan loss rate o ation face o ul loss, h o s (solar o e cooling 04)m to	g require r June, v Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tale May 5°C inter 0 (101)m 0 cable we 0 whole co	0 ole 10b Jun onal temp 907.96 0.84 763.5 eather re	Jul perature 714.78 0.91 647.92 egion, se 905.7 continuo	0 Tota Aug and exter 732.5 0.88 644.72 ee Table 850.12 ous (kW	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	S41.26 Nove from T 0 0	8) _{15,912} = Dec Table 10) 0 0	50.17	(100) (101) (102)
Space Space Space Space Space Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	e heatin pace coulated fo Jan loss rate o ation face o ul loss, h o s (solar o e cooling 04)m to	g require r June, v Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require	ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for the following f	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month,	See Tale May 5°C inter 0 (101)m 0 cable we 0 whole co	0 ole 10b Jun onal temp 907.96 0.84 763.5 eather re	Jul perature 714.78 0.91 647.92 egion, se 905.7	0 Tota Aug and exte 732.5 0.88 644.72 ee Table 850.12	0 0 0	295.76 (kWh/year Oct nperatur 0 0 24 x [(10)	S41.26 Nove from T 0 0 0 0 0 0 0 0 0	8) _{15,912} = Dec Table 10) 0 0	50.17	(100) (101) (102)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace coulated fo Jan loss rate o ation face s (solar q o (o4)m to	g require coling reco r June, C Feb e Lm (ca 0 mLm (V 0 gains ca 0 g require zero if (ement in quirement July and Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tak May 5°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun rnal temp 907.96 0.84 763.5 eather re 945.59	Jul perature 714.78 0.91 647.92 egion, se 905.7 continuo	0 Tota Aug and exter 732.5 0.88 644.72 ee Table 850.12 ous (kW	0 0 0 0 0 0 0 0 0 0 Total	295.76 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(541.26 Nov e from T 0 0 0 0 1.04)	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	50.17 x (41)m 475.71	(100) (101) (102) (103)
Space Space Space Space Space Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co llated fo Jan loss rate 0 ation face 1 0 ation face 0 s (solar (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	g require r June, v Feb e Lm (ca 0 ttor for lo 0 mLm (W 0 gains ca 0 g require zero if (ement in quirement in Mar Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for (104)m < 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tak May 5°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun rnal temp 907.96 0.84 763.5 eather re 945.59	Jul perature 714.78 0.91 647.92 egion, se 905.7 continuo	0 Tota Aug and exter 732.5 0.88 644.72 ee Table 850.12 ous (kW	0 0 0 0 0 0 0 0 0 0 Total	295.76 (kWh/year Oct nperatur 0 0 24 x [(10) 0 = Sum(S41.26 Nove from T 0 0 0 0 0 0 0 0 0	8) _{15,912} = Dec Table 10) 0 0 102)m] 2	50.17 x (41)m	(100) (101) (102) (103)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 0 ation face cooling 04)m to d fraction ittency face	g require coling rec r June, c Feb e Lm (ca 0 tor for lo 0 mLm (V 0 gains ca 0 g require zero if (0	ement in July and Mar Ilculated 0 Oss hm 0 Vatts) = (0 Osment for (104)m < 0 Osment for	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tab May 5°C inter 0 (101)m 0 cable we 0 whole com	ole 10b Jun nal temp 907.96 0.84 763.5 eather re 945.59 dwelling,	0 Jul perature 714.78 0.91 647.92 egion, see 905.7 continue 191.79	0 Tota Aug and exter 732.5 0.88 644.72 ee Table 850.12 ous (kW	0 Sep ernal ten 0 0 10) 0 10) 0 Total f C =	295.76 (kWh/year Oct nperatur 0 0 0 24 x [(10) 0 = Sum(cooled :	541.26 Nov e from T 0 0 0 0 1.04) area ÷ (4	8) _{15,912} = Dec able 10) 0 0 102)m] :	50.17 x (41)m 475.71	(100) (101) (102) (103)
Space Space Space Space Space Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 0 ation face cooling 04)m to d fraction ittency face	g require r June, v Feb e Lm (ca 0 ttor for lo 0 mLm (W 0 gains ca 0 g require zero if (ement in quirement in Mar Mar Ilculated 0 oss hm 0 Vatts) = (0 lculated 0 ement for (104)m < 0	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tak May 5°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun rnal temp 907.96 0.84 763.5 eather re 945.59	Jul perature 714.78 0.91 647.92 egion, se 905.7 continuo	0 Tota Aug and exter 732.5 0.88 644.72 ee Table 850.12 ous (kW	0 0 0 0 0 0 0 0	295.76 (kWh/year Oct nperatur 0	S41.26 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	8) _{15,912} = Dec Table 10) 0 0 102)m] 2 0 = 1) =	50.17 x (41)m 475.71	(100) (101) (102) (103) (104) (105)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi (106)m=	e heatin pace co lated fo Jan loss rate 0 ation face 1 o s (solar o e cooling 04)m to d fraction ittency fo 0	g require oling rec r June, v Feb e Lm (ca 0 ttor for lo 0 mLm (V 0 gains ca 0 g require zero if (0 actor (Ta 0	ement in July and Mar Ilculated 0 Oss hm 0 Vatts) = (0 Osment for (104)m < 0 Osment for	kWh/m² t August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	See Tate May 5°C inter 0 (101)m (100) cable we 0 whole come 0	0 ole 10b Jun onal temp 907.96 0.84 763.5 eather re 945.59 dwelling, 131.1	0 Jul perature 714.78 0.91 647.92 egion, see 905.7 continue 191.79	0 Tota Aug and exter 732.5 0.88 644.72 ee Table 850.12 ous (kW	0 0 0 0 0 0 0 0	295.76 (kWh/year Oct nperatur 0 0 0 24 x [(10) 0 = Sum(cooled :	S41.26 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	8) _{15,912} = Dec able 10) 0 0 102)m] :	50.17 x (41)m 475.71 1	(100) (101) (102) (103)

Space	cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n					_	
(107)m=	0	0	0	0	0	32.78	47.95	38.21	0	0	0	0		
•	Total = Sum(107) =													
Space	Space cooling requirement in kWh/m²/year (107) ÷ (4) =													
8f. Fab	ric Ene	rgy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabrio	Energ	y Efficier	псу						(99)	+ (108) =	=		51.71	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								59.46	(109)

		Hee	er Details:						
Access at Name.	Zabid Ashraf	036		a Mirros	b a v .		CTDO	001000	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	•	Stroma Softwa					001082 on: 1.0.5.9	
Contware reame.	O. O		rty Address:		31011.		7 01010	7.0.0.0	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (45)		(1a) x		2.5	(2a) =	193.02	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(1n)	77.21	(4)	\	n (O)	(0.)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	193.02	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of allignments	heating he	ating		,			40 =	-	_
Number of chimneys			0] = [0			0	(6a)
Number of open flues	0 +	0 +	0] = [0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents	3			L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a))+(6b)+(7a)+(7b	o)+(7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended			ontinue fr			. (0) =	0	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fragressent, use the value correspond			•	uction			0	(11)
deducting areas of openi		oriding to the g	realer wall are	a (anter					
If suspended wooden	floor, enter 0.2 (unseale	d) or 0.1 (se	ealed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
· ·	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	aro avaraged in subject		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubic	-	•	•	etre or e	envelope	area	3	(17)
	es if a pressurisation test has l				is beina u	sed		0.15	(18)
Number of sides sheltere			3	,	3			1	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			0.92	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified f	for monthly wind speed								
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ÷ 4								
<u> </u>	1.23 1.1 1.08	0.95 0.9	5 0.92	1	1.08	1.12	1.18		
					<u> </u>		<u> </u>	J	

