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 14:54:17

Project Information:

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

Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 86.6m² Plot Reference: Site Reference : Hermitage Lane Plot 31

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))

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

Dwelling Carbon Dioxide Emission Rate (DER) 9.66 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 43.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 35.7 kWh/m²

OK

2 Fabric U-values

Element Average Highest

External wall 0.15 (max. 0.30) 0.15 (max. 0.70) OK

Floor (no floor)

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

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

100.0%	
75.0%	ок
1.02	
1.5	ок
70%	OK
Slight	ОК
Ç	
Average or unknown	
6.1m²	
6.07m²	
4.58m²	
6.00	
3.0 m³/m²h	
0.13 W/m ² K	
	1.02 1.5 93% 70% Slight Average or unknown 6.1m ² 6.07m ² 4.58m ² 6.00

		1	Jser D	etaile:						
Assessor Name:	Zahid Ashraf			Strom:	a Nium	hori		STD()	001082	
Software Name:	Stroma FSAP 2012	2		Softwa	-				on: 1.0.5.9	
				Address:						
Address :										
1. Overall dwelling dime	ensions:			(0)						
Ground floor				a(m²) 36.6	(1a) x		ight(m) 2.5	(2a) =	Volume(m³	(3a)
Total floor area TFA = (1	2)+(1b)+(1c)+(1d)+(1c)	14 (1p)			(4)				210.5	
	a)+(10)+(10)+(10)+(1e)	/+(III)	8	36.6)*(3°)*(3°	d)+(3e)+	(3n) -		7.5
Dwelling volume					(3a)+(3b))+(30)+(30	i)+(3e)+	.(311) =	216.5	(5)
2. Ventilation rate:	main se	condary		other		total			m³ per hou	r
Number of chimneys	heating he	eating 0	+ [0	1 = [0	x 4	40 =	0	(6a)
Number of open flues			+ -]		x	20 =		╡``
Number of intermittent fa		0	L	0	J F	0		10 =	0	(6b) (7a)
					Ļ	0		10 =	0	╡``
Number of flueless are fi					Ļ	0		40 =	0	(7b)
Number of flueless gas fi	ires					0	* '	+0 =	0	(7c)
Air changes per hour										
Infiltration due to chimne	ys, flues and fans = (6a	ı)+(6b)+(7a)+	+(7b)+(7	7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended	d, proceed to	o (17), c	otherwise c	ontinue fr	om (9) to ((16)			-
Number of storeys in the Additional infiltration	he dwelling (ns)						[(0)	410.4	0	(9)
	.25 for steel or timber fi	rame or 0.	.35 for	masonr	v constr	uction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are p	resent, use the value corresp				•				<u> </u>	
deducting areas of openia	ngs); if equal user 0.35 floor, enter 0.2 (unseale	ed) or 0.1 ((seale	d) else	enter ()				0	(12)
If no draught lobby, en	•	54) 01 0.1	(ocaic	a), cioc	critor o				0	(13)
• •	s and doors draught str	ipped							0	(14)
Window infiltration				0.25 - [0.2		_			0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value, If based on air permeabil	q50, expressed in cubi	-		•	•	etre of e	envelope	area	3	(17)
	es if a pressurisation test has					is being u	sed		0.15	(18)
Number of sides sheltered	ed								1	(19)
Shelter factor				(20) = 1 - [9)] =			0.92	(20)
Infiltration rate incorporat	_			(21) = (18)	x (20) =				0.14	(21)
Infiltration rate modified f	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		Juli	Jui	Aug	ОСР	000	1400	Dec	_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	-)	1				ı	1		I	
Wind Factor (22a)m = (2.32)m $= 4.37$	 	0.05	0.05	0.00	4	1.00	1 40	1 10	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		

0.18	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	I	!		l		<u></u>	_
If mechanic				(22				. (00)	\			0.5	(23
If exhaust air h		0		, ,	,	. `	,, .	•) = (23a)			0.5	(23
If balanced with		,	,	J		`		,				79.05	(23
a) If balance						- ` ` 	- ´ ` -	í `	, 	- 	1 ` ´) ÷ 100] 1	(0.4
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	1					- 	, 	ŕ	r ´ `			1	(0.
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h		tract ven ≺ (23b), t							5 v (22h	,)			
(24c)m = 0	0.5 7	0	0	0	0	0	C) = (22)	0	0	0	0	1	(24
d) If natural						<u> </u>						J	(-
,		en (24d)		•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in bo	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]	(25
2 Hoot loose	o and be	oot loog i	ooromote	or:			•					-	
3. Heat losse ELEMENT	S and ne	·	Openin		Net Ar	22	U-val	ПΩ	AXU		k-value	Δ	Χk
ELEIVIENI	area		m		A,r		W/m2		(W/I	K)	kJ/m²-		/K
Doors					2	x	1.4	=	2.8				(26
Windows Type	e 1				6.097	₇ χ1	/[1/(1.4)+	0.04] =	8.08	$\overline{}$			(27
Windows Type	e 2				6.075	x1	/[1/(1.4)+	0.04] =	8.05	$\overline{}$			(27
Windows Type	э 3				4.579) x1	/[1/(1.4)+	0.04] =	6.07				(27
Walls Type1	78.7	75	16.7	5	62	x	0.15	─ - i	9.3	= [(29
Walls Type2	14.3	37	2		12.37	7 X	0.14	-	1.75	Ħ i		= =	(29
Walls Type3	12.5	56	0		12.56	3 x	0.13	=	1.66	F i			<u> </u>
Total area of e					105.6	=							` (31
* for windows and			effective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2	•
** include the are	as on both	sides of in	nternal wali	s and pan	titions								
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30) + (32) =				37.72	(33
Heat capacity		` '						((28).	(30) + (32	2) + (32a)	(32e) =	1217.1	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35
For design asses: can be used inste				construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridg				ısina An	pendix l	<						10.38	(36
if details of therma	,	,		• .	-	•						10.30	
Total fabric he			()	,	,			(33) +	(36) =			48.1	(37
Ventilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (25)m x (5)		
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan				10.11	16.9	16.9	16.65	17.4	18.14	18.64	19.13]	(38
	19.88	19.63	18.39	18.14	10.0]	•
	<u> </u>		18.39	10.14	1	<u> </u>		<u> </u>	= (37) + (37)	<u> </u>		ı	·
(38)m= 20.12	<u> </u>		18.39 66.49	66.24	65	65	64.75	<u> </u>	<u> </u>	<u> </u>	67.23]	`

Heat loss par	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	· (4)			
(40)m= 0.79	0.78	0.78	0.77	0.76	0.75	0.75	0.75	0.76	0.76	0.77	0.78		
	_ !	!		ļ		ļ	<u> </u>	'	Average =	Sum(40) ₁ .	12 /12=	0.77	(40)
Number of da	ays in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occ if TFA > 13 if TFA £ 13	s.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		58		(42)
Annual avera Reduce the annu not more that 12:	ual average	hot water	usage by	5% if the α	lwelling is	designed t	` ,		se target c		0.41		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								1 7 -		L			
(44)m= 110.45	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		
, ,										m(44) ₁₁₂ =	L	1204.88	(44)
Energy content of	of hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62		
L	1	1	l .		l .			-	Total = Su	m(45) ₁₁₂ =	=	1579.79	(45)
If instantaneous	water heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)			_		_
(46)m= 24.57	21.49	22.17	19.33	18.55	16.01	14.83	17.02	17.22	20.07	21.91	23.79		(46)
Water storage		•		•		•	•	•	•				
Storage volur	me (litres)) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	•			_			, ,		(01.1				
Otherwise if r Water storage		not wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
a) If manufac		eclared I	oss facto	or is kno	wn (k\/\/ł	n/day).					0		(48)
Temperature				51 15 KHO	WII (ICVVI	i/day).							(49)
Energy lost fr				oor			(48) x (49)	\ _			0		
b) If manufac		•			or is not		(46) X (49)) =		1	10		(50)
Hot water sto			-							0.	02		(51)
If community	heating s	see secti	on 4.3										
Volume factor	r from Ta	ble 2a								1.	.03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost fr	om wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter (50) or	(54) in (5	55)								1.	.03		(55)
Water storage	e loss cal	culated t	or 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	ns dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m 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	it loss (ar	nnual) fro	m Table	<u>-</u> -							0		(58)
Primary circuit	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified b	y factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calcul	ated for	r oach	month (61\m -	(60) · ·	265 v (A1	/m							
(61)m= 0	0	0	0	01)111 =	00) +	0 7 (41)) 0	П	0	0	0	0	1	(61)
Total heat require				,									(50)m + (61)m	(-)
		203.1	182.37	178.94	160.2	154.16	168.	_	168.32	189.09	199.56	213.9	(39)111 + (01)111	(62)
Solar DHW input calc													i	(/
(add additional lin										COMMISC	mon to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0		(63)
Output from wate	r heater						<u> </u>	!			Į		ı	
· — —		203.1	182.37	178.94	160.2	154.16	168.	74	168.32	189.09	199.56	213.9	I	
` '							<u> </u>	Outp	ut from wa	ater heat	_ I er (annual)₁	12	2230.63	(64)
Heat gains from v	vater he	eating.	kWh/mo	onth 0.2	8.01 ` 5	5 × (45)m	+ (6	1)m	1 + 0.8 x	: [(46)m	+ (57)m	+ (59)m	1	
		93.37	85.65	85.34	78.28	77.1	81.9	_	80.97	88.71	91.36	96.96	اً	(65)
include (57)m i	n calcula	ation o	of (65)m	only if c	vlinder	is in the o	dwelli	ina (or hot w	ater is t	rom com	munity h	ı ıeating	
5. Internal gains				-	,								Julius J	
Metabolic gains (·											
		Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec	1	
(66)m= 128.81 12	28.81 12	28.81	128.81	128.81	128.81	128.81	128.	81	128.81	128.81	128.81	128.81		(66)
Lighting gains (ca	lculated	in Ap	pendix l	L, equati	on L9	or L9a), a	lso se	ee T	able 5		•	•	1	
(67)m= 20.97 1	8.63 1	15.15	11.47	8.57	7.24	7.82	10.1	16	13.64	17.32	20.22	21.55	[(67)
Appliances gains	(calcula	ated in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ole 5	•		ı	
(68)m= 232.68 2	35.1 2	29.01	216.06	199.71	184.34	174.07	171.	66	177.74	190.7	207.05	222.42	[(68)
Cooking gains (ca	alculated	d in Ap	pendix	L, equat	ion L1	or L15a), also	o se	e Table	5	•		ı	
(69)m= 35.88 3	5.88 3	35.88	35.88	35.88	35.88	35.88	35.8	38	35.88	35.88	35.88	35.88		(69)
Pumps and fans	gains (T	able 5	a)			•		•			•	•	ı	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	1	(70)
Losses e.g. evap	oration ((negati	ive valu	es) (Tab	le 5)	•		'	-		•		ı	
(71)m= -103.05 -10	03.05 -1	03.05	-103.05	-103.05	-103.05	-103.05	-103.	.05	-103.05	-103.05	-103.05	-103.05		(71)
Water heating ga	ins (Tab	ole 5)				•					•	!	ı	
(72)m= 132.64 13	30.32 1	125.5	118.95	114.7	108.72	103.63	110.	15	112.46	119.24	126.89	130.33	[(72)
Total internal ga	ins =	•			(6	6)m + (67)m	ı + (68)m +	(69)m + (70)m + (71)m + (72))m	1	
(73)m= 447.93 44	15.68 4	431.3	408.12	384.63	361.94	347.17	353.	61	365.49	388.9	415.8	435.94	1	(73)
6. Solar gains:						,	'				,			
Solar gains are calc	ulated usir	ng solar	flux from	Table 6a	and asso	ciated equa	itions t	o coi	nvert to th	e applica	ble orienta	tion.		
Orientation: Acc		ctor	Area			ux		_	g	_	FF		Gains	
1 a b	le 6d		m²		1;	able 6a		la	able 6b	'	Table 6c		(W)	_
Southeast 0.9x	0.77	X	6.	1	х	36.79	X		0.63	x	0.7	=	68.56	(77)
Southeast 0.9x	0.77	X	6.	1	х	62.67	x		0.63	x	0.7	=	116.78	(77)
Southeast _{0.9x}	0.77	X	6.	1	х	85.75	x [0.63	x	0.7	=	159.78	(77)
Southeast _{0.9x}	0.77	x	6.	1	х	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	x	6.1	7 x	118.15	_	x	0.63	x	0.7		220.15	(77)
Southeast 0.9x	0.77	$\frac{1}{x}$	6.1	」 ^ _ x	113.91	=	X	0.63	$=$ $\begin{bmatrix} 1 \\ x \end{bmatrix}$	0.7	╡ -	212.25	= (''')
Southeast 0.9x	0.77	= ^	6.1] ^] x	104.39		X	0.63	$=$ $\frac{1}{x}$	0.7	╡ -	194.51	(77)
Southeast 0.9x	0.77	T x	6.1	」 ^ x	92.85		X	0.63	$\frac{1}{2}$	0.7	=	173.01	(77)
Southeast 0.9x	0.77	x	6.1] ^] _x	69.27		X	0.63	$=$ $\begin{bmatrix} \\ \\ \\ \end{bmatrix}$	0.7	-	129.07	(77)
Southeast 0.9x	0.77	x	6.1] ^] x	44.07	픰	X	0.63	^x	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	6.07] ^] x	36.79	=		0.63		0.7	╡ -	68.31	(79)
Southwest _{0.9x}	0.77	×	6.07] ^] x	62.67	_		0.63		0.7	╡ -	116.36	(79)
Southwest _{0.9x}	0.77	×	6.07] x	85.75			0.63	x	0.7	╡ -	159.21	(79)
Southwest _{0.9x}	0.77	×	6.07] x	106.25	_		0.63	×	0.7	╡ -	197.27	(79)
Southwest _{0.9x}	0.77	×	6.07] ^] x	119.01	=		0.63	x	0.7	╡ -	220.96	(79)
Southwest _{0.9x}	0.77	×	6.07] x	118.15			0.63	×	0.7		219.36	(79)
Southwest _{0.9x}	0.77	×	6.07] x	113.91			0.63	x	0.7	╡ -	211.48	(79)
Southwest _{0.9x}	0.77	×	6.07	」] x	104.39			0.63	x	0.7	= =	193.81	(79)
Southwest _{0.9x}	0.77	×	6.07	」 】x	92.85			0.63	x	0.7	╡ -	172.39	(79)
Southwest _{0.9x}	0.77	X	6.07] x	69.27			0.63	×	0.7	╡ .	128.6	(79)
Southwest _{0.9x}	0.77	×	6.07	」] x	44.07			0.63	x	0.7		81.82	(79)
Southwest _{0.9x}	0.77	×	6.07	」 】x	31.49			0.63	x	0.7	╡ -	58.46	(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	×	4.58	」 】x	41.38		x	0.63	x	0.7	= =	57.91	(81)
Northwest _{0.9x}	0.77	×	4.58	」 기 x	67.96	=	x	0.63	x	0.7	=	95.1	(81)
Northwest _{0.9x}	0.77	×	4.58] x	91.35	〓	x	0.63	x	0.7	= =	127.83	(81)
Northwest _{0.9x}	0.77	×	4.58	」 】x	97.38	一	x	0.63	= x	0.7	= =	136.28	(81)
Northwest _{0.9x}	0.77	×	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	×	0.7	= =	101.63	(81)
Northwest _{0.9x}	0.77	×	4.58	」 】x	50.42	一	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	X	4.58	」 】x	9.21	一	x	0.63	×	0.7	= =	12.89	(81)
				J				0.00		· · ·			(- /
Solar gains in w	atts, cal	culated	for each mor	nth		((83)m	n = Sum(74)m	(82)m				
1 1	265.28	376.9	490.35 570.5		75.79 551	.22	489	.96 415.96	296.9	183.81	130.03		(83)
Total gains – int	ternal an	d solar	(84)m = (73)	m + (83)m , wat	ts					•	•	
(84)m= 600.59	710.96	808.2	898.47 955.1	7 9	37.73 898	.39	843	.57 781.45	685.8	5 599.61	565.97		(84)
7. Mean intern	al tempe	erature (heating seas	on)									
Temperature d	luring he	ating pe	eriods in the I	iving	area from	Tab	le 9	Th1 (°C)				21	(85)
Utilisation factor	or for gai	ins for li	iving area, h1	,m (s	ee Table 9	a)							
Jan	Feb	Mar	Apr Ma	ıy	Jun Ju	ال	Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.94	0.9	0.84	0.73 0.59		0.43 0.3	31	0.3	0.54	0.78	0.91	0.95		(86)
Mean internal	tempera	ture in I	iving area T1	(follo	w steps 3	to 7	in T	able 9c)					
(87)m= 19.65	19.93	20.28	20.64 20.8		20.97 20.9		20.		20.63	20.09	19.6		(87)
<u> </u>	•		•	•	•			-		•		•	

