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 14:53:58*

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 51.02m²Site Reference:Hermitage LanePlot Reference:Plot 38

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))

Target Carbon Dioxide Emission Rate (TER) 20.94 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

13.77 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 43.6 kWh/m²

OK

2 Fabric U-values

ElementAverageHighestExternal wall0.14 (max. 0.30)0.15 (max. 0.70)OKFloor(no floor)

Roof 0.10 (max. 0.20) 0.10 (max. 0.35) **OK**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)

Maximum 10.0 **OK**

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

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.65m ²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Roofs U-value	0.1 W/m ² K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		عوا ا	r Details:						
Access Name:	Zahid Ashrof	USE		a Mirros	b a v .		CTDO	001000	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	>	Stroma Softwa					001082 on: 1.0.5.9	
Contware Hame.	Ottoma 1 0/11 2012		ty Address:				V 01010	7.0.0.0	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(4-)		ight(m)	1 (0-)	Volume(m³	<u>-</u>
				(1a) x	2	2.5	(2a) =	127.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	51.02	(4)			•		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	127.55	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
	heating he	eating	Other	, –	lotai			ill' per llou	_
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	ins				0	X ·	10 =	0	(7a)
Number of passive vents	;				0	X ·	10 =	0	(7b)
Number of flueless gas fi	ires			Ī	0	X 4	40 =	0	(7c)
				_					
							Air ch	nanges per ho	our —
Infiltration due to chimne	•				0		÷ (5) =	0	(8)
Number of storeys in the	peen carried out or is intended he dwelling (ns)	a, proceea to (1.	7), otnerwise d	ontinue tr	om (9) to	(16)		0	(9)
Additional infiltration	ine arreining (ine)					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber fi	rame or 0.35	for masonr	y constr	uction			0	(11)
	resent, use the value corresp	onding to the gr	reater wall are	a (after			'		
deducting areas of openii	ngs);	ed) or 0.1 (se	aled), else	enter 0				0	(12)
If no draught lobby, en	•	,a, or o. r (oo	aioa), 0.00	oritor o				0	(13)
• •	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubi	-	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	•							0.15	(18)
Number of sides sheltere	es if a pressurisation test has	been done or a	degree air pei	meability	is being u	sea	ı	3	(19)
Shelter factor	,		(20) = 1 -	0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								_
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2\m ÷ 4								
	1.23 1.1 1.08	0.95 0.95	5 0.92	1	1.08	1.12	1.18		
, ,,		0.00				L <u>-</u>		J	

djusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effect If mechanica		_	rate for t	he appli	cable ca	se						0.5	(2
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(2
a) If balance	d mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (22	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (I	MV) (24b)m = (22	2b)m + (23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n					•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n				•	•				0.5]			•	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-		
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
3. Heat losse	s and he	eat loss r	paramete	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	<)	k-value kJ/m²-l		A X k
oors					2	x	1.4	=	2.8	Ì			(2
/indows					8.651	x1	/[1/(1.4)+	0.04] =	11.47				(2
/alls Type1	25.7	'1	8.65	;	17.06	3 x	0.15	=	2.56				(2
/alls Type2	20.0)9	2		18.09) x	0.14	=	2.56				<u> </u>
oof	20.0	5	0		20.6	X	0.1	=	2.06				(3
otal area of e	lements	, m²			66.4								(3
for windows and include the area						ated using	g formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	n 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				21.45	(3
eat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	677.47	(3
nermal mass	parame	ter (TMF	P = Cm +	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design assess				construct	ion are no	t known pi	ecisely the	indicative	values of	TMP in Ta	able 1f		
<i>n be used inster</i> nermal bridge				ıcina Δr	nandiy l	<i>(</i>						40.0	
details of therma	`	,		• .	•	`						12.3	(3
otal fabric he			17-7	(0	,			(33) +	(36) =			33.75	(3
entilation hea	t loss ca	alculatec	d monthly	y				(38)m	= 0.33 × (25)m x (5)	1	•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
3)m= 10.65	10.53	10.4	9.79	9.67	9.06	9.06	8.94	9.3	9.67	9.91	10.16]	(;
eat transfer o	oefficier	nt, W/K						(39)m	= (37) + (37)	38)m		_	
												-	
9)m= 44.4	44.27	44.15	43.54	43.42	42.81	42.81	42.68	43.05	43.42	43.66	43.91		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.87	0.87	0.85	0.85	0.84	0.84	0.84	0.84	0.85	0.86	0.86		
		!							Average =	Sum(40) ₁	12 /12=	0.85	(40)
Number of day	·							-					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occi 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		72		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed t			se target c		.01		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								*F					
(44)m= 86.91	83.75	80.59	77.43	74.27	71.1	71.1	74.27	77.43	80.59	83.75	86.91		
	ļ								Total = Su	m(44) ₁₁₂ =		948.07	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 128.88	112.72	116.32	101.41	97.3	83.96	77.81	89.28	90.35	105.29	114.94	124.81		_
If instantaneous v	water heati	na at naint	of uso (no	hot water	r storago)	ontor O in	havas (16		Total = Su	m(45) ₁₁₂ =	= [1243.06	(45)
	1		,	ı	, , , , , , , , , , , , , , , , , , ,		· · ·	, , , -		l .=			(40)
(46)m= 19.33 Water storage	16.91 ! loss:	17.45	15.21	14.6	12.59	11.67	13.39	13.55	15.79	17.24	18.72		(46)
Storage volum) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n	o stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•			or io not		(48) x (49)) =		1	10		(50)
b) If manufactHot water stor			-							0	02		(51)
If community I	•			- (,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77					02		(-1)
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature t	factor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (55)								1.	03		(55)
Water storage	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	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	 - 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	y factor f	rom Tab	le H5 if t	here is	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 calculated f	or each	month (61)m =	(60) ÷ 3	65 × (41))m						
(61)m= 0 0	0	0	0	0	0	0	0	0	T 0	0	1	(61)
Total heat required for	water he	eating ca	alculated	for eac	h month	(62)m	 ı = 0.85 x (′45)m +	. (46)m +	(57)m +	l (59)m + (61)m	
(62)m= 184.16 162.65	171.59	154.9	152.58	137.46	133.08	144.5		160.57	168.43	180.09		(62)
Solar DHW input calculated u	using Appe	endix G or	Appendix	H (negati	l .	L	' '0' if no sola	r contribu	tion to wate	er heating)	ł	
(add additional lines if F										0,		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water heat	er				•				•	•	ı	
(64)m= 184.16 162.65	171.59	154.9	152.58	137.46	133.08	144.5	6 143.84	160.57	168.43	180.09	1	
						0	utput from wa	ater heat	er (annual)	112	1893.9	(64)
Heat gains from water I	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8 x	((46)m	n + (57)m	+ (59)m	1	
(65)m= 87.07 77.42	82.9	76.51	76.57	70.71	70.09	73.9	72.84	79.23	81.01	85.72		(65)
include (57)m in calc	ulation o	of (65)m	only if c	ylinder i	s in the o	dwellir	ng or hot w	ater is	from com	munity h	' leating	
5. Internal gains (see	Table 5	and 5a)):									
Metabolic gains (Table	5), Watt	S										
Jan Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 86.01 86.01	86.01	86.01	86.01	86.01	86.01	86.0	86.01	86.01	86.01	86.01		(66)
Lighting gains (calculat	ed in Ap	pendix l	L, equati	on L9 o	r L9a), a	lso se	e Table 5					
(67)m= 13.79 12.25	9.96	7.54	5.64	4.76	5.14	6.68	8.97	11.39	13.29	14.17		(67)
Appliances gains (calcu	ulated in	Append	dix L, eq	uation L	13 or L1	3a), a	so see Ta	ble 5	-		•	
(68)m= 149.89 151.44	147.52	139.18	128.65	118.75	112.13	110.5	8 114.5	122.84	133.37	143.27		(68)
Cooking gains (calculate	ted in Ap	pendix	L, equat	ion L15	or L15a)	, also	see Table	5	•	•	•	
(69)m= 31.6 31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6		(69)
Pumps and fans gains	(Table 5	a)			•		•		•	•		
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evaporation	n (negati	ive valu	es) (Tab	le 5)	•		•	•	•	•	•	
(71)m= -68.81 -68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.8	1 -68.81	-68.81	-68.81	-68.81		(71)
Water heating gains (Ta	able 5)						•		•	•	•	
(72)m= 117.03 115.21	111.42	106.27	102.92	98.21	94.21	99.34	101.16	106.49	112.52	115.22		(72)
Total internal gains =	·			(66)m + (67)m	ı + (68)ı	m + (69)m + ((70)m + (71)m + (72))m	•	
(73)m= 329.51 327.7	317.71	301.79	286.01	270.52	260.29	265.4	273.43	289.53	307.99	321.47		(73)
6. Solar gains:	·											
Solar gains are calculated u	ısing solar	flux from	Table 6a	and assoc	iated equa	tions to	convert to th	e applica	ble orienta	tion.		
Orientation: Access F	actor	Area		Flu			g_ Table Ch	_	FF		Gains	
Table 6d		m²			ble 6a		Table 6b		Table 6c		(W)	_
Northeast 0.9x 0.77	X	8.6	5	х	11.28	×	0.63	×	0.7	=	29.83	(75)
Northeast 0.9x 0.77	X	8.6	5	x	22.97	x	0.63	x [0.7	=	60.72	(75)
Northeast 0.9x 0.77	X	8.6	5	X	11.38	x	0.63	x	0.7	=	109.4	(75)
Northeast 0.9x 0.77	X	8.6	5	x (67.96	×	0.63	x	0.7	=	179.67	(75)
Northeast 0.9x 0.77	X	8.6	55	x (91.35	x	0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	X	8.6	55	X	97.38	x[0.63	x	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	91.1	_ x [0.63	x	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	72.63	X		0.63	x	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	50.42	x		0.63	х	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	х	8.6	55	x	28.07	x		0.63	x	0.7		74.21	(75)
Northeast _{0.9x}	0.77	х	8.6	55	x	14.2	x		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	х	8.6	55	x	9.21	x		0.63	_ x [0.7	=	24.36	(75)
•														_
Solar gains in	watts, ca	alculated	for eacl	n month			(83)m	ı = Sı	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.47	240.86	192.	.02	133.31	74.21	37.53	24.36		(83)
Total gains –	internal a	nd solar	(84)m =	= (73)m ·	+ (83)m	, watts								
(84)m= 359.34	388.42	427.11	481.46	527.51	527.99	501.15	457.	.42	406.74	363.73	345.52	345.83		(84)
7. Mean inte	rnal temp	erature	(heating	season)									
Temperature	•		`		,	from Tal	ble 9,	, Th	1 (°C)				21	(85)
Utilisation fa	_				_				` ,					
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(86)m= 0.94	0.93	0.89	0.79	0.65	0.49	0.37	0.4		0.63	0.84	0.92	0.95		(86)
Mean interna	l tompor	atura in	living or	no T1 /f/	llow et	one 2 to	7 in T	I	2 00)		1			
(87)m= 19.44	19.63	19.98	20.43	20.76	20.93	20.98	20.9		20.84	20.42	19.87	19.41		(87)
` '					<u> </u>	ļ				20.12	10.07	10.11		(- /
Temperature					r	Ť	Т		` ,	00.04	T 00 04	00.0	1	(00)
(88)m= 20.19	20.19	20.2	20.21	20.21	20.22	20.22	20.2	22	20.22	20.21	20.21	20.2		(88)
Utilisation fac	ctor for g	ains for i	rest of d	welling,	h2,m (s	ee Table	9a)					1	Ī	
(89)m= 0.94	0.92	0.87	0.77	0.61	0.43	0.3	0.3	35	0.58	0.81	0.91	0.94		(89)
Mean_interna	al temper	ature in	the rest	of dwelli	ng T2 (follow ste	eps 3	to 7	in Tabl	e 9c)			_	
(90)m= 18.1	18.37	18.87	19.51	19.95	20.16	20.21	20.	.2	20.06	19.51	18.73	18.05		(90)
									f	LA = Livir	ng area ÷ (4) =	0.45	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1 -	– fL	A) × T2					
(92)m= 18.7	18.94	19.37	19.93	20.32	20.51	20.55	20.5	_	20.41	19.92	19.25	18.66		(92)
Apply adjusti	ment to tl	he mean	internal	temper	ature fr	om Table	4e, v	whe	re appro	priate	•			
(93)m= 18.7	18.94	19.37	19.93	20.32	20.51	20.55	20.5	55	20.41	19.92	19.25	18.66		(93)
8. Space hea	ating requ	uirement					•							
Set Ti to the					ed at s	tep 11 of	Table	e 9b	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	1					T			_	_		I _	Ī	
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisation fac	,			0.62	0.45	0.22	Ι , ,		0.59	0.0	1 0 00	0.02		(94)
(94)m= 0.92	0.9	0.85	0.76		0.45	0.33	0.3	00	0.59	0.8	0.89	0.93		(34)
Useful gains (95)m= 330.75		364.71	365.49	326.14	239.85	165.81	171	8	241.26	290.79	308.22	320.62		(95)
Monthly avei						100.01	1		241.20	200.70	000.22	020.02		(55)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.	.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat						1					<u> </u>	l		• •
(97)m= 639.48	1	568.38	480.1	374.06	252.87	169.3	177.		271.74	404.71	530.34	635.13		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Vh/mor	1 = 0.02	24 x [(97)	m – (95)m] x (4	1)m	I	1	
(98)m= 229.69	182.86	151.53	82.53	35.66	0	0	0	Ó	0	84.76	159.93	233.99		
						-	-				!		1	