0.18	0.17	0.17	0.15	0.15	0.13	0.13	0.13	0.14	0.15	0.16	0.16		
Calculate effe		-	rate for t	he appli	cable ca	se	<u>l</u>	ļ	<u>l</u>				_
If mechanic			andiv NL (O	ah) (aa	s) Em. /	accetion (N	JEV otho	muiaa (22h	\ (220\		Ĺ	0.5	(23
If exhaust air h		0		, ,	, ,	. ,	,, .	,) = (23a)		Ĺ	0.5	(2:
If balanced with		-	-	_					21.) (001.)	1 (00)	79.05	(2:
a) If balance 0.28	0.28	anicai ve	o.26	0.25	at recove	0.24	1R) (24a 0.23	m = (22) 0.24	2b)m + () 0.25	23b) × [* 0.26	1 - (23c)	÷ 100]	(2
24a)m= 0.28 b) If balance					<u> </u>	<u> </u>	l	l .			0.27		(2
24b)m= 0		o lical ve	0	0	0	0	0	0	0	23D) 0	0		(2
c) If whole h					<u> </u>								(-
,	n < 0.5 ×			•	•				5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilation	on or wh	ole hous	e positiv	re input	ventilatio	on from I	oft	<u> </u>				
,	m = 1, the				•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	iter (24a) or (24k	o) or (24	c) or (24	d) in box	x (25)					
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.24	0.25	0.26	0.27		(2
3. Heat losse	s and he	eat loss r	paramet	er:									
LEMENT	Gros		Openin		Net Ar	ea	U-valı	ue	AXU		k-value	e A :	Χk
	area	(m^2)	'n	=	A ,r	m²	W/m2		(W/I	<)	kJ/m²-k		
Doors					2	Х	1.4	=	2.8				(2
Vindows Type	e 1				3.105	x1.	/[1/(1.4)+	0.04] =	4.12				(2
Vindows Type	e 2				6.097	7 x1.	/[1/(1.4)+	0.04] =	8.08				(2
Vindows Type	e 3				4.579	y1.	/[1/(1.4)+	0.04] =	6.07				(2
loor					77.21	X	0.12	=	9.2652				(2
Valls Type1	78.2	24	13.7	В	64.46	S X	0.15	<u> </u>	9.67				(2
Valls Type2	33.8	31	2		31.81	X	0.14	-	4.48			7	= (2
Total area of e	elements	, m²			189.2	6							 (3
for windows and	l roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area				ls and par	titions								_
abric heat los		•	U)				(26)(30)				ļ	44.49	(3
leat capacity	`	` ,							(30) + (32	, , ,	(32e) =	9840.85	(3
hermal mass	•	`		,					tive Value			100	(3
				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
or design asses	ad of a dea	anou ouro		usina Ap	pendix I	<					Γ	14.5	— (3
For design asses an be used inste		x Y) cale	culated i								L	11.0	``
For design assess an be used inste Thermal bridg	es : S (L	,			1)								
For design assess an be used inste Thermal bridg details of therma	es : S (L al bridging	,			1)			(33) +	(36) =			58.99	(3
For design assessan be used inste Thermal bridg details of therma Total fabric he	es : S (L al bridging eat loss	are not kn	own (36) =	= 0.05 x (3					(36) = = 0.33 × (25)m x (5)	<u> </u>	58.99	(3
For design asses: an be used inste Thermal bridg details of therma Total fabric he	es : S (L al bridging eat loss	are not kn	own (36) =	= 0.05 x (3	Jun	Jul	Aug			25)m x (5)	Dec	58.99	(3
For design assessan be used inste Thermal bridged details of thermal fotal fabric here.	es : S (L al bridging eat loss at loss ca	are not kn	own (36) =	= 0.05 x (3	· -	Jul 15.07	Aug 14.85	(38)m	= 0.33 × (58.99	
For design assessan be used insternal bridger details of thermal fotal fabric here.	es : S (L al bridging eat loss at loss ca Feb 17.72	are not kn alculated Mar 17.5	own (36) =	9 0.05 x (3) May	Jun	-	⊢ <u> </u>	(38)m Sep 15.51	= 0.33 × (Nov 16.62	Dec	58.99	(3
For design assessan be used insterior fermal bridger details of thermal fotal fabric here. Jan Jan 38)m= 17.94	es : S (L al bridging eat loss at loss ca Feb	are not kn alculated Mar 17.5	own (36) =	9 0.05 x (3) May	Jun	-	⊢ <u> </u>	(38)m Sep 15.51	= 0.33 × (Oct 16.17	Nov 16.62	Dec	58.99	

Heat loss para	ımeter (l	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 1	0.99	0.99	0.98	0.97	0.96	0.96	0.96	0.96	0.97	0.98	0.98	ı	
								,	Average =	Sum(40) ₁ .	12 /12=	0.98	(40)
Number of day		`	le 1a)									ı	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ı	
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	inancv	N									44	ı	(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		41		(42)
Annual averag											.19	ı	(43)
Reduce the annua							to achieve	a water us	se target o	f			
		· ·										ı	
Jan Hot water usage i	Feb	Mar Mar	Apr	May	Jun	Jul Fablo 10 x	Aug	Sep	Oct	Nov	Dec		
				1				ı		T	1	ı	
(44)m= 105.81	101.97	98.12	94.27	90.42	86.58	86.58	90.42	94.27	98.12	101.97	105.81		–
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd.r	n x nm x F.	0Tm / 3600			m(44) ₁₁₂ = ables 1b. 1		1154.34	(44)
		141.62	123.47	118.47	102.23		108.71		128.2	139.94		ı	
(45)m= 156.92	137.24	141.02	123.47	110.47	102.23	94.73	106.71	110.01			151.97	1512 52	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		10tai = Su	m(45) ₁₁₂ =	= [1513.52	(43)
(46)m= 23.54	20.59	21.24	18.52	17.77	15.33	14.21	16.31	16.5	19.23	20.99	22.8	ı	(46)
Water storage			10.02		10.00		10.01	10.0	10.20	20.00	22.0		(- /
Storage volum	e (litres)) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0	ı	(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage												ı	
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0	i	(49)
Energy lost fro		_	-				(48) x (49)) =		1	10	ı	(50)
b) If manufactHot water store			-								00	ı	(51)
If community h	-			C Z (KVV	ii/iiti e/ue	(y)				0.	02		(31)
Volume factor	_									1.	03	ı	(52)
Temperature f	actor fro	m Table	2b							-	.6	ı	(53)
Energy lost fro	m watei	rstorage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03	ı	(54)
Enter (50) or	(54) in (5	55)	·							_	03	ı	(55)
Water storage	loss cal	culated f	or 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	ı	(56)
If cylinder contains												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	ı	(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0	ı	(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)		ı	
(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	ı	(59)

