### **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 14:53:55* 

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 73.31m²Site Reference:Hermitage LanePlot Reference:Plot 39

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) 19.83 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER) 12.96 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 58.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 46.4 kWh/m²

OK

2 Fabric U-values

Element Average Highest

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

Floor (no floor)

Page Highest 0.15 (max. 0.70) OK

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		
	400.00/	
Percentage of fixed lights with low-energy fittings	100.0%	01/
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	1.02	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	ок
Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
ased on:		
Overshading:	Average or unknown	
Windows facing: North East	7.66m²	
Windows facing: South East	3.82m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Roofs U-value	0.1 W/m <sup>2</sup> K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		l lea	er Details:						
Access at Name.	Zahid Ashraf	USC		n Mirron	<b>b</b> a v .		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012	)	Stroma Softwa					001082 on: 1.0.5.9	
Contware Hame.	Ottoma 1 O/ (1 2012		rty Address:				V 01010	7.0.0.0	
Address :		·	·						
1. Overall dwelling dime	ensions:								
Ground floor		<i>,</i>	Area(m²)	(1a) x		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (45)				2.5	(2a) =	183.28	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	73.31	(4)	\	I) (O )	(0.)		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
Number of allignments	heating	eating		1 _ F			40 =		_
Number of chimneys			0	] = [	0			0	(6a)
Number of open flues	0 +	0 +	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents	<b>;</b>			L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
Air changes per hour									
Infiltration due to chimne	vs_flues and fans = (6a	)+(6b)+(7a)+(7	b)+(7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended			ontinue fr			- (3) =	0	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fr resent, use the value corresp			•	uction			0	(11)
deducting areas of openi		onaing to the g	reater wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 (se	ealed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
· ·	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubi	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	es if a pressurisation test has				is heina u	sad		0.15	(18)
Number of sides sheltere		boon done or c	a dogree dir per	modelinty	io boiling a	50 <b>u</b>		2	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified f	or monthly wind speed						•		
Jan Feb	Mar Apr May	Jun Ju	ıl 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	8 3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2\m <i>÷ 4</i>								
	1.23 1.1 1.08	0.95 0.9	0.92	1	1.08	1.12	1.18		
, ,,		3.0	1	•				J	

Adjusted infiltra	ation rat	e (allowi	na for st	nelter an	d wind s	peed) =	(21a) x	(22a)m						
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15			
Calculate effec		•	rate for t	he appli	cable ca	se	<u>I</u>		<u>I</u>	!	ļ.			_
If mechanica				al.) (aa			.=	. (22)	\ (22.)			0.	5	(23a)
If exhaust air he									) = (23a)			0.	5	(23b)
If balanced with		•	-	_								79.	05	(23c)
a) If balance						<u> </u>	<del></del>	<del>``</del>	<del> </del>	<del></del>	<del>- ` '</del>	÷ 100]		
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25			(24a)
b) If balance					1	overy (N	ЛV) (24b	<u> </u>	2b)m + (	23b)		1		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If whole he if (22b)m				•	•				5 × (23b	o)		_		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If natural v if (22b)m									0.5]			-		
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				-		
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25			(25)
3. Heat losses	s and he	at lose r	naramet	or.										
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	IE.	AXU		k-value	<u> </u>	АХ	( k
LLLIVILINI	area	-	m		A ,r		W/m2		(W/I	K)	kJ/m²-		kJ/	
Doors					2	Х	1.4	=	2.8					(26)
Windows Type	1				7.661	x1,	/[1/( 1.4 )+	0.04] =	10.16					(27)
Windows Type	2				3.819	x1,	/[1/( 1.4 )+	0.04] =	5.06	一				(27)
Walls Type1	51.2	27	11.4	В	39.79	) x	0.15	=	5.97	<b>=</b> [				(29)
Walls Type2	18.8	32	2		16.82	2 x	0.14	<u> </u>	2.38	Ħ i		7 F		(29)
Roof	63.8	31	0		63.81	X	0.1	<u> </u>	6.38	F i		7 F		(30)
Total area of el	lements	, m²			133.9									(31)
* for windows and	roof wind	ows, use e			alue calcul		formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	3.2		` ,
** include the area				ls and pan	titions		(00) (00)	. (20)						<b>-</b>
Fabric heat los		•	U)				(26)(30)		(22)	-) (0.5.)	(22.)	32.	75	(33)
Heat capacity (	`	,		TE 4) :	1 1/ 014			***	.(30) + (32	, , ,	(32e) =	136	6.8	(34)
Thermal mass	•	`		,					tive Value			10	0	(35)
For design assess can be used instead				construct	ion are noi	: known pr	ecisely the	indicative	values of	IMP IN I	able 1f			
Thermal bridge				using Ap	pendix l	<						20.	36	(36)
if details of therma	l bridging	are not kn	own (36) =	= 0.05 x (3	1)									
Total fabric hea	at loss							(33) +	(36) =			53.	11	(37)
Ventilation hea	t loss ca	alculated	l monthly	<u>/</u>				(38)m	= 0.33 × (	25)m x (5	)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m= 16.17	15.97	15.78	14.82	14.63	13.66	13.66	13.47	14.05	14.63	15.01	15.4			(38)
Heat transfer c	oefficier	nt, W/K						(39)m	= (37) + (37)	38)m				
(39)m= 69.27	69.08	68.89	67.92	67.73	66.77	66.77	66.57	67.15	67.73	68.12	68.5			