	Total per year (kWh/year) = Sum(98) _{15,912} =	1160.93	(98)
Space heating requirement in kWh/m²/year		22.75	(99)
9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating p Fraction of space heat from secondary/supplementary heating (Table		0	(301)
Fraction of space heat from community system 1 – (301) =	Г	1	(302)
The community scheme may obtain heat from several sources. The procedure allows	L for CHP and up to four other heat sources; th	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See Approximation of heat from Community boilers			(303a)
·	(303) × (3035) -	1	(304a)
Fraction of total space heat from Community boilers	(302) x (303a) =	1	╡`
Factor for control and charging method (Table 4c(3)) for community	nealing system	1	(305)
Distribution loss factor (Table 12c) for community heating system	L	1.05	(306)
Space heating Annual space heating requirement	Г	1160.93	, T
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	1218.98	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water besting	L		
Water heating Annual water heating requirement		1893.9	7
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1988.6	ー │(310a)
·	$0.01 \times [(307a)(307e) + (310a)(310e)] = $	32.08	(313)
Cooling System Energy Efficiency Ratio	[(3074)(3076) + (3104)(3106)] = [0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):	= (107) ÷ (014) =	0	(010)
mechanical ventilation - balanced, extract or positive input from outsi	ide	177.01	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	177.01	(331)
Energy for lighting (calculated in Appendix L)		243.51	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.71	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity	y)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor E kWh/year kg CO2/kWh k	missions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two to the control of the	fuels repeat (363) to (366) for the second fuel	94	(367a)
CO2 associated with heat source 1 [(307b)+(310b))] x 100 ÷ (367b) x 0.22 =	737.06	(367)
Electrical energy for heat distribution [(313)	x 0.52 =	16.65	(372)

Total CO2 associated with community systems	(363)(366) + (368)(372)	=	753.71	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater of	or instantaneous heater (312) x	.22 =	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		753.71	(376)
CO2 associated with electricity for pumps and fans	within dwelling (331)) x	.52 =	91.87	(378)
CO2 associated with electricity for lighting	(332))) x	.52 =	126.38	(379)
Energy saving/generation technologies (333) to (334 Item 1	4) as applicable 0.52	x 0.01 =	-269.21	(380)
Total CO2, kg/year sum of (376)	(382) =		702.75	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			13.77	(384)
El rating (section 14)			90.19	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 38

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: No Number of storeys: 1

Front of dwelling faces: South West

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

Night ventilation: False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach): 4 (Windows fully open)

Overheating Details:

Summer ventilation heat loss coefficient: 168.37 (P1)

Transmission heat loss coefficient: 33.7

Summer heat loss coefficient: 202.12 (P2)

Overhangs:

Orientation: Ratio: Z_overhangs:

North East (NE) 0 1

Solar shading:

Orientation:Z blinds:Solar access:Overhangs:Z summer:North East (NE)10.910.9

Solar gains:

Orientation FF Area Flux Shading Gains g_{-} 98.85 0.9 305.45 North East (NE) 0.9 x8.65 0.63 0.7 **Total** 305.45 (P3/P4)

Internal gains:

June July **August** 368.79 362.54 Internal gains 355.87 612.43 698.54 661.33 (P5) Total summer gains Summer gain/loss ratio 3.46 3.27 3.03 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Thermal mass temperature increment 1.3 1.3 1.3 (P7) Threshold temperature 20.76 22.47 22.13 Likelihood of high internal temperature Slight Medium Medium

Assessment of likelihood of high internal temperature: Medium

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			0001082 on: 1.0.5.9	
Address :	F	Property	Address	Plot 38					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		;	51.02	(1a) x	2	2.5	(2a) =	127.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (51.02	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	127.55	(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	2	x '	10 =	20	(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	nanges per ho	our —
'	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$ een carried out or is intended, proceed			ontinuo fr	20		÷ (5) =	0.16	(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	ruction			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)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	50		(8) + (10)					0	(16)
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] +$	•	•	•	etre of e	envelope	area	3	(17)
•	es if a pressurisation test has been do				is being u	sed		0.31	(18)
Number of sides sheltere				·	J			3	(19)
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			0.78	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.24	(21)
Infiltration rate modified f	- 1 	1	1 .		T _	T	_	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	 	1	1 0.7		1	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							_	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.3	0.3	0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28		
Calculate effe If mechanic		_	rate for t	пе арри	саріе са	se						0	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(2:
If balanced with	n heat reco	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	ed mecha	anical ve	entilation	with hea	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	d mech	anical ve	entilation	without	heat red	covery (N	ЛV) (24b)m = (22	2b)m + (23b)		_	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r				•	•			outside o) m + 0.	5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r								oft 2b)m² x	0.5]			•	
24d)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(25
3. Heat losse	s and he	eat loss r	paramet	er:									
LEMENT	Gros area	SS	Openin	gs	Net Ar A ,r		U-valı W/m2		A X U (W/	K)	k-value kJ/m²-l		A X k kJ/K
Doors					2	х	1.4	=	2.8				(2
Vindows					8.651	x1.	/[1/(1.4)+	0.04] =	11.47				(2
Valls Type1	25.7	1	8.65		17.06	3 x	0.15		2.56	$\overline{}$ [$\neg \sqcap$	(2
Valls Type2	20.0	9	2		18.09) x	0.14	_ =	2.56	$\overline{}$		\neg	(2
Roof	20.0	6	0		20.6	x	0.1	_ =	2.06	$\overline{}$		\neg	(30
otal area of e	lements	, m²			66.4								(3
for windows and * include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragraph	3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				21.45	(3
leat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	677.47	(3
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
For design asses: an be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridg				ısina An	pendix l	<						12.3	(3
details of therma	•	,		• .	•	•						12.0	\
otal fabric he			•	•				(33) +	(36) =			33.75	(3
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 22.98	22.91	22.83	22.49	22.42	22.12	22.12	22.06	22.24	22.42	22.55	22.69		(3
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (38)m		_	
39)m= 56.73	56.65	56.58	56.24	56.17	55.87	55.87	55.81	55.99	56.17	56.3	56.44		
39)m= 56.73		00.00	00.21	00.17	00.0.	00.07	00.0.	00.00			00.11		

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
0)m= 1.11	1.11	1.11	1.1	1.1	1.1	1.1	1.09	1.1	1.1	1.1	1.11		
umber of day	s in moi	oth (Tab	0 10)						Average =	Sum(40) ₁ .	12 /12=	1.1	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
-1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing enei	rgy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (TFA -13.		72		(42)
nnual averag educe the annua ot more that 125	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.01		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	i litres per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)						
4)m= 86.91	83.75	80.59	77.43	74.27	71.1	71.1	74.27	77.43	80.59	83.75	86.91	040.07	
nergy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1	L	948.07	(44
.5)m= 128.88	112.72	116.32	101.41	97.3	83.96	77.81	89.28	90.35	105.29	114.94	124.81		
instantaneous w	otor hooti	na ot noint	of upo (no	hot water	r otorogo)	ontor O in	hayaa (16		Total = Su	m(45) ₁₁₂ =	=	1243.06	(45
6)m= 0	0	0 0 ng at point	0	0	0	0	0	0	0	0	0		(46
/ater storage	-		U	0			U				0		(10
torage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47
community h	_			-			` '	ara) ant	or 'O' in /	47)			
therwise if no /ater storage		not wate	: (11115 11	iciuues i	HStaritai	ieous co	יווטט וטוויוי	ers) erik	ei O III (41)			
a) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48
emperature fa	actor fro	m Table	2b								0		(49
nergy lost fro		•	•				(48) x (49)) =			0		(50
) If manufact ot water stora 			-								0		(51
community h	•			- (• • • • • • • • • • • • • • • • • • • •					<u> </u>		(-
olume factor	-										0		(52
emperature fa	actor fro	m Table	2b								0		(53
nergy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	-	0		(54
Enter (50) or (, ,	,					((50)	EE) (44)			0		(58
ater storage	ioss cai	culated i	or eacn	montn	i		((56)m = (55) × (41)	m -				
6)m= 0 cylinder contains	0 dedicate	0 d solar sto	0 rage, (57)ı	0 n = (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 Appendi	хН	(56
7)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57
rimary circuit	loss (ar	nual) fro	m Table	3							0		(58
rimary circuit	loss cal	culated f	or each	month (•	. ,	, ,						
(modified by	factor f	rom Tabl	e H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
9)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5