Combi loss o	ralculated	for each	month (′61)m =	(60) <u>-</u>	. 365 v (41	۱m							
(61)m= 0	0	0	0	0	0	0) T)	0	0	0	0	1	(61)
	l	water h	eating ca	l	l for e	ach month	(62)	m –	0.85 x /	(45)m +	(46)m +	(57)m +	ן · (59)m + (61)m	
(62)m= 212.2		196.9	176.96	173.75	155.		163		163.5	183.48	193.44	207.24]	(62)
Solar DHW inpu		using App	L endix G oı	Appendix	H (ne	I	v) (ent	ter '0	l ' if no sola	r contribu	tion to wate	r heating)]	
(add addition												0,		
(63)m= 0	0	0	0	0	0	0	C)	0	0	0	0]	(63)
Output from	water hea	ter								•		•	•	
(64)m= 212.2	2 187.17	196.9	176.96	173.75	155.	73 150.01	163	.98	163.5	183.48	193.44	207.24]	
	•				•	•		Outp	out from w	ater heate	er (annual)	12	2164.36	(64)
Heat gains for	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.	85 × (45)m	n + (6	31)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	n]	
(65)m= 96.4	85.58	91.31	83.85	83.61	76.7	9 75.72	80.	37	79.37	86.85	89.33	94.75]	(65)
include (5	7)m in cal	culation (of (65)m	only if c	ylinde	er is in the	dwell	ling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):										
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts														
Jan		Mar	Apr	May	Ju	n Jul	А	ug	Sep	Oct	Nov	Dec]	
(66)m= 144.4	7 144.47	144.47	144.47	144.47	144.	17 144.47	144	.47	144.47	144.47	144.47	144.47]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L	or L9a), a	ılso s	ee -	Table 5				_	
(67)m= 48.67	7 43.23	35.15	26.61	19.89	16.8	18.15	23.	59	31.66	40.2	46.92	50.02]	(67)
Appliances of	gains (calc	ulated in	Append	dix L, eq	uatior	1 L13 or L1	3a),	alsc	see Ta	ble 5		-	_	
(68)m= 318.6	7 321.98	313.65	295.91	273.51	252.4	17 238.4	235	5.1	243.43	261.17	283.57	304.61]	(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	tion L	15 or L15a), als	o se	ee Table	5	-	-	_	
(69)m= 51.85	5 51.85	51.85	51.85	51.85	51.8	5 51.85	51.	85	51.85	51.85	51.85	51.85]	(69)
Pumps and f	fans gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	C)	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)									
(71)m= -96.3	1 -96.31	-96.31	-96.31	-96.31	-96.3	-96.31	-96	.31	-96.31	-96.31	-96.31	-96.31]	(71)
Water heating	ng gains (T	able 5)											_	
(72)m= 129.5	7 127.34	122.73	116.46	112.38	106.	55 101.77	108	.02	110.24	116.73	124.06	127.35]	(72)
Total intern	al gains =					(66)m + (67)n	n + (68	3)m +	+ (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 596.9	2 592.56	571.54	538.99	505.8	475.	92 458.34	466	.72	485.34	518.12	554.56	582		(73)
6. Solar gai														
Solar gains ar		Ü				•	ations	to co		ne applica		tion.		
Orientation:	Access F Table 6d		Area m²			Flux Table 6a		Т	g_ able 6b	т	FF able 6c		Gains (W)	
Courthogat a a					_		1						. ,	1 ,
Southeast 0.9		X	6.		x L	36.79	X		0.63		0.7	=	68.56	(77)
Southeast 0.9	<u> </u>	X	6.		x	62.67] X]		0.63		0.7	_ =	116.78](77)
Southeast 0.9		X	6.		x	85.75] X	_	0.63	×	0.7	=	159.78](77)] ₍₇₇₎
Southeast 0.9		X	6.		x	106.25	X	_	0.63		0.7	_ =	197.98](77)],
Southeast 0.9	0.77	X	6.	1	X	119.01	X		0.63	X	0.7	=	221.76	(77)

0 4 · F								,			_				
Southeast 0.9x	0.77	X	6.	1	X	1	18.15	X		0.63	X	0.7	=	220.15	(77)
Southeast 0.9x	0.77	X	6.	1	X	1	13.91	X		0.63	X	0.7	=	212.25	(77)
Southeast 0.9x	0.77	X	6.	1	X	1	04.39	X		0.63	X	0.7	=	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	X	9	2.85	X		0.63	X	0.7	=	173.01	(77)
Southeast 0.9x	0.77	X	6.	1	X	6	9.27	X		0.63	X	0.7	=	129.07	(77)
Southeast 0.9x	0.77	X	6.	1	X	4	4.07	X		0.63	X	0.7	=	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	X	3	1.49	X		0.63	X	0.7	=	58.67	(77)
Southwest _{0.9x}	0.77	X	3.1	1	X	3	6.79]		0.63	X	0.7	=	34.91	(79)
Southwest _{0.9x}	0.77	Х	3.1	1	X	6	2.67]		0.63	X	0.7	=	59.47	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	8	5.75]		0.63	X	0.7	=	81.37	(79)
Southwest _{0.9x}	0.77	X	3.1	1	x	1	06.25			0.63	X	0.7	=	100.83	(79)
Southwest _{0.9x}	0.77	X	3.1	1	x	1	19.01			0.63	X	0.7	=	112.93	(79)
Southwest _{0.9x}	0.77	Х	3.1	1	X	1	18.15			0.63	x	0.7	=	112.12	(79)
Southwest _{0.9x}	0.77	Х	3.1	1	X	1	13.91			0.63	x	0.7	=	108.09	(79)
Southwest _{0.9x}	0.77	x	3.1	1	x	1	04.39]		0.63	x	0.7	=	99.06	(79)
Southwest _{0.9x}	0.77	x	3.1	1	x	9	2.85]		0.63	x	0.7	=	88.11	(79)
Southwest _{0.9x}	0.77	x	3.1	1	x	6	9.27	Ī		0.63	x	0.7	=	65.73	(79)
Southwest _{0.9x}	0.77	X	3.1	1	x	4	4.07	Ī		0.63	x	0.7	_ =	41.82	(79)
Southwest _{0.9x}	0.77	х	3.1	1	X	3	1.49	Ī		0.63	T x	0.7	=	29.88	(79)
Northwest 0.9x	0.77	х	4.5	8	X	1	1.28	x		0.63	×	0.7	=	15.79	(81)
Northwest 0.9x	0.77	х	4.5	8	X	2	2.97	x		0.63	x	0.7	=	32.14	(81)
Northwest 0.9x	0.77	х	4.5	8	x	4	1.38	j x		0.63	×	0.7	=	57.91	(81)
Northwest 0.9x	0.77	х	4.5	8	X	6	7.96	X		0.63	×	0.7	_ =	95.1	(81)
Northwest 0.9x	0.77	х	4.5	8	x	9	1.35	j x		0.63	×	0.7	=	127.83	(81)
Northwest _{0.9x}	0.77	x	4.5	8	X	9	7.38	X		0.63	×	0.7	_	136.28	(81)
Northwest _{0.9x}	0.77	X	4.5	8	X		91.1	X		0.63	x	0.7	=	127.49	(81)
Northwest _{0.9x}	0.77	X	4.5	8	X	_	2.63	X		0.63	×	0.7	-	101.63	(81)
Northwest _{0.9x}	0.77	x	4.5	8	X	5	0.42	X		0.63	×	0.7	_	70.56	(81)
Northwest _{0.9x}	0.77	X	4.5	8	X	2	8.07	X		0.63	x	0.7	=	39.28	(81)
Northwest 0.9x	0.77	X	4.5	8	X		14.2	X		0.63	×	0.7	-	19.87	(81)
Northwest _{0.9x}	0.77	X	4.5	8	X		9.21	X		0.63	x ا	0.7		12.89	(81)
								_							
Solar gains in	watts, ca	alculated	for eacl	n mont	h			(83)m	ı = Sı	ım(74)m	(82)m				
(83)m= 119.26	208.39	299.06	393.9	462.52	4	68.55	447.83	395	.21	331.68	234.08	143.8	101.45	7	(83)
Total gains – ir	nternal a	nd solar	(84)m =	: (73)m	+ (83)m	, watts							_	
(84)m= 716.18	800.95	870.6	932.89	968.32	9	44.47	906.17	861	.92	817.02	752.19	698.37	683.44		(84)
7. Mean inter	nal temp	erature	(heating	seaso	n)										
Temperature	during h	eating p	eriods ir	the liv	ing	area	from Tal	ble 9	, Th1	1 (°C)				21	(85)
Utilisation fac	tor for ga	ains for I	iving are	a, h1,ı	n (s	ee Ta	ble 9a)								
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 0.91	0.87	0.82	0.73	0.61		0.47	0.35	0.3	38	0.56	0.76	0.87	0.92		(86)
Mean internal	l temper	ature in	living are	ea T1 (follo	w ste	ps 3 to 7	7 in T	able	9c)		-	-	_	
(87)m= 19.45	19.69	20.04	20.44	20.74	_	20.92	20.97	20.		20.85	20.48	19.91	19.4	7	(87)
							<u> </u>	-				-		_	