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.94	0.94	0.94	0.93	0.92	0.91	0.91	0.91	0.92	0.92	0.93	0.93		
				ı		ı	l		Average =	: Sum(40) <sub>1</sub>	12 /12=	0.93	(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	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		32		(42)
if TFA £ 13.	•	-1			V/.L -		(O.F. N.I.)	. 00					
Annual average Reduce the annual									se target o		.09		(43)
not more that 125	_				-	-			Ü				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x							
(44)m= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5		
	!			ļ.		ļ.	ļ.		Total = Su	ım(44) <sub>112</sub> =	=	1129.13	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		
									Total = Su	im(45) <sub>112</sub> =	=	1480.46	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)					
(46)m= 23.02	20.14	20.78	18.12	17.38	15	13.9	15.95	16.14	18.81	20.53	22.3		(46)
Water storage		الماليطان		olor or M	MALLIDO	otoro ao	within o		aal				(47)
Storage volum	` .	•				•		anie ves	5 <del>C</del> I		0		(47)
If community hotherwise if no	-			_			, ,	ers) enta	er '∩' in <i>(</i>	<b>(47</b> )			
Water storage		not wate	) (tillo li	1014400 1	iiotaiitai	10000 00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Cro) Crit	JI O III (	(-1)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact	turer's d	eclared o	cylinder l	loss fact	or is not	known:							, ,
Hot water stor	•			le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community he Volume factor	•		on 4.3								1		(50)
Temperature f			2h							-	.6		(52) (53)
·				oor			(47) v (51)	) x (52) x (	52) _				, ,
Energy lost fro Enter (50) or		_	, KVVII/y	zai			(47) X (31)	) X (32) X (	JJ) =	-	.03		(54) (55)
Water storage	` , ` `	,	for each	month			((56)m = (	(55) × (41)	m		.03		(00)
		1			00.00		. , ,	. , , ,	ı	1 00 00	00.04		(EC)
(56)m= 32.01 If cylinder contain	28.92	32.01	30.98	32.01 m = (56)m	30.98	32.01	32.01	30.98 7)m = (56)	32.01	30.98 (H11) is fro	32.01	iv H	(56)
										1			(==)
(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	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	` '	, ,						
(modified by			ı —				<del></del>	<u> </u>		<del>-                                    </del>			/==-
(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) ÷ 3	65 × (41	)m							
(61)m= 0 0	0	0	0	0	00 % (11)	)   0		0	0	0	0	1	(61)
Total heat required for	· water he	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= 208.77 184.17	193.81	174.27	171.16	153.49	147.94	161.	_	161.1	180.68	190.38	203.93	]	(62)
Solar DHW input calculated	using Appe	endix G or	Appendix	L H (negat	I ive quantity	v) (ent	<b></b> l er '0'	if no sola	r contribu	tion to wate	r heating)	1	
(add additional lines if											0,		
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from water hea	ter					•					•		
(64)m= 208.77 184.17	193.81	174.27	171.16	153.49	147.94	161.	.61	161.1	180.68	190.38	203.93	1	
				Į.		•	Outp	out from wa	ater heate	er (annual)	12	2131.3	(64)
Heat gains from water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	: [(46)m	+ (57)m	+ (59)m	ı ]	
(65)m= 95.26 84.58	90.28	82.95	82.75	76.04	75.03	79.	58	78.57	85.92	88.31	93.65	1	(65)
include (57)m in cal	culation c	of (65)m	only if c	ylinder i	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (see	e Table 5	and 5a	):										
Metabolic gains (Table	e 5), Watt	:S											
Jan Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(66)m= 116.19 116.19	116.19	116.19	116.19	116.19	116.19	116.	.19	116.19	116.19	116.19	116.19		(66)
Lighting gains (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee T	Table 5		-		•	
(67)m= 19.14 17	13.82	10.47	7.82	6.61	7.14	9.2	8	12.45	15.81	18.45	19.67	]	(67)
Appliances gains (cald	culated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ole 5	-		•	
(68)m= 204.9 207.02	201.67	190.26	175.86	162.33	153.29	151.	.16	156.52	167.93	182.32	195.86		(68)
Cooking gains (calcula	ated in Ap	pendix	L, equat	ion L15	or L15a	), als	o se	e Table	5	-		•	
(69)m= 34.62 34.62	34.62	34.62	34.62	34.62	34.62	34.6	62	34.62	34.62	34.62	34.62		(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	on (negat	ive valu	es) (Tab	le 5)	-					-		•	
(71)m= -92.95 -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.	95	-92.95	-92.95	-92.95	-92.95		(71)
Water heating gains (	Γable 5)			-	-						-	•	
(72)m= 128.03 125.86	121.35	115.21	111.23	105.62	100.85	106.	.96	109.13	115.48	122.65	125.87		(72)
Total internal gains =	•			(66	)m + (67)m	n + (68	3)m +	- (69)m + (	70)m + (	71)m + (72)	)m	•	
(73)m= 409.93 407.74	394.69	373.79	352.77	332.41	319.13	325.	.25	335.96	357.07	381.29	399.26	]	(73)
6. Solar gains:													
Solar gains are calculated	•	flux from	Table 6a	and assoc	ciated equa	tions t	to co	nvert to th	e applica		tion.		
Orientation: Access I		Area m²		Flu			_	g_ able 6b	-	FF able 6c		Gains	
Table 6c	! 				ble 6a		1	able ob	_ '	able 60		(W)	7
Northeast 0.9x 0.77	X	7.6	66	X	11.28	X		0.63	X	0.7	=	26.42	(75)
Northeast 0.9x 0.77	Х	7.6	66	x	22.97	X		0.63	x	0.7	=	53.77	(75)
Northeast 0.9x 0.77	X	7.6	66	X A	41.38	X		0.63	x	0.7	=	96.88	(75)
Northeast 0.9x 0.77	X	7.6	66	× (	67.96	X		0.63	x	0.7	=	159.11	(75)
Northeast 0.9x 0.77	X	7.6	66	x	91.35	X		0.63	X	0.7	=	213.87	(75)