Combi loss o	alculated	for each	month (′61)m =	(60) ÷ 3	65 × (41)m							
(61)m= 0	0	0	0	0	0	0	0		0	0	Ιο	0	1	(61)
	quired for	water h	L eating ca	Lulated	L I for eac	h month	(62)ı	—— m =	0 85 x (′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 109.55	`	98.87	86.2	82.71	71.37	66.13	75.8	_	76.8	89.5	97.7	106.09]	(62)
Solar DHW inpu	t calculated	using App	endix G or	· Appendix	: H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	_	
(add addition												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from	water hea	ter				•	•				!	•	•	
(64)m= 109.5	5 95.81	98.87	86.2	82.71	71.37	66.13	75.8	89	76.8	89.5	97.7	106.09]	
				•	•	•		Outp	out from wa	ater heate	er (annual) ₁	l12	1056.6	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	([(46)m	+ (57)m	+ (59)m	n]	
(65)m= 27.39	23.95	24.72	21.55	20.68	17.84	16.53	18.9	97	19.2	22.37	24.42	26.52]	(65)
include (57	m in calc	culation	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 ga	ins (Table	5), Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.0	01	86.01	86.01	86.01	86.01]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9 c	or L9a), a	lso s	ee 7	Table 5				_	
(67)m= 13.79	12.25	9.96	7.54	5.64	4.76	5.14	6.6	8	8.97	11.39	13.29	14.17]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5		-	_	
(68)m= 149.89	9 151.44	147.52	139.18	128.65	118.75	112.13	110.	.58	114.5	122.84	133.37	143.27]	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5	-			
(69)m= 31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.	6	31.6	31.6	31.6	31.6		(69)
Pumps and f	ans gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. e	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.8°	l -68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.	81	-68.81	-68.81	-68.81	-68.81]	(71)
Water heatin	g gains (T	able 5)											_	
(72)m= 36.81	35.64	33.22	29.93	27.79	24.78	22.22	25.	.5	26.67	30.07	33.92	35.65		(72)
Total interna	al gains =				(66	6)m + (67)m	า + (68	3)m +	- (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 249.29	9 248.14	239.51	225.45	210.88	197.09	188.3	191.	.57	198.94	213.11	229.39	241.9		(73)
6. Solar gai														
Solar gains are		ŭ				·	ations 1	to co		e applica		tion.		
Orientation:	Access F Table 6d	actor	Area m²		Flu Ta	ux ible 6a		Т	g_ able 6b	Т	FF able 6c		Gains (W)	
Northeast 0.9x							1 1					_		1,
Northeast 0.9x		X				11.28	X		0.63		0.7	=	29.83	(75)
		X	8.6			22.97	X		0.63	X	0.7	=	60.72	(75)
Northeast 0.9x		X	8.6			41.38	X 1		0.63	×	0.7	=	109.4	[(75)
		X				67.96	X		0.63		0.7	=	179.67	(75)
Northeast 0.9x	0.77	X	8.6	55	X	91.35	X		0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	X	8.6	65	X	97.38] x [0.63	3	_ x _	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	x	8.6	65	x	91.1] x [0.63	3	_ x _	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	55	X	72.63	x [0.63	3	x	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	Х	8.6	65	X .	50.42] x [0.63	3	x [0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	х	8.6	55	X	28.07	x	0.63	3	x	0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	14.2	×	0.63	3	x	0.7		37.53	(75)
Northeast 0.9x	0.77	х	8.6	65	х	9.21	i × i	0.63	3	i x	0.7	=	24.36	(75)
•		<u>_</u>					_			_				
Solar gains in	watts, ca	alculated	I for eacl	h month			(83)m	= Sum(74	l)m	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.47	240.86	192.0	02 133.	.31	74.21	37.53	24.36		(83)
Total gains –	internal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts							•	
(84)m= 279.12	308.86	348.91	405.12	452.38	454.56	429.16	383.	58 332.	.24	287.31	266.93	266.26		(84)
7. Mean inte	rnal temp	erature	(heating	season)									
Temperature	during h	eating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C	;)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see Ta	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Se	ер	Oct	Nov	Dec		
(86)m= 0.97	0.96	0.94	0.88	0.78	0.64	0.51	0.57	7 0.7	8	0.92	0.96	0.98		(86)
Mean interna	al temper	atura in	living ar	22 T1 (f	ollow eta	one 3 to 3	7 in Ta	ahla Oc)	!_					
(87)m= 18.6	18.82	19.25	19.85	20.39	20.76	20.9	20.8			19.86	19.13	18.55		(87)
		4!			ali a 113 a .		-1-1-0	T- 0 (0)				<u> </u>		
Temperature	19.99	19.99	erioas ir	rest of	aweiling	20 1rom 18	20.0		Ť	20	20	20		(88)
` '	ļ				<u> </u>	ļ		1 20	<u> </u>	20		20		(00)
Utilisation fa	T				· `	1	Τ	<u> </u>				1	1	(0.0)
(89)m= 0.97	0.96	0.93	0.86	0.74	0.57	0.41	0.48	3 0.7	3	0.9	0.96	0.97		(89)
Mean interna	al temper	ature in	the rest	of dwell	ng T2 (follow ste	eps 3	to 7 in T	able	9c)	_			
(90)m= 17.79	18.01	18.43	19.02	19.53	19.85	19.96	19.9	4 19.6	69	19.04	18.32	17.75		(90)
									fL	A = Livin	ig area ÷ (4	4) =	0.45	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = 1	fLA × T1	+ (1 -	- fLA) ×	T2					
(92)m= 18.16	18.37	18.8	19.39	19.92	20.26	20.39	20.3	6 20.0	08	19.41	18.69	18.11		(92)
Apply adjust	ment to tl	ne mean	internal	temper	ature fro	om Table	4e, v	vhere a	pprop	oriate	•			
(93)m= 18.16	18.37	18.8	19.39	19.92	20.26	20.39	20.3	6 20.0	08	19.41	18.69	18.11		(93)
8. Space hea	ating requ	uirement												
Set Ti to the					ned at st	tep 11 of	Table	9b, so	that	Ti,m=(76)m an	d re-calc	culate	
the utilisation	1						1 4			0.1	N.			
Jan Utilisation for	Feb	Mar	. Apr	May	Jun	Jul	Au	g Se	ер	Oct	Nov	Dec		
Utilisation factors (94)m= 0.96	0.94	0.91	0.85	0.74	0.59	0.45	0.51	0.7	'3	0.89	0.94	0.96		(94)
Useful gains					0.00	0.40	0.0	0.7	<u> </u>	0.00	0.04	0.00		(= -)
(95)m= 267.47	<u> </u>	319.01	343.29	332.88	267.11	194.3	196.5	55 242.	.97	254.9	251.96	256.31		(95)
Monthly ave														, ,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	1 14.	.1	10.6	7.1	4.2		(96)
Heat loss rat					Lm , W	=[(39)m					1	I	I	
(97)m= 786.12		696.03	590.14	461.74	316.21	211.55	220.9		 -	494.87	652.31	785.07		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Wh/mor	th = 0.02	24 x [(97)m –	(95)r	m] x (4	1)m			
(98)m= 385.88	316.83	280.5	177.73	95.88	0	0	0	0		178.53	288.25	393.4		

								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2117	(98)
Space	heatin	g require	ement in	kWh/m²	/year								41.49	(99)
8c. Sp	ace co	oling req	uiremer	nt										
Calcul	ated fo	r June, J	luly and	August.	See Tal	ole 10b	_	_			_	_	_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat lo	oss rate	e Lm (ca	lculated	using 25	5°C inter	nal temp	oerature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	525.17	413.43	424.18	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.77	0.83	0.79	0	0	0	0		(101)
Useful	loss, h	mLm (V	/atts) = ((100)m x	(101)m	-	-	-					•	
(102)m=	0	0	0	0	0	406.26	343.58	336.96	0	0	0	0		(102)
Gains	(solar (gains ca	culated	for appli	cable we	eather re	egion, se	e Table	10)				•	
(103)m=	0	0	0	0	0	596.3	565.41	513.13	0	0	0	0		(103)
		g require zero if (lwelling,	continue	ous (kW	h' = 0.02	24 x [(10	03)m – (102)m] .	x (41)m	
(104)m=	0	0	0	0	0	136.83	165.04	131.07	0	0	0	0		
_									Total	= Sum(104)	=	432.94	(104)
Cooled	fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermit	tency f	actor (Ta	able 10b)										
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	l = Sum(104)	=	0	(106)
Space of	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	34.21	41.26	32.77	0	0	0	0		
									Total	= Sum(107)	=	108.23	(107)
Space of	cooling	requirer	nent in k	kWh/m²/y	/ear				(107)	÷ (4) =			2.12	(108)
8f. Fabr	ric Ene	rgy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabric	Energy	y Efficier	псу						(99) -	+ (108) =	=		43.61	(109)

SAP Input

Property Details: Plot 38

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 51.022 m² 2.5 m

Living area: 23.04 m² (fraction 0.452)

Front of dwelling faces: South West

Opening types:

Name: Source: Type: Glazing: Argon: Frame:

SW Manufacturer Solid

NE Manufacturer Windows double-glazed Yes

Name: Gap: Frame Factor: g-value: **U-value:** Area: No. of Openings: 1.4 SW mm 0 0 2 ΝE 16mm or more 0.7 0.63 1.4 8.651

Name: Type-Name: Location: Orient: Width: Height: SW Corridor Wall South West 0 0

NE External Wall North East 0 0

Overshading: Average or unknown

Opagua Flamonts:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
External Wall	25.713	8.65	17.06	0.15	0	False	N/A
Corridor Wall	20.087	2	18.09	0.15	0.4	False	N/A
Flat Roof	20.598	0	20.6	0.1	0		N/A

Internal Elements
Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1853

Length	Psi-value		
4.795	0.289	E2	Other lintels (including other steel lintels)
13.2	0.047	E4	Jamb
21.409	0.063	E7	Party floor between dwellings (in blocks of flats)

SAP Input

5.8	0.055	E18	Party wall between dwellings
5.8	0.109	E25	Staggered party wall between dwellings
12.973	0.114	E24	Eaves (insulation at ceiling level - inverted)
8.866	0.56	E15	Flat roof with parapet
1.31	0.068	E14	Flat roof
14.714	0	P3	Intermediate floor between dwellings (in blocks of flats)
6.092	0.24	P4	Roof (insulation at ceiling level)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