Ta		المصادرين		مان مام نس		مال مال	. f	bla O T	۱۵ (۵C)					
(88)m=	20.09	20.09	eating p	20.1	20.11	20.12	20.12	20.12	n2 (°C) 20.11	20.11	20.1	20.1		(88)
. ,			ains for i				<u>!</u>	<u> </u>	20.11	20.11	20.1	20.1		(00)
(89)m=	0.9	0.86	0.8	0.71	0.57	0.41	0.28	0.31	0.5	0.72	0.85	0.91		(89)
Mean	interna	l I temner	ature in	the rest	of dwelli	na T2 (f	ollow ste	ne 3 to .	I 7 in Tahl	L 9c)				
(90)m=	18.04	18.38	18.87	19.43	19.82	20.04	20.1	20.1	19.97	19.49	18.71	17.98		(90)
,		l	<u> </u>				l		l f	L LA = Livin	g area ÷ (4	4) =	0.41	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lina) = fl	LA × T1	+ (1 – fL	A) x T2			L		
(92)m=	18.61	18.92	19.35	19.84	20.2	20.4	20.46	20.45	20.33	19.89	19.2	18.56		(92)
Apply	adjustr	nent to t	he mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.61	18.92	19.35	19.84	20.2	20.4	20.46	20.45	20.33	19.89	19.2	18.56		(93)
8. Sp	ace hea	iting requ	uirement											
			ernal ter or gains			ed at ste	ep 11 of	Table 9l	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=	0.87	0.84	0.78	0.7	0.58	0.43	0.31	0.34	0.52	0.72	0.83	0.88		(94)
Usefu		hmGm	, W = (94	1)m x (84	4)m		i	r	r	r	r			
(95)m=	625.75	671.58	683.08	649.34	557.73	405.1	278.86	290.21	421.06	538.31	581.9	604.25		(95)
	<u> </u>	 	rnal tem				T	T						(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)
пеаі (97)m=		1075.22	an intern 982.65	824.91	638.66	429.45	285.56	299.07	464.28	698.61	914.64	1091.74		(97)
. ,			ement fo					l		l	l	1001.71		()
(98)m=	353.55	271.24	222.88	126.41	60.21	0	0	0	0	119.27	239.57	362.69		
		<u>!</u>	<u> </u>				<u>!</u>	Tota	l per year	ı (kWh/year) = Sum(9	8) _{15,912} =	1755.82	(98)
Space	e heatin	g require	ement in	kWh/m²	/year							ĺ	22.74	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme)							
			ace hea								unity sch	neme.	0	(301)
	-			-		-	_	Table 1	1, 0 11 11	OHO		[[_՝ ՝
	-		from co	-	-							l	1	(302)
includes	boilers, h	neat pump	s, geothern	nal and wa	aste heat f					up to four (other heat	sources; th	ne latter	_
Fraction	n of hea	at from (Commun	ity boiler	S								1	(303a)
Fraction	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for con	trol and	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
-	heatin	_											kWh/yea	
Annua	l space	heating	requirem	nent									1755.82	
Space	heat fro	om Comi	munity b	oilers					(98) x (30	04a) x (305	5) x (306) :	= [1843.61	(307a)
Efficie	ncy of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308

			ı		_
Space heating requirement from second	ondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2164.36	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305)	x (306) =	2272.58	(310a)
Electricity used for heat distribution	0	01 × [(307a)(307e) + (3	310a)(310e)] =	41.16	(313)
Cooling System Energy Efficiency Ra	itio			0	(314)
Space cooling (if there is a fixed cooli	ing system, if not enter 0)	= (107) ÷ (314) =		0	(315)
Electricity for pumps and fans within one mechanical ventilation - balanced, ex	<u> </u>	de		267.87	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/ye	ear	=(330a) + (330b) + (330b)	30g) =	267.87	(331)
Energy for lighting (calculated in Appe	endix L)			343.8	(332)
Electricity generated by PVs (Append	lix M) (negative quantity)			-782.18	(333)
Electricity generated by wind turbine	(Appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heatin	g scheme				
	Fuel kWh/year	Fuel Pri (Table 1		Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24	x 0.01 =	78.17	(340a)
Water heating from CHP	(310a) x	4.24	x 0.01 =	96.36	(342a)
Water heating from CHP		4.24 Fuel Pri		96.36	(342a)
Pumps and fans	(331)		ce x 0.01 =	96.36 35.33	(342a) (349)
· ·		Fuel Pri	x 0.01 =		
Pumps and fans	(331)	Fuel Pri	x 0.01 =	35.33	(349)
Pumps and fans Energy for lighting	(331) (332) 2)	Fuel Pri	x 0.01 =	35.33 45.35	(349)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies	(331) (332) 2) 9S = (340a)(342e) + (345)(354) =	Fuel Pri	x 0.01 =	35.33 45.35 120	(349) (350) (351)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost	(331) (332) 2) 9S = (340a)(342e) + (345)(354) =	Fuel Pri	x 0.01 =	35.33 45.35 120	(349) (350) (351)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin	(331) (332) 2) 9S = (340a)(342e) + (345)(354) =	Fuel Pri	x 0.01 =	35.33 45.35 120 375.21	(349) (350) (351) (355)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12)	(331) (332) 2) es = (340a)(342e) + (345)(354) = g scheme	Fuel Pri	x 0.01 =	35.33 45.35 120 375.21	(349) (350) (351) (355) (356)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF)	(331) (332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] =	Fuel Pri 13.19 13.19	x 0.01 = x 0.01 =	35.33 45.35 120 375.21 0.42 1.29 82.01	(349) (350) (351) (355) (356) (357)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12)	(331) (332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Fuel Pri	ce	35.33 45.35 120 375.21 0.42 1.29 82.01	(349) (350) (351) (355) (356) (357)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12)	(331) (332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Fuel Pri 13.19 13.19 inergy Em Wh/year kg	ce x 0.01 = x 0.01 = x 0.01 = ission factor CO2/kWh	35.33 45.35 120 375.21 0.42 1.29 82.01 Emissions kg CO2/year	(349) (350) (351) (355) (356) (357)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community heatin CO2 from other sources of space and	(331) (332) 2) 2) 2s = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme Exact water heating (not CHP) If there is CHP using two full	Fuel Pri 13.19 13.19 inergy Em Wh/year kg	ce x 0.01 = x 0.01 = x 0.01 = ission factor CO2/kWh	35.33 45.35 120 375.21 0.42 1.29 82.01 Emissions kg CO2/year	(349) (350) (351) (355) (356) (357) (358)
Pumps and fans Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community heatin CO2 from other sources of space and Efficiency of heat source 1 (%)	(331) (332) 2) 2) 2s = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme Exact water heating (not CHP) If there is CHP using two full	Fuel Pri 13.19 13.19 13.19 whyear Em Wh/year kg rels repeat (363) to (366) x 100 ÷ (367b) x	x 0.01 = x 0.01 =	35.33 45.35 120 375.21 0.42 1.29 82.01 Emissions kg CO2/year	(349) (350) (351) (355) (356) (357) (358)