. K		_					٦ .		_		_		_
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	97.38	X	0.63	X	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	86	X	72.63	X	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	86	X	50.42	X	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	28.07	X	0.63	X	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	14.2	X	0.63	X	0.7	=	33.24	(75)
Northeast 0.9x	0.77	X	7.6	66	x	9.21	X	0.63	X	0.7	=	21.57	(75)
Southeast 0.9x	0.77	X	3.8	32	x	36.79	x	0.63	X	0.7	=	42.94	(77)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	62.67	X	0.63	X	0.7	=	73.15	(77)
Southeast 0.9x	0.77	X	3.8	32	x	85.75	x	0.63	x	0.7	=	100.08	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	106.25	x	0.63	x	0.7		124.01	(77)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	119.01	X	0.63	x	0.7	<del>-</del>	138.9	(77)
Southeast 0.9x	0.77	x	3.8	32	x	118.15	X	0.63	x	0.7	<del>-</del>	137.9	(77)
Southeast 0.9x	0.77	x	3.8	32	x	113.91	x	0.63	x	0.7		132.95	(77)
Southeast 0.9x	0.77	X	3.8	32	x	104.39	X	0.63	x	0.7		121.84	(77)
Southeast 0.9x	0.77	x	3.8	32	x [	92.85	j x	0.63	×	0.7	_ =	108.37	(77)
Southeast 0.9x	0.77	X	3.8	32	x	69.27	X	0.63	X	0.7	= =	80.84	(77)
Southeast 0.9x	0.77	X	3.8	32	x	44.07	X	0.63	X	0.7	=	51.44	(77)
Southeast 0.9x	0.77	X	3.8	32	x [	31.49	] x	0.63	×	0.7		36.75	(77)
_					_		_						
Solar gains in	watts, cal	culated	for eacl	h month	l		(83)m	n = Sum(74)m .	(82)m				
(83)m= 69.36		196.97	283.12	352.77	1	55.9 346.24	291		146.56	84.68	58.32		(83)
													()
Total gains – i	nternal an	ıd solar	(84)m =	= (73)m ·	+ (8	3)m , watts				1	1	I	(==)
Total gains – i (84)m= 479.29		d solar 591.66	(84)m = 656.91	= (73)m · 705.54	·	3)m , watts 8.31 665.37	617		503.63	<u> </u>	457.58	1	(84)
(84)m= 479.29	534.66	591.66	656.91	705.54	698	<del></del>	617			-	1		, ,
(84)m= 479.29 7. Mean inter	534.66	591.66 erature (	656.91 (heating	705.54 season	698	8.31 665.37	ı	.13 562.38		-	1	21	, ,
(84)m= 479.29  7. Mean inter Temperature	534.66 mal tempe during he	591.66 erature ( eating pe	656.91 (heating	705.54 season the livi	698 ) ng a	8.31 665.37 area from Ta	ı	.13 562.38		-	1	21	(84)
(84)m= 479.29 7. Mean inter	534.66 mal tempe during he	591.66 erature ( eating pe	656.91 (heating	705.54 season the livi	698	8.31 665.37 area from Ta	ble 9	.13 562.38 , Th1 (°C)		3 465.96	1	21	(84)
7. Mean inter Temperature Utilisation fac	534.66 rnal tempe during he ctor for gai	591.66 erature (erating periods for li	656.91 (heating eriods in	705.54 season the livinga, h1,m	ng a	8.31 665.37 area from Ta	ble 9	.13 562.38 , Th1 (°C) ug Sep	503.63	3 465.96	457.58	21	(84)
7. Mean inter Temperature Utilisation fact  Jan  (86)m= 0.96	tor for gai	erature (eating poins for limar 0.9	656.91 (heating eriods in iving are Apr 0.83	705.54  season the livin ea, h1,m May 0.71	698 ng a (se J	8.31 665.37  area from Ta te Table 9a) lun Jul 55 0.42	ble 9	.13 562.38 , Th1 (°C) ug Sep	503.63 Oct	3 465.96 Nov	457.58 Dec	21	(84)
7. Mean inter Temperature Utilisation fact Jan (86)m= 0.96  Mean interna	temperate temperate to the following here to the following here to the following temperate tempe	erature (eating period of the formula of the formul	656.91 (heating eriods ir iving are 0.83	ros.54 season the livin ea, h1,m May 0.71 ea T1 (fo	ng an (se of one	8.31 665.37  area from Ta te Table 9a)  Jun Jul 55 0.42  v steps 3 to	ble 9 A 0.4 7 in T	.13 562.38 , Th1 (°C) ug Sep 16 0.67 Table 9c)	503.63 Oct 0.86	Nov 0.94	457.58  Dec 0.96	21	(84)
7. Mean inter Temperature Utilisation fact  Jan (86)m= 0.96  Mean interna (87)m= 19.17	temperate 19.4	erature (eating perins for lime Mar 0.9 ture in large)	656.91 (heating eriods ir iving are 0.83 iving are 20.26	ros.54 season the livin ea, h1,m May 0.71 ea T1 (for 20.65	698 ng a n (se 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	8.31 665.37  Area from Ta te Table 9a) Jun Jul 55 0.42  v steps 3 to 0.88 20.96	ble 9  A 0.4 7 in T 20.	.13   562.38 , Th1 (°C) ug   Sep 16   0.67 Table 9c) 95   20.78	503.63 Oct	Nov 0.94	457.58 Dec	21	(84)