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: 3
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: 0.63 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		User_l	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 38	}				
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor		_	ea(m²)	l(10) v		ight(m)	_	Volume(m³	<u>^</u>
			51.02	(1a) x		2.5	(2a) =	127.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	51.02	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	127.55	(5)
2. Ventilation rate:			41						
	main seconda heating heating		other		total			m³ per hou	r
Number of chimneys	0 + 0	+	0] = [0	X	40 =	0	(6a)
Number of open flues	0 + 0	+	0] = [0	X	20 =	0	(6b)
Number of intermittent fa	ins				2	×	10 =	20	(7a)
Number of passive vents	;			Ī	0	x	10 =	0	(7b)
Number of flueless gas fi	ires			Ĺ	0	×	40 =	0	(7c)
ŭ				L					` ′
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =		20		÷ (5) =	0.16	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise (continue fi	rom (9) to	(16)			_
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(0))-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame of	or 0.35 fc	r mason	rv consti	ruction	[(9))-1]XU.1 =	0	(10)
	resent, use the value corresponding			•					(` ' ' '
deducting areas of openii) 1 /oool	مما المم	t O					7
If no draught lobby, en	floor, enter 0.2 (unsealed) or the 0.05, else enter 0.05	J.1 (Seai	ea), eise	enter o				0	(12)
•	s and doors draught stripped							0	(14)
Window infiltration	o ama accio araagini carippoa		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelope	e area	5	(17)
·	lity value, then $(18) = [(17) \div 20] +$							0.41	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has been do	one or a de	egree air pe	rmeability	is being u	sed			7(40)
Shelter factor	tu .		(20) = 1 -	[0.075 x (19)] =			0.78	(19) (20)
Infiltration rate incorporat	ting shelter factor		(21) = (18	s) x (20) =				0.32	(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	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Easter (22a)m = (2	2)m · 4								
Wind Factor $(22a)m = (22a)m = 1.27$ 1.25	2)m ÷ 4 1.23	0.95	0.92	1 1	1.08	1.12	1.18	1	
(-20)	0 1.00 0.90	1 0.00	1 0.02	Ш.	L	12	10	J	

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.35	0.37]		
Calculate effec		•	rate for t	he appli	cable ca	se	!	!	!	!		<u>.</u>		٦ ،
If mechanica			andiv N. /O	2h) _ (22c) Em. (auation (VEVV otho	muiaa (22h) - (220)					(23a)
If balanced with) = (23a)					(23b)
		-	-	_					21.)	001.)	4 (00)	()	(23c)
a) If balance	a mecha 0	anicai ve			at recove	- ` ` 	$\frac{1R}{0}$	ŕ	 	23b) × [``) ÷ 100]]		(24a)
(- 7			0	0	<u> </u>	0		0	0		0]		(24a)
b) If balance		ı —				- 		ŕ	 		Ι ,	1		(24b)
(24b)m= 0	0	0	0	0		0	0	0	0	0	0]		(240)
c) If whole he if (22b)m				•	•				5 v (23h	,)				
(24c)m = 0	0.5 x	0	0	0	0	0	0	0	0	0	0	1		(24c)
(''						<u> </u>]		(= :0)
d) If natural v if (22b)m									0.5]					
(24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]		(24d)
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)			•	-		
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	1		(25)
2 Heatleses	مطلم مرم	ot loss i	t	~ # ·								_		
3. Heat losses	Gros	•			Net Ar	00	U-valı	110	AXU		k-value	^	ΑX	/ k
ELEMENT	area	-	Openin m		A,r		W/m2		(W/I	K)	kJ/m².		kJ/ł	
Doors					2	X	1		2					(26)
Windows					8.651	x1.	/[1/(1.4)+	0.04] =	11.47	=				(27)
Walls Type1	25.7	'1	8.65		17.06	x	0.18	= [3.07	=		П Г		(29)
Walls Type2	20.0	19	2		18.09	x	0.18	≓ <u>-</u> i	3.26	=		≓		(29)
Roof	20.6	_	0		20.6	=	0.13	<u>-</u>	2.68	륵 ;		=		(30)
Total area of el					66.4	=	0.10		2.00					(31)
* for windows and		•	effective wi	ndow H-va			ı formula 1	/[(1/LI-valu	ıe)+0 041 a	as aiven in	naragrani	h 3 2		(31)
** include the area		•				a.co a a.o	, , , , , , , , , , , , , , , , , , , ,	,[(,, o , a.o	,	.e g e	paragrap.	. 0.2		
Fabric heat los	s, W/K =	= S (A x	U)				(26)(30)) + (32) =				22.	47	(33)
Heat capacity (Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	677	.47	(34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		25	50	(35)
For design assess				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f			_
can be used instea						,								-
Thermal bridge	•	,		• .	•	`						12.	01	(36)
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			34.	10	(37)
Ventilation hea		alculated	l monthly	,					$= 0.33 \times ($	25)m x (5)	١	34.	40	_(01)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1		
(38)m= 24.45	24.32	24.19	23.58	23.46	22.93	22.93	22.84	23.14	23.46	23.69	23.93	1		(38)
` '		<u> </u>	L_5.55	_0.70	L		L	<u> </u>	<u> </u>	<u> </u>		J		(- -)
Heat transfer c			E0 00	57.0F	57.40	57 AO	57.22	r	= (37) + (37)		50 40	1		
(39)m= 58.93	58.8	58.67	58.06	57.95	57.42	57.42	57.32	57.62	57.95 Average =	58.18	58.42	58.	06	(39)
								•	Average =	Juiii(Ja)1	12 / 14=	36.		_(00)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.15	1.15	1.15	1.14	1.14	1.13	1.13	1.12	1.13	1.14	1.14	1.14		
					l .	ı	ı		Average =	Sum(40) ₁	12 /12=	1.14	(40)
Number of day	<u> </u>	nth (Tab	le 1a)	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 requ	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.		72		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the α	lwelling is	designed t	` ,		se target o		.06		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 82.56	79.56	76.56	73.55	70.55	67.55	67.55	70.55	73.55	76.56	79.56	82.56		
						_				m(44) ₁₁₂ =		900.66	(44)
Energy content of		used - cal		onthly = 4.							c, 1d)		
(45)m= 122.44	107.08	110.5	96.34	92.44	79.77	73.91	84.82	85.83	100.03	109.19	118.57		–
If instantaneous w	vater heati	ina at point	of use (no	o hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1180.91	(45)
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage	1 *		0								Ů		(10)
Storage volum	ne (litres) includir	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	nk in dw	velling, e	nter 110	litres in	(47)						
Otherwise if no		hot water	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		oclared I	occ foct	or ic kno	wo (k\\/l	2/d2v/):					0		(40)
a) If manufactTemperature f				UI IS KIIU	wii (Kvvi	i/uay).					0		(48)
Energy lost fro				oor			(48) x (49)	\ _			0		(49)
b) If manufact		-	-		or is not		(40) X (49)) =			0		(50)
Hot water stor			-								0		(51)
If community h	_		on 4.3										
Volume factor			Oh.								0		(52)
Temperature f							(47) (54)	(50) (50)		0		(53)
Energy lost fro Enter (50) or		_	, KVVh/ye	ear			(47) X (51)) x (52) x (53) =		0		(54) (55)
Water storage	` , ` `	,	or each	month			((56)m - (55) × (41)	m		0		(55)
		1			l				1	Ι ,			(EC)
(56)m= 0 If cylinder contains	0 s dedicate	d solar sto	0 rage (57)	m = (56)m	0 x [(50) = (0 H11)] ÷ (5)	0 0) else (5	0 7)m = (56)	0 m where (0 H11) is fro	m Append	ix H	(56)
					1	1							(E7)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	•	•			>	(= 0) -	,				0		(58)
Primary circuit (modified by				,	•	. ,	, ,		r tharma	etat)			
(59)m= 0	0	0	0	nere is s	olar wa	er neatii			0	0	0		(59)
(33)111= 0			U								U		(00)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
		1				· ` `		Ι ,	Ι ,	Ι ,	Ι ,	1	(61)
(61)m= 0	!	0	0	0	0	0	0	0	0	0	0	(50)	(01)
	<u> </u>						`		ì ´	ì ´	` ´ 	(59)m + (61)m 1	(00)
(62)m= 104	<u> </u>	93.92	81.89	78.57	67.8	62.83	72.1	72.96	85.02	92.81	100.79	J	(62)
Solar DHW in									r contribut	tion to wate	er heating)		
(add additio		1		0	applies 0	, see Ap		(S)	0	T 0		1	(63)
(63)m= 0		0	0	0	U	0	0	0	0	0	0	J	(03)
Output from (64)m= 104		93.92	81.89	78.57	67.8	62.83	72.1	72.96	85.02	92.81	100.79	1	
(04)111= 104	.07 91.02	93.92	01.09	10.51	07.0	02.03	<u> </u>	put from w			l	1003.77	(64)
Heat going	from woton	hooting	Is\A/lb/ma	anth A 21	= ′ [O OE	(4E)m](01)
Heat gains (65)m= 26.	1	23.48	20.47	19.64	16.95	15.71	18.02	18.24	21.26	23.2	25.2	.]]	(65)
` '	I												(00)
· ·	57)m in cal			•	yıınaer i	s in the d	aweiling	or not w	ater is t	rom com	munity r	leating	
	l gains (se):									
Metabolic o			_			·			<u> </u>	1		1	
Ja (CC) TO		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(66)
(66)m= 86.	I	86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.01	J	(66)
Lighting ga			•					1		1		1	(07)
(67)m= 13.	!	9.96	7.54	5.64	4.76	5.14	6.68	8.97	11.39	13.29	14.17	J	(67)
Appliances	- 	1						1		Т	1	1	
(68)m= 149	.89 151.44	147.52	139.18	128.65	118.75	112.13	110.58	114.5	122.84	133.37	143.27]	(68)
Cooking ga	ins (calcula	ated in Ap	pendix	L, equat	ion L15	or L15a	, also s	ee Table	5			1	
(69)m= 31	.6 31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6		(69)
Pumps and	l fans gains	(Table 5	ia)									,	
(70)m=	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g	. evaporation	on (negat	ive valu	es) (Tab	le 5)		_			_		_	
(71)m= -68	81 -68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81		(71)
Water heat	ing gains (Table 5)										_	
(72)m= 34.	97 33.86	31.56	28.43	26.4	23.54	21.11	24.23	25.33	28.57	32.23	33.87		(72)
Total inter	nal gains =	=			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m		
(73)m= 247	.45 246.35	237.85	223.96	209.49	195.85	187.19	190.29	197.6	211.61	227.7	240.12		(73)
6. Solar g	ains:												
Solar gains	Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.												
Orientation			Area		Flu		_	g_ Fable Ch	-	FF		Gains	
	Table 6d	<u> </u>	m²		1a	ble 6a		Table 6b	_ '	able 6c		(W)	_
Northeast 0.		×	8.6	55	X 1	1.28	х	0.63	X	0.7	=	29.83	(75)
Northeast _{0.}	9x 0.77	Х	8.6	55	x	22.97	x	0.63	x	0.7	=	60.72	(75)
Northeast _{0.}	9x 0.77	Х	8.6	65	X Z	11.38	x	0.63	x	0.7	=	109.4	(75)
Northeast 0.	9x 0.77	X	8.6	65	x (67.96	x	0.63	x	0.7	=	179.67	(75)
Northeast 0.	9x 0.77	x	8.6	65	x (91.35	х	0.63	х	0.7	=	241.51	(75)