T		المادة المادة المادة				al a III: a as	. f T.	O T	LO (0 0)					
(88)m=	20.26	20.27	neating p	20.28	20.28	20.3	20.3	20.3	n2 (°C) 20.29	20.28	20.28	20.27		(88)
` ′		<u> </u>	ains for				<u> </u>	<u> </u>	20.29	20.28	20.28	20.21		(00)
(89)m=	0.93	0.89	0.82	0.7	0.55	0.39	0.27	0.3	0.49	0.75	0.89	0.94		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	ens 3 to	r 7 in Tabl	le 9c)				
(90)m=	18.44	18.85	19.34	19.85	20.13	20.26	20.29	20.29	20.22	19.83	19.08	18.38		(90)
									1	fLA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = f	LA × T1	+ (1 – fL	.A) × T2			•		
(92)m=	18.85	19.22	19.67	20.12	20.38	20.51	20.53	20.53	20.46	20.11	19.43	18.8		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	18.85	19.22	19.67	20.12	20.38	20.51	20.53	20.53	20.46	20.11	19.43	18.8		(93)
•		·	uirement											
			ternal ter or gains			ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.92	0.87	0.81	0.7	0.55	0.4	0.28	0.31	0.5	0.74	0.88	0.93		(94)
			, W = (94					ı	ı		1			4
(95)m=	550.99	621.5	652.53	626.1	530.07	373.43	253.17	264	392.88	507.32	525.89	525.13		(95)
(96)m=	aly avera	age exte	ernal tem	perature 8.9	11.7	able 8 14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` '			an intern								7.1	4.2		(00)
(97)m=	992.9	973.4	891.67	746.01	575.24	383.87	255.51	267.39	416.54	629.71	822.77	981.29		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Mh/mon [·]	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	<u> </u>		
(98)m=	328.78	236.47	177.92	86.33	33.61	0	0	0	0	91.06	213.75	339.38		
•		-					-	Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	1507.3	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year								17.41	(99)
9b. En	ergy red	quiremer	nts – Cor	nmunity	heating	scheme)							
			ace hea from se								unity sch	neme.	0	(301)
	-			-		-	_	(Table T	1, 0 11 11	OHO		<u> </u>		(302)
	-		from co	•	-			,, ,	0110			[1	(302)
	-		y obtain he s, geotherr							up to tour	otner neat	sources; ti	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	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	commun	ity heati	ng syste	m					1.05	(306)
Space	heating	g										•	kWh/yea	r r
Annua	l space	heating	requiren	nent									1507.3	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	= [1582.66	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
												•		

Space heating requirement from secondary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
	() () () () () () () () () ()	` ′ [」 ` ⁻′
Water heating Annual water heating requirement		[2230.63	1
If DHW from community scheme:				┙ ┓
Water heat from Community boilers	, , , , ,	(305) x (306) =	2342.16	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	39.25	(313)
Cooling System Energy Efficiency Ratio		إ	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	$= (107) \div (314)$	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outs	side	[336.77	(330a)
warm air heating system fans		[0	(330b)
pump for solar water heating		[0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	336.77	(331)
Energy for lighting (calculated in Appendix L)]	370.34	(332)
Electricity generated by PVs (Appendix M) (negative quantity)]	-872.75	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity	ty)]	0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	kWh/year	kg CO2/kWh		(367a)
Efficiency of heat source 1 (%) If there is CHP using two	kWh/year	kg CO2/kWh	kg CO2/year](367a)](367)
Efficiency of heat source 1 (%) If there is CHP using two	kWh/year • fuels repeat (363) to • [b] x 100 ÷ (367b) x	kg CO2/kWh	kg CO2/year	
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution [(307b)+(310b) [(313b) [(31	kWh/year • fuels repeat (363) to • [b] x 100 ÷ (367b) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 =	94 901.87	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution If there is CHP using two [(307b)+(310b)] [(313b)]	kWh/year b fuels repeat (363) to b)] x 100 ÷ (367b) x 3) x (366) + (368)(372)	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 =	94 901.87 20.37	(367)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems [(307b)+(310t) [(313)	kWh/year o fuels repeat (363) to b)] x 100 ÷ (367b) x B) x (366) + (368)(372	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0.52 = 0.52	94 901.87 20.37 922.24	(367) (372) (373)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous	kWh/year o fuels repeat (363) to b)] x 100 ÷ (367b) x B) x (366) + (368)(372	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 =	94 901.87 20.37 922.24	(367) (372) (373) (374)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous	kWh/year o fuels repeat (363) to b)] x 100 ÷ (367b) x B) x 0(366) + (368)(372 o keater (312) x o heater (374) + (375) =	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 =	94 901.87 20.37 922.24 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous Total CO2 associated with space and water heating (373)	kWh/year of fuels repeat (363) to b)] x 100 ÷ (367b) x 3) x)(366) + (368)(372 c) x s heater (312) x) + (374) + (375) = (331)) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0.52 = 0 0 = 0.22	94 901.87 20.37 922.24 0 922.24	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling	kWh/year ofuels repeat (363) to b)] x 100 ÷ (367b) x B) x c)(366) + (368)(372 c) x s heater (312) x c) + (374) + (375) = (331)) x c))) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 = 0.52 =	94 901.87 20.37 922.24 0 922.24 174.78	(367) (372) (373) (374) (375) (376) (378)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO332) Energy saving/generation technologies (333) to (334) as applicable litem 1	kWh/year ofuels repeat (363) to b)] x 100 ÷ (367b) x B) x c)(366) + (368)(372 c) x s heater (312) x c) + (374) + (375) = (331)) x c))) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 = 0.52 = 0.52 =	94 901.87 20.37 922.24 0 0 922.24 174.78 192.2	(367) (372) (373) (374) (375) (376) (378) (379)
Efficiency of heat source 1 (%) CO2 associated with heat source 1 Electrical energy for heat distribution Total CO2 associated with community systems CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO3 associated with electricity for lighting CO3 associated with electricity for lighting CO3 associated with electricity for lighting CO4 associated with electricity for lighting CO5 associated with electricity for lighting CO6 associated with electricity for lighting CO7 associated with electricity for lighting CO8 associated with electricity for lighting CO9 associated with electricity for lighting	kWh/year ofuels repeat (363) to b)] x 100 ÷ (367b) x B) x c)(366) + (368)(372 c) x s heater (312) x c) + (374) + (375) = (331)) x c))) x	kg CO2/kWh (366) for the second fuel 0.22 = 0.52 = 0 = 0.22 = 0.52 = 0.52 =	94 901.87 20.37 922.24 0 0 922.24 174.78 192.2	(367) (372) (373) (374) (375) (376) (378) (379)

SAP 2012 Overheating Assessment

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

Property Details: Plot 31

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

Night ventilation: Blinds, curtains, shutters:

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

Overheating Details

Summer ventilation heat loss coefficient: 428.67 (P1)

Transmission heat loss coefficient: 48.1

Summer heat loss coefficient: 476.77 (P2)

Overhangs:

Overhangs:

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

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South East (SE)	1	0.9	1	0.9	(P8)
South West (SW)	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 East (SE)	0.9 x	6.1	119.92	0.63	0.7	0.9	261.18	
South West (SW)	0.9 x	6.07	119.92	0.63	0.7	0.9	260.24	
North West (NW)	0.9 x	4.58	98.85	0.63	0.7	0.9	161.68	
						Total	683.09	(P3/P4)

Internal gains:

	June	July	August
Internal gains	506.5	487.55	496.32
Total summer gains	1228.4	1170.64	1115.01 (P5)
Summer gain/loss ratio	2.58	2.46	2.34 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	19.88	21.66	21.44 (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	Property	Address	Plot 31					
Address :									
Overall dwelling dime	ensions:	Δro	a(m²)		Δν Ηο	ight(m)		Volume(m	31
Ground floor				(1a) x		2.5	(2a) =	216.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1		86.6	(4)]`		
Dwelling volume	-, (-, (-, (-, (-,	′ L	00.0)+(3c)+(3c	d)+(3e)+	.(3n) =	216.5	(5)
				(==) - (==	, (00)	., (,	-()	210.5	(3)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating beauting heating	- + -	0] = [0	x	40 =	0	(6a)
Number of open flues		╣ + 片	0]	0	x 2	20 =	0	(6b)
Number of intermittent fa		_ L		J L	3	x	10 =	30	(7a)
Number of passive vents				Ļ			10 =		=
·				Ļ	0		40 =	0	(7b)
Number of flueless gas f	iies			L	0	^	+0 =	0	(7c)
							Air ch	nanges per h	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.14	(8)
	peen carried out or is intended, procee	ed to (17),	otherwise o	continue fr	rom (9) to	(16)			<u>-</u>
Number of storeys in t Additional infiltration	he dwelling (ns)					[(0)	410.4	0	(9)
	.25 for steel or timber frame o	r 0 35 fo	r masoni	v constr	ruction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value corresponding t			•	Gottori				(\.,
deducting areas of openi	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	1 (222)	مط/ مامم	antar O					— (40)
If no draught lobby, en	,	. i (Seai	eu), eise	enter o				0	(12)
• • • • • • • • • • • • • • • • • • • •	s and doors draught stripped							0	(14)
Window infiltration	3 11		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	es per h	our per s	quare m	etre of e	envelope	area	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (18) = [(17$							0.29	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has been do ad	ne or a de	gree air pe	rmeability	is being u	sed		4	(19)
Shelter factor	,u		(20) = 1 -	[0.0 75 x (1	19)] =			0.92	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.27	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
(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]	
·				<u> </u>		Ц	<u> </u>	J	

	ation rat	· ·				` 	`	` 	T	T	T	1	
0.34 Calculate effe	0.33 Ctive air	0.33 change i	0.29 rate for t	0.29 he appl i	0.25 cable ca	0.25 se	0.25	0.27	0.29	0.3	0.31		
If mechanic		_										0	(23a
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(230
a) If balance	ed mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance					1		ЛV) (24b	m = (22)	2b)m + (2	23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r	ouse ex n < 0.5 ×			-	-				5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
d) If natural	ventilation								0.51			1	
(24d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55]	(240
Effective air	change	rate - er	ıter (24a) or (24k	o) or (24	c) or (24	d) in box	(25)	<u> </u>			ı	
(25)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55]	(25
2 Heat lease	0 0 0 0 0 0	ot loop r		~ W.								J	
3. Heat losse	S and ne	·	Openin		Net Ar	00	U-valı	10	AXU		k-value	n	A X k
ELEMENT	area	-	operiiri m		A,r		W/m2		(W/I	K)	kJ/m²-l		kJ/K
Doors					2	х	1.4	= [2.8				(26)
Windows Type	e 1				6.097	, x1.	/[1/(1.4)+	0.04] =	8.08				(27)
Windows Type	2				6.075	x1.	/[1/(1.4)+	0.04] =	8.05	一			(27)
Windows Type	e 3				4.579	x1.	/[1/(1.4)+	0.04] =	6.07				(27
Walls Type1	78.7	' 5	16.7	5	62	x	0.15		9.3	= [(29)
Walls Type2	14.3	37	2	_	12.37	, x	0.14	= i	1.75	₹ i		i	(29
Walls Type3	12.5	56	0		12.56	x	0.13	=	1.66	=		-	(29)
Total area of e	elements	, m²			105.6	9							(31
* for windows and	l roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	 ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	n 3.2	
** include the area				ls and par	titions							_	
Fabric heat los		•	U)				(26)(30)					37.72	(33
Heat capacity	,	,						((28)	.(30) + (32	2) + (32a).	(32e) =	1217.1	(34)
Thermal mass	•	•		,					tive Value			100	(35
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
				using Ap	pendix l	<						10.38	(36
Thermal bridg		are not kn	own (36) =	= 0.05 x (3	1)								`
•	al bridging		' '					(00)	(00)			48.1	
if details of therma			,					(33) +	(36) =			40.1	(37
if details of therma Total fabric he	at loss			y	ı	•	•		(36) = = 0.33 × ((25)m x (5))	1	(37
if details of therma Total fabric he	at loss			y May	Jun	Jul	Aug			(25)m x (5)	Dec	40.1	
Thermal bridg if details of thermal Total fabric he Ventilation hea Jan (38)m= 39.86	at loss	alculated	l monthly		Jun 38.02	Jul 38.02	Aug 37.9	(38)m	= 0.33 × (1	70.1	(38)
if details of therma Total fabric he Ventilation hea	at loss cat	Mar 39.54	l monthly Apr	May	-		-	(38)m Sep 38.27	= 0.33 × (Nov 38.94	Dec	40.1	

eat loss para	meter (H	ILP), W/	m²K					(40)m	= (39)m ÷	· (4)			
))m= 1.02	1.01	1.01	1	1	0.99	0.99	0.99	1	1	1.01	1.01		_
umber of day	s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
. Water heat	ing ener	gy requi	rement:								kWh/yea	ar:	
sumed occu			[4	/ o ooo	140 /TF	- 40.0	\0\1 · 0 /	2042 /	TEA 40		58		(4
if TFA > 13.9 if TFA £ 13.9	-	+ 1.76 X	[1 - exp	(-0.0003	549 X (11	-A -13.9)2)] + 0.(JU13 X (IFA -13.	.9)			
nual average									a taraat a		0.41		(4
duce the annua t more that 125	_				_	_	o acriieve	a water us	se largel o	ı			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage in	litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	•		!			
)m= 110.45	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		
ergy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1204.88	(4
)m= 163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62		
, []							<u> </u>			m(45) ₁₁₂ =	<u> </u>	1579.79	(4
nstantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					_
i)m= 0	0	0	0	0	0	0	0	0	0	0	0		(4
ater storage orage volum		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
community h	, ,		•			•					<u> </u>		(
herwise if no								ers) ente	er '0' in (47)			
ater storage													
If manufacti				or is kno	wn (kWh	n/day):					0		(4
mperature fa	actor fro	m Table	2b								0		(4
ergy lost from		_	-				(48) x (49)) =			0		(5
If manufacto ot water stora			-										(5
community h	_			C Z (KVV	ii/iiti e/ua	iy <i>)</i>					0		(5
lume factor	_		011 1.0								0		(5
mperature fa	actor fro	m Table	2b							-	0		(5
ergy lost fro				ear			(47) x (51)) x (52) x (53) =		0		(!
nter (50) or (-	, 100 vi 11/y C	Jui			(11)11(21)	, (==, (/		0		(!
ater storage	, ,	•	or each	month			((56)m = (55) × (41)	m		<u> </u>		,
						ı	· · · ·	1	ı				//
m= 0 //linder contains	0 dedicated	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Appendix	Н	(!
	0	0	0	0	0	0	0	0	0	0	0		(5
)m= 0													
′ LI	loss (an	inual) fro	m Table	e 3							0		(5
mary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m			0		(5
mary circuit mary circuit mary circuit (modified by	loss cal	culated f	for each	month (•	. ,	, ,		r thermo		0		(!