7. Mean inter Temperature Utilisation fact  Jan (86)m= 0.96  Mean interna (87)m= 19.17  Temperature	sat.66 considering her during her	erature (eating poins for limited Mar 0.9 ture in label 19.78 eating poins	656.91 (heating eriods ir iving are 0.83 iving are 20.26 eriods ir	705.54  season the livin ea, h1,m May 0.71 ea T1 (for 20.65	ng an (se of one	8.31 665.37  Area from Table 9a)  Jun Jul  55 0.42  v steps 3 to  0.88 20.96  Elling from Table 9a)	ble 9  A  0.4  7 in T  20.  able 9	.13 562.38  , Th1 (°C)  ug Sep  16 0.67  Table 9c)  95 20.78  9, Th2 (°C)	Oct 0.86	Nov 0.94	Dec 0.96	21	(84) (85) (86) (87)
7. Mean inter Temperature Utilisation fact  Jan (86)m= 0.96  Mean interna (87)m= 19.17  Temperature (88)m= 20.13	sat.66 consists of the sector for gain sector	erature (eating poins for limited Mar 0.9 ture in label 19.78 eating poins 20.13	656.91 (heating eriods in iving are 0.83 iving are 20.26 eriods in 20.15	705.54  season the livin ea, h1,m May 0.71 ea T1 (for 20.65 rest of 20.15	ng a (se J O. Dollow dwe 20	8.31 665.37  Area from Table 9a)  Jun Jul  55 0.42  V steps 3 to  0.88 20.96  Elling from Ta  0.16 20.16	ble 9  A 0.4 7 in T 20. able 9	.13 562.38  , Th1 (°C)  ug Sep  16 0.67  Table 9c)  95 20.78  9, Th2 (°C)	503.63 Oct 0.86	Nov 0.94	457.58  Dec 0.96	21	(84)
7. Mean inter Temperature Utilisation fac  Jan (86)m= 0.96  Mean interna (87)m= 19.17  Temperature (88)m= 20.13  Utilisation fac	stor for gai	erature (eating poins for limited in limited	656.91 (heating eriods ir iving are 0.83 iving are 20.26 eriods ir 20.15 est of decrease in the control of the	ros.54 season the livin ea, h1,m May 0.71 ea T1 (for 20.65 rest of 20.15 welling,	698 ng a n (se	8.31 665.37  Area from Table 9a)  Jun Jul  55 0.42  V steps 3 to  0.88 20.96  Elling from Table  0.16 20.16  m (see Table	ble 9  A 0.4 7 in T 20. able 9 20.	.13   562.38 , Th1 (°C) ug   Sep 16   0.67 Table 9c) 95   20.78 9, Th2 (°C) 16   20.15	Oct 0.86 20.28	Nov 0.94 19.65	Dec 0.96 19.13	21	(84) (85) (86) (87) (88)
7. Mean inter Temperature Utilisation fact  Jan (86)m= 0.96  Mean interna (87)m= 19.17  Temperature (88)m= 20.13	sat.66 consists of the sector for gain sector	erature (eating poins for limited Mar 0.9 ture in label 19.78 eating poins 20.13	656.91 (heating eriods in iving are 0.83 iving are 20.26 eriods in 20.15	705.54  season the livin ea, h1,m May 0.71 ea T1 (for 20.65 rest of 20.15	698 ng a n (se	8.31 665.37  Area from Table 9a)  Jun Jul  55 0.42  V steps 3 to  0.88 20.96  Elling from Ta  0.16 20.16	ble 9  A 0.4 7 in T 20. able 9	.13   562.38 , Th1 (°C) ug   Sep 16   0.67 Table 9c) 95   20.78 9, Th2 (°C) 16   20.15	Oct 0.86	Nov 0.94	Dec 0.96	21	(84) (85) (86) (87)
7. Mean inter Temperature Utilisation fac  Jan (86)m= 0.96  Mean interna (87)m= 19.17  Temperature (88)m= 20.13  Utilisation fac	stor for gailant during he 20.13 ctor for gailant during he 20.93	erature (eating poins for limited poins for real points for real poin	656.91 (heating eriods ir iving are 20.26 eriods ir 20.15 est of do	ros.54 season the livin ea, h1,m May 0.71 ea T1 (for 20.65 rest of 20.15 welling, 0.67	698	8.31 665.37  Area from Table 9a)  Jun Jul  55 0.42  V steps 3 to  0.88 20.96  Elling from Table  0.16 20.16  m (see Table  49 0.35	ble 9  A 0.4 7 in T 20. able 9 20. 9 9a) 0.3	.13 562.38  , Th1 (°C)  ug Sep 16 0.67  Table 9c) 95 20.78  9, Th2 (°C) 16 20.15	Oct 0.86 20.28	Nov 0.94 19.65	Dec 0.96 19.13	21	(84) (85) (86) (87) (88)
7. Mean interaction factors (84)m= 479.29  7. Mean interaction factors (86)m= 0.96  Mean internaction (87)m= 19.17  Temperature (88)m= 20.13  Utilisation factors (89)m= 0.95	stor for gailant during he 20.13 ctor for gailant during he 20.93	erature (eating poins for limited poins for real points for real poin	656.91 (heating eriods ir iving are 20.26 eriods ir 20.15 est of do	ros.54 season the livin ea, h1,m May 0.71 ea T1 (for 20.65 rest of 20.15 welling, 0.67	698   1 (se   J   0.   0.     20     1 (se   20   1 (se	8.31 665.37  Area from Table 9a)  Jun Jul  55 0.42  V steps 3 to  0.88 20.96  Elling from Table  0.16 20.16  m (see Table  49 0.35	ble 9  A 0.4 7 in T 20. able 9 20. 9 9a) 0.3	.13   562.38 , Th1 (°C) ug   Sep 16   0.67 Table 9c) 95   20.78 9, Th2 (°C) 16   20.15 39   0.62 1 to 7 in Tabl 12   19.93	Oct 0.86 20.28 20.15 0.83 e 9c)	Nov 0.94 19.65 20.14 0.93	Dec 0.96 19.13 20.14 0.96	21	(84) (85) (86) (87) (88)