Northeast _{0.9x} 0	77 ×	8.6	65	x g	97.38] x [0.63	x	0.7	=	257.47	(75)
Northeast 0.9x 0	77 x	8.6	65	x	91.1] x [0.63	x [0.7	=	240.86	(75)
Northeast 0.9x 0	77 x	8.6	65	x	72.63	x [0.63	x	0.7	=	192.02	(75)
Northeast 0.9x 0	77 x	8.6	65	х (50.42] x [0.63	x	0.7	=	133.31	(75)
Northeast 0.9x 0	77 ×	8.6	65	x 2	28.07	x [0.63	x	0.7	=	74.21	(75)
Northeast 0.9x 0	77 ×	8.6	65	х	14.2	×	0.63	x	0.7	=	37.53	(75)
Northeast 0.9x 0	77 ×	8.6	65	х	9.21	x	0.63	x [0.7	=	24.36	(75)
						_						
Solar gains in watts	, calculate	d for eac	h month			(83)m	= Sum(74)m	(82)m				
(83)m= 29.83 60.7	2 109.4	179.67	241.51	257.47	240.86	192.0	133.31	74.21	37.53	24.36		(83)
Total gains – interna	al and sola	r (84)m =	= (73)m ·	+ (83)m	, watts							
(84)m= 277.28 307.0	08 347.25	403.62	450.99	453.32	428.05	382.3	330.91	285.81	265.23	264.48		(84)
7. Mean internal te	mperature	(heating	season)								
Temperature durin	g heating p	periods i	n the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation factor fo	r gains for	living are	ea, h1,m	(see Ta	able 9a)							_
Jan Fe	b Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m= 1 1	0.99	0.97	0.9	0.74	0.57	0.65	0.9	0.99	1	1		(86)
Mean internal temp	erature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	7 in Ta	able 9c)					
(87)m= 19.7 19.8	2 20.07	20.43	20.75	20.94	20.99	20.9	7 20.82	20.41	20	19.68		(87)
Temperature durin	a heating r	periods i	n rest of	dwelling	from Ta	able 9	Th2 (°C)	•	•	•		
(88)m= 19.96 19.9		19.97	19.97	19.98	19.98	19.9		19.97	19.97	19.96		(88)
Litilization factor fo	r going for	root of d	wolling	h2 m /o/	a Tabla	. 00)	Į.	<u> </u>		!		
Utilisation factor fo	0.99	0.96	0.86	0.65	0.45	9a) 0.53	0.85	0.98	T 1	1		(89)
	<u> </u>	ļ		<u> </u>	ļ	<u> </u>	<u> </u>	ļ	<u> </u>	<u> </u>		()
Mean internal temp	1	1		ing 12 (f	1	i 	1	-	10.00	10.75		(90)
(90)m= 18.77 18.8	9 19.14	19.5	19.8	19.95	19.98	19.9		19.49 fl Δ = Livi	19.08 ng area ÷ (18.75	0.45	(90)
								127 (— 21VI	ing area . (, -	0.45	(31)
Mean internal temp		1			i	- ` -		1	,			
(92)m= 19.19 19.3		19.92	20.23	20.4	20.43	20.4		19.9	19.49	19.17		(92)
Apply adjustment t				1	1	1		r '	T 40 40	40.47		(02)
(93)m= 19.19 19.3		19.92	20.23	20.4	20.43	20.4	3 20.3	19.9	19.49	19.17		(93)
8. Space heating r			ro obtoir	and at at	an 11 af	Toble	Ob oo the	t Tim	(76)m on	d ro oolo	uloto	
Set Ti to the mean the utilisation factor				ieu at st	ерттог	Table	90, SO III <i>a</i>	at 11,111=	(70)III aII	u re-caic	uiale	
Jan Fe		Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
Utilisation factor fo	r gains, hn		, ,	•	•		<u> </u>	•	<u> </u>			
(94)m= 1 1	0.99	0.96	0.87	0.69	0.51	0.58	0.87	0.98	1	1		(94)
Useful gains, hmG	m , W = (9	4)m x (8	4)m									
(95)m= 276.69 305.8	343.66	388.26	392.96	311.4	216.44	223.5	286.61	280.34	264.17	264.03		(95)
Monthly average e	xternal ten	perature	e from Ta	able 8								
(96)m= 4.3 4.9	6.5	8.9	11.7	14.6	16.6	16.4		10.6	7.1	4.2		(96)
Heat loss rate for r	1	· ·	1		T			r e	1_	-		(0=)
(97)m= 877.4 847.		639.82	494.43	332.89	220.06	230.7		539.1	720.88	874.6		(97)
Space heating req		1					- i - ` -	í - `	- 	454.00		
(98)m= 446.93 363.9	314.36	181.13	75.5	0	0	0	0	192.52	328.84	454.26		

								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2357.43	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year								46.2	(99)
8c. Sp	pace cod	oling req	uiremen	it										
Calcu	lated for	r June, J	luly and	August.	See Tal	ole 10b	_						i	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	Lm (ca	lculated	using 2	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)	ı	
(100)m=	0	0	0	0	0	539.72	424.88	435.62	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm										ı	
(101)m=	0	0	0	0	0	0.87	0.93	0.9	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = (100)m x	(101)m								1	
(102)m=	0	0	0	0	0	471.92	395.02	390.34	0	0	0	0		(102)
Gains	(solar g	gains cal	culated	for appli	cable we	eather re	gion, se	e Table	10)				1	
(103)m=	0	0	0	0	0	595.06	564.3	511.86	0	0	0	0		(103)
			ement fo. 104)m <			lwelling,	continue	ous (kW	h') = 0.02	24 x [(10	03)m – (102)m]>	x (41)m	
(104)m=	0	0	0	0	0	88.66	125.94	90.41	0	0	0	0		
l									Total	= Sum(104)	=	305.01	(104)
Cooled	fraction	1							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency fa	actor (Ta	able 10b)									1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	' = Sum(104)	= [0	(106)
		requirer	nent for	month =	(104)m	× (105)	× (106)r	n					1	<u> </u>
(107)m=	0	0	0	0	0	22.16	31.49	22.6	0	0	0	0		
									Total	= Sum(107)	=	76.25	(107)
Space	cooling	requiren	nent in k	:Wh/m²/y	/ear				(107)	÷ (4) =			1.49	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabric Energy Efficiency (99) + (108) = 47												47.7	(109)	
Targe	et Fabrio	Energ	y Efficie	ncy (TF	EE)								54.85	(109)

		User I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			0001082 on: 1.0.5.9	
Address :	F	Property	Address	Plot 38					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			51.02	(1a) x	2	2.5	(2a) =	127.55	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (51.02	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	127.55	(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	nanges 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	ruction			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	250 averaged in autic mate		(8) + (10)					0	(16)
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	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							3	(19)
Shelter factor			(20) = 1 -		19)] =			0.78	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.12	(21)
Infiltration rate modified f	- 1 	11	1 4	0.5.5	0-4	Nan	Data	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
(-2)::-	77 7.0 0.0	I 5.0	1 5.7		I 7.5	I 7.5	I 7./	I	
Wind Factor $(22a)m = (2a)m =$	2)m ÷ 4						1	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

djusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effect If mechanica		_	rate for t	he appli	cable ca	se						0.5	(2
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(2
a) If balance	d mech	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	ı)m = (22	2b)m + (23b) × [′	1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (I	MV) (24b)m = (22	2b)m + (23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n					•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n				•	•				0.5]			•	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-		
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
3. Heat losse	s and he	eat loss r	paramete	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	<)	k-value kJ/m²-l		A X k
oors					2	x	1.4	=	2.8	Ì			(2
/indows					8.651	x1	/[1/(1.4)+	0.04] =	11.47				(2
/alls Type1	25.7	'1	8.65	;	17.06	3 x	0.15	=	2.56				(2
/alls Type2	20.0)9	2		18.09) x	0.14	=	2.56				<u> </u>
oof	20.0	5	0		20.6	X	0.1	=	2.06				(3
otal area of e	lements	, m²			66.4								(3
for windows and include the area						ated using	g formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	n 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				21.45	(3
eat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	677.47	(3
nermal mass	parame	ter (TMF	P = Cm +	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design assess				construct	ion are no	t known pi	ecisely the	indicative	values of	TMP in Ta	able 1f		
<i>n be used inster</i> nermal bridge				ıcina Δr	nandiy l	<i>(</i>						40.0	
details of therma	`	,		• .	•	`						12.3	(3
otal fabric he			17-7	(0	,			(33) +	(36) =			33.75	(3
entilation hea	t loss ca	alculatec	d monthly	y				(38)m	= 0.33 × (25)m x (5)	1	•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
3)m= 10.65	10.53	10.4	9.79	9.67	9.06	9.06	8.94	9.3	9.67	9.91	10.16]	(;
eat transfer o	oefficier	nt, W/K						(39)m	= (37) + (37)	38)m		_	
												-	
9)m= 44.4	44.27	44.15	43.54	43.42	42.81	42.81	42.68	43.05	43.42	43.66	43.91		