Combiles s	الممامانيما	for oo ab	ma a matha	(C1)	(00) . 20	CE (44)	\						
Combi loss ca	liculated 0	for each	month	(61)m =	(60) ÷ 30	05 × (41))m 0	T 0	0	0	0	1	(61)
									<u> </u>		<u> </u>] · (59)m + (61)m	(01)
(62)m= 139.22	121.76	125.65	109.54	105.11	90.7	84.05	96.45		113.74	124.16	134.83	(59)111 + (61)111	(62)
Solar DHW input		l		<u> </u>]	(02)
(add additiona									ii contribu	ion to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter		<u>I</u>		<u> </u>		Į.			<u> </u>	1	
(64)m= 139.22	121.76	125.65	109.54	105.11	90.7	84.05	96.45	97.6	113.74	124.16	134.83]	
	Į	ļ	ļ.	Į	<u>I</u>	l	Oı	utput from w	ater heate	r (annual)	112	1342.82	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	 n]	-
(65)m= 34.81	30.44	31.41	27.39	26.28	22.68	21.01	24.11	1	28.44	31.04	33.71	1	(65)
include (57)	m in cald	culation (of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):	•								
Metabolic gair	ns (Table	5), Wat	ts	,									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.8°	128.81	128.81	128.81	128.81	1	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5		-	-	-	
(67)m= 20.97	18.63	15.15	11.47	8.57	7.24	7.82	10.16	13.64	17.32	20.22	21.55]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5	-	_	-	
(68)m= 232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	3 177.74	190.7	207.05	222.42]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5	-	-	-	
(69)m= 35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88]	(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= -103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.0	-103.05	-103.05	-103.05	-103.05]	(71)
Water heating	gains (T	able 5)										_	
(72)m= 46.78	45.3	42.22	38.04	35.32	31.49	28.24	32.41	33.89	38.22	43.11	45.31]	(72)
Total internal	gains =				(66))m + (67)m	n + (68)n	n + (69)m +	(70)m + (7	'1)m + (72))m	_	
(73)m= 362.08	360.66	348.02	327.21	305.24	284.71	271.78	275.88	286.92	307.88	332.02	350.92		(73)
6. Solar gain													
Solar gains are		-					itions to		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
-				. 1			, –				_		7,
Southeast 0.9x	0.77	X	6.		-	36.79)	0.63	×	0.7	=	68.56	[(77)
Southeast 0.9x	0.77	X	6.		-	62.67] X	0.63		0.7	=	116.78	[(77)
Southeast 0.9x	0.77	X	6.			35.75)	0.63		0.7	=	159.78](77)
Southeast 0.9x	0.77	X	6.		-	06.25]	0.63		0.7	=	197.98	[(77)
Southeast 0.9x	0.77	X	6.	1	x 1	19.01	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	(77)
Southeast 0.9x	0.77	$=$ $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$	6.1	」^] ×	113.91] ^] _x	0.63	$=$ $\frac{1}{x}$	0.7	= -	212.25	(77)
Southeast 0.9x	0.77	$=$ $\frac{1}{x}$	6.1	」 ^] x	104.39] ^ x	0.63	$=$ $\frac{1}{x}$	0.7	= -	194.51	(77)
Southeast 0.9x	0.77	$=$ $\frac{1}{x}$	6.1	」 ^] x	92.85	'] ^ x	0.63	$=$ $\frac{1}{x}$	0.7		173.01	(77)
Southeast 0.9x	0.77		6.1	」 ^] _x	69.27		l ^ l x	0.63	$=$ $\frac{1}{x}$	0.7		129.07	(77)
Southeast 0.9x	0.77	X	6.1] ^] x	44.07		l ^ l x	0.63	x x	0.7	= =	82.12	(77)
Southeast 0.9x	0.77	- x	6.1] ^] x	31.49] ^] x	0.63	T x	0.7		58.67	(77)
Southwest _{0.9x}	0.77	X	6.07]	36.79] ^]	0.63	X	0.7		68.31	(79)
Southwest _{0.9x}	0.77	X	6.07]	62.67] 	0.63	x	0.7	_	116.36	(79)
Southwest _{0.9x}	0.77	X	6.07]	85.75		! 	0.63	X	0.7	_	159.21	(79)
Southwest _{0.9x}	0.77	×	6.07]]	106.25	;	!]	0.63	×	0.7		197.27	(79)
Southwest _{0.9x}	0.77	X	6.07] x	119.01		!]	0.63	X	0.7	=	220.96	(79)
Southwest _{0.9x}	0.77	x	6.07]]	118.15		!]	0.63	x	0.7	= =	219.36	(79)
Southwest _{0.9x}	0.77	x	6.07]]	113.91		!]	0.63	x	0.7	=	211.48	(79)
Southwest _{0.9x}	0.77	X	6.07] X	104.39		! 	0.63	×	0.7	= =	193.81	(79)
Southwest _{0.9x}	0.77	x	6.07]]	92.85		! 	0.63	x	0.7	= =	172.39	(79)
Southwest _{0.9x}	0.77	X	6.07]]	69.27		! 	0.63	×	0.7	= =	128.6	(79)
Southwest _{0.9x}	0.77	X	6.07	X	44.07		! 	0.63	X	0.7	= =	81.82	(79)
Southwest _{0.9x}	0.77	X	6.07) X	31.49		! 	0.63	×	0.7		58.46	(79)
Northwest _{0.9x}	0.77	X	4.58] 	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	×	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	j×	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	x	4.58	x	9.21		x	0.63	x	0.7	=	12.89	(81)
<u></u>							•						
Solar gains in w	atts, cal	culated	for each mon	th			(83)m	n = Sum(74)m	ı(82)m			•	
` '		376.9	490.35 570.5			1.22	489	.96 415.96	296.9	5 183.81	130.03		(83)
Total gains – int			` 	<u> </u>					_			Ī	
(84)m= 514.74	625.94	724.92	817.55 875.7	8 8	860.5 82	23	765	.83 702.88	604.8	3 515.83	480.94		(84)
7. Mean intern	al tempe	erature (heating seaso	on)									
Temperature d	luring he	ating pe	eriods in the li	ving	area from	Tab	ole 9	, Th1 (°C)				21	(85)
Utilisation factor				Ť								 I	
Jan	Feb	Mar	Apr Ma	_		ul	 	ug Sep	Oct	Nov	Dec		
(86)m= 0.97	0.94	0.9	0.82 0.71		0.56 0.	43	0.4	0.68	0.87	0.95	0.97		(86)
Mean internal	temperat	ture in l	iving area T1	(follo	w steps 3	to 7	in T	able 9c)				•	
(87)m= 18.9	19.22	19.66	20.18 20.6	2	20.85 20	.95	20.	93 20.74	20.18	19.43	18.83		(87)

T		المالية ماليانات	4!	المالم المالم		ali i i a Illia ai	(T-	LL O T	LO (0O)					
	20.07	20.07	eating p	20.08	20.08	20.09	20.09	20.09	n2 (°C) 20.09	20.08	20.08	20.08		(88)
(88)m=			<u>!</u>						20.09	20.08	20.08	20.08		(00)
Utilisa			ains for i			· ·		9a)	,					
(89)m=	0.96	0.93	0.89	0.8	0.67	0.5	0.35	0.39	0.62	0.84	0.94	0.97		(89)
Mean	internal	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m=	18.14	18.45	18.89	19.39	19.77	20	20.06	20.06	19.91	19.4	18.68	18.08		(90)
					-		=	=	1	fLA = Livin	g area ÷ (4	4) =	0.34	(91)
Mean	internal	l temner	ature (fo	r the wh	ole dwe	lling) – fl	Δ ν Τ1	+ (1 – fl	A) × T2			•		
(92)m=	18.4	18.71	19.15	19.66	20.06	20.29	20.37	20.36	20.19	19.67	18.94	18.34		(92)
			he mean					ļ						
(93)m=	18.4	18.71	19.15	19.66	20.06	20.29	20.37	20.36	20.19	19.67	18.94	18.34		(93)
	ace hea	tina real	uirement											
			ternal ter		re obtain	ed at ste	ep 11 of	Table 9l	b. so tha	t Ti.m=(76)m an	d re-calc	ulate	
			or gains	•										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.95	0.92	0.87	0.79	0.67	0.51	0.38	0.42	0.63	0.83	0.92	0.96		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	488.69	575.22	631.14	643.77	583.94	442.51	310.43	320.92	440.21	500.91	477.06	460.13		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8			_					
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern		erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1240.2	1212.96	1109.05	935.21	724.95	490.01	324.52	340.27	526.22	786.62	1030.31	1234.59		(97)
Snac									L					
Space	e heating	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=	559.13	g require 428.56	ement fo 355.57	r each n 209.84	104.91	Wh/mon	th = 0.02	4 x [(97)m – (95 0)m] x (4 ⁻	1)m 398.34	576.2		
-		i i						0	<u> </u>	212.57	398.34	L	2845.11	(98)
(98)m=	559.13	428.56		209.84	104.91			0	0	212.57	398.34	L	2845.11	(98)
(98)m=	559.13 e heatin	428.56 g require	355.57 ement in	209.84 kWh/m²	104.91			0	0	212.57	398.34	L		===
(98)m= Space 8c. S	559.13 e heating	428.56 g require	355.57 ement in quiremen	209.84 kWh/m²	104.91 ² /year	0		0	0	212.57	398.34	L		===
(98)m= Space 8c. S	559.13 e heating	428.56 g require	355.57 ement in	209.84 kWh/m²	104.91 ² /year	0		0	0	212.57	398.34	L		===
(98)m= Space 8c. Si Calcu	e heating pace cool lated for Jan	428.56 g require oling rec r June, C	355.57 ement in quirement July and	kWh/m² t August. Apr	104.91 P/year See Tal May	0 ble 10b Jun	Jul	0 Tota	0 al per year	212.57 (kWh/year	398.34 r) = Sum(9	8) _{15,912} =		===
(98)m= Space 8c. Si Calcu	e heating pace cool lated for Jan loss rate	428.56 g require oling rec r June, C	ass.s7 ement in quirement July and Mar	kWh/m² t August. Apr	104.91 P/year See Tal May	0 ble 10b Jun	Jul	0 Tota	0 al per year	212.57 (kWh/year	398.34 r) = Sum(9	8) _{15,912} =		===
(98)m= Space 8c. Si Calcu Heat (100)m=	e heating coace cool lated for Jan loss rate	g require oling rec r June, c Feb e Lm (ca	ass.57 ement in quirement July and Mar llculated	kWh/m² t August. Apr using 25	104.91 2/year See Tat May 5°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug	0 al per year Sep	212.57 (kWh/year	398.34 r) = Sum(9 Nov e from T	8) _{15,912} = Dec able 10)		(99)
(98)m= Space 8c. Si Calcu Heat (100)m=	e heating pace cool lated for Jan loss rate 0 ation face	g require coling recording	ass.57 ement in quirement July and Mar llculated	kWh/m² t August. Apr using 25	104.91 2/year See Tat May 5°C inter	0 ole 10b Jun nal temp	Jul perature	0 Tota Aug	0 al per year Sep	212.57 (kWh/year	398.34 r) = Sum(9 Nov e from T	8) _{15,912} = Dec able 10)		(99)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m=	e heating coace cool lated for Jan loss rate 0 ation fac	g require r June, c Feb e Lm (ca	ass.57 ement in quirement July and Mar alculated 0 oss hm	kWh/m² t August. Apr using 29	See Tal May 5°C inter	0 Die 10b Jun rnal temp 809.53	Jul perature 637.29	O Total Aug and extended and e	0 ol per year Sep ernal ten	212.57 (kWh/year Oct nperatur 0	398.34 r) = Sum(9 Nov e from T	8) _{15,912} = Dec Table 10)		(100)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m=	be heating pace cool lated for Jan loss rate 0 ation face 0 ll loss, h	g require r June, c Feb e Lm (ca	ass.57 ement in quirement July and Mar alculated 0 pss hm 0	kWh/m² t August. Apr using 29	See Tal May 5°C inter	0 Die 10b Jun rnal temp 809.53	Jul perature 637.29	O Total Aug and extended and e	0 ol per year Sep ernal ten	212.57 (kWh/year Oct nperatur 0	398.34 r) = Sum(9 Nov e from T	8) _{15,912} = Dec Table 10)		(100)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	be heating pace cool lated for loss rate of the loss, heating the loss of the loss, heating the loss of the loss, heating the loss, heating the loss, heating the loss, heating the loss of the loss, heating the loss of the loss, heating the loss, heating the loss of the loss, heating the loss of the	g require r June, c Feb e Lm (ca 0 ttor for lo	assistant in a specific property of the control of	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 809.53 0.84	0 Jul perature 637.29 0.89	0 Tota Aug and exte 653.61 0.87	Sep ernal ten 0	212.57 (kWh/year Oct nperatur 0	398.34 r) = Sum(9 Nov e from T 0	8) _{15,912} = Dec Table 10) 0		(100)
Space 8c. Si Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	be heating pace cool lated for Jan loss rate 0 ation face 0 ll loss, h 0 s (solar cools)	g require r June, c Feb e Lm (ca 0 ttor for lo	ass.57 ement in quirement July and Mar alculated 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 nal temp 809.53 0.84 681.93 eather re	0 Jul perature 637.29 0.89	0 Tota Aug and exte 653.61 0.87 569.21	Sep ernal ten 0	212.57 (kWh/year Oct nperatur 0	398.34 r) = Sum(9 Nov e from T 0	8) _{15,912} = Dec Table 10) 0		(100)
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Space Space Space Space Space Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	be heating pace cooling of the cooli	g require r June, c Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require	asss.s7 ement in quirement Mar July and Mar Ilculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement for	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month,	See Take May 5°C inter 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 ole 10b Jun nal temp 809.53 0.84 681.93 eather re	Jul perature 637.29 0.89 567.93 egion, se 1056.45	0 Tota Aug and exte 653.61 0.87 569.21 ee Table 991.26	0 0 0	212.57 (kWh/year Oct nperatur 0 0 24 x [(10)	398.34 Nover from T 0 0 0 0 0 0 0 0 0 0 0 0 0	8) _{15,912} = Dec Table 10) 0 0 102)m] >	32.85 x (41)m	(100) (101) (102) (103)
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Space Space Space Space Space Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	be heating pace cooling of traction for the cooling of the cooling	g require r June, c Feb e Lm (ca 0 ttor for lo 0 mLm (W 0 gains ca 0 g require zero if (0	assistantial and a second and a	kWh/m² kWh/m² August. Apr using 2! 0 100)m x 0 for appli 0 r month, 3 x (98) 0	See Tak May 5°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun nal temp 809.53 0.84 681.93 eather re 1102.28	0 Jul perature 637.29 0.89 567.93 egion, se 1056.45 continuo	0 Tota Aug and exte 653.61 0.87 569.21 ee Table 991.26 ous (kW	0 0 0 0 0 0 0 0	212.57 (kWh/year Oct Oct O O O O O O O O O	398.34 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	8) _{15,912} = Dec Table 10) 0 0 102)m] >	32.85 (41)m 980.11 1	(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=	be heating pace cooling of the cooli	de la de la decimienta decimienta de la decimienta decimienta decimienta decimienta de la decimienta decimienta decimienta decimienta decimienta decimienta decimienta decimienta de la decimienta de la decimienta decimienta decimienta decimienta de la decimienta de la decimienta de la decimienta decimienta decimienta decimienta decimienta decimienta de la decimienta decimienta decimienta de la decimienta decimienta de la decimienta decimienta de la decimienta decimienta decimienta de la decimienta decimienta decimienta decimienta decimienta decimienta de la decimie	assistantial and a second and a	kWh/m² t August. Apr using 29 0 100)m x 0 for appli 0 r month, 3 x (98 0	See Tate May 5°C inter 0 (101)m (101	0 ole 10b Jun nal temp 809.53	0 Jul perature 637.29 0.89 567.93 egion, se 1056.45 continuo 363.45	0 Tota Aug and extended and ex	0 0 0 0 0 0 0 0	212.57 (kWh/year Oct nperatur 0	398.34 Nov e from T 0 0 0 0 1,0,4) area ÷ (4	8) _{15,912} = Dec Table 10) 0 0 102)m] x	32.85 (41)m 980.11 1	(100) (101) (102) (103)

Space cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n						
(107)m= 0	0	0	0	0	75.66	90.86	78.5	0	0	0	0		
								Total	= Sum(107)	=	245.03	(107)
Space cooling	requirer	ment in k	kWh/m²/y	/ear				(107)) ÷ (4) =			2.83	(108)
8f. Fabric Ene	rgy Effici	iency (ca	alculated	only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric Energy	y Efficier	псу						(99)	+ (108) =	=		35.68	(109)

SAP Input

Property Details: Plot 31

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 86.6 m² 2.5 m

Living area: 29.75 m² (fraction 0.344)

Front of dwelling faces: North East

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
NE	Manufacturer	Solid			
SE	Manufacturer	Windows	double-glazed	Yes	
SW	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
SE	16mm or more	0.7	0.63	1.4	6.097	1
SW	16mm or more	0.7	0.63	1.4	6.075	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
SE		External Wall	South East	0	0
SW		External Wall	South West	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:	Карра:
External Elemen	<u>nts</u>						
External Wall	78.751	16.75	62	0.15	0	False	N/A
Corridor Wall	14.374	2	12.37	0.15	0.4	False	N/A
Stairwell Wall	12.562	0	12.56	0.15	0.9	False	N/A

Internal Elements
Party Elements

Thermal bridges:

SAP Input

Thermal bridges:		User-define	d (individual PSI	-values)	Y-Value = 0.0982
-		Length	Psi-value		
		8.395	0.294	E2	Other lintels (including other steel lintels)
		31.2	0.049	E4	Jamb
		77.569	0.067	E7	Party floor between dwellings (in blocks of flats)
	[Approved]	5.45	0.09	E16	Corner (normal)
		2.725	-0.072	E17	Corner (inverted internal area greater than external area)
		5.45	0.055	E18	Party wall between dwellings
		5.45	0.109	E25	Staggered party wall between dwellings
		20.289	0	P3	Intermediate floor between dwellings (in blocks of flats)

Ventilation.