7. Mean interest Temperature Utilisation factors  Jan (86)m= 0.96  Mean interna (87)m= 19.17  Temperature (88)m= 20.13  Utilisation factors (89)m= 0.95  Mean interna	sat.66 considered to the constant temperature during he constant during he consta	erature (eating poins for limited in limited	656.91 (heating eriods ir iving are 20.26 eriods ir 20.15 est of do 0.8	705.54  season the livin ea, h1,m May 0.71 ea T1 (for 20.65 rest of 20.15 welling, 0.67 of dwelling	698   1 (se   J   0.   0.     20     1 (se   20   1 (se	8.31 665.37  Area from Table 9a)  Jun Jul  55 0.42  V steps 3 to  0.88 20.96  Elling from Ta  0.16 20.16  m (see Table  49 0.35	ble 9  A 0.2 7 in T 20. able 9 20. 9a) 0.3 eps 3	.13   562.38 , Th1 (°C) ug   Sep 16   0.67 Table 9c) 95   20.78 9, Th2 (°C) 16   20.15 39   0.62 1 to 7 in Tabl 12   19.93	Oct 0.86 20.28 20.15 0.83 e 9c)	Nov 0.94 19.65 20.14	Dec 0.96 19.13 20.14 0.96	0.32	(84) (85) (86) (87) (88) (89)
7. Mean interest Temperature Utilisation factors  Jan (86)m= 0.96  Mean interna (87)m= 19.17  Temperature (88)m= 20.13  Utilisation factors (89)m= 0.95  Mean interna	sat.66 during he during he of the control of the co	erature (eating perins for line for real land)	656.91 (heating eriods ir iving are 20.26 eriods ir 20.15 est of do 0.8 che rest 19.23	705.54  season the livin ea, h1,m May 0.71 ea T1 (for 20.65 n rest of 20.15 welling, 0.67 of dwelling, 19.75	698	8.31 665.37  Irea from Ta the Table 9a)  Jun Jul 55 0.42  V steps 3 to 0.88 20.96  Elling from Ta 0.16 20.16  In (see Table 49 0.35  T2 (follow steps) 0.05 20.13	ble 9  A 0.4 7 in T 20. able 9 20. 9a) 0.3 eps 3 20.	.13   562.38 , Th1 (°C) ug   Sep 16   0.67 Table 9c) 95   20.78 9, Th2 (°C) 16   20.15 39   0.62 10 7 in Tabl 12   19.93	Oct 0.86 20.28 20.15 0.83 e 9c)	Nov 0.94 19.65 20.14 0.93	Dec 0.96 19.13 20.14 0.96		(84) (85) (86) (87) (88) (89)
7. Mean interaction factors (84)m= 479.29  7. Mean interaction factors (86)m= 0.96  Mean internaction factors (87)m= 19.17  Temperature (88)m= 20.13  Utilisation factors (89)m= 0.95  Mean internaction factors (90)m= 17.66	sat.66 during he during he of the control of the co	erature (eating perins for line for real land)	656.91 (heating eriods ir iving are 20.26 eriods ir 20.15 est of do 0.8 che rest 19.23	705.54  season the livin ea, h1,m May 0.71 ea T1 (for 20.65 n rest of 20.15 welling, 0.67 of dwelling, 19.75	698   1 (se   J   0.   0.   0.     0.     0.     0.     1   0.     1   0.     1   1   1   0.     1   1   1   1   1   1   1   1   1	8.31 665.37  Irea from Ta the Table 9a)  Jun Jul 55 0.42  V steps 3 to 0.88 20.96  Elling from Ta 0.16 20.16  In (see Table 49 0.35  T2 (follow steps) 0.05 20.13	ble 9  A 0.4 7 in T 20. able 9 20. 9a) 0.3 eps 3 20.	.13 562.38  , Th1 (°C)  ug Sep  6 0.67  able 9c)  95 20.78  9, Th2 (°C)  16 20.15  39 0.62  1 to 7 in Tabl  12 19.93  f  - fLA) × T2	Oct 0.86 20.28 20.15 0.83 e 9c)	Nov 0.94 19.65 20.14 0.93 18.38 ring area ÷ (4	Dec 0.96 19.13 20.14 0.96		(84) (85) (86) (87) (88) (89)
7. Mean intermodular Temperature Utilisation factor Jan (86)m= 0.96  Mean interna (87)m= 19.17  Temperature (88)m= 20.13  Utilisation factor (89)m= 0.95  Mean interna (90)m= 17.66	sat.66 considering her during her	erature (eating perins for line 19.78 eating perins for records) and the seating perins for records to the s	cheating eriods ir iving are 20.26 eriods ir 20.15 est of dro.8 che rest 19.23 er the whole 19.56	705.54  season the livin ea, h1,m May 0.71 ea T1 (for 20.65 n rest of 20.15 welling, 0.67 of dwelling 19.75  sole dwe 20.04	698	8.31 665.37  Area from Ta the Table 9a)  Jun Jul 55 0.42  V steps 3 to 0.88 20.96  Elling from Ta 0.16 20.16  In (see Table 49 0.35  T2 (follow steps)  T2 (follow steps)  T3 (follow steps)  T4 (follow steps)  T5 (follow steps)  T6 (follow steps)  T7 (follow steps)  T8 (follow steps)  T9 (follow steps)	ble 9  A 0.4 7 in T 20. able 9  0.3 eps 3 20. + (1 20.	.13   562.38 , Th1 (°C) ug   Sep 16   0.67 Table 9c) 95   20.78 9, Th2 (°C) 16   20.15 39   0.62 10 7 in Table 12   19.93 find 12   19.93 find 12   19.93	Oct 0.86  20.28  20.15  0.83  e 9c) 19.27  LA = Liv	Nov 0.94 19.65 20.14 0.93 18.38 ring area ÷ (4	Dec 0.96 19.13 20.14 0.96 17.61 4) =		(84) (85) (86) (87) (88) (89) (90) (91)