Total CO2 associated with community	systems	(363)(366) + (368)(372	2)	=	967.21	(373)
CO2 associated with space heating (se	econdary)	(309) x	0	=	0	(374)
CO2 associated with water from imme	rsion heater or instanta	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =			967.21	(376)
CO2 associated with electricity for pur	nps and fans within dwe	elling (331)) x	0.52	=	139.02	(378)
CO2 associated with electricity for light	ting	(332))) x	0.52	=	178.43	(379)
Energy saving/generation technologies Item 1	s (333) to (334) as appl	icable	0.52 × 0.01	= [-405.95	(380)
Total CO2, kg/year	sum of (376)(382) =				878.72	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.38	(384)
El rating (section 14)					90.37	(385)
13b. Primary Energy – Community hea	ating scheme					
		Energy kWh/year	Primary factor		Energy Vh/year	
		•			•	
Energy from other sources of space ar Efficiency of heat source 1 (%)		HP) sing two fuels repeat (363) to			94	(367a)
•	If there is CHP us				_	(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP us	sing two fuels repeat (363) to	(366) for the second	fuel	94	」` ¬
Efficiency of heat source 1 (%) Energy associated with heat source 1	If there is CHP us	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x	(366) for the second	fuel =	94 5342.28	(367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution	If there is CHP us [(307b	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372	(366) for the second 1.22 2)	fuel = =	94 5342.28 126.37	(367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communication	If there is CHP us [(307b) ity systems ess specified otherwise	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372	(366) for the second 1.22 2)	fuel = =	94 5342.28 126.37 5468.65	(367) (372) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communities if it is negative set (373) to zero (unle	If there is CHP us [(307b) ity systems ess specified otherwise (secondary)	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 c, see C7 in Appendix C (309) x	(366) for the second 1.22 2)	fuel = = = =	94 5342.28 126.37 5468.65 5468.65	(367) (372) (373) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communitif it is negative set (373) to zero (unlike) Energy associated with space heating	If there is CHP us [(307b) ity systems ess specified otherwise (secondary) nersion heater or instar	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 c, see C7 in Appendix C (309) x	(366) for the second 1.22 2) 0	fuel	94 5342.28 126.37 5468.65 5468.65	(367) (372) (373) (373) (374)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communitif it is negative set (373) to zero (unlike) Energy associated with space heating Energy associated with water from imm	If there is CHP us [(307b) ity systems ess specified otherwise (secondary) nersion heater or instar	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(372 e, see C7 in Appendix C (309) x Intaneous heater(312) x	(366) for the second 1.22 2) 0	fuel	94 5342.28 126.37 5468.65 5468.65 0	(367) (372) (373) (373) (374) (375)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communities if it is negative set (373) to zero (unledent) Energy associated with space heating Energy associated with water from immortal Energy associated with space and	ity systems ess specified otherwise (secondary) mersion heater or instar	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) a, see C7 in Appendix C (309) x ntaneous heater(312) x (373) + (374) + (375) = (315) x	(366) for the second 1.22 2) 0 1.22	fuel	94 5342.28 126.37 5468.65 5468.65 0 0 5468.65	(367) (372) (373) (373) (374) (375) (376)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with communities it is negative set (373) to zero (unlike) Energy associated with space heating Energy associated with water from immortal Energy associated with space and Energy associated with space cooling	ity systems ess specified otherwise (secondary) mersion heater or instar ind water heating umps and fans within de	sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373) c, see C7 in Appendix C (309) x ntaneous heater(312) x (373) + (374) + (375) = (315) x	(366) for the second 1.22 2) 0 1.22 3.07	fuel	94 5342.28 126.37 5468.65 0 0 5468.65 0	(367) (372) (373) (373) (374) (375) (376) (377)

sum of (376)...(382) =

Total Primary Energy, kWh/year

4945.2

(383)

		He	er Details:						
Access Name	Zahid Ashraf	US		n Mirron	b a v .		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012)	Stroma Softwa					001082 on: 1.0.5.9	
Continuito Humo.	Guerra 1 Gra 2012		erty Address:		OlOII.		7 0 10 10	1101010	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		, 	Area(m²) 77.21	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
	a) . (1b) . (1a) . (1d) . (1a)					2.5	(2a) –	193.02	(Ja)
Total floor area TFA = (1a	a)+(10)+(10)+(10)+(10)	+(111)	77.21	(4)) . (2-) . (2-	1) . (2 -) .	(2-)		_
Dwelling volume				(3a)+(3b))+(3C)+(3C	l)+(3e)+	.(3h) =	193.02	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
Number of chimneys	heating he	eating		1 = [40 =		_
•		-]	0		20 =	0	(6a)
Number of open flues		0 +	0] <u> </u>	0			0	(6b)
Number of intermittent fa				Ļ	3		10 =	30	(7a)
Number of passive vents				Ļ	0		10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a))+(6b)+(7a)+(7	7b)+(7c) =	Г	30		÷ (5) =	0.16	(8)
If a pressurisation test has b	een carried out or is intended	I, proceed to (17), otherwise o	ontinue fr			` ′		`` <i>`</i>
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	.25 for steel or timber fr	ame or 0.34	5 for mason	v constr	ruction	[(9)	-1]x0.1 =	0	$=$ $\frac{(10)}{(11)}$
	resent, use the value corresp			•	uction			0	(11)
deducting areas of openir	• / .						,		-
•	floor, enter 0.2 (unseale	d) or 0.1 (s	ealed), else	enter 0				0	(12)
If no draught lobby, en	s and doors draught stri	nned						0	$=$ $\frac{(13)}{(14)}$
Window infiltration	s and doors draught still	ppeu	0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate			(8) + (10)			+ (15) =		0	(16)
	q50, expressed in cubic	c metres pe					area	5	(17)
If based on air permeabil		•	•	•				0.41	(18)
Air permeability value applie	es if a pressurisation test has	been done or a	a degree air pe	meability	is being u	sed			
Number of sides sheltere	ed							1	(19)
Shelter factor			(20) = 1 -		[9)] =			0.92	(20)
Infiltration rate incorporat			(21) = (18)	x (20) =				0.38	(21)
Infiltration rate modified f	 				l _			1	
Jan Feb	Mar Apr May	Jun J	ul Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	1 1	<u> </u>				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		
Wind Factor (22a)m = (22	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95 0.9	95 0.92	1	1.08	1.12	1.18		

0.48	0.47	0.46	0.41	0.4	0.36	0.36	0.35	(22a)m _{0.38}	0.4	0.42	0.44		
Calculate effe		•	rate for t	he appli	cable ca	se							
If mechanica							.=				Ĺ	0	(23
If exhaust air h		0 11		, ,	,	. `	,, .	•) = (23a)		Ĺ	0	(23
If balanced with		•	•	_							L	0	(23
a) If balance	i					<u> </u>	<u> </u>	``	- ` `			÷ 100]	(0.4
(24a)m= 0		0	0	0	. 0	0	0	0	0	0	0		(24
b) If balance	ı —							í È					(2.4
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	ve input v o); otherv				5 v (23h	.)			
$\frac{11(220)11}{24c)m=0}$	0.5 7	0	0	0	0	0	0	0	0	0	0		(24
d) If natural			,					<u> </u>					(
,				•	rwise (2				0.5]				
24d)m= 0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.61	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25
3. Heat losse	c and he	nat loce r	aramata	or:									
	S and the Gros	•	Openin		Net Ar	22	U-valı	ıΩ	AXU		k-value	Δ	Χk
ELEMENT	area		r		A,r		W/m2		(W/I	۲)	kJ/m ² ·K		/K
Doors					2	x	1	=	2				(26
Vindows Type	e 1				3.105	x1,	/[1/(1.4)+	0.04] =	4.12				(27
Vindows Type	2				6.097	x1,	/[1/(1.4)+	0.04] =	8.08				(27
Vindows Type	3				4.579	x1,	/[1/(1.4)+	0.04] =	6.07	Ħ			(27
Floor					77.21	x	0.13		10.0373	<u> </u>			(28
Walls Type1	78.2	24	13.78	3	64.46	x	0.18	<u> </u>	11.6	F i		ī	<u> </u>
Walls Type2	33.8	31	2		31.81	X	0.18	=	5.73	F i		1	(29
Total area of e					189.20	6							(31
for windows and			ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	
* include the area	as on both	sides of in	ternal wal	ls and par	titions						_		
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				47.64	(33
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	9840.85	(34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(38
	sments wh			construct	ion are not	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
For design assess	ad of a de		ilation.		nondiy k	(Г	13.06	(36
can be used inste			culated i	ısina Ar)()—II()IX r	•					L	13.00	(50
an be used inste hermal bridge	es : S (L	x Y) cal			•								
an be used inste hermal bridge details of therma	es : S (L al bridging	x Y) cal			•			(33) +	(36) =		Γ	60.7	(37
an be used inste hermal bridge details of therma otal fabric he	es : S (L al bridging at loss	x Y) cal	own (36) =	= 0.05 x (3	•				(36) = = 0.33 × (25)m x (5)	[60.7	(37
=	es : S (L al bridging at loss	x Y) cal	own (36) =	= 0.05 x (3	•	Jul	Aug			25)m x (5) Nov	Dec	60.7	(37
an be used instermal bridger details of thermal ortal fabric head	es:S(L al bridging at loss at loss ca	x Y) cal	own (36) =	= 0.05 x (3	1)	Jul 35.89	Aug 35.68	(38)m	= 0.33 × (60.7	(38)
an be used instermal bridger details of thermal of thermal of a fabric head of the fabric	es : S (L al bridging at loss at loss ca Feb 38.85	x Y) calcare not known alculated Mar 38.57	own (36) = monthly Apr	= 0.05 x (3 / May	Jun		Ť	(38)m Sep 36.33	= 0.33 × (Nov 37.52	Dec	60.7	