Heat loss para	meter (l	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.87	0.87	0.85	0.85	0.84	0.84	0.84	0.84	0.85	0.86	0.86		
Number of day	ro in mo	nth /Tab	lo 10)					,	Average =	Sum(40) ₁ .	12 /12=	0.85	(40)
Number of day 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>	<u> </u>			<u> </u>		<u> </u>		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	pancy,	N								1.	72		(42)
if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)			` ,
Annual averag	e hot wa										.01		(43)
Reduce the annua	_				-	-	to achieve	a water us	se target o	f			
not more that 125								_					
Jan Hot water usage in	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	·			1			, ,				1		
(44)m= 86.91	83.75	80.59	77.43	74.27	71.1	71.1	74.27	77.43	80.59	83.75	86.91	0.40.07	7(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D)Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		948.07	(44)
(45)m= 128.88	112.72	116.32	101.41	97.3	83.96	77.81	89.28	90.35	105.29	114.94	124.81		
()										m(45) ₁₁₂ =	l l	1243.06	(45)
lf instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(- /			 `
(46)m= 19.33	16.91	17.45	15.21	14.6	12.59	11.67	13.39	13.55	15.79	17.24	18.72		(46)
Water storage													
Storage volum	e (litres)) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	•			•			` '		(01.1)				
Otherwise if no Water storage		not wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWh	n/dav).					0		(48)
Temperature fa				51 10 Ki10	**** (1*)	"day).					0		(49)
Energy lost fro				ar			(48) x (49)	١ –					(50)
b) If manufact		_	-		or is not		(40) X (40)	, –			10		(30)
Hot water stora			-							0.	02		(51)
If community h	_		on 4.3										
Volume factor										1.	03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	_	03		(54)
Enter (50) or (, ,	,								1.	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m 				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 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 Table	3							0		(58)
Primary circuit	loss cal	culated f	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(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 $(61)m = (60) \div 365 \times (41)m$ $(61)m = $														
(61)m= 0	0	0	0	01)111 =	00) - 0	0 700)	0	0	0	0	1	(61)
	l			alculated	l for ea	ch month						<u> </u>	J · (59)m + (61)m	` ,
(62)m= 184.1		171.59	154.9	152.58	137.46		144		143.84	160.57	168.43	180.09]	(62)
Solar DHW inpu		using App	endix G o	r Appendix	L : H (nega	I tive quantit) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)]	
(add addition												0,		
(63)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(63)
Output from	water hea	ter				•						!	•	
(64)m= 184.1	6 162.65	171.59	154.9	152.58	137.46	133.08	144	.56	143.84	160.57	168.43	180.09]	
	•							Outp	out from wa	ater heate	er (annual)	l12	1893.9	(64)
Heat gains for	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (6	1)m	1] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	n]	
(65)m= 87.07	7 77.42	82.9	76.51	76.57	70.71	70.09	73.	91	72.84	79.23	81.01	85.72]	(65)
include (5	7)m in cal	culation	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	Aı	ug	Sep	Oct	Nov	Dec]	
(66)m= 103.2	1 103.21	103.21	103.21	103.21	103.21	103.21	103	.21	103.21	103.21	103.21	103.21]	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5				_	
(67)m= 34.47	7 30.62	24.9	18.85	14.09	11.9	12.85	16.	71	22.43	28.47	33.23	35.43]	(67)
Appliances of	gains (calc	ulated ir	Append	dix L, eq	uation I	_13 or L1	3a), a	also	see Ta	ble 5		-	_	
(68)m= 223.7	1 226.03	220.18	207.73	192.01	177.23	167.36	165	.04	170.89	183.35	199.07	213.84]	(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a), als	o se	e Table	5	-	-	_	
(69)m= 47.0 ⁴	47.04	47.04	47.04	47.04	47.04	47.04	47.	04	47.04	47.04	47.04	47.04]	(69)
Pumps and t	fans gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g.	evaporatio	on (nega	tive valu	es) (Tab	le 5)									
(71)m= -68.8	1 -68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.	.81	-68.81	-68.81	-68.81	-68.81]	(71)
Water heating	ng gains (T	Table 5)											_	
(72)m= 117.0	3 115.21	111.42	106.27	102.92	98.21	94.21	99.	34	101.16	106.49	112.52	115.22]	(72)
Total intern	al gains =				(60	6)m + (67)n	า + (68	3)m +	- (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 456.6	6 453.31	437.95	414.29	390.47	368.79	355.87	362	.54	375.93	399.76	426.26	445.93		(73)
6. Solar gai														
Solar gains ar		•					ations	to co		e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
North coat a a					_		1						. ,	1,
Northeast 0.9		X			X	11.28	X		0.63	×	0.7	=	29.83	(75)
Northeast 0.9	<u> </u>	X			X	22.97	X		0.63	×	0.7	=	60.72	(75)
Northeast 0.9		X	8.6		x	41.38	X		0.63	×	0.7	=	109.4	[(75)
Northeast 0.9		X	8.6		-	67.96	X 1		0.63	×	0.7	_ =	179.67](75)
Northeast 0.9	0.77	X	8.6	65	X	91.35	X		0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	Х	8.6	55	x	9	7.38	x		0.63	x	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	(91.1	x		0.63	_ x	0.7		240.86	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	7	2.63	x		0.63	x	0.7		192.02	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	5	0.42	x		0.63	_ x [0.7		133.31	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	2	8.07	x		0.63	_ x [0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	,	14.2	x		0.63	×	0.7	= =	37.53	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	Ç	9.21	x		0.63		0.7	- -	24.36	(75)
								•							
Solar gains in	watts, ca	alculated	for eacl	n month				(83)m	n = Si	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	25	57.47	240.86	192	2.02	133.31	74.21	37.53	24.36		(83)
Total gains – i	nternal a	nd solar	(84)m =	(73)m	+ (8	33)m	, watts					_			
(84)m= 486.5	514.03	547.35	593.96	631.98	62	26.26	596.73	554	.55	509.23	473.97	463.8	470.3		(84)
7. Mean inter	rnal temp	erature	(heating	season)										
Temperature						area f	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisation fac	•	•			-					, ,					_
Jan	Feb	Mar	Apr	May	È	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 0.89	0.86	0.81	0.71	0.57	().42	0.31	0.3	35	0.53	0.74	0.85	0.9		(86)
Mean interna	l temper	atura in l	living ar	 22 T1 (f	الد	w sta	ns 3 to 7	7 in T	Table	2 0c)			!		
(87)m= 19.8	19.96	20.24	20.6	20.84	_	0.96	20.99	20.		20.9	20.61	20.17	19.77		(87)
` ′	ļ						<u> </u>					1	1		` '
Temperature	20.19	eating p	eriods ir 20.21		1	elling _{0.22}	20.22	20.		12 (°C) 20.22	20.21	20.21	20.2	Ī	(88)
(88)m= 20.19	20.19	20.2	20.21	20.21		0.22	20.22	20.	.22	20.22	20.21	20.21	20.2		(00)
Utilisation fac	r Š				1		1	T .				_		1	>
(89)m= 0.88	0.85	0.79	0.68	0.54).37	0.26	0.2	29	0.48	0.71	0.83	0.88		(89)
Mean interna	l temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	eps 3	3 to 7	7 in Tabl	e 9c)	_			
(90)m= 18.61	18.83	19.23	19.72	20.03	2	0.18	20.21	20.	.21	20.12	19.75	19.14	18.57		(90)
										f	LA = Livi	ng area ÷ (4) =	0.45	(91)
Mean interna	ıl temper	ature (fo	r the wh	ole dwe	lling	g) = fl	LA × T1	+ (1	– fL	.A) × T2					
(92)m= 19.15	19.34	19.69	20.11	20.4	2	0.53	20.56	20.	.56	20.47	20.14	19.61	19.11		(92)
Apply adjustr	ment to t	ne mean	internal	temper	atu	re fro	m Table	4e,	whe	re appro	priate	•			
(93)m= 19.15	19.34	19.69	20.11	20.4	2	0.53	20.56	20.	.56	20.47	20.14	19.61	19.11		(93)
8. Space hea	ating requ	uirement													
Set Ti to the					ned	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the utilisation						Luc	11			Con	0 = 4	Nev	l Daa		
Jan Utilisation fac	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	<u> A</u>	ug	Sep	Oct	Nov	Dec		
(94)m= 0.86	0.83	0.78	0.68	0.54		0.39	0.28	0.3	31	0.5	0.71	0.82	0.87		(94)
Useful gains					`		0.20			0.0	0.7 1	0.02	0.07		(- /
(95)m= 417.53	1	427.7	404.66	344.04	24	15.32	167.42	174	.35	255.44	335.06	379.33	407.77		(95)
Monthly aver			perature				<u> </u>								
(96)m= 4.3	4.9	6.5	8.9	11.7	$\overline{}$	14.6	16.6	16	5.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m	x [(9:	3)m-	– (96)m]	1	1	I	
(97)m= 659.12	639.35	582.32	488.29	377.53	25	53.85	169.58	177	'.48	274.42	414.08	546.12	654.71		(97)
Space heating	g require	ement fo	r each m	nonth, k	Wh	/mont	th = 0.02	24 x	[(97)	m – (95)m] x (4	11)m		•	
(98)m= 179.74	141.73	115.04	60.21	24.91		0	0)	0	58.79	120.09	183.72		

	Total per year (kWh/year) = Sum(98) _{15,912} =	884.24	(98)
Space heating requirement in kWh/m²/year		17.33	(99)
9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating praction of space heat from secondary/supplementary heating (Tabl		0	(301)
Fraction of space heat from community system 1 – (301) =	·	1	(302)
The community scheme may obtain heat from several sources. The procedure allows	•	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See A Fraction of heat from Community boilers	ppendix C.	1	(303a)
Fraction of total space heat from Community boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating	L	kWh/year	- ·
Annual space heating requirement		884.24	
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	928.45	(307a)
Efficiency of secondary/supplementary heating system in % (from Ta	able 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating	_		_
Annual water heating requirement		1893.9	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1988.6	(310a
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	29.17	(313)
Cooling System Energy Efficiency Ratio	Ī	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outs	ide	177.01	(330a)
warm air heating system fans		0	` ☐(330b
pump for solar water heating	L T	0	 ☐(330g
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	177.01	(331)
Energy for lighting (calculated in Appendix L)	<u> </u>	243.51	<u> </u> (332)
Electricity generated by PVs (Appendix M) (negative quantity)	<u> </u>	-518.71	
Electricity generated by wind turbine (Appendix M) (negative quantity	y)	0	(334)
10b. Fuel costs – Community heating scheme	L		
Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP (307a) x	4.24 x 0.01 =	39.37	(340a
Water heating from CHP (310a) x	4.24 x 0.01 =	84.32	(342a)

			Fuel Price		
Pumps and fans	(331)	[13.19 × 0.0	1 = 23.35	(349)
Energy for lighting	(332)	[13.19 × 0.0	1 = 32.12	(350)
Additional standing charges (Table 12)				120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (345)(354) =		299.15	(355)
11b. SAP rating - Community heating	scheme				
Energy cost deflator (Table 12)				0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0]	=			(357)
SAP rating (section12)				81.75	(358)
12b. CO2 Emissions – Community hea	ting scheme				
		Energy kWh/year	Emission fact kg CO2/kWh	or Emissions kg CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)	. , , ,	g two fuels repeat (36	3) to (366) for the second	I fuel 94	(367a)
CO2 associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b	0.22	= 670.3	(367)
Electrical energy for heat distribution		[(313) x	0.52	= 15.14	(372)
Total CO2 associated with community s	systems	(363)(366) + (368).	(372)	= 685.44	(373)
CO2 associated with space heating (se	condary)	(309) x	0	= 0	(374)
CO2 associated with water from immer	sion heater or instantane	eous heater (312	0.22	= 0	(375)
Total CO2 associated with space and v	vater heating	(373) + (374) + (375)	=	685.44	(376)
CO2 associated with electricity for pum	ps and fans within dwelli	ng (331)) x	0.52	= 91.87	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	= 126.38	(379)
Energy saving/generation technologies Item 1	(333) to (334) as applica	able [0.52 x 0.0°	1 = -269.21	(380)
Total CO2, kg/year	sum of (376)(382) =	•		634.48	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			12.44	(384)
El rating (section 14)				91.15	(385)
13b. Primary Energy – Community hea	ting scheme	_	D :	5.5	
		Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space an Efficiency of heat source 1 (%)			3) to (366) for the second	I fuel 94	(367a)
Energy associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b) x 1.22	= 3785.96	(367)
Electrical energy for heat distribution		[(313) x		= 89.55	(372)
Total Energy associated with community	ty systems	(363)(366) + (368).	(372)	= 3875.52	(373)
if it is negative set (373) to zero (unle	ess specified otherwise, s	see C7 in Appena	lix C)	3875.52	(373)
Energy associated with space heating	(secondary)	(309) x	0	= 0	(374)