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 2

Ductwork: Insulation, rigid

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

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

Installed Peak power: 1.06 Tilt of collector: 30°

Overshading: None or very little

SAP Input

Collector Orientation: South West

Assess Zero Carbon Home:

Nο

		User_[Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 31					
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			a(m²)	14-2	Av. He	• • •	_	Volume(m ³	<u>-</u>
			86.6	(1a) x		2.5	(2a) =	216.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	86.6	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	216.5	(5)
2. Ventilation rate:									
	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	Ħ + F	0		0	<u> </u>	(20 =	0	(6b)
Number of intermittent fa	ins			_	3	×	c 10 =	30	(7a)
Number of passive vents				L	0		(10 =	0	(7b)
Number of flueless gas fi				L			(40 =		╡``
Number of flueless gas in	1165				0		(40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.14	(8)
	peen carried out or is intended, proce			continue fi		(16)		3	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9	9)-1]x0.1 =	0	(10)
	.25 for steel or timber frame or resent, use the value corresponding			•	ruction			0	(11)
deducting areas of openi		io ine grea	iter wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
•	s and doors draught stripped		0.05 10.0		1001			0	(14)
Window infiltration			0.25 - [0.2			. (4E)		0	(15)
Infiltration rate	q50, expressed in cubic metr	oo nor h	(8) + (10)				o oroo	0	(16)
•	lity value, then $(18) = [(17) \div 20]$ +	•	•	•	ielie oi e	rivelop	e area	0.39	(17)
•	es if a pressurisation test has been de				is being u	sed		0.39	(10)
Number of sides sheltered	ed							1	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.92	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	s) x (20) =				0.36	(21)
Infiltration rate modified f						1	_	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		_	•	•	•	1		1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
		-				-	-1	1	

0.46	ation rat	0.44	0.4	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
Calculate effe	ctive air	change i			1								
If mechanic												0	(23
If exhaust air h		0		, ,	,	. `	,, .	•) = (23a)			0	(23
If balanced with		-	-	_								0	(23
a) If balance						<u> </u>	- ^ `-	``	 		<u>`</u>	÷ 100]	(0.4
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	1					_ ``	<u> </u>	<u> </u>	<u> </u>			İ	(0.4
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	nouse ex n < 0.5 ×			-	-				5 v (23h	.\			
(24c)m = 0	0.5 7	0	0	0	0	0	0	0	0	0	0		(24
d) If natural													(
	n = 1, the								0.5]				
(24d)m= 0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)			•	•	
(25)m= 0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(25
2 Hoot loose	o and he	ot logo r	paramata	or:									
3. Heat losse	S and ne	·	Openin		Net Ar	00	U-valı	10	AXU		k-value	. /	λΧk
ELEMENT	area	_	m		A,r		W/m2		(W/I	<)	kJ/m²·ł		J/K
Doors					2	х	1	=	2				(26
Windows Type	e 1				6.097	x1.	/[1/(1.4)+	0.04] =	8.08				(27
Windows Type	e 2				6.075	x1.	/[1/(1.4)+	0.04] =	8.05				(27
Windows Type	e 3				4.579	x1.	/[1/(1.4)+	0.04] =	6.07				(27
Walls Type1	78.7	5	16.75	5	62	x	0.18		11.16	7			(29
Walls Type2	14.3	7	2		12.37	· x	0.18	=	2.23	=			(29
Walls Type3	12.5		0	_	12.56	=	0.18	=	2.26	-			(29
Total area of e	L				105.6	=	0.10		2.20				(31
* for windows and			ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	e)+0.041 a	s aiven in	paragraph	3.2	(01
** include the area						· ·			,	J	, , ,		
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				39.86	(33
Heat canacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	1217.1	(34
ical capacity	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35
		411-								TMD in T	ahla 1f		
Thermal mass				construct	ion are not	known pr	ecisely the	indicative	values of	IIVIP III 18	able II		
Thermal mass For design assess can be used inste	ead of a de	tailed calcu	ulation.				ecisely the	indicative	values of	IIVIP III T	able II	0.04	
Thermal mass For design assess can be used inste Thermal bridg	ead of a de es : S (L	tailed calcu x Y) calc	ulation. culated u	using Ap	pendix ł		ecisely the	indicative	values or	TIMP III T	able II	8.31	(36
Thermal mass For design assess can be used inste Thermal bridg	ead of a de es : S (L al bridging	tailed calcu x Y) calc	ulation. culated u	using Ap	pendix ł		ecisely the		(36) =	TIMP III T	able II		
Thermal mass For design assess can be used inste Thermal bridg if details of therma Total fabric he	ead of a dea es:S(L al bridging eat loss	tailed calcu x Y) calcu are not kn	ulation. culated (own (36) =	using Ap = 0.05 x (3	pendix ł		ecisely the	(33) +				8.31 48.17	
Thermal mass For design assess can be used inste Thermal bridg if details of therma Total fabric he	ead of a dea es:S(L al bridging eat loss	tailed calcu x Y) calcu are not kn	ulation. culated (own (36) =	using Ap = 0.05 x (3	pendix ł		Aug	(33) +	(36) =				
Thermal mass For design assess can be used inste Thermal bridg if details of therma Total fabric he Ventilation hea	ead of a de es:S(L al bridging eat loss at loss ca	tailed calcu x Y) calcu are not kn	ulation. culated to	using Ap = 0.05 x (3	ppendix ł	((33) + (38)m	(36) = = 0.33 × (25)m x (5)			(37
Thermal mass For design assess can be used inste Thermal bridg if details of therma Total fabric he Ventilation hea Jan (38)m= 43.22	es : S (L al bridging eat loss at loss ca Feb	x Y) calconnected x Y) calconn	ulation. culated to own (36) = I monthly	using Ap = 0.05 x (3 / May	ppendix k 1) Jun	Jul	Aug	(33) + (38)m Sep 40.34	(36) = = 0.33 × (Oct 41.06	25)m x (5) Nov 41.56	Dec		(36)
Thermal mass For design assess can be used inste Thermal bridg if details of therma Total fabric he Ventilation hea	es : S (L al bridging eat loss at loss ca Feb	x Y) calconnected x Y) calconn	ulation. culated to own (36) = I monthly	using Ap = 0.05 x (3 / May	ppendix k 1) Jun	Jul	Aug	(33) + (38)m Sep 40.34	(36) = = 0.33 × (25)m x (5) Nov 41.56	Dec		(37

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.04	1.04		
				!					Average =	Sum(40) ₁	12 /12=	1.03	(40)
Number of day	<u> </u>	1 `										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. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		58		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the c	lwelling is	designed i	` ,		se target o		5.39		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								1 - 22		1			
(44)m= 104.92	101.11	97.29	93.48	89.66	85.85	85.85	89.66	93.48	97.29	101.11	104.92		
, ,				l .		l .	<u> </u>		Total = Su	ım(44) ₁₁₂ =	<u> </u>	1144.64	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600	0 kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 155.6	136.09	140.43	122.43	117.48	101.37	93.94	107.79	109.08	127.12	138.77	150.69		
									Total = Su	im(45) ₁₁₂ =	=	1500.8	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)				ı	
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage Storage volum) includir	na anv si	olar or M	WHRS	etorana	within es	ama vas	امء		450		(47)
If community h	•					_		anio voo	001		150		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water storage			•					,	·	,			
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	om wate	r storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If manufact			-									' 	
Hot water stor If community h	•			le 2 (KVV	n/litre/da	ay)					0		(51)
Volume factor	_		JII 4.3								0		(52)
Temperature f			2b								0		(52)
Energy lost fro				ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		_	,					, , , ,	,	-	0		(55)
Water storage	loss cal	culated f	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 contain			_	_		-	-	_			_	ix H	()
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
	ļ	<u>ļ</u>								<u> </u>	<u> </u>		
Primary circuit	•	•			E0\	(EQ) + QC	SE /44\				0		(58)
Primary circuit (modified by					•	. ,	, ,		r thermo	nstat)			
(59)m= 0	0	0	0	0	0	0		0	0	0	0		(59)
(33)111-			U								U U		(00)

Cambi lasa sa	المعاديما	for ooah		(C4)	(00) . 0	CE (44)	١							
Combi loss ca	o loculated	or each	montn (61)m =	(60) ÷ 3	05 × (41))m o	T 0	0	0	0	1	(61)	
(*)		<u> </u>					<u> </u>	_!	<u> </u>	ļ.		(F0)m + (61)m	(01)	
(62)m= 132.26	·	119.37	104.07	99.85	86.17	79.85	91.63	92.72	108.06	117.95	128.09	(59)m + (61)m	(62)	
Solar DHW input										<u> </u>		l	(02)	
(add additiona									ii contribu	ion to wate	or ricating)			
(63)m= 0	0	0	0	0	0	0	0		0	0	0]	(63)	
Output from w	vater hea	ter					Į	_ !				ı		
(64)m= 132.26	1	119.37	104.07	99.85	86.17	79.85	91.63	92.72	108.06	117.95	128.09			
	1	<u> </u>				l	Ou	tput from w	ater heate	r (annual)₁	12	1275.68	(64)	
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	 .]	-	
(65)m= 33.07	28.92	29.84	26.02	24.96	21.54	19.96	22.91	23.18	27.01	29.49	32.02	ĺ	(65)	
include (57))m in cald	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	g 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 Foh Mar Apr May Jun July Aug Son Oct Nov Doc														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]		
(66)m= 128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81	128.81		(66)	
Lighting gains	(calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5	•	•	•	•		
(67)m= 20.97	18.63	15.15	11.47	8.57	7.24	7.82	10.16	13.64	17.32	20.22	21.55	1	(67)	
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5	•	•	•		
(68)m= 232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	177.74	190.7	207.05	222.42]	(68)	
Cooking gains	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also s	see Table	5	•	•	•		
(69)m= 35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88		(69)	
Pumps and fa	ıns gains	(Table 5	ia)			•								
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)	
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-	-				
(71)m= -103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05		(71)	
Water heating	g gains (T	able 5)				-	-	-	-	-	-			
(72)m= 44.44	43.03	40.11	36.13	33.55	29.92	26.83	30.79	32.19	36.31	40.96	43.04		(72)	
Total interna	l gains =	:		-	(66)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m			
(73)m= 359.74	358.4	345.91	325.3	303.48	283.14	270.37	274.26	285.22	305.97	329.86	348.65		(73)	
6. Solar gain	s:													
Solar gains are		•	r flux from	Table 6a		•	itions to d	convert to th	ne applical		tion.			
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF		Gains		
•	Table 60				Га	Die ba	, –	Table 6b	_ '	able 6c		(W)	,	
Southeast 0.9x	0.77	X	6.	1	x ;	36.79	×	0.63	X	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 8	35.75	×	0.63	X	0.7	=	159.78	(77)	
Southeast 0.9x	0.77	X	6.	1	x 1	06.25	×	0.63	x	0.7	=	197.98	(77)	
Southeast 0.9x	0.77	X	6.	1	x 1	19.01	X	0.63	X	0.7	=	221.76	(77)	

Southeast 0.9x	0.77				۱.,		0.45	1		0.00	ا ا		_	г		7(77)
Southeast 0.9x	0.77	x	6.		X I	_	8.15] X]		0.63		0.7	_	F	220.15	(77)
Southeast 0.9x	0.77	X	6.		X		3.91] X]		0.63	X	0.7	╡ ╸	늗	212.25	(77)
<u>L</u>	0.77	×	6.		X I)4.39] X]		0.63	_ x	0.7	_ =	늗	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	X		2.85] X]		0.63	_ × ¦	0.7	_ -	<u> </u>	173.01	(77)
Southeast 0.9x	0.77	X	6.		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	X	0.7	-	<u>ٰ</u> ٰ	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	Х	3	1.49	X		0.63	×	0.7	-	·	58.67	(77)
Southwest _{0.9x}	0.77	X	6.0)7	X	3	6.79]		0.63	X	0.7	-	·	68.31	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	6	2.67	_		0.63	X	0.7	=	Ļ	116.36	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	8	5.75]		0.63	X	0.7	=	Ļ	159.21	(79)
Southwest _{0.9x}	0.77	X	6.0)7	х	10	06.25]		0.63	X	0.7	=	· <u>L</u>	197.27	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	11	9.01	<u> </u>		0.63	X	0.7	=	· <u>L</u>	220.96	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	11	8.15			0.63	x	0.7	=	· [219.36	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	11	3.91			0.63	X	0.7		: [211.48	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	10)4.39]		0.63	х	0.7	=		193.81	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	9	2.85]		0.63	x	0.7			172.39	(79)
Southwest _{0.9x}	0.77	Х	6.0)7	x	6	9.27]		0.63	x	0.7	=		128.6	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	4	4.07			0.63	х	0.7			81.82	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	3	1.49]		0.63	x	0.7		: [58.46	(79)
Northwest _{0.9x}	0.77	х	4.5	58	x	1	1.28	x		0.63	x	0.7		· Ē	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		· F	57.91	(81)
Northwest _{0.9x}	0.77	х	4.5	58	х	6	7.96	х		0.63	x	0.7	<u> </u>	·Ē	95.1	(81)
Northwest _{0.9x}	0.77	x	4.5	58	х	9	1.35	х		0.63	x	0.7	<u> </u>	Ē	127.83	(81)
Northwest _{0.9x}	0.77	x	4.5	58	х	9	7.38	х		0.63	x	0.7	<u> </u>	Ē	136.28	(81)
Northwest _{0.9x}	0.77	x	4.5	58	х	9)1.1	х		0.63	x	0.7		· Ē	127.49	(81)
Northwest _{0.9x}	0.77	x	4.5	58	х	7	2.63	x		0.63	x	0.7	<u> </u>	Ē	101.63	(81)
Northwest _{0.9x}	0.77	x	4.5	58	x	5	0.42	x		0.63	×	0.7	╡ -		70.56	(81)
Northwest _{0.9x}	0.77	x	4.5	58	x	2	8.07	x		0.63	×	0.7			39.28	(81)
Northwest 0.9x	0.77	x	4.5	58	x		4.2	x		0.63	T x	0.7	╡ -		19.87	(81)
Northwest 0.9x	0.77	X	4.5	58	x).21	X		0.63	= x	0.7	〓.		12.89	(81)
L					l			J			_ '			_		_ _` `
Solar gains in	watts, ca	alculated	I for eac	h mont	th			(83)m	n = Sı	um(74)m .	(82)m					
(83)m= 152.66	265.28	376.9	490.35	570.54	$\overline{}$	75.79	551.22	489	.96	415.96	296.95	183.81	130.03	3		(83)
Total gains – i	nternal a	nd solai	(84)m =	= (73)n	า + (83)m	watts		•							
(84)m= 512.4	623.68	722.81	815.65	874.02	2 8	58.93	821.59	764	.21	701.18	602.92	513.67	478.68	3		(84)
7. Mean inter	nal temp	erature	(heating	seaso	n)											
Temperature	during h	eating p	eriods i	n the liv	ving	area f	rom Tal	ole 9	, Th	1 (°C)					21	(85)
Utilisation fac	ctor for g	ains for	living are	ea, h1,	m (s	ee Ta	ble 9a)									_
Jan	Feb	Mar	Apr	May	у	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	<u>:</u>]		
(86)m= 1	0.99	0.98	0.94	0.82		0.63	0.47	0.5	52	0.78	0.97	1	1			(86)
Mean interna	ıl temper	ature in	living ar	ea T1 ((follo	w ste	os 3 to 7	7 in T	able	9c)				_		
(87)m= 19.88	20.07	20.33	20.65	20.88		20.98	21	20.		20.93	20.62	20.19	19.85	\neg		(87)
	-	•	•					-				•	-	_		