Heat loss para	meter (l	HP) W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.29	1.29	1.29	1.27	1.27	1.25	1.25	1.25	1.26	1.27	1.27	1.28		
(10)	0	0			20				<u> </u>	Sum(40) ₁ .		1.27	(40)
Number of day	s in mo	nth (Tabl	le 1a)						go	J		·· - ·	
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)
		<u> </u>		l		<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>		
											130/1/		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		41		(42)
Annual averag Reduce the annua not more that 125	ıl average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.39		(43)
Jan Hot water usage ir	Feb	Mar	Apr	May	Jun	Jul Table 10 V	Aug	Sep	Oct	Nov	Dec		
		uay ioi ea		vu,iii = ia i		1	, ,		1				
(44)m= 100.52	96.87	93.21	89.56	85.9	82.25	82.25	85.9	89.56	93.21	96.87	100.52		_
Energy content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E)Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1096.62	(44)
(45)m= 149.07	130.38	134.54	117.3	112.55	97.12	90	103.27	104.51	121.79	132.95	144.37		
		•		•				_	Total = Su	m(45) ₁₁₂ =	=	1437.84	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46) to (61)			•		
(46)m= 22.36	19.56	20.18	17.59	16.88	14.57	13.5	15.49	15.68	18.27	19.94	21.66		(46)
Water storage	loss:			!									
Storage volum	e (litres)) includin	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	eating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	rcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage													
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufact			-										
Hot water stora	-			ie 2 (KVV	n/litre/da	ıy)					0		(51)
If community h	•		on 4.3										(50)
Temperature fa			2h							—	0		(52) (53)
•							(47) v (E4)) v (EQ) v (I	E0\				, ,
Energy lost fro Enter (50) or (_	, KVVII/ye	ear			(47) X (51)) x (52) x (55) =		0		(54) (55)
` ' '		,	er ooob	manth			((EC) (FF\ (44\)		0.	75		(55)
Water storage	ioss cai	culated i	or each	month		1	((56)m = (55) × (41)ı	m -	,			
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	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= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	•	•									0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by						ı —			ı —	<u> </u>			
(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)

Cambilaa		for ood-		(C1)	(00) . 0	CE (44	١						
	s calculated	Tor each	0	(61)m =	(60) ÷ 3	05 × (41)m 0	0	T 0	Ιο	0	1	(61)
			<u> </u>				ļ		<u>. </u>	ļ		(F0)m + (61)m	(01)
	5.67 172.47	181.14	162.39	159.14	142.21	136.59	149.8		168.39	178.04	190.96	(59)m + (61)m]	(62)
` '	nput calculated	ļ	<u> </u>							ļ]	(02)
	ional lines if								ii continuu	ion to wate	er rieatiriy)		
(63)m=	0 0	0	0	0	0	0	0		0	0	0]	(63)
	m water hea	l	<u> </u>	<u> </u>		<u> </u>	<u> </u>		ļ	<u> </u>		J	, ,
	5.67 172.47	181.14	162.39	159.14	142.21	136.59	149.8	7 149.6	168.39	178.04	190.96]	
				l		<u> </u>	C	utput from w	ater heate	r (annual)₁	12	1986.46	(64)
Heat gain:	s from water	heating.	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	 .]	-
	6.84 77.02	82.01	75.07	74.7	68.37	67.2	71.6	1	77.77	80.28	85.28	ĺ	(65)
include	 (57)m in cal	culation of	of (65)m	only if c	vlinder i	s in the	dwellir	ng or hot w	/ater is f	rom com	munity h	ı neating	
	al gains (se				,						,	<u> </u>	
	gains (Table			,									
	an Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 12	0.39 120.39	120.39	120.39	120.39	120.39	120.39	120.3	9 120.39	120.39	120.39	120.39	1	(66)
Lighting g	ains (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5				•	
(67)m= 19	0.47 17.29	14.06	10.65	7.96	6.72	7.26	9.44	12.67	16.08	18.77	20.01		(67)
Appliance	s gains (cald	culated in	Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5	-	-	-	
(68)m= 21	3.51 215.73	210.14	198.26	183.25	169.15	159.73	157.5	2 163.1	174.98	189.99	204.09]	(68)
Cooking g	ains (calcula	ated in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	-		•	
(69)m= 35	5.04 35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.04	35.04]	(69)
Pumps an	d fans gains	(Table 5	5a)			-		-		-		-	
(70)m=	3 3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.	g. evaporation	on (nega	tive valu	es) (Tab	le 5)								
(71)m= -9	6.31 -96.31	-96.31	-96.31	-96.31	-96.31	-96.31	-96.3	1 -96.31	-96.31	-96.31	-96.31		(71)
Water hea	ting gains (Table 5)										_	
(72)m= 11	6.72 114.61	110.23	104.27	100.4	94.95	90.32	96.26	98.36	104.53	111.5	114.62		(72)
Total inte	rnal gains =	•		-	(66)m + (67)m	n + (68)	m + (69)m +	(70)m + (7	'1)m + (72))m		
(73)m= 41	1.82 409.75	396.55	375.29	353.73	332.94	319.43	325.3	2 336.24	357.71	382.37	400.84		(73)
6. Solar	gains:												
•	are calculated	•					itions to	convert to the	ne applical		tion.		
Orientatio	n: Access I Table 6c		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
0							, –					. ,	٦
Southeast			6.	==	-	36.79]	0.63	X	0.7	=	68.56	(77)
Southeast	<u> </u>		6.			62.67]	0.63	x	0.7	=	116.78	[(77)
Southeast			6.			35.75]	0.63	×	0.7	=	159.78	(77)
Southeast			6.		-	06.25] x [0.63	x	0.7	_ =	197.98	(77)
Southeast	0.77 0.77	X	6.	1	X 1	19.01	X	0.63	X	0.7	=	221.76	(77)