Total Primary Energy, kWh/year sum of (37	' 6)(382) =			3574.07	(383)
Energy saving/generation technologies Item 1		3.07 × 0.01	= [-1592.44	(380)
Energy associated with electricity for lighting	(332))) x	3.07	=	747.56	(379)
Energy associated with electricity for pumps and fans within	dwelling (331)) x	3.07	=	543.43	(378)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Total Energy associated with space and water heating	(373) + (374) + (375) =			3875.52	(376)
Energy associated with water from immersion heater or insta	antaneous heater(312) x	1.22	=	0	(375)

		User D)etails: _											
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	<u> </u>	Strom Softwa					0001082 on: 1.0.5.9						
Address	F	Property	Address	Plot 38										
Address: 1. Overall dwelling dime	ensions:													
		Are	a(m²)		Av. He	ight(m)		Volume(m	3)					
Ground floor		5	51.02	(1a) x	2	2.5	(2a) =	127.55	(3a)					
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	51.02	(4)			_							
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	127.55	(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	Ī - Ē	0	x2	20 =	0	(6b)					
Number of intermittent fa	ns			, <u> </u>	2	x '	10 =	20	(7a)					
Number of passive vents	· · · · · · · · · · · · · · · · · · ·			F	0	x -	10 =	0	(7b)					
Number of flueless gas fi	ires			F	0	X 4	40 =	0	(7c)					
-				L										
Air changes per hour Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div (5) =$ 0.16 (8)														
	•			[20		÷ (5) =	0.16	(8)					
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otnerwise (continue tr	om (9) to	(16)		0	(9)					
Additional infiltration	ino direning (rie)					[(9)-	-1]x0.1 =	0	(10)					
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			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 (seale	ed), else	enter 0				0	(12)					
If no draught lobby, en	ter 0.05, else enter 0							0	(13)					
Percentage of windows	s and doors draught stripped							0	(14)					
Window infiltration			0.25 - [0.2	. ,	-			0	(15)					
Infiltration rate			(8) + (10)					0	(16)					
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] + (18)$	•		•	etre of e	envelope	area	5	(17)					
•	es if a pressurisation test has been do				is being u	sed		0.41	(18)					
Number of sides sheltere		·	,	,	J			3	(19)					
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			0.78	(20)					
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.32	(21)					
Infiltration rate modified f	- 1 	1	1 .			T	_	1						
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec							
Monthly average wind sp	 	1 20	2.7		T 42	1 4 5	4.7	1						
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	l						
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							

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m						
0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.35	0.37]		
Calculate effec		•	rate for t	he appli	cable ca	se	!	!	!	!		<u>.</u>		٦ ،
If mechanica			andiv N. /O	2h) _ (22c) Em. (auation (VEVV otho	muiaa (22h) - (220)					(23a)
If balanced with) = (23a)					(23b)
		-	-	_					21.)	001.)	4 (00)	()	(23c)
a) If balance	a mecha 0	anicai ve			at recove	- ` ` 	$\frac{1R}{0}$	ŕ	 	23b) × [``) ÷ 100]]		(24a)
(- 7			0	0	<u> </u>	0		0	0		0]		(24a)
b) If balance		ı —				- 		ŕ	 		Ι ,	1		(24b)
(24b)m= 0	0	0	0	0		0	0	0	0	0	0]		(240)
c) If whole he if (22b)m				•	•				5 v (23h	,)				
(24c)m = 0	0.5 x	0	0	0	0	0	0	0	0	0	0	1		(24c)
(''						<u> </u>]		(= :0)
d) If natural v if (22b)m									0.5]					
(24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57]		(24d)
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)			•	-		
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	1		(25)
2 Heatleses	مطلم مرم	ot loss i	t	~ # ·								_		
3. Heat losses	Gros	•			Net Ar	00	U-valı	110	AXU		k-value	^	ΑX	/ k
ELEMENT	area	-	Openin m		A,r		W/m2		(W/I	K)	kJ/m².		kJ/ł	
Doors					2	X	1		2					(26)
Windows					8.651	x1.	/[1/(1.4)+	0.04] =	11.47	=				(27)
Walls Type1	25.7	'1	8.65		17.06	x	0.18	= [3.07	=		П Г		(29)
Walls Type2	20.0	19	2		18.09	x	0.18	≓ <u>-</u> i	3.26	=		≓		(29)
Roof	20.6	_	0		20.6	=	0.13	<u>-</u>	2.68	륵 ;		=		(30)
Total area of el					66.4	=	0.10		2.00					(31)
* for windows and		•	effective wi	ndow H-va			ı formula 1	/[(1/LI-valu	ıe)+0 041 a	as aiven in	naragrani	h 3 2		(31)
** include the area		•				a.co a a.og	, , , , , , , , , , , , , , , , , , , ,	,[(,, o , a.o	,	.e g e	paragrap.	. 0.2		
Fabric heat los	s, W/K =	= S (A x	U)				(26)(30)) + (32) =				22.	47	(33)
Heat capacity (Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	677	.47	(34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		25	50	(35)
For design assess				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f			_
can be used instea						,								-
Thermal bridge	•	,		• .	•	`						12.	01	(36)
if details of therma Total fabric hea		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			34.	10	(37)
Ventilation hea		alculated	l monthly	,					$= 0.33 \times ($	25)m x (5)	١	34.	40	_(01)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1		
(38)m= 24.45	24.32	24.19	23.58	23.46	22.93	22.93	22.84	23.14	23.46	23.69	23.93	1		(38)
` '		<u> </u>	L_5.55	_0.70	L		L	<u> </u>	<u> </u>	<u> </u>		J		(- -)
Heat transfer c			E0 00	57.0F	57.40	57.40	57.22	r	= (37) + (37)		50 40	1		
(39)m= 58.93	58.8	58.67	58.06	57.95	57.42	57.42	57.32	57.62	57.95 Average =	58.18	58.42	58.	06	(39)
								•	Average =	Juiii(Ja)1	12 / 14=	36.		_(00)

Heat loss para	ımeter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.15	1.15	1.15	1.14	1.14	1.13	1.13	1.12	1.13	1.14	1.14	1.14		
	!		<u>. </u>	!	<u>. </u>	!	!		Average =	Sum(40) ₁	12 /12=	1.14	(40)
Number of day	1		· ·										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								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		72		(42)
Annual average Reduce the annual not more that 125	, al average	hot water	usage by	5% if the c	lwelling is	designed i	,		se target o		5.06		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x							
(44)m= 82.56	79.56	76.56	73.55	70.55	67.55	67.55	70.55	73.55	76.56	79.56	82.56		
Energy content of	hat water	used sel	aulatad m	anthly 1	100 v Vd v		Tm / 260/			im(44) ₁₁₂ =		900.66	(44)
Energy content of										1			
(45)m= 122.44	107.08	110.5	96.34	92.44	79.77	73.91	84.82	85.83	100.03	109.19	118.57	1100.01	(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		10tal = Su	ım(45) ₁₁₂ =	•	1180.91	(43)
(46)m= 18.37	16.06	16.57	14.45	13.87	11.96	11.09	12.72	12.87	15	16.38	17.79		(46)
Water storage		!	<u>!</u>	Į	<u>!</u>	ļ	Į	<u>!</u>	!	<u> </u>			
Storage volum	` '					•		ame ves	sel		150		(47)
If community h Otherwise if no	-			-			, ,	ora) ant	or 'O' in <i>(</i>	(47)			
Water storage		not wate	וו פוווט) ופ	iciudes i	HStafftaf	ieous cc	ווטט וטווונ	ers) erik	ei O III ((47)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
b) If manufact			-										(54)
Hot water store If community h	-			ie z (KVV	n/iitre/ua	ay)					0		(51)
Volume factor	•		011 110								0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	(54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where ((H11) is fro	m Append	хH	
(57)m= 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	loss (ar	nnual) fro	m Table	e 3		· · · · · ·	· · · · · ·	· · · · · ·			0		(58)
Primary circuit	,	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by			ı —		ı —			-	1	- 			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loog oo	Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m													
$\begin{array}{c c} \text{Combinoss ca} \\ \hline \text{(61)m=} & 0 \end{array}$	lculated 0	or each	0	0	(60) ÷ 30	05 × (41))m 0	Το	0	0	Ιο	1	(61)	
											<u> </u>] · (59)m + (61)m	(01)	
(62)m= 169.03	149.17	157.09	141.43	139.03	124.86	120.51	131.41		146.62	154.28	165.17	(59)III + (61)III]	(62)	
Solar DHW input		<u> </u>	<u> </u>	<u> </u>								1	(02)	
(add additiona									i contribu	lion to wate	er ricating)			
(63)m= 0	0	0	0	0	0	0	0		0	0	0	1	(63)	
Output from w	ater hea	ter		<u>I</u>				Į.			<u> </u>	J		
(64)m= 169.03		157.09	141.43	139.03	124.86	120.51	131.41	130.92	146.62	154.28	165.17]		
		ļ	ļ.	Į	<u> </u>	<u>!</u>	Ot	Itput from w	ater heate	r (annual)	112	1729.53	(64)	
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m		-	
(65)m= 77.99	69.27	74.02	68.11	68.01	62.6	61.85	65.48	1	70.54	72.38	76.7	1	(65)	
include (57)	m in calc	culation of	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 ga	ains (see	Table 5	and 5a):	-			_						
Metabolic gains (Table 5), Watts														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(66)m= 86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.01	86.01	1	(66)	
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				-		
(67)m= 13.79	12.25	9.96	7.54	5.64	4.76	5.14	6.68	8.97	11.39	13.29	14.17]	(67)	
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5		•	-		
(68)m= 149.89	151.44	147.52	139.18	128.65	118.75	112.13	110.58	114.5	122.84	133.37	143.27		(68)	
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5		-	-		
(69)m= 31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6]	(69)	
Pumps and fa	ns gains	(Table 5	5a)									_		
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3]	(70)	
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)									
(71)m= -68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81	-68.81]	(71)	
Water heating	gains (T	able 5)										_		
(72)m= 104.82	103.09	99.49	94.59	91.41	86.94	83.14	88.01	89.74	94.81	100.53	103.09]	(72)	
Total internal	gains =	l			(66))m + (67)m	n + (68)m	n + (69)m +	(70)m + (7	71)m + (72))m	_		
(73)m= 320.3	318.58	308.77	293.11	277.5	262.25	252.21	257.07	265.01	280.84	299	312.34		(73)	
6. Solar gain	s:													
Solar gains are		•				•	tions to	convert to th	ne applical		tion.			
Orientation:	Access F Table 6d		Area m²		Flu	ix ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)		
_							, –		_ '				7	
Northeast 0.9x	0.77	X	8.6			1.28	X	0.63		0.7	=	29.83	(75)	
Northeast 0.9x	0.77	X	8.6			22.97] x _	0.63	x	0.7	=	60.72	(75)	
Northeast 0.9x	0.77	X	8.6			11.38] x	0.63		0.7	=	109.4	<u> </u> (75)	
Northeast 0.9x	0.77	X	8.6	==	-	67.96	X	0.63	x	0.7	=	179.67	(75)	
Northeast _{0.9x}	0.77	X	8.6	S5	X (91.35	X	0.63	Х	0.7	=	241.51	(75)	