Compare lature during heating periods in rest of dwelling from Table 9, ThZ (°C) Compare 1	remp	oroturo	during b	ootina n	ariada ir	root of	dwalling	from To	hla O T	h2 (°C)					
Utilisation factor for gains for rest of dwelling, h2/m (see Table 9a) (89)m= 1 0.09 0.88 0.92 0.77 0.65 0.37 0.42 0.71 0.95 0.09 1 (99) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.01 19.2 19.48 19.78 19.98 20.02 20.07 20.07 20.03 19.76 19.33 18.99 (90) Mean internal temperature (for the whole dwelling) = LLX x T1 + (1 - LLX) x T2 (92)m= 19.31 19.5 19.78 20.08 20.28 20.28 20.39 20.38 20.38 20.34 20.05 19.62 19.29 (92) Apply adjustment to the mean internal temperature form Table 4c, where appropriate (93)me 19.31 19.5 19.78 20.08 20.28 20.28 20.39 20.39 20.38 20.34 20.05 19.62 19.29 (92) Apply adjustment to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm. SelT 1to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm. 4.1	(88)m-								· ·	- ` ´	20.06	20.05	20.05		(88)
Man internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)ms 1 (90)ms 1 (19.01 19.2 19.46 19.78 19.98 20.05 20.07 20.07 20.03 19.76 19.33 18.99 (90)ms 10.01 19.2 19.46 19.78 19.98 20.06 20.07 20.07 20.03 19.76 19.33 18.99 (90)ms 10.01 19.2 19.46 19.78 19.98 20.06 20.07 20.07 20.03 19.76 19.33 18.99 (90)ms 10.01 19.2 19.46 19.78 20.08 20.29 20.38 20.39 20.38 20.05 19.62 19.29 (92)ms 19.31 19.5 19.76 20.08 20.29 20.38 20.39 20.39 20.34 20.05 19.62 19.29 (92)ms 19.31 19.5 19.76 20.08 20.29 20.38 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 19.31 19.5 19.76 20.08 20.29 20.38 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 19.31 19.5 19.76 20.08 20.29 20.38 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 19.31 19.5 19.76 20.08 20.29 20.38 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 20.39 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 20.39 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 20.39 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 20.39 20.39 20.39 20.34 20.05 19.62 19.29 (93)ms 20.39										20.07	20.00	20.03	20.03		(00)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)							· `							1	(00)
Soline 19.01 19.2 19.46 19.76 19.88 20.06 20.07 20.07 20.03 19.76 19.33 18.99 (0)	(89)m=	1	0.99	0.98	0.92	0.77	0.55	0.37	0.42	0.71	0.95	0.99	1		(89)
Mean intermal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (2/2)me 19.31 19.5 19.76 20.08 20.29 20.38 20.38 20.39 20.34 20.05 19.02 19.29 (92) (93	Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
Mean intermal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m 19:31 19:5 19:76 20:08 20:29 20:38 20:39 20:38 20:34 20:05 19:82 19:29 (92) Apply adjustment to the mean intermal temperature from Table 4e, where appropriate (33)me 19:31 19:5 19:76 20:08 20:29 20:38 20:39 20:38 20:34 20:05 19:82 19:29 (83) (83)me 19:31 19:5 19:76 20:08 20:29 20:38 20:39 20:38 20:34 20:05 19:82 19:29 (83) (83)me 19:31 19:5 19:76 20:08 20:29 20:38 20:39 20:38 20:34 20:05 19:82 19:29 (83) (8	(90)m=	19.01	19.2	19.46	19.78	19.98	20.06	20.07	20.07	20.03	19.76	19.33	18.99		(90)
19.31 19.5 19.76 20.08 20.29 20.38 20.39 20.39 20.34 20.05 19.62 19.29 (92)										f	LA = Livin	g area ÷ (4	4) =	0.34	(91)
19.31 19.5 19.76 20.08 20.29 20.38 20.39 20.39 20.34 20.05 19.62 19.29 (92)	Mean	interna	l temner	ature (fo	r the wh	ole dwe	ling) – fl	Δ ~ T1	⊥ (1 _ fl	Δ) v T2			'		
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m											20.05	19.62	19.29		(92)
19.31 19.5 19.76 20.08 20.29 20.38 20.38 20.38 20.38 20.34 20.05 19.62 19.29 (83)												10.02	10.20		. ,
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)me 1 0.99 0.97 0.92 0.79 0.58 0.4 0.46 0.73 0.95 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)me 510.8 618.09 703.86 748.52 686.42 496.85 332.15 347.74 512.54 572.25 509.79 477.63 (95) Monthly average external temperature from Table 8 (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 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)me 1371.93 1329.83 1204.27 1000.06 766.22 508.51 333.48 350.22 552.19 843.34 1123.81 1361.91 (97) Space heating requirement for each month, kWh/month = 0.024 x ([97)m - (95)m) x (41)m Total per year (kWh/year) = Sum((38). 10.10 16.5 1.00 16.0									T		<u> </u>	19.62	19.29		(93)
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= 1 0.99 0.97 0.92 0.79 0.58 0.4 0.46 0.73 0.95 0.99 1. (94) Useful gains, hmGm; W = (94)m x (84)m Useful gains, hmGm; W = (94)m x (84)m Useful gains, hmGm; W = (94)m x (84)m Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W = (109)m x (193)m = (93)m x (193)m x (193)m = (93)m x (193)m x (193)m = (93)m x (193)m x (193)m = (193)m x (193)m						20.20	20.00	20.00	20.00	20.01	20.00	10.02	10.20		()
The bilisation factor for gains using Table 9a						re obtain	ed at sta	an 11 of	Tahla 0l	h so tha	t Ti m-(76)m an	d re-calc	rulata	
Utilisation factor for gains, hm: (94)m					•		eu ai sii	эр гтог	i able 9i	0, 50 tria	it 11,111=(rojili ali	u re-caic	Julate	
Utilisation factor for gains, hm: (94)m							Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Gelma	Utilisa	ation fac			•	- 7								I	
Signar S						0.79	0.58	0.4	0.46	0.73	0.95	0.99	1		(94)
Signar S	Usefu	ıl gains,	hmGm	. W = (94	1)m x (84	4)m			<u>I</u>	ı	l	l		I	
Ge me				· `	<u> </u>		496.85	332.15	347.74	512.54	572.25	509.79	477.63		(95)
Ge me			age exte	rnal tem	perature	from Ta	able 8		<u> </u>	<u> </u>	<u> </u>	<u> </u>		I	
(97)me 1371.93 1329.83 1204.27 1000.06 766.22 508.51 333.48 350.22 552.19 843.34 1123.81 1361.91 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 640.68 478.29 372.29 181.1 59.37 0 0 0 0 201.69 442.1 657.9 Total per year (kWh/year) = Sum(98)43.12 3033.43 (98) Space heating requirement in kWh/m²/year 35.03 (99) 8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m 0 0 0 0 0 827.69 651.59 667.55 0 0 0 0 0 0 Utilisation factor for loss hm (101)m 0 0 0 0 0 0 0 777.84 633.68 641.28 0 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m 0 0 0 0 0 0 1100.7 1055.03 989.84 0 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 0 0 Cooled fraction Total = Sum(104) = 805.14 (104) 105 106) Intermittency factor (Table 10b) (106)m 0 0 0 0 0 0 0 0 0				1	•			16.6	16.4	14.1	10.6	7.1	4.2		(96)
(97)me 1371.93 1329.83 1204.27 1000.06 766.22 508.51 333.48 350.22 552.19 843.34 1123.81 1361.91 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 640.68 478.29 372.29 181.1 59.37 0 0 0 0 201.69 442.1 657.9 Total per year (kWh/year) = Sum(98)43.12 3033.43 (98) Space heating requirement in kWh/m²/year 35.03 (99) 8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m 0 0 0 0 0 827.69 651.59 667.55 0 0 0 0 0 0 Utilisation factor for loss hm (101)m 0 0 0 0 0 0 0 777.84 633.68 641.28 0 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m 0 0 0 0 0 0 1100.7 1055.03 989.84 0 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 0 0 Cooled fraction Total = Sum(104) = 805.14 (104) 105 106) Intermittency factor (Table 10b) (106)m 0 0 0 0 0 0 0 0 0	. ,	Loss rate	for mea	an intern	al tempe	erature.	 _m . W =	-[(39)m :	r [(93)w	i – (96)m	<u> </u>			I	
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m=					·				-``	<u> </u>		1123.81	1361.91		(97)
Space heating requirement in kWh/m²/year Space heating requirement Space heating requirem		L e heatin	a reauire	ement fo	r each m	nonth. k\	Vh/mont	h = 0.02	1 24 x [(97)m – (95)ml x (4	1)m		I	
Space heating requirement in kWh/m²/year Sum(98)au 303.43 (98)	-											·	657.9		
Space heating requirement in kWh/m²/year 35.03 (99)	, ,								I Tota	l per vear	(kWh/vear) = Sum(9	8)1 50 12 =	3033.43	(98)
Sc. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Chan	- h			L-\ A / lb / rag 3	2/1.00					(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,(-	- / 10,012		= ```
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Space	e neaun	g require	ement in	KVVII/III²	/year								35.03	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	8c. S														(99)
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 0 0 0 827.69 651.59 667.55 0 0 0 0 0 0 (100) Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0 0.94 0.97 0.96 0 0 0 0 0 0 (101) Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 777.84 633.68 641.28 0 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 1100.7 1055.03 989.64 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 Total = Sum(104) = 805.14 (104) Cooled fraction		pace co	oling rec	uiremen	it										(99)
Cooled fraction Cooled fra	Calcu		r June, c	July and	August.		ole 10b								(99)
Utilisation factor for loss hm (101)m= 0 0 0 0 0 0 0.94 0.97 0.96 0 0 0 0 0 0 Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 0 777.84 633.68 641.28 0 0 0 0 0 Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 1100.7 1055.03 989.64 0 0 0 0 0 Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 Total = Sum(1,04) = 805.14 (104) Cooled fraction		lated fo Jan	r June, c Feb	July and Mar	August. Apr	May	Jun								(əə)
(101)m= 0 0 0 0 0 0 0.94 0.97 0.96 0 0 0 0 0 (101) Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 0 0 777.84 633.68 641.28 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 1100.7 1055.03 989.64 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m= 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 Total = Sum(1,04) = 805.14 (104) Cooled fraction	Heat	lated fo Jan loss rate	r June, c Feb	July and Mar Iculated	August. Apr using 25	May 5°C inter	Jun nal temp	perature	and ext	ernal ten	nperatur	e from T	able 10)		
Useful loss, hmLm (Watts) = (100) m x (101) m (102)m= 0 0 0 0 0 777.84 633.68 641.28 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 1100.7 1055.03 989.64 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103) m - (102) m] x (41) m set (104) m to zero if (104) m < 3 x (98) m (104)m= 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 Total = Sum(10.4) = 805.14 (104) Cooled fraction f C = cooled area ÷ (4) = 1 (105) Intermittency factor (Table 10b) (106) m= 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 0 (106)	Heat (100)m=	Jan Jan loss rate	r June, c Feb e Lm (ca	July and Mar Iculated	August. Apr using 25	May 5°C inter	Jun nal temp	perature	and ext	ernal ten	nperatur	e from T	able 10)		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heat (100)m=	Jan Jan loss rate 0 ation fac	r June, c Feb e Lm (ca	July and Mar Iculated	August. Apr using 25	May 5°C inter	Jun nal temp 827.69	651.59	and ext	ernal ten	nperatur	e from T	able 10) 0		(100)
Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 0 0 1100.7 1055.03 989.64 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 \times [(103) m – (102) m] \times (41) m set (104) m to zero if (104) m < 3 \times (98) m (104)m= 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 Total = Sum(104) = 805.14 (104) Cooled fraction	Heat (100)m= Utilisa (101)m=	Jan Jan loss rate 0 ation fac	r June, C Feb E Lm (ca 0 tor for lo	July and Mar Iculated 0 sss hm 0	August. Apr using 25	May 5°C inter 0	Jun nal temp 827.69 0.94	651.59	and ext	ernal ten	nperatur 0	e from T	able 10) 0		(100)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heat (100)m= Utilisa (101)m= Usefu	Jan loss rate 0 ation fac	r June, C Feb E Lm (ca 0 tor for lo	July and Mar Iculated 0 sss hm 0	August. Apr using 25	May 5°C inter 0	Jun nal temp 827.69 0.94	651.59	and ext	ernal ten	nperatur 0	e from T	able 10) 0		(100)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 × (98)m (104)m = 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 Total = Sum(104) = 805.14 (104) Cooled fraction f C = cooled area \div (4) = 1 (105) Intermittency factor (Table 10b) (106)m = 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 0 Total = Sum(104) = 0 (106)	Heat (100)m= Utilisa (101)m= Usefu	Jan loss rate 0 ation fac	r June, c Feb Lm (ca 0 tor for lc 0 mLm (W	July and Mar Iculated 0 pss hm 0 Vatts) = (August. Apr using 25 0 0 100)m x	May 5°C inter 0 0 (101)m	Jun nal temp 827.69 0.94	0.97	and extended and e	ernal ten	o 0	e from T 0	able 10) 0		(100)
set (104)m to zero if (104)m < $3 \times (98)$ m (104)m= 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 Total = Sum(104) = 805.14 (104) Cooled fraction	Heat (100)m= Utilisa (101)m= Usefu (102)m=	Jan Jan Joss rate 0 ation fac 0 I loss, h	r June, c Feb E Lm (ca 0 tor for lo mLm (W	July and Mar Iculated 0 oss hm 0 Vatts) = (August. Apr using 25 0 0 100)m x	May 5°C inter 0 0 (101)m 0	Jun nal temp 827.69 0.94 777.84	0.97 633.68	and extended and e	ernal ten 0 0	o 0	e from T 0	able 10) 0		(100)
(104)m= 0 0 0 0 0 232.46 313.49 259.18 0 0 0 0 0 Total = Sum(104) = 805.14 (104) Cooled fraction	Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	lated fo Jan loss rate 0 ation fac 0 Il loss, h 0 (solar q	r June, c Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains ca	July and Mar Iculated 0 pss hm 0 Vatts) = (0	August. Apr using 25 0 100)m x 0 for appli	May 5°C inter 0 0 (101)m 0 cable we	Jun nal temp 827.69 0.94 777.84 eather re	0.97 0.97 633.68 egion, se	and extended and e	0 0 10)	o 0	e from T 0 0	able 10) 0 0		(100) (101) (102)
Total = Sum(1.04) = 805.14 (104) Cooled fraction	Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	lated fo Jan loss rate 0 ation fact I loss, h 0 s (solar of the cooling of	r June, c Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0	July and Mar Iculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo	August. Apr using 25 0 100)m x 0 for appli 0 r month,	May 5°C inter 0 (101)m 0 cable we 0 whole co	Jun nal temp 827.69 0.94 777.84 eather re 1100.7	0.97 633.68 egion, se	and extended and e	0 0 10) 0	o 0 0	e from T 0 0 0	able 10) 0 0 0		(100) (101) (102)
Cooled fraction $f C = cooled area \div (4) = 1$ (105) Intermittency factor (Table 10b) (106)m= 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 0 $Total = Sum(1.0.4) = 0$ (106)	Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	lated fo Jan loss rate 0 ation face 0 Il loss, h 0 s (solar g 0 e cooling 04)m to	r June, c Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 grequire zero if (July and Mar Iculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo 104)m <	August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we 0 whole come	Jun nal temp 827.69 0.94 777.84 eather re 1100.7	0.97 0.97 633.68 egion, se 1055.03	and extended and e	0 0 10) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 24 x [(10	e from T 0 0 0 0 0 03)m – (able 10) 0 0 0 102)m]		(100) (101) (102)
Intermittency factor (Table 10b) (106)m= 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 Total = Sum(104) = 0 (106)	Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	lated fo Jan loss rate 0 ation face 0 Il loss, h 0 s (solar g 0 e cooling 04)m to	r June, c Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 grequire zero if (July and Mar Iculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo 104)m <	August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we 0 whole come	Jun nal temp 827.69 0.94 777.84 eather re 1100.7	0.97 0.97 633.68 egion, se 1055.03	and extended and e	0 0 10) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 24 x [(10	e from T 0 0 0 0 0 03)m - (0 0 0 102)m] x	x (41)m	(100) (101) (102) (103)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	lated fo Jan loss rate 0 ation fac 0 Il loss, h 0 s (solar g 0 e cooling 04)m to	r June, C Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (July and Mar Iculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo 104)m <	August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we 0 whole come	Jun nal temp 827.69 0.94 777.84 eather re 1100.7	0.97 0.97 633.68 egion, se 1055.03	and extended and e	0 0 10) 0 /h) = 0.0	0 0 0 24 x [(100 0 = Sum(e from T 0 0 0 0 0 03)m - (0 104)	0 0 0 102)m] x	x (41)m 805.14	(100) (101) (102) (103)
Total = Sum(1Q4) = 0 (106)	Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	lated fo Jan loss rate 0 ation fact outliness, he cooling 04)m to d fraction	r June, c Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (July and Mar Iculated 0 oss hm 0 Vatts) = (0 Iculated 0 ement fo 104)m <	August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we 0 whole come	Jun nal temp 827.69 0.94 777.84 eather re 1100.7	0.97 0.97 633.68 egion, se 1055.03	and extended and e	0 0 10) 0 /h) = 0.0	0 0 0 24 x [(100 0 = Sum(e from T 0 0 0 0 0 03)m - (0 104)	0 0 0 102)m] x	x (41)m 805.14	(100) (101) (102) (103)
	Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi	lated fo Jan loss rate 0 ation fac 0 Il loss, h 0 s (solar o e cooling 04)m to d fraction	r June, C Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (July and Mar Iculated 0 pss hm 0 Vatts) = (0 Iculated 0 ement for 104)m < 0	August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we whole comes	Jun nal temp 827.69 0.94 777.84 eather re 1100.7 lwelling, 232.46	0.97 0.97 633.68 egion, se 1055.03 continuo	and extended and e	0 0 10) 0 Total f C =	0 0 0 24 x [(10 0 = Sum(e from T 0 0 0 0 0 0 0 104) area ÷ (4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	x (41)m 805.14	(100) (101) (102) (103)
	Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi	lated fo Jan loss rate 0 ation fac 0 Il loss, h 0 s (solar o e cooling 04)m to d fraction	r June, C Feb Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (July and Mar Iculated 0 pss hm 0 Vatts) = (0 Iculated 0 ement for 104)m < 0	August. Apr using 25 0 100)m x 0 for appli 0 r month, 3 x (98	May 5°C inter 0 (101)m 0 cable we whole comes	Jun nal temp 827.69 0.94 777.84 eather re 1100.7 lwelling, 232.46	0.97 0.97 633.68 egion, se 1055.03 continuo	and extended and e	0 0 10) 0 Total f C =	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 1,0,4) area ÷ (4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	x (41)m 805.14	(100) (101) (102) (103) (104) (105)