												i	
(93)m= 18.14	18.44	18.94	19.56	20.04	20.32	20.4	20.39	20.2	19.59	18.78	18.1		(93)
8. Space hea													
Set Ti to the the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac				iviay	Our	Oui	/ rug	ОСР	001	1101	DCO		
(94)m= 0.93	0.91	0.87	0.79	0.66	0.5	0.37	0.41	0.62	0.82	0.91	0.94		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	!	<u> </u>	!			<u> </u>			
(95)m= 446.4	485.73	512.5	515.79	466.95	351.34	244.92	253.32	350.34	411.23	421.84	429.3		(95)
Monthly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]			ı	
(97)m= 959.01	935.5	856.67	724.13	564.93	381.69	253.5	265.35	409.6	609.16	795.79	951.89		(97)
Space heatin	<del></del>	1		1	I						<del>- 1</del>	1	
(98)m= 381.38	302.24	256.07	150	72.89	0	0	0	0	147.26	269.24	388.8		<b>-</b>
							Tota	l per year	(kWh/yeaı	) = Sum(9	8) <sub>15,912</sub> =	1967.89	(98)
Space heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								26.84	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme								
This part is us										unity sch	neme.		_
Fraction of spa	ace heat	from se	condary	/supplen	nentary I	neating (	(Table 1	1) '0' if n	one		l	0	(301)
Fraction of space heat from community system $1 - (301) =$								1	(302)				
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter													
includes boilers, h		-			rom powe	stations.	See Appei	ndix C.			ı	4	7(2020)
Fraction of hea			•								[	1	(303a)
Fraction of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for conf	trol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting syst	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for (	commun	ity heatii	ng syste	m					1.05	(306)
Space heating	g										'	kWh/yea	 r
Annual space	_	requiren	nent									1967.89	
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	<b>=</b>	2066.28	(307a)
Efficiency of se		•		heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
•			•	_	•	•			)1) x 100 -	ŕ	[		` (309)
Space heating	require	ment no	III Secon	iuai y/Suļ	эріеттет	lary Sysi	lem	(90) X (30	71) X 100 -	- (300) =		0	(309)
Water heating											ı		_
Annual water I	_	•									l	2131.3	
If DHW from c Water heat fro								(64) x (30	)3a) x (30	5) x (306) :	<u> </u>	2237.87	(310a)
Electricity use		•					0.01	× [(307a).					(313)
•							0.01	x [(307a).	(3076) +	(310a)(	[310 <del>e</del> ]] = [	43.04	=
Cooling System	m Energ	y Efficie	ncy Rati	0							ļ	0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											ı		<b>¬</b> .
mechanical ve	entilation	- balanc	ed, extra	act or po	sitive in	out from	outside					285.09	(330a)