Southeast 0.9x	0.77	×	6.	1	X	1	18.15] _x		0.63	7 x	0.7		220.15	(77)
Southeast _{0.9x}	0.77	×	6.		X		13.91] x		0.63	x	0.7	╡ -	212.25	
Southeast _{0.9x}	0.77	x	6.	1	X	10	04.39	X		0.63	×	0.7		194.51	(77)
Southeast 0.9x	0.77	x	6.	1	X	9	2.85	X		0.63	×	0.7		173.01	
Southeast 0.9x	0.77	x	6.	1	X	6	9.27	X		0.63	×	0.7		129.07	(77)
Southeast _{0.9x}	0.77	x	6.	1	X	4	4.07	x		0.63	×	0.7	= =	82.12	(77)
Southeast 0.9x	0.77	x	6.	1	X	3	1.49	x		0.63	×	0.7	_ =	58.67	(77)
Southwest _{0.9x}	0.77	x	3.1	1	X	3	6.79	j		0.63	×	0.7		34.91	(79)
Southwest _{0.9x}	0.77	x	3.1	1	X	6	2.67	ĺ		0.63	x	0.7	_ =	59.47	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	8	5.75]		0.63	x	0.7	=	81.37	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	10	06.25]		0.63	x	0.7	=	100.83	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	1	19.01]		0.63	x	0.7	=	112.93	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	1	18.15]		0.63	x	0.7	=	112.12	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	1	13.91]		0.63	x	0.7	=	108.09	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	10	04.39]		0.63	x	0.7	=	99.06	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	9	2.85]		0.63	x	0.7	=	88.11	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	6	9.27]		0.63	x	0.7	=	65.73	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	4	4.07]		0.63	x	0.7	=	41.82	(79)
Southwest _{0.9x}	0.77	X	3.1	1	X	3	1.49]		0.63	x	0.7	=	29.88	(79)
Northwest 0.9x	0.77	X	4.5	58	X	1	1.28	X		0.63	x	0.7	=	15.79	(81)
Northwest 0.9x	0.77	X	4.5	58	X	2	2.97	x		0.63	x	0.7	=	32.14	(81)
Northwest _{0.9x}	0.77	X	4.5	58	X	4	1.38	x		0.63	x	0.7	=	57.91	(81)
Northwest 0.9x	0.77	Х	4.5	58	X	6	7.96	x		0.63	x	0.7	=	95.1	(81)
Northwest _{0.9x}	0.77	X	4.5	58	X	9	1.35	X		0.63	x	0.7	=	127.83	(81)
Northwest 0.9x	0.77	X	4.5	58	X	9	7.38	x		0.63	x	0.7	=	136.28	(81)
Northwest 0.9x	0.77	X	4.5	58	X		91.1	X		0.63	x	0.7	=	127.49	(81)
Northwest _{0.9x}	0.77	X	4.5	58	X	7	2.63	X		0.63	x	0.7	=	101.63	(81)
Northwest _{0.9x}	0.77	X	4.5	58	X	5	0.42	X		0.63	x	0.7	=	70.56	(81)
Northwest _{0.9x}	0.77	X	4.5	58	X	2	8.07	X		0.63	x	0.7	=	39.28	(81)
Northwest 0.9x	0.77	X	4.5	58	X		14.2	X		0.63	x	0.7	=	19.87	(81)
Northwest 0.9x	0.77	X	4.5	58	X	(9.21	X		0.63	X	0.7	=	12.89	(81)
Solar gains in (83)m= 119.26	watts, ca 208.39	lculated 299.06	for eac 393.9	h mont 462.52	\neg	68.55	447.83	(<mark>83)m</mark> 395	$\overline{}$	um(74)m 331.68	(<mark>82)m</mark> 234.08	3 143.8	101.45	٦	(83)
Total gains – ii			<u> </u>					393	.21	331.00	234.00	143.6	101.45		(00)
(84)m= 531.08	618.14	695.62	769.19	816.25		01.49	767.26	720	.53	667.93	591.79	526.18	502.28	7	(84)
7. Mean inter	nal tomp							<u> </u>							
Temperature	•		`			area t	rom Tah	ole 9	. Th	1 (°C)				21	(85)
Utilisation fac	_	•			_				,	. ()					(23)
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	А	ug	Sep	Oct	Nov	Dec	7	
(86)m= 1	0.99	0.98	0.95	0.86	+	0.7	0.54	0.5	_	0.83	0.96	0.99	1	1	(86)
Mean interna	l tempera	ature in	living ar	ea T1 (follo	w ste	os 3 to 7	in T	able	e 9c)		•		_	
(87)m= 19.65	19.83	20.1	20.46	20.76	\neg	20.94	20.99	20.		20.86	20.47	20	19.62	7	(87)
	<u> </u>		!	<u>!</u>			<u> </u>		!	!			<u> </u>	_	