Space	cooling	requirer	ment for	month =	: (104)m	× (105)	× (106)r	n					_		
(107)m=	0	0	0	0	0	58.12	78.37	64.8	0	0	0	0			
•		201.28	(107)												
Space	pace 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 Efficie	ncy						(99)	+ (108) =	=		37.35	(109)	
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								42.96	(109)	

		User I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve				001082 on: 1.0.5.9	
Address :	F	Property	Address	Plot 31					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			86.6	(1a) x	2	2.5	(2a) =	216.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	86.6	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	216.5	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	0	x ′	10 =	0	(7a)
Number of passive vents	;			Ī	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				L					
				_			Air ch	anges per ho	our —
'	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$ een carried out or is intended, proceed			ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in the		eu 10 (17),	ourerwise (onunue n	om (9) to ((10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are padeducting areas of openia	resent, use the value corresponding t	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	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)
Infiltration rate	arron annotation and in an alice and the		(8) + (10)					0	(16)
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] +$	•	•	•	etre or e	envelope	area	3	(17)
•	es if a pressurisation test has been do				is being u	sed		0.15	(10)
Number of sides sheltered	ed							1	(19)
Shelter factor			(20) = 1 -		19)] =			0.92	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.14	(21)
Infiltration rate modified f	- 1 		1 .					1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	peed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0 4.4 4.3 3.8	3.6	3.1	4	4.3	<u> </u>	4.1		
Wind Factor $(22a)m = (2a)m =$	2)m ÷ 4							•	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.18	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	I	I		l		<u></u>	_
If mechanic				(22				. (00)	\			0.5	(23
If exhaust air h		0		, ,	,	. `	,, .	•) = (23a)			0.5	(23
If balanced with		,	,	J		`		,				79.05	(23
a) If balance						- ` ` 	- ´ ` -	í `	, 	- 	1 ` ´) ÷ 100] 1	(0.4
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	1					- 	, 	ŕ	r ´ `			1	(0.
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h		tract ven ≺ (23b), t							5 v (22h	,)			
(24c)m = 0	0.5 7	0	0	0	0	0	C) = (22)	0	0	0	0	1	(24
d) If natural						<u> </u>						J	(-
,		en (24d)		•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in bo	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]	(25
2 Hoot loose	o and be	oot loog i	ooromote	or:			•					-	
3. Heat losse ELEMENT	S and ne	·	Openin		Net Ar	22	U-val	UΔ	AXU		k-value	Δ	Χk
ELEIVIENI	area		m		A,r		W/m2		(W/I	K)	kJ/m²-		/K
Doors					2	x	1.4	=	2.8				(26
Windows Type	e 1				6.097	₇ χ1	/[1/(1.4)+	0.04] =	8.08	$\overline{}$			(27
Windows Type	e 2				6.075	x1	/[1/(1.4)+	0.04] =	8.05	$\overline{}$			(27
Windows Type	э 3				4.579) x1	/[1/(1.4)+	0.04] =	6.07				(27
Walls Type1	78.7	75	16.7	5	62	x	0.15	─ - i	9.3	= [(29
Walls Type2	14.3	37	2		12.37	7 X	0.14	-	1.75	Ħ i		= =	(29
Walls Type3	12.5	56	0		12.56	3 x	0.13	=	1.66	F i			<u> </u>
Total area of e					105.6	=							` (31
* for windows and			effective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2	•
** include the are	as on both	sides of in	nternal wali	s and pan	titions								
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30) + (32) =				37.72	(33
Heat capacity		` '						((28).	(30) + (32	2) + (32a)	(32e) =	1217.1	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35
For design asses: can be used inste				construct	ion are no	t known pi	ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridg				ısina An	pendix l	<						10.38	(36
if details of therma	,	,		• .	-	•						10.30	
Total fabric he			()	,	,			(33) +	(36) =			48.1	(37
Ventilation hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (25)m x (5)		
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan				10.11	16.9	16.9	16.65	17.4	18.14	18.64	19.13]	(38
	19.88	19.63	18.39	18.14	10.0]	•
	<u> </u>		18.39	10.14	1	<u> </u>		<u> </u>	= (37) + (37)	<u> </u>		ı	·
(38)m= 20.12	<u> </u>		18.39 66.49	66.24	65	65	64.75	<u> </u>	<u> </u>	<u> </u>	67.23]	`

Heat loss para	meter (l	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.79	0.78	0.78	0.77	0.76	0.75	0.75	0.75	0.76	0.76	0.77	0.78		
` ,		<u> </u>				<u> </u>	<u> </u>		L Average =	: Sum(40)₁.	12 /12=	0.77	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					•								
4. 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 (¯	TFA -13		58		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the a	lwelling is	designed			se target o		0.41		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Δυα	Sep	Oct	Nov	Dec		
Hot water usage in				<u></u>			Aug (43)	Sep	Oct	INOV	Dec		
	106.43	102.41	98.4	94.38	90.37	90.37	94.38	98.4	102.41	106.43	110.45		
(44)m= 110.45	100.43	102.41	90.4	94.30	90.37	90.37	94.36	<u> </u>		m(44) ₁₁₂ =	l	1204.88	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			. ,		1204.00	(44)
(45)m= 163.79	143.25	147.82	128.88	123.66	106.71	98.88	113.47	114.82	133.81	146.07	158.62		
(10)							1			m(45) ₁₁₂ =	l l	1579.79	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(/2	·		` ′
(46)m= 24.57	21.49	22.17	19.33	18.55	16.01	14.83	17.02	17.22	20.07	21.91	23.79		(46)
Water storage	loss:		<u> </u>	!	ļ.	<u>!</u>			<u>!</u>		<u> </u>		
Storage volum	e (litres)) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage			ft-	ممامات	/1.\^/L	- /-l-> -\							(40)
a) If manufact				or is kno	wn (kvvr	n/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro		_	-				(48) x (49)) =		1	10		(50)
b) If manufactHot water stora			-								02		(51)
If community h	-			2 (1000)	11/11/11/07/01	•9)				0.	02		(01)
Volume factor	•									1.	03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or (54) in (5	55)	-								03		(55)
Water storage	loss cal	culated f	or 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 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		(57)
Primary circuit	loss (ar	nual) fro	m Tahla	3		•	•	•			0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					. ,
(modified by				,	•	. ,	, ,		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)
				<u> </u>					<u> </u>				

Combi loss ca	lculated	for each	month (′61)m =	(60) ÷ :	365 × (41)m							
(61)m= 0	0	0	0	0	0	0)		0	0	0	0]	(61)
	uired for	water he	eating ca	alculated	l for ea	 ch month	(62)	 m =	0.85 × ((45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 219.07	193.18	203.1	182.37	178.94	160.2	154.16	168	_	168.32	189.09	199.56	213.9]	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	: H (nega	tive quantit	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	.	
(add additiona												•		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0		(63)
Output from w	ater hea	ter				•	•					•	•	
(64)m= 219.07	193.18	203.1	182.37	178.94	160.2	154.16	168	.74	168.32	189.09	199.56	213.9]	
								Outp	out from wa	ater heate	er (annual)	112	2230.63	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	n]	
(65)m= 98.68	87.57	93.37	85.65	85.34	78.28	77.1	81.	95	80.97	88.71	91.36	96.96]	(65)
include (57)	m in calc	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 gains (see Table 5 and 5a):														
Metabolic gains (Table 5), Watts														
Jan	Feb	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
(66)m= 154.58	154.58	154.58	154.58	154.58	154.58	154.58	154	.58	154.58	154.58	154.58	154.58		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				_	
(67)m= 52.42	46.56	37.87	28.67	21.43	18.09	19.55	25.	41	34.11	43.31	50.54	53.88]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a),	also	see Tal	ble 5		_	_	
(68)m= 347.29	350.89	341.81	322.48	298.07	275.13	259.81	256	.21	265.29	284.62	309.03	331.96		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a), als	o se	e Table	5	-	-	-	
(69)m= 53.03	53.03	53.03	53.03	53.03	53.03	53.03	53.	03	53.03	53.03	53.03	53.03]	(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	/aporatio	n (nega	tive valu	es) (Tab	le 5)	•				•	•	•	-	
(71)m= -103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103.05	-103	.05	-103.05	-103.05	-103.05	-103.05]	(71)
Water heating	gains (T	able 5)				-					-		-	
(72)m= 132.64	130.32	125.5	118.95	114.7	108.72	103.63	110	.15	112.46	119.24	126.89	130.33]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68	3)m +	- (69)m + ((70)m + (71)m + (72))m	•	
(73)m= 636.91	632.33	609.74	574.66	538.76	506.5	487.55	496	.32	516.42	551.73	591.02	620.73]	(73)
6. Solar gain	s:					_					•			
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations	to co	nvert to th	e applica	ble orienta	tion.		
Orientation:		actor	Area			lux		_	g_ 	_	FF		Gains	
_	Table 6d		m²			able 6a	_		able 6b	_ '	able 6c		(W)	_
Southeast _{0.9x}	0.77	X	6.	1	X	36.79	X		0.63	X	0.7	=	68.56	(77)
Southeast 0.9x	0.77	X	6.	1	x	62.67	x		0.63	×	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	х	6.	1	х	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				l .,		40.45	1		2.00	٦.,		_	Г	000.45	7(77)
Southeast 0.9x	0.77	X	6.		X	_	18.15	X		0.63	X	0.7	╡ ╸	F	220.15	(77)
Southeast 0.9x	0.77	X	6.		X		13.91	X		0.63	×	0.7	╡ ‐	늗	212.25	(77)
<u> </u>	0.77	×	6.		X I		04.39	X 1		0.63	×	0.7	_ =	늗	194.51	(77)
Southeast 0.9x	0.77	X	6.		X I	_	2.85	X		0.63	→ ×	0.7	_ =	Ļ	173.01	(77)
Southeast 0.9x	0.77	X	6.	1	X	6	9.27	X		0.63	×	0.7	_ =	Ļ	129.07	(77)
Southeast 0.9x	0.77	X	6.	1	X	4	4.07	X		0.63	X	0.7	=	· L	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	X	3	1.49	X		0.63	X	0.7	=	Ļ	58.67	(77)
Southwest _{0.9x}	0.77	X	6.0	07	X	3	6.79	<u> </u>		0.63	X	0.7	=	• <u>L</u>	68.31	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	6	2.67			0.63	X	0.7	=	: <u>L</u>	116.36	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	8	5.75			0.63	X	0.7	=	• <u>L</u>	159.21	(79)
Southwest _{0.9x}	0.77	X	6.0	07	X	1	06.25]		0.63	X	0.7			197.27	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	1	19.01			0.63	X	0.7	=	• [220.96	(79)
Southwest _{0.9x}	0.77	х	6.0	07	x	1	18.15]		0.63	x	0.7		• [219.36	(79)
Southwest _{0.9x}	0.77	X	6.0	07	x	1	13.91]		0.63	X	0.7		• [211.48	(79)
Southwest _{0.9x}	0.77	x	6.0	07	x	1	04.39	ĺ		0.63	x	0.7		· Ē	193.81	(79)
Southwest _{0.9x}	0.77	x	6.0	07	x	9	2.85	ĺ		0.63	x	0.7	=	┇	172.39	(79)
Southwest _{0.9x}	0.77	x	6.0)7	x	6	9.27	j		0.63	×	0.7	╡ -	. Ē	128.6	(79)
Southwest _{0.9x}	0.77	x	6.0	07	x	4	4.07	j		0.63	×	0.7	〓 -	. F	81.82	(79)
Southwest _{0.9x}	0.77	x	6.0	D7	x	3	1.49	j		0.63	= x	0.7	〒 -	┇	58.46	(79)
Northwest _{0.9x}	0.77	x	4.5	58	x	1	1.28	X		0.63	×	0.7	=		15.79	(81)
Northwest _{0.9x}	0.77	X	4.5	58	X		2.97	X		0.63	X	0.7			32.14	(81)
Northwest _{0.9x}	0.77	x	4.5		X		1.38) X		0.63	×	0.7	╡ -	┇	57.91	(81)
Northwest _{0.9x}	0.77	×	4.5	58	X	6	7.96	X		0.63	= x	0.7	╡ -	┇	95.1	(81)
Northwest _{0.9x}	0.77	×	4.5		X		1.35] 		0.63	= x	0.7	╡ -	┇	127.83	(81)
Northwest _{0.9x}	0.77	x	4.5		X	_	7.38]]		0.63	╡ ×	0.7	╡.	┇┝	136.28	(81)
Northwest _{0.9x}	0.77	×	4.5		X		91.1]]		0.63	= x	0.7	╡.	. F	127.49	(81)
Northwest 0.9x	0.77	×	4.5		×		2.63]]		0.63	X	0.7		┇┝	101.63	(81)
Northwest 0.9x	0.77	×	4.5		x	_	0.42] x		0.63	X	0.7	╡.	F	70.56	(81)
Northwest 0.9x	0.77	×	4.5		l ^		8.07] ^] _x		0.63	^ x	0.7	= =	F	39.28	(81)
Northwest 0.9x	0.77	×	4.5		^ x		14.2] ^] x		0.63	┤	0.7	╡ .	늗	19.87	(81)
Northwest _{0.9x}		x			^ x] ^] x			^ x	0.7	\dashv	F		(81)
Ttoranwood 0.9x	0.77	^ ^	4.5	00	'		9.21] ^		0.63	^^	0.7		L	12.89	(61)
Solar gains in	watta ac	doulotos	l for ooo	h man	łh.			(02\m	s – Cı	ım(74)m	(92)m					
(83)m= 152.66	265.28	376.9	490.35	570.54	_	75.79	551.22	489	$\overline{}$	um(74)m 415.96	296.9	5 183.81	130.03	3		(83)
Total gains – ir												1	1			` '
(84)m= 789.57	897.61	986.63	1065	1109.3		082.29		986	.28	932.38	848.6	7 774.83	750.76	3		(84)
	nal tamp	oroturo	(hooting))				ļ					_		
7. Mean inter			`			oroo	from Tok	olo O	Th	1 (°C)				_	0.4	(85)
Temperature	_	•			_			JIE 9	, 1111	i (C)				L	21	(65)
Utilisation fac	Feb				Ť			Ι		Son	Oct	Nov	Doc	\Box		
(86)m= 0.89	0.84	Mar 0.77	Apr 0.66	May 0.52	_	Jun _{0.38}	Jul 0.27	0.:	ug	Sep 0.46	Oct 0.69	0.84	0.9	\dashv		(86)
			!	ļ				<u> </u>			0.03	0.04	0.9			(00)
Mean interna				1	Ì		·				00.7-	1 00 04	40.00	\neg		(07)
(87)m= 19.96	20.2	20.47	20.75	20.91	2	20.98	20.99	20.	99	20.95	20.75	20.34	19.92			(87)

T		.1		and a dia dia			(T.	LL O T	LO (0 0)					
(88)m=	20.26	20.27	neating p	20.28	20.28	20.3	20.3	20.3	n2 (°C) 20.29	20.28	20.28	20.27		(88)
` ′		<u> </u>	ains for					<u> </u>	20.29	20.28	20.28	20.21		(00)
(89)m=	0.88	0.83	0.75	0.63	0.49	0.34	0.23	0.25	0.42	0.66	0.82	0.89		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	na T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)	I			
(90)m=	18.89	19.22	19.6	19.98	20.18	20.28	20.29	20.29	20.24	19.99	19.43	18.84		(90)
l								Į.	f	LA = Livin	g area ÷ (4	1) =	0.34	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2			•		_
(92)m=	19.26	19.55	19.9	20.24	20.43	20.52	20.53	20.53	20.49	20.25	19.74	19.21		(92)
	adjustn		he mear		temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.26	19.55	19.9	20.24	20.43	20.52	20.53	20.53	20.49	20.25	19.74	19.21		(93)
•		·	uirement											
			ternal ter or gains			ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.86	0.81	0.74	0.63	0.49	0.35	0.24	0.27	0.43	0.65	0.8	0.87		(94)
			, W = (9 ²				ı	<u> </u>	ı		ı			(0.5)
(95)m=	677.11	726.11	727.95	667.37	546.68	377.66	254.19	265.55	403.42	555.47	623.38	653.58		(95)
(96)m=	11y avera	age exte	ernal tem	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` '			an intern					<u> </u>			<u> </u>	7.2		(00)
(97)m=	1020.57	1	907.46	754.04	578.25	384.59	255.68	267.65	418.39	639.21	843.54	1009.21		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	255.54	181.38	133.56	62.41	23.49	0	0	0	0	62.31	158.52	264.59		
								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	1141.79	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								13.18	(99)
9b. En	ergy rec	quiremer	nts – Cor	nmunity	heating	scheme								
			oace hea from se								unity sch	neme.	0	(301)
	-			-		-	_	Table 1	1, 0	0110				(302)
	-		from co	•	-			-!! f	OUD and	to for	- 41 v. 1 4		1	(302)
	-		y obtain he s, geotherr							up to rour	otner neat	sources; ti	ie iaπer	
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	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m				ĺ	1.05	(306)
Space	heating	g										•	kWh/yeaı	-
Annua	l space	heating	requirem	nent									1141.79	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	1198.88	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
												•		