Northeast _{0.9x}	0.77	X	8.6	55	x	9	7.38	x		0.63	x	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	Х	8.6	55	x	9	91.1	x		0.63	x	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	7	2.63	x		0.63	x	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	5	0.42	x		0.63	_ x [0.7		133.31	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	2	8.07	х		0.63	x [0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	X	8.6	55	х	1	14.2	x		0.63	×	0.7		37.53	(75)
Northeast 0.9x	0.77	X	8.6	55	x [9	9.21	x		0.63		0.7	_ =	24.36	(75)
_								•							
Solar gains in v	watts, ca	alculated	for eacl	n month				(83)m	n = Si	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	25	7.47	240.86	192	.02	133.31	74.21	37.53	24.36		(83)
Total gains – ir	nternal a	nd solar	(84)m =	(73)m	+ (8	3)m ,	, watts							•	
(84)m= 350.13	379.3	418.17	472.78	519.01	51	9.72	493.07	449	.09	398.32	355.05	336.53	336.7		(84)
7. Mean intern	nal temp	erature	(heating	season)										
Temperature						area f	rom Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisation fac	_	•			•					, ,					_
Jan	Feb	Mar	Apr	May	È	Jun	Jul	А	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.95	0.85	0	.67	0.5	0.5	57	0.84	0.97	0.99	1		(86)
Mean internal	temper	atura in l	living ar	 22 T1 (f	ساما	w stai	ne 3 to 7	Tin T	I	2 9c)					
(87)m= 19.83	19.95	20.19	20.53	20.82		0.96	20.99	20.		20.88	20.52	20.13	19.81		(87)
` '															
Temperature (88)m= 19.96	19.96	19.96	erioas ir 19.97	19.97	_	9.98	19.98	19.		12 (°C)	19.97	19.97	19.96		(88)
` '									90	19.90	19.97	19.97	19.90		(00)
Utilisation fac					_	<u> </u>		T				 		İ	(00)
(89)m= 1	0.99	0.98	0.93	0.8	0	.58	0.39	0.4	45	0.76	0.96	0.99	1		(89)
Mean internal	temper	ature in	the rest	of dwell	ng	T2 (fo	ollow ste	eps 3	to 7	7 in Tabl	e 9c)			•	
(90)m= 18.41	18.59	18.94	19.43	19.8	19	9.96	19.98	19.	98	19.88	19.42	18.85	18.38		(90)
										f	LA = Livi	ng area ÷ (4	4) =	0.45	(91)
Mean internal	temper	ature (fo	r the wh	ole dwe	lling	g) = fL	_A × T1	+ (1	– fL	A) × T2					
(92)m= 19.05	19.2	19.5	19.93	20.26	20	0.41	20.44	20.	43	20.33	19.92	19.42	19.03		(92)
Apply adjustm	nent to th	ne mean	internal	temper	atuı	re fro	m Table	4e,	whe	re appro	priate	_		•	
(93)m= 19.05	19.2	19.5	19.93	20.26	20	0.41	20.44	20.	43	20.33	19.92	19.42	19.03		(93)
8. Space heat															
Set Ti to the re the utilisation					ed	at ste	ep 11 of	Tabl	le 9t	o, so tha	t Ti,m=	(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May		Jun	Jul	<u>Γ</u>	ug	Sep	Oct	Nov	Dec		
Utilisation fac				iviay		Juli	Jui		ug	Sep	Oct	INOV	Dec		
(94)m= 0.99	0.99	0.98	0.93	0.82	0	.62	0.44	0.5	51	0.79	0.96	0.99	0.99		(94)
Useful gains,	hmGm ,	W = (94	1)m x (84	4)m		!			!			<u>!</u>			
(95)m= 347.92	375.43	408.72	441.16	423.49	32	20.33	218.25	227	.33	314.63	339.35	332.6	334.94		(95)
Monthly avera	age exte	rnal tem	perature	from T	able	 e 8						1			
(96)m= 4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m	x [(9	3)m-	– (96)m]			•	
(97)m= 869.32	840.97	762.9	640.21	496.04	33	3.58	220.24	231	.13	359.12	540.04	716.95	866.22		(97)
Space heating		ement fo	r each m	nonth, k	/Vh/	mont/	h = 0.02	24 x [(97)	m – (95)m] x (4	1)m		•	
(98)m= 387.92	312.84	263.52	143.32	53.98		0	0	C)	0	149.31	276.73	395.27		

boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kg CO2/kWh Energy kg CO2/kWh						Tota	l per year	(kWh/yea	r) = Sum(9	98) _{15,912} =	1982.88	(98)	
Space heating: Fraction of space heat from secondary/supplementary system	Space heating requirement in kWh/m²/year							38.86	(99)				
Fraction of space heat from secondary/supplementary system	9a. Energy requirements – I	ndividual h	eating s	ystems i	ncluding	micro-C	CHP)						
Fraction of space heating from main system (s) Fraction of total heating from main system 1 (204) = (202) × (1 - (203)) =										ı		-	
Fraction of total heating from main system 1 (204) = (202) x (1 - (203)) =	•			mentary	-		(204)				0	= '	
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	·	-	. ,			,	,	(2.2.2)			1	╡` ′	
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year	_	•				(204) = (2	02) × [1 –	(203)] =				╡` ′	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year		0,			24							╡` ′	
Space heating requirement (calculated above) 387.92 312.84 263.52 143.32 53.98 0 0 0 0 149.31 276.73 395.27		.	·	g systen	Ո, % 	ī	ī	.	i		-	`	
Secondary 312.84 263.52 143.32 53.98 0 0 0 0 149.31 276.73 395.27 (211) = {[[(98)m × (204)] 3 × 100 ÷ (206) Total (kWh/year) = Sum(211),s		_ ' _	<u> </u>		Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	∍ar	
(211)m = { [(98)m x (204)] } x 100 ÷ (206)	·	` 1	 	<u></u>	0	0	0	149.31	276.73	395.27	ı		
## 414.89 334.59 281.84 153.28 57.73 0 0 0 0 158.69 295.97 422.75			ļ									(211)	
Space heating fuel (secondary), kWh/month = { [[(98)m x (201)] } x 100 ÷ (208)				0	0	0	0	159.69	295.97	422.75	ı	(=11)	
Section Sect	L ! !		•		•	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,101}	2=	2120.73	(211)	
Calcing Calc	Space heating fuel (second	lary), kWh	/month							'		_	
Total (kWhyear) = Sum(215) Lasa				1		ı	ı	ı	1		ı		
Water heating Output from water heater (calculated above) Efficiency of water heater 79.8 (216) (217)m= 86.96 86.74 86.18 84.85 82.53 79.8 79.8 79.8 84.86 86.36 87.06 2217) Fuel for water heating, kWh/month (219)m= (64)m x 100 + (217)m Total = Sum(219a)_{19} = 2061.14 (219)m= 194.37 171.96 182.28 166.68 168.46 156.46 151.01 164.68 164.06 172.78 178.66 189.72 Annual totals kWh/year Space heating fuel used, main system 1 Energy (230a) (230c) Water heating pump: 30 (230c) Colspan="8">2061.14 (230a) 1 2061.14 243.51 (232) 1 2061.14 243.51 (232) 2061.14 2061.14 2061.14 2061.14 2061.14 2061.14 2061.14 <td co<="" td=""><td>(215)m= 0 0 0</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td><td></td><td>_</td><td></td><td></td><td></td><td>7(045)</td></td>	<td>(215)m= 0 0 0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td>7(045)</td>	(215)m= 0 0 0	0	0	0	0			_				7(045)
Output from water heater (calculated above) 169.03 149.17 157.09 141.43 139.03 124.86 120.51 131.41 130.92 146.62 154.28 165.17 Efficiency of water heater	Water heating					TOLA	ii (KVVII/yea	ar) =Surri(2	213) _{15,101}	2=	0	(215)	
169.03 149.17 157.09 141.43 139.03 124.86 120.51 131.41 130.92 146.62 154.28 165.17	_	alculated a	bove)										
(217) 86.96 86.74 86.18 84.85 82.53 79.8 79.8 79.8 79.8 79.8 84.86 86.36 87.06 (217)			1	124.86	120.51	131.41	130.92	146.62	154.28	165.17	ı		
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = 194.37 171.96 182.28 166.68 168.46 156.46 151.01 164.68 164.06 172.78 178.66 189.72 Total = Sum(219a)2 = 2061.14 (219) Annual totals	Efficiency of water heater										79.8	(216)	
(219)m = (64)m x 100 ÷ (217)m (219)m = 194.37	(217)m= 86.96 86.74 86.1	8 84.85	82.53	79.8	79.8	79.8	79.8	84.86	86.36	87.06		(217)	
194.37 171.96 182.28 166.68 168.46 156.46 151.01 164.68 164.06 172.78 178.66 189.72	O ,												
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kWh/year Emission factor kg CO2/kWh kg CO2/kWh kg CO2/year	` '	1	168.46	156.46	151.01	164.68	164.06	172.78	178.66	189.72	ı		
Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/year		!				Tota	I = Sum(2	19a) ₁₁₂ =			2061.14	(219)	
Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kWh/year Emission factor kg CO2/kWh kg CO2/kWh kg CO2/year	Annual totals kWh/year _								kWh/yea	<u></u>			
Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kg CO2/kWh Energy kg CO2/year	Space heating fuel used, main system 1								2120.73				
central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kg CO2/kWh Energy kg CO2/kWh	Water heating fuel used										2061.14		
boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting Energy kWh/year Energy kg CO2/kWh Energy kg CO2/kWh	Electricity for pumps, fans a	nd electric	keep-ho	t									
Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (231) Electricity for lighting 243.51 (232) 12a. CO2 emissions – Individual heating systems including micro-CHP Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/year	central heating pump:									30	ı	(230c)	
Electricity for lighting 243.51 (232) 12a. CO2 emissions – Individual heating systems including micro-CHP Energy	boiler with a fan-assisted fl	ue								45	ı	(230e)	
12a. CO2 emissions – Individual heating systems including micro-CHP Energy Emission factor kg CO2/kWh Emissions kg CO2/year	Total electricity for the above, kWh/year sum of (230a)(230g) =								75	(231)			
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year	Electricity for lighting							243.51	(232)				
kWh/year kg CO2/kWh kg CO2/year	12a. CO2 emissions – Indi	vidual heat	ing syste	ems incl	uding mi	cro-CHF)						
										tor			
	Space heating (main system	າ 1)			-					= [(261)	

Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	445.21 (264)
Space and water heating	(261) + (262) + (263) + (264) =		903.28 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	126.38 (268)
Total CO2, kg/year	sum	of (265)(271) =	1068.59 (272)

TER = 20.94 (273)