Comparison Com	T		ما يەمئىرىلى		مان مام نس		مانا مسالم	from To	bla O Ti	ha (00)					
Utilisation factor for gains for rest of dwelling, h2/m (see Table 9a) (89)	· · · · ·							i		·	10.07	10.00	10.06		(88)
Man internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m (18.07 18.38 18.73 19.24 19.03 19.84 19.87 19.87 19.77 19.27 19.	` ′ ∟	!					<u>!</u>	<u> </u>		19.87	19.87	19.86	19.86		(00)
Man internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 18.07							· `			0.74	0.05	0.00			(00)
Sect 1 to the mean internal temperature 2 to 2	(89)m=	1	0.99	0.97	0.93	0.81	0.61	0.41	0.46	0.74	0.95	0.99	1		(89)
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (12) (12							` `	i	-						
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (82)m	(90)m=	18.07	18.33	18.73	19.24	19.63	19.84	19.87	19.87						¬ `´
18,71 18,94 19,29 19,73 20,09 20,28 20,33 20,32 20,21 19,76 19,16 18,68 (92)										f	LA = Livin	g area ÷ (4	1) =	0.41	(91)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (33)ms 18.71 18.94 19.29 19.73 20.09 20.28 20.33 20.32 20.21 19.76 19.16 18.68 (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 Uain Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.98 0.99 0.97 0.93 0.83 0.83 0.64 0.46 0.51 0.77 0.95 0.99 0.99 0.99 (94) Useful gains, hmGm, W = (94)m x (84)m Useful dains, hmGm, W = (94)m x (84)m Monthly average external temperature from Table 8 (95)m= 527.58 609.9 675.15 712.63 673.56 516.05 354.46 389.25 515.43 559.46 519.33 499.69 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.77 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 ((39)m - (96)m) Table 96) (77m= 1438.91 1937.93 1936.93 1	Mean i	nternal	temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
18.71 18.94 19.29 19.73 20.09 20.28 20.33 20.32 20.21 19.76 19.16 18.68 (93)	(92)m=	18.71	18.94	19.29	19.73	20.09	20.28	20.33	20.32	20.21	19.76	19.16	18.68		(92)
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	Apply a	adjustm	ent to th	ne mean	internal	temper	ature fro	m Table	4e, whe	re appro	opriate				
Set Ti to the mean intermal 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= 0.99 0.99 0.97 0.93 0.83 0.83 0.64 0.46 0.51 0.77 0.95 0.99 0.99 0.99 0.99 Useful gains, hmCm , W = (94)m x (84)m Useful gains, hmCm , W = (94)m x (84)m (95)m= 527.58 609.9 675.15 712.63 673.65 516.05 354.46 369.25 515.43 559.46 519.33 499.69 (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 x (96)m 1 (97)m= (1438.91 1397.33 1269.35 1061.48 82.11 549.1 359.99 378.1 592.9 884.79 1184.58 1430.03 (97) Space heating requirement for each month, kWh/month = 0.024 x ([67)m - (95)m] x (41)m (88)m= 678.03 529.19 442.08 251.17 109.03 0 0 0 0 0 249.48 478.97 692.17 Total per year (kWh/year) = Sum(88)s. 1.0 = 3430.12 (88) Space heating requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system Fraction of space heat from main system 1 (204) = (202) x [1 - (201)] = 1 (202) Fraction of space heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) [67.03 529.19 442.08 251.71 109.03 0 0 0 0 0 249.48 478.97 692.17 [721] (211)m = {((18)m x (204))} x 100 + (206) Total (kWh/year) = Sum(211), x.s., x²²²²²²²²²²²²²²²²²²²²²²²²²²²²²²²²²²²²	(93)m=	18.71	18.94	19.29	19.73	20.09	20.28	20.33	20.32	20.21	19.76	19.16	18.68		(93)
The utilisation factor for gains using Table 9a Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8. Spac	ce heat	ing requ	uirement											
Utilisation factor for gains, hms Apr May Jun Jul Aug Sep Oct Nov Dec					•		ed at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (34)me							lun	lul	Διια	San	Oct	Nov	Dec		
(94)me	L Utilisati				<u> </u>	iviay	Juli	Jui	Aug	Sep	Oct	INOV	Dec		
Useful gains, hmGm , W = (94)m x (84)m (85)m (85	_					0.83	0.64	0.46	0.51	0.77	0.95	0.99	0.99		(94)
S27.58 609.9 675.15 712.63 673.56 516.05 354.46 369.25 515.43 559.46 519.33 499.69 (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= 1438.91 1397.39 1269.35 1061.48 820.11 549.1 359.99 378.1 592.9 894.79 1184.56 1430.03 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 676.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 476.97 692.17 Total per year (kWh/year) = Sum(98). ss. 22 3430.12 (98) Space heating requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) x [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17 (211)m = { ([98)m x (204)] } x 100 ÷ (206) Total (kWh/year) = Sum(211) x 100 ÷ (208) Total (kWh/year) = Sum(211) x 100 ÷ (208) (211) x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0		gains.	hmGm .	W = (94	1)m x (84	4)m	<u> </u>	l							
Ge me					<u> </u>		516.05	354.46	369.25	515.43	559.46	519.33	499.69		(95)
Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) (97)m=	ــ Monthly	y avera	ige exte	rnal tem	perature	from Ta	able 8	!							
139.739 1397.39 1269.35 1061.48 820.11 549.1 359.99 378.1 592.9 894.79 1184.56 1430.03 (97)	(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)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17 Total per year (kWh/year) = Sum(98), ss. v2 = 3430.12 (98) Space heating requirement in kWh/m²/year 444.43 (99) 9a. Energy requirements — Individual heating systems including micro-CHP) Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) [678.03 529.19 442.08 251.17 109.03 0 0 0 0 0 249.48 478.97 692.17 (211) [725.16 565.98 472.82 268.63 116.61 0 0 0 0 266.83 512.26 740.29 Total (kWh/year) = Sum(211)_{L.s.vov2} 3668.58 (211) Space heating fuel (secondary), kWh/month = [[(98)m x (201)] } x 100 ÷ (208) [215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Heat lo	ss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
Space heating requirement in kWh/m²/year Space heating from main system	(97)m= 1	1438.91	1397.39	1269.35	1061.48	820.11	549.1	359.99	378.1	592.9	894.79	1184.56	1430.03		(97)
Space heating requirement in kWh/m²/year Sum(98)_Ls_2.12 3430.12 (98)	Space	heating	g require	ement fo	r each m	nonth, k\	Wh/mon	th = 0.02	4 x [(97))m – (95)m] x (4′	1)m			
Space heating requirement in kWh/m²/year 44.43 (99)	(98)m=	678.03	529.19	442.08	251.17	109.03	0	0	0	0	249.48	478.97	692.17		_
Space heating: Fraction of space heat from secondary/supplementary system 0 (201)									Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	3430.12	(98)
Space heating: Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 678.03 529.19 442.08 251.17 109.03 0 0 0 0 0 249.48 478.97 692.17 (211)m = {[(98)m x (204)]} x 100 ÷ (206) (211) 725.16 565.98 472.82 268.63 116.61 0 0 0 0 266.83 512.26 740.29 Total (kWh/year) = Sum(211), 4.1012 = 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (208) (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space	heating	g require	ement in	kWh/m²	/year								44.43	(99)
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) [678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17 [211)m = {[(98)m x (204)]} x 100 ÷ (206) Total (kWh/year) = Sum(211)_1_s_101z = 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) [215)m = 0 0 0 0 0 0 0 0 0 0	9a. Ener	rgy req	uiremer	ıts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) [678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17] [211)m = {[(98)m x (204)]} x 100 ÷ (206) Total (kWh/year) = Sum(211) _{13.1012} 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) [215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space	heatin	g:												_
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (204) Efficiency of main space heating system 1 93.5 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) [678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17] [678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17] [678.03 529.19 442.08 251.17 109.03 0 0 0 0 266.83 512.26 740.29] Total (kWh/year) = Sum(211) _{1.5.1012} 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) [(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fractio	n of sp	ace hea	t from se	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17 (211)m = {[(98)m x (204)]} x 100 ÷ (206) T25.16 565.98 472.82 268.63 116.61 0 0 0 0 266.83 512.26 740.29 Total (kWh/year) = Sum(211) _{1.5.1012} 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fractio	n of sp	ace hea	t from m	ain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) [678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17 [211)m = {[(98)m x (204)] } x 100 ÷ (206) [725.16 565.98 472.82 268.63 116.61 0 0 0 0 266.83 512.26 740.29 Total (kWh/year) = Sum(211) _{1.5.1012} 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) [(215)m= 0 0 0 0 0 0 0 0 0 0	Fractio	n of tot	al heatiı	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	Efficien	ncy of n	nain spa	ce heat	ing syste	em 1								93.5	(206)
Space heating requirement (calculated above) [678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17 [211) m = {[(98)m x (204)] } x 100 ÷ (206) [725.16 565.98 472.82 268.63 116.61 0 0 0 0 266.83 512.26 740.29 [211) Total (kWh/year) = Sum(211) ₁₅₁₀₁₂ 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) [215)m= 0 0 0 0 0 0 0 0 0	Efficien	ncy of s	econda	ry/supple	ementar	y heatin	g systen	າ, %						0	(208)
Space heating requirement (calculated above) [678.03 529.19 442.08 251.17 109.03 0 0 0 0 249.48 478.97 692.17 [211) m = {[(98)m x (204)] } x 100 ÷ (206) [725.16 565.98 472.82 268.63 116.61 0 0 0 0 266.83 512.26 740.29 [211) Total (kWh/year) = Sum(211) ₁₅₁₀₁₂ 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) [215)m= 0 0 0 0 0 0 0 0 0	Г	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
$ (211) \text{m} = \{ [(98) \text{m x } (204)] \} \text{ x } 100 \div (206) \\ \hline 725.16 \ 565.98 \ 472.82 \ 268.63 \ 116.61 \ 0 \ 0 \ 0 \ 0 \ 266.83 \ 512.26 \ 740.29 \\ \hline \hline Total (kWh/year) = \text{Sum}(211)_{161012} = 3668.58 \ (211) \\ \hline \text{Space heating fuel (secondary), kWh/month} \\ = \{ [(98) \text{m x } (201)] \} \text{ x } 100 \div (208) \\ \hline (215) \text{m} = 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$	Space	heating	require	ement (c	alculated	d above)			-				-	
Total (kWh/year) = Sum(211) _{15,1012} 3668.58 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0	(678.03	529.19	442.08	251.17	109.03	0	0	0	0	249.48	478.97	692.17		
	(211)m =	= {[(98)	m x (20	4)] } x 1	00 ÷ (20	16)	_	-							(211)
Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0		725.16	565.98	472.82	268.63	116.61	0	0	0	0	266.83	512.26	740.29		
$= \{ [(98)m \times (201)] \} \times 100 \div (208)$ $(215)m = $							•		Tota	l (kWh/yea	ar) =Sum(2	211),,,,5,10,12	=	3668.58	(211)
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0	Space	heating	g fuel (s	econdar	y), kWh/	month									_
		n x (20	1)] } x 1	00 ÷ (20	8)										
Total (kWh/year) = Sum(215) _{15,1012} = 0 (215)	(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
							•	•			\ ^ ·	\\			┓.

195.67 172.47 181.14 162.39 159.14 1	42.21 136.59	149.87	149.6	168.39	178.04	190.96		
Efficiency of water heater				100.00		100.00	79.8	(2
	79.8 79.8	79.8	79.8	85.86	87.33	87.95		」` (2
ruel for water heating, kWh/month	_			Į.		!		
$219)m = (64)m \times 100 \div (217)m$	70 04 474 47	107.0	107.47	106.10	202.07	247.42		
219)m= 222.7 196.85 207.95 188.88 189.84 1	78.21 171.17	187.8	187.47	196.12 19a) ₁₁₂ =	203.87	217.13	2347.99](2
annual totals		7014	- Gam(L		Wh/year		kWh/year](2
pace heating fuel used, main system 1				, K	vii/yeai		3668.58	1
Vater heating fuel used							2347.99	ĺ
Electricity for pumps, fans and electric keep-hot						I		J
central heating pump:						30		(2
boiler with a fan-assisted flue								ì
			((000)	(000.)		45		(2 1 .
otal electricity for the above, kWh/year		sum	of (230a).	(230g) =			75](2
Electricity for lighting							343.8	(2
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP						
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP		Emiss	ion fac	tor	Emissions	
12a. CO2 emissions – Individual heating system				Emiss kg CO		tor	Emissions kg CO2/yea	r
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy				2/kWh	tor =		r](2
Ŭ.	Energy kWh/year			kg CO	2/kWh		kg CO2/yea](2
Space heating (main system 1)	Energy kWh/year			kg CO	2/kWh	=	kg CO2/yea	-
Space heating (main system 1) Space heating (secondary) Vater heating	Energy kWh/year (211) x (215) x			0.2 0.5	2/kWh	=	kg CO2/yea](2
space heating (main system 1) space heating (secondary) Vater heating space and water heating	Energy kWh/year (211) x (215) x (219) x			0.2 0.5	2/kWh 16 19	=	kg CO2/yea 792.41 0 507.17	(2) (2) (2) (2
Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x (219) x (261) + (262)			0.2 0.5 0.2	2/kWh 16 19 16	=	kg CO2/yea 792.41 0 507.17 1299.58](2](2](2

TER =

(273)

19.65