					_
Space heating requirement from second	ondary/supplementary system	(98) x (301) x	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement				2230.63	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a)	x (305) x (306) =	2342.16	(310a)
Electricity used for heat distribution	(0.01 × [(307a)(30	07e) + (310a)(310e)] =	35.41	(313)
Cooling System Energy Efficiency Ra	atio			0	(314)
Space cooling (if there is a fixed cooling	ing system, if not enter 0)	= (107) ÷ (314	4) =	0	(315)
Electricity for pumps and fans within mechanical ventilation - balanced, ex	<u> </u>	ide		336.77	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/ye	ear	=(330a) + (33	0b) + (330g) =	336.77	(331)
Energy for lighting (calculated in App	endix L)			370.34	(332)
Electricity generated by PVs (Append	lix M) (negative quantity)			-872.75	(333)
Electricity generated by wind turbine	(Appendix M) (negative quantity	/)		0	(334)
10b. Fuel costs – Community heating	g scheme				
	Fuel kWh/year		el Price able 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x		4.24 x 0.01 =	50.83	(340a)
Water heating from CHP	(310a) x		4.24 x 0.01 =	99.31	(342a)
		Fu	el Price		
		<u> </u>	<u> </u>		_
Pumps and fans	(331)		13.19 x 0.01 =	44.42	(349)
Energy for lighting	(332)		v 0.01	44.42 48.85	(349)
·	(332)		13.19 x 0.01 =		
Energy for lighting	(332)		13.19 x 0.01 =	48.85	(350)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologies	(332) 2) es = (340a)(342e) + (345)(354) =		13.19 x 0.01 =	48.85 120	(350)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologic Total energy cost	(332) 2) es = (340a)(342e) + (345)(354) =		13.19 x 0.01 =	48.85 120	(350)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heating	(332) 2) es = (340a)(342e) + (345)(354) =		13.19 x 0.01 =	48.85 120 363.41	(350) (351) (355)
Energy for lighting Additional standing charges (Table 12 Energy saving/generation technologie Total energy cost 11b. SAP rating - Community heating Energy cost deflator (Table 12)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme		13.19 x 0.01 =	48.85 120 363.41	(350) (351) (355) (356)
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)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme		13.19 x 0.01 = 13.19 x 0.01 =	48.85 120 363.41 0.42 1.16 83.82	(350) (351) (355) (356) (357)
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)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme		13.19 × 0.01 = 13.19 × 0.01 = Emission factor	48.85 120 363.41 0.42 1.16 83.82	(350) (351) (355) (356) (357)
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)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Energy kWh/year	13.19 × 0.01 = 13.19 × 0.01 = Emission factor kg CO2/kWh	48.85 120 363.41 0.42 1.16 83.82 Emissions kg CO2/year	(350) (351) (355) (356) (357) (358)
Energy for lighting Additional standing charges (Table 12) Energy saving/generation technologic Total energy cost 11b. SAP rating - Community heatin Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community heating	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Energy kWh/year	13.19 × 0.01 = 13.19 × 0.01 = Emission factor kg CO2/kWh	48.85 120 363.41 0.42 1.16 83.82 Emissions kg CO2/year	(350) (351) (355) (356) (357) (358)
Energy for lighting Additional standing charges (Table 12) Energy saving/generation technologies Total energy cost 11b. SAP rating - Community heating Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community heating CO2 from other sources of space and Efficiency of heat source 1 (%)	(332) 2) es = (340a)(342e) + (345)(354) = g scheme [(355) x (356)] ÷ [(4) + 45.0] = eating scheme	Energy kWh/year fuels repeat (363) to	13.19 × 0.01 = 13.19 × 0.01 = Emission factor kg CO2/kWh 0 (366) for the second fuel	48.85 120 363.41 0.42 1.16 83.82 Emissions kg CO2/year 94 813.68	(350) (351) (355) (356) (357) (358)

Total CO2 associated with community	systems	(363)(366) + (368)(37	2)	=	832.06	(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) =			832.06	(376)
CO2 associated with electricity for pun	nps and fans within dwe	elling (331)) x	0.52	=	174.78	(378)
CO2 associated with electricity for light	ting	(332))) x	0.52	=	192.2	(379)
Energy saving/generation technologies Item 1	s (333) to (334) as appl	icable	0.52 × 0.01	= [-452.96	(380)
Total CO2, kg/year	sum of (376)(382) =				746.09	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				8.62	(384)
El rating (section 14)					92.4	(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 (%)		•	(366) for the second	fuel	94	(367a)
•	If there is CHP us	HP)	(366) for the second	fuel =		(367a) (367)
Efficiency of heat source 1 (%)	If there is CHP us	HP) sing two fuels repeat (363) to			94	」` ¬
Efficiency of heat source 1 (%) Energy associated with heat source 1	If there is CHP us	HP) sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x	1.22	=	94 4595.81	(367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution	If there is CHP us [(307b	HP) sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373)	1.22	=	94 4595.81 108.71	(367)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with commun	If there is CHP us [(307b) ity systems ess specified otherwise	HP) sing two fuels repeat (363) to b)+(310b)] x 100 ÷ (367b) x [(313) x (363)(366) + (368)(373)	1.22	=	94 4595.81 108.71 4704.52	(367) (372) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with commun if it is negative set (373) to zero (unli	If there is CHP us [(307b) ity systems ess specified otherwise (secondary)	HP) 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	1.22	= = =	94 4595.81 108.71 4704.52 4704.52	(367) (372) (373) (373)
Efficiency of heat source 1 (%) Energy associated with heat source 1 Electrical energy for heat distribution Total Energy associated with commun if it is negative set (373) to zero (unli	If there is CHP us [(307b) ity systems ess specified otherwise (secondary) nersion heater or instar	HP) 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	1.22	= = =	94 4595.81 108.71 4704.52 4704.52	(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 commun if it is negative set (373) to zero (unli Energy associated with space heating Energy associated with water from imr	If there is CHP us [(307b) ity systems ess specified otherwise (secondary) nersion heater or instar	HP) 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	1.22	= = =	94 4595.81 108.71 4704.52 4704.52 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 commun if it is negative set (373) to zero (unli Energy associated with space heating Energy associated with water from immodule to the series of the series o	If there is CHP us [(307b) ity systems ess specified otherwise (secondary) mersion heater or instar and water heating	HP) sing two fuels repeat (363) to c)+(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	1.22 (2) (2) (3) (4) (5)	= = = = = = = = = = = = = = = = = = = =	94 4595.81 108.71 4704.52 4704.52 0 0 4704.52	(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 commun if it is negative set (373) to zero (unli Energy associated with space heating Energy associated with water from immortal Energy associated with space are Energy associated with space cooling	ity systems ess specified otherwise (secondary) mersion heater or instar id water heating umps and fans within d	HP) 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	1.22 (2) (2) (3) (1.22)	= = = = = = = = = = = = = = = = = = = =	94 4595.81 108.71 4704.52 4704.52 0 0 4704.52	(367) (372) (373) (373) (374) (375) (376) (377)

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

Total Primary Energy, kWh/year

4195.98

(383)

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	- 036 11	Strom Softwa					001082 on: 1.0.5.9	
	F	Property	Address	Plot 31					
Address: 1. Overall dwelling dime	pnoiono:								
1. Overall dwelling diffie	ensions.	Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor				(1a) x		2.5	(2a) =	216.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	86.6	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	216.5	(5)
2. Ventilation rate:									
2. Ventilation rate.	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating 0 + 0	- + -	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0		0	i = F	0	x	20 =	0	(6b)
Number of intermittent fa	ins			, F	3	x -	10 =	30	(7a)
Number of passive vents	3			F	0	x -	10 =	0	(7b)
Number of flueless gas f	ires			_ [0	X 4	40 =	0	(7c)
_				L					`
							Air ch	anges per ho	our
	ys, flues and fans = $(6a)+(6b)+($			į [30		÷ (5) =	0.14	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ea to (17),	otnerwise (continue tr	om (9) to	(16)		0	(9)
Additional infiltration	3 ()					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t 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 window 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	5	(17)
,	lity value, then $(18) = [(17) \div 20] + (18)$	-	•	•		•		0.39	(18)
	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			_
Number of sides shelters Shelter factor	ed		(20) = 1 -	0.075 x (1	19)] =			0.92	(19)
Infiltration rate incorpora	ting shelter factor		(21) = (18		,,			0.36	(21)
Infiltration rate modified f	•							0.00	(/
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
	• •	_			_			-	

	0.45	0.44	ng for sh 0.4	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
Calculate effec		_	rate for t	he appli	cable ca	se	<u> </u>	<u> </u>		!	Į	l 	
If mechanica			l' N (0	al.) (aa	\ - (/	15// (1	. (22)	\ (00 \			0	
If exhaust air he		0 11		, ,	, ,	. ,	,, .	`) = (23a)			0	
If balanced with		•		_								0	(:
a) If balance					.	- ` ` 	- ` ` - 	```	<u> </u>	- 	' ' '	÷ 100] I	(1
24a)m= 0	0		0	0	0	0	0	0	0	0	0		(:
b) If balance	ea mech	anicai ve	ntilation	without	neat red	overy (i	0 (24b	0)m = (22)	0 m + (d2	23b)	Ι ,	1	(:
,					<u> </u>			<u> </u>	U		0	J	(4
c) If whole h if (22b)n				•					5 × (23h	n)			
$\frac{(225)^{11}}{24c)m} = 0$	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural	ventilatio	on or wh	ole hous	e positiv	l /e input	L ventilatio	n from l	oft		<u>!</u>	ļ.	J	
if (22b)n				•	•				0.5]				
24d)m= 0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(2
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(:
3. Heat losse	s and he	eat loss r	naramete	⊃r.									
LEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	9	ΑΧk
	area	-	m		A ,r		W/m2		(W/		kJ/m²-l		kJ/K
oors					2	X	1		2				(:
lindows Type													(-
viriuows rype	e 1				6.097	y x1.	/[1/(1.4)+	!	8.08				(2
• •					6.097	=	<u> </u>	0.04] =					,
Vindows Type	e 2					x1	/[1/(1.4)+	0.04] = 0.04] =	8.08				(2
Vindows Type Vindows Type Vindows Type Valls Type1	e 2	75	16.75	5	6.075	x1	/[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] =	8.08			-	(2
Vindows Type Vindows Type Valls Type1	e 2 e 3		16.75	5	6.075 4.579	x10 x10 x10	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = 0.04] = 0.04] =	8.08 8.05 6.07				(2
Vindows Type Vindows Type Valls Type1 Valls Type2	e 2 e 3	37		5	6.075 4.579 62	x1.	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 	0.04] = [0.04] = [0.04] = [= [8.08 8.05 6.07 11.16				(3
Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3	78.7 14.3	37 56	2	5	6.075 4.579 62 12.37	x10 x10 x10 x x x x x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18	0.04] = [0.04] = [0.04] = [= = [8.08 8.05 6.07 11.16 2.23				(:
Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3	78.7 78.7 14.3 12.5 12.5	57 56 , m ²	0		6.075 4.579 62 12.37 12.56	x10 x10 x x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18	0.04] = [0.04] = [0.04] = [= [= = [8.08 8.05 6.07 11.16 2.23 2.26	as given in	ı paragraph	3.2	(1)
Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Total area of e for windows and the include the area	78.7 14.3 12.5 elements	56 , m² cows, use e	2 0 ffective winternal wall	ndow U-va	6.075 4.579 62 12.37 12.56 105.6	x1. x1. x1. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26	as given in	ı paragraph] [] [] 3.2	(1)
Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Total area of e for windows and include the area fabric heat los	78.7 14.3 12.5 Plements I roof windles on both	ows, use e sides of in	2 0 ffective winternal wall	ndow U-va	6.075 4.579 62 12.37 12.56 105.6	x1. x1. x1. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26	as given in	ı paragraph	39.8	(;
Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Total area of e for windows and include the area fabric heat los	78.7 14.3 12.5 Elements I roof windows on both as on both SS, W/K:	in the state of th	0 Iffective winternal wall U)	ndow U-va	6.075 4.579 62 12.37 12.56 105.6 alue calculatitions	x1. x1. x x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 (e)+0.04] a	2) + (32a).		Г	(1)
Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Total area of experiments and include the area Tabric heat loss Jeat capacity Thermal mass	78.7 14.3 12.5 Plements I roof wind as on both as, W/K: Cm = S(m ² , m ² ows, use e sides of in a S (A x k) ter (TMF	2 0 offective winternal wall U) $P = Cm \div$	ndow U-va Is and pan	6.075 4.579 62 12.37 12.56 105.6 alue calculatitions	x1. x1. x1. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 (26)(30)	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 2.26 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	39.8	(3)
Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 Total area of e for windows and thinclude the area Tabric heat los Ileat capacity Thermal mass	78.7 14.3 12.5 Elements I roof winders on both SS, W/K: Cm = S(in the state of the sides of in the sides of in the sides of in the sides of the si	2 0 offective winternal wall U) P = Cm ÷	ndow U-va Is and pan	6.075 4.579 62 12.37 12.56 105.6 alue calculatitions	x1. x1. x1. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 (26)(30)	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 2.26 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	39.8 1217	(1)
Vindows Types Vindows Types Valls Type1 Valls Type2 Valls Type3 Total area of each for windows and the include the area fabric heat loss leat capacity thermal mass for design assess and be used instead	78.7 14.3 12.5 Elements I roof winder as on both as	sides of interest of the state	2 0 Iffective winternal wall U) P = Cm ÷ tails of the ulation.	ndow U-vels and pand	6.075 4.579 62 12.37 12.56 105.6 alue calculations kJ/m²K	x1 x1 x x x x y x y x y ated using	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 (26)(30)	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 2.26 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	39.8 1217 250	(i) (i) (i) (i) (i) (i) (i) (i) (i) (i)
Vindows Types Vindows Types Valls Type1 Valls Type2 Valls Type3 Total area of ending the area Tabric heat loss Ileat capacity Thermal mass Tor design assess Thermal bridges	78.7 14.3 12.5 Elements I roof winders on both ss, W/K: Cm = S(parame sments who ad of a de es: S (L	is and the state of the state o	2 0 Iffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and pand	6.075 4.579 62 12.37 12.56 105.6 alue calculatitions n kJ/m²K	x1 x1 x x x x y x y x y ated using	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 (26)(30)	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 2.26 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	39.8 1217	(i) (i) (i) (i) (i) (i) (i) (i) (i) (i)
Vindows Types Vindows Types Valls Type1 Valls Type2 Valls Type3 Total area of ending the area of abric heat loss deat capacity Thermal mass for design assess an be used instead thermal bridges details of thermal	78.7 14.3 12.5 Elements I roof winder as on both as, W/K: Cm = S(parame sments whe ad of a de es : S (L al bridging	is and the state of the state o	2 0 Iffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and pand	6.075 4.579 62 12.37 12.56 105.6 alue calculatitions n kJ/m²K	x1 x1 x x x x y x y x y ated using	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 (26)(30)	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 2.26 (30) + (32) tive Value	2) + (32a). : Medium	(32e) =	39.8 1217 250	(i) (i) (i) (i) (i) (i) (i) (i) (i) (i)
Vindows Type Vindows Type	78.7 14.3 12.5 Plements I roof wind as on both as on both ss, W/K: Cm = S(parame sments wh ad of a de es: S (L al bridging at loss	is i	2 0 offective winternal wall U) $P = Cm \div tails of the ulation.$ culated to own (36) =	ndow U-vals and pand - TFA) ir construction using Ap	6.075 4.579 62 12.37 12.56 105.6 alue calculatitions n kJ/m²K	x1 x1 x x x x y x y x y ated using	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 (26)(30)	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 (30) + (32) tive Value e values of	2) + (32a). : Medium	(32e) =	39.8 1217 250 8.3	(i) (i) (i) (i) (i) (i) (i) (i) (i) (i)
Vindows Types Vindows Types Valls Type1 Valls Type2 Valls Type3 Total area of ending the area Tabric heat loss Ileat capacity Thermal mass Tor design assess Thermal bridges Total fabric he	78.7 14.3 12.5 Plements I roof wind as on both as on both ss, W/K: Cm = S(parame sments wh ad of a de es: S (L al bridging at loss	is i	2 0 offective winternal wall U) $P = Cm \div tails of the ulation.$ culated to own (36) =	ndow U-vals and pand - TFA) ir construction using Ap	6.075 4.579 62 12.37 12.56 105.6 alue calculatitions n kJ/m²K	x1 x1 x x x x y x y x y ated using	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.18 0.18 0.18 (26)(30)	0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 (30) + (32) tive Value e values of	2) + (32a). : Medium : TMP in Ta	(32e) =	39.8 1217 250 8.3	(i) (i) (i) (i) (i) (i) (i) (i) (i) (i)
Vindows Types Vindows Types Valls Type1 Valls Type2 Valls Type3 Total area of experiments for windows and experiments fabric heat loss fleat capacity fleat capacity fleat mass for design assess for design assess fan be used instead fleat hermal bridge details of thermal fotal fabric her fentilation head	78.7 14.3 12.5 Elements I roof winder as on both as, W/K: Cm = S(parame sments whe ad of a de es: S (L al bridging at loss at loss ca	sides of interpretation of the sides of interpretation of the sides of interpretation of the sides of the sid	graph of the state of the count (36) =	ndow U-vels and pandown of the construction of	6.075 4.579 62 12.37 12.56 105.6 alue calculations kJ/m²K ion are not	x1 x1 x x x x x y x x y ated using	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = [0.04]	8.08 8.05 6.07 11.16 2.23 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.26 2.27 2.28 2.29 2.29 2.20 2.00	2) + (32a). : Medium : <i>TMP in T</i> 3	(32e) =	39.8 1217 250 8.3	(i) (i) (i) (i) (i) (i) (i) (i) (i) (i)
Vindows Type Vindows Type Valls Type1 Valls Type2 Valls Type3 otal area of e for windows and include the area abric heat los leat capacity hermal mass or design assess an be used instead hermal bridge details of therma otal fabric he fentilation hea	78.7 14.3 12.5 Elements I roof winding as on both as on both as on both ad of a de es: S (Lal bridging at loss at loss cate Feb 42.93	is and the state of the state o	general wall atternal wall ternal wall ternal wall ternal wall tails of the culation. Culated to cown (36) = I monthly	ndow U-vels and pand - TFA) ir construction using Ap = 0.05 x (3)	6.075 4.579 62 12.37 12.56 105.6 alue calcultitions kJ/m²K ion are not	x1. x1. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	/[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	0.04] = [0.04] = [0.04] = [0.04] = [8.08 8.05 6.07 11.16 2.23 2.26 (30) + (32) tive Values of (36) = = 0.33 × (00)	2) + (32a). : Medium : TMP in Ta (25)m x (5) Nov 41.56	(32e) = Sable 1f	39.8 1217 250 8.3	(i)