warm air heating system fans			(	(330b)
pump for solar water heating			(	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	285	5.09 (331)
Energy for lighting (calculated in Appendix L)			338	3.01 (332)
Electricity generated by PVs (Appendix M) (negative	quantity)		-74	1.01 (333)
Electricity generated by wind turbine (Appendix M) (n	egative quantity)		(	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	kg CO2	
CO2 from other sources of space and water heating ( Efficiency of heat source 1 (%)	(not CHP) is CHP using two fuels repeat (363) to	(366) for the second fu	ıel	94 (367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	= 98	39.04 (367)
Electrical energy for heat distribution	[(313) x	0.52	= 2	2.34 (372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	= 10	11.38 (373)
CO2 associated with space heating (secondary)	(309) x	0	=	0 (374)
CO2 associated with water from immersion heater or	instantaneous heater (312) x	0.22	=	0 (375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		10	11.38 (376)
CO2 associated with electricity for pumps and fans w	ithin dwelling (331)) x	0.52	= 14	17.96 (378)
CO2 associated with electricity for lighting	(332))) x	0.52	= 17	75.43 (379)
Energy saving/generation technologies (333) to (334) Item 1	as applicable	0.52 x 0.01 =	-38	34.59 (380)
Total CO2, kg/year sum of (376)(	(382) =		95	50.18 (383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			1	2.96 (384)
El rating (section 14)			8	9.24 (385)