Heat loss para	meter (l	HLP). W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.05	1.05	1.03	1.03	1.02	1.02	1.01	1.02	1.03	1.04	1.04		
()									<u> </u>	Sum(40) ₁ .		1.03	(40)
Number of day	s in mo	nth (Tab	le 1a)							(),			` ` ′
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					<u> </u>	<u> </u>	<u> </u>	l	<u> </u>	<u>. </u>			
A Materia	•										1.30/1./		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13		58		(42)
Annual averag Reduce the annua	l average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		.39		(43)
not more that 125	litres per	person per	day (all w	ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)	-	-	-	-		
(44)m= 104.92	101.11	97.29	93.48	89.66	85.85	85.85	89.66	93.48	97.29	101.11	104.92		
		•		•	•	•	•	-	Total = Su	m(44) ₁₁₂ =	=	1144.64	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600) kWh/mon	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 155.6	136.09	140.43	122.43	117.48	101.37	93.94	107.79	109.08	127.12	138.77	150.69		
									Total = Su	m(45) ₁₁₂ =	=	1500.8	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)	_				
(46)m= 23.34	20.41	21.06	18.36	17.62	15.21	14.09	16.17	16.36	19.07	20.81	22.6		(46)
Water storage						-		-					
Storage volum	` '		-			•		ame ves	sel		150		(47)
If community h	•			•			` '		(01.1)				
Otherwise if no		hot wate	er (this in	ıcludes ı	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
Water storage a) If manufact		oclared k	occ foct	or is kno	wp (k\\/k	n/dov/):					00		(40)
,				JI IS KIIO	wii (Kvvi	i/uay).					39		(48)
Temperature fa										0.	54		(49)
Energy lost fro		_	-		ar ia nat		(48) x (49)) =		0.	75		(50)
b) If manufact Hot water stora			-								0		(51)
If community h	•			2 (100)	11/11/11/07/01	· y /					0		(01)
Volume factor	_										0		(52)
Temperature fa	actor fro	m Table	2b							—	0		(53)
Energy lost fro	m watei	· storage	. kWh/ve	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (_	, ,						•		75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m	<u> </u>			
(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												ix H	(00)
				· · ·		1	· · · · ·						(E7)
(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 —			ı —	<u> </u>	<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)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
					<u> </u>	· ` `	<u> </u>	1 0	Ι ,	Ι ,	Ι ο	1	(61)
(61)m= 0	0	0	0	0	0	0	(2.2)	0	0	0	0	<u> </u>	(61)
							`		` ´ 	ì ´	`´	(59)m + (61)m 1	(00)
(62)m= 202.2	178.18	187.03	167.52	164.07	146.47	140.53	154.39		173.72	183.86	197.29	J	(62)
Solar DHW input									r contribut	tion to wate	er heating)		
(add additiona (63)m= 0	o lines ii	rGHKS 0	and/or v	0	applies 0	, see Ap	pendix 0	T 0	0	T 0	0	1	(63)
			0	0	0							J	(00)
Output from w $(64)m = 202.2$	178.18	ter 187.03	167.52	164.07	146.47	140.53	154.39	154.17	173.72	183.86	197.29	1	
(04)111= 202.2	170.10	107.03	107.32	104.07	140.47	140.55	ļ	itput from w				2049.42	(64)
Hoot going fro	m water	hooting	k\A/b/m	anth 0 2	= ′ [U 0E	v (4E)m](0.)
Heat gains fro	78.92	83.97	76.78	76.34	69.78	68.51	73.12	1	79.54	82.21	87.38	'	(65)
` '						ļ		_					(00)
include (57)					yıınaer ı	s in the (aweilin	g or not w	ater is t	rom com	munity r	neating	
5. Internal ga	·):									
Metabolic gair					1	1	A		0-4	Nan		1	
(66)m= 128.81	Feb 128.81	Mar 128.81	Apr 128.81	May 128.81	Jun 128.81	Jul 128.81	128.81	+	Oct 128.81	Nov 128.81	Dec 128.81	ł	(66)
` '						l	l		120.01	120.01	120.01	J	(00)
Lighting gains (67)m= 20.97	18.63	15.15	11.47	L, equat 8.57	7.24	7.82			17.32	20.22	04.55	1	(67)
						Į	10.16		ļ.	20.22	21.55	J	(07)
Appliances ga	· `					1	- 			007.05	L 000 40	1	(68)
(68)m= 232.68	235.1	229.01	216.06	199.71	184.34	174.07	171.66	_ <u>ļ</u>	190.7	207.05	222.42	J	(00)
Cooking gains	`	i								05.00	05.00	1	(60)
(69)m= 35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	35.88	J	(69)
Pumps and fa						T .	<u> </u>		<u> </u>	1		1	(70)
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	J	(70)
Losses e.g. ev	 	<u> </u>				l						1	(74)
(71)m= -103.05		-103.05	-103.05	-103.05	-103.05	-103.05	-103.0	-103.05	-103.05	-103.05	-103.05	J	(71)
Water heating								1		1	l	1	(70)
(72)m= 119.64	117.44	112.86	106.64	102.6	96.92	92.08	98.28	100.48	106.91	114.18	117.45		(72)
Total internal	-							n + (69)m +	· · · · · ·	•		1	(70)
(73)m= 437.94	435.8	421.67	398.81	375.53	353.14	338.62	344.74	356.51	379.58	406.09	426.06		(73)
6. Solar gains Solar gains are		ueina eolai	r flux from	Table 6a	and accor	iated equa	ations to	convert to th	a annlical	nle orientat	tion		
Orientation: /		-	Area		Flu		1110115 10	g_	іе арріісаі	FF	uon.	Gains	
	Table 6d	actor	m ²			ble 6a		Table 6b	Т	able 6c		(W)	
Southeast 0.9x	0.77	x	6.	1	x 3	36.79] _x [0.63	x [0.7		68.56	(77)
Southeast 0.9x	0.77	X	6.			62.67]	0.63		0.7	= =	116.78](77)
Southeast 0.9x	0.77	×	6.			35.75	」^∟ 1 x 「	0.63	^	0.7		159.78](77)
Southeast 0.9x	0.77	×	6.		—	06.25	」^ <u> </u>	0.63	^	0.7		197.98](77)
Southeast 0.9x	0.77	×	6.		-	19.01] ^ <u> </u>] x [0.63	^	0.7		221.76] ₍₇₇₎
V.U.	0.17		L	·	'		」 ̄	5.55	— □ □ ∟	0.1			J ' ' '

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	6.0)7	X	3	6.79]		0.63	X	0.7	=	68.31	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	6	2.67]		0.63	X	0.7	=	116.36	(79)
Southwest _{0.9x}	0.77	X	6.0)7	X	8	5.75]		0.63	X	0.7	=	159.21	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	1	06.25			0.63	X	0.7	=	197.27	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	1	19.01			0.63	x	0.7	=	220.96	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	1	18.15			0.63	X	0.7	=	219.36	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	1	13.91]		0.63	X	0.7	=	211.48	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	1	04.39	1		0.63	x	0.7	=	193.81	(79)
Southwest _{0.9x}	0.77	X	6.0)7	x	9	2.85]		0.63	x	0.7	=	172.39	(79)
Southwest _{0.9x}	0.77	x	6.0)7	X	6	9.27	Ī		0.63	х	0.7	=	128.6	(79)
Southwest _{0.9x}	0.77	х	6.0)7	X	4	4.07	Ī		0.63	х	0.7	=	81.82	(79)
Southwest _{0.9x}	0.77	x	6.0)7	x	3	1.49	Ī		0.63	x	0.7	=	58.46	(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	j x		0.63	x	0.7	=	57.91	(81)
Northwest _{0.9x}	0.77	X	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	j 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	×	0.7		136.28	(81)
Northwest _{0.9x}	0.77	X	4.5	58	X	9	91.1	X		0.63	x	0.7		127.49	(81)
Northwest _{0.9x}	0.77	X	4.5	58	X	_	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	×	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	×	0.7		19.87	(81)
Northwest _{0.9x}	0.77	X	4.5	58	x		9.21	X		0.63	×	0.7		12.89	(81)
								J							
Solar gains in	watts, ca	alculated	I for eac	h mont	h			(83)m	n = Su	um(74)m	(82)m				
(83)m= 152.66	265.28	376.9	490.35	570.54	5	75.79	551.22	489	.96	415.96	296.9	183.81	130.03		(83)
Total gains – ir	nternal a	nd solar	· (84)m =	= (73)m	+ (83)m	, watts					-		_	
(84)m= 590.6	701.08	798.56	889.16	946.07	9	28.93	889.84	834	1.7	772.47	676.52	589.9	556.09		(84)
7. Mean inter	nal temp	erature	(heating	seaso	n)										
Temperature						area	from Tal	ble 9	, Th′	1 (°C)				21	(85)
Utilisation fac	tor for ga	ains for I	living are	ea, h1,ı	n (s	ee Ta	ble 9a)								
Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.97	0.92	0.79		0.59	0.43	0.4	18	0.73	0.95	0.99	1]	(86)
Mean interna	temper	ature in	living ar	ea T1 (follo	w ste	ps 3 to 7	7 in T	able	9c)		•	-	-	
(87)m= 19.97	20.15	20.4	20.7	20.9	_	20.98	21	2	-	20.95	20.68	20.27	19.94	1	(87)
							<u> </u>		!				1	_	

T	ماريات ماري	ما بم مراس		مان مام اس		مانا منام	. fuo To	bla O Ti	ha (00)					
· -							from Ta		·	20.00	20.05	20.05		(88)
` ′	!	20.04	20.04	20.06	20.06	20.07	20.07	20.07	20.07	20.06	20.05	20.05		(00)
		~~	1			· ` `	e Table		0.05	0.00	0.00	4		(89)
(89)m=	!	0.99	0.96	0.89	0.73	0.51	0.34	0.39	0.65	0.92	0.99	1		(69)
		.	i			<u> </u>	ollow ste	-					ſ	(2.2)
(90)m= 1	18.66 1	8.93	19.3	19.72	19.97	20.06	20.07	20.07	20.03	19.7	19.11	18.63		(90)
									T	LA = Livin	g area ÷ (4	1) =	0.34	(91)
Mean in	ternal te	mpera	ature (fo	r the wh	ole dwe	ling) = fl	LA × T1	+ (1 – fL	A) × T2				ı	
(92)m= 1	19.11 1	9.35	19.68	20.06	20.29	20.38	20.39	20.39	20.35	20.04	19.51	19.08		(92)
· · · · · —			e mean	internal	temper	ature fro	m Table	4e, whe		priate			ı	
(93)m= 1	19.11 1	9.35	19.68	20.06	20.29	20.38	20.39	20.39	20.35	20.04	19.51	19.08		(93)
8. Spac		•												
Set Ti to the utilis				•		ed at ste	ep 11 of	Table 9l	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	r	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	on factor	for ga	ins, hm	:										
(94)m=	0.99	0.98	0.96	0.89	0.75	0.54	0.37	0.42	0.68	0.92	0.99	1		(94)
Useful g	gains, hn	nGm ,	W = (94	1)m x (84	1)m									
(95)m= 5	86.76 68	89.97	766.45	791.52	705.05	500.4	332.62	348.66	524.92	623.85	581.16	553.39		(95)
Monthly	average	e exte	nal tem	perature	from Ta	able 8							1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
						Lm , W =	=[(39)m	x [(93)m	– (96)m]			ı	
` ′			1196.73	998.31	766.48	508.68	333.52	350.29	552.75	842.04	1113.47	1342.84		(97)
_			i				th = 0.02				·		ı	
(98)m= 5	70.46 42	20.78	320.13	148.89	45.71	0	0	0	0	162.34	383.26	587.35		_
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2638.91	(98)
Space h	neating r	equire	ment in	kWh/m²	/year								30.47	(99)
9a. Energ			ts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space I	•		from o		/aunnla	monton	ovetem						2	7(204)
	•				• • •	mentary	system	(000) 4	(004)				0	(201)
	of spac			•	` ,			(202) = 1 -	` '				1	(202)
Fraction	of total	heatin	ıg from ı	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiend	cy of ma	in spa	ce heati	ng syste	em 1								93.5	(206)
Efficiend	cy of sec	condar	y/supple	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space h	neating r	equire	ment (c	alculate	d above)									
5	70.46 42	20.78	320.13	148.89	45.71	0	0	0	0	162.34	383.26	587.35		
(211)m =	: {[(98)m	x (204	4)] } x 1	00 ÷ (20	6)									(211)
6	10.11 4	50.03	342.38	159.24	48.88	0	0	0	0	173.62	409.91	628.18		
	-						-	Tota	I (kWh/yea	ar) =Sum(2	211),15,1012	_	2822.37	(211)
Space h	neating f	uel (se	econdary	y), kWh/	month									
= {[(98)m	x (201)] } x 1(00 ÷ (20	8)			•						ı	
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		_
								Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)

Water heating								
Output from water heater (calculated above) 202.2 178.18 187.03 167.52 164.07 1	46.47 140.53	154.39	154.17	173.72	183.86	197.29]	
Efficiency of water heater							79.8	(216)
(217)m= 87.43 87.03 86.24 84.5 81.91	79.8 79.8	79.8	79.8	84.63	86.73	87.55		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m	•						•	
· · · · · · · · · · · · · · · · · · ·	83.54 176.11	193.47	193.2	205.26	211.99	225.34		
	•	Tota	= Sum(2	19a) ₁₁₂ =		•	2440.34	(219)
Annual totals				k'	Wh/year	•	kWh/year	- -
Space heating fuel used, main system 1							2822.37	_
Water heating fuel used							2440.34	
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(230c)
boiler with a fan-assisted flue						45		(230e)
Total electricity for the above, kWh/year		sum	of (230a).	(230g) =			75	(231)
Electricity for lighting							370.34	(232)
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP						
	Energy kWh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x			0.2	16	=	609.63	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	527.11	(264)
Space and water heating	(261) + (262)	+ (263) + (264) =				1136.74	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	192.2	(268)
Total CO2, kg/year			sum o	of (265)(2	271) =		1367.87	(272)

TER =

(273)

15.8