### **SAP 2012 Overheating Assessment**

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

### Property Details: Plot 39

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: South West

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

**Night ventilation:** False

Blinds, curtains, shutters:

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

### Overheating Details

Summer ventilation heat loss coefficient: 362.89 (P1)

Transmission heat loss coefficient: 53.1

Summer heat loss coefficient: 416 (P2)

### Overhangs:

Orientation:	Ratio:	Z_overhangs:
NI II E I (NIE)	•	4

North East (NE) 0 1 South East (SE) 0 1

### Solar shading:

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

### Solar gains:

Orientation		Area	Flux	<b>g</b> _	FF	Shading	Gains
North East (NE)	0.9 x	7.66	98.85	0.63	0.7	0.9	270.5
South East (SE)	0.9 x	3.82	119.92	0.63	0.7	0.9	163.6
						Total	434.09 <b>(P3/P4)</b>

### Internal gains.

	June	July	August
Internal gains	462.15	445.22	453.51
Total summer gains	925.91	879.32	827.42 <b>(P5)</b>
Summer gain/loss ratio	2.23	2.11	1.99 <b>(P6)</b>
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	19.53	21.31	21.09 <b>(P7)</b>
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight

		Hee	r Details:						
Access Name:	Zahid Ashraf	USE		n Mirron	<b>b</b> a v .		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012	•	Stroma Softwa					001082 on: 1.0.5.9	
Contware Hame.	Ottoma i Orii 2012		ty Address:				V 01010	710.0.0	
Address :		·	·						
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(10) v		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (45)		(1a) x		2.5	(2a) =	183.28	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(1n)	73.31	(4)	\	I) (O )	(0.)		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of alligners	heating he	ating		1 _ F			40 =		_
Number of chimneys		<del>-</del>	0	] = [	0			0	(6a)
Number of open flues	0 +	0 +	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				Ĺ	3		10 =	30	(7a)
Number of passive vents	3			L	0	X '	10 =	0	(7b)
Number of flueless gas f	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)	)+(6b)+(7a)+(7b	o)+(7c) =	Г	30		÷ (5) =	0.16	(8)
	peen carried out or is intended			ontinue fr			. (0) –	0.10	
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fra			•	uction			0	(11)
deducting areas of openi	resent, use the value correspongs); if equal user 0.35	onaing to the gi	reater wall are	а (аптег					
If suspended wooden	floor, enter 0.2 (unseale	d) or 0.1 (se	aled), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
· ·	s and doors draught stri	pped						0	(14)
Window infiltration			0.25 - [0.2	, ,	_			0	(15)
Infiltration rate			(8) + (10)	, , ,	, , ,			0	(16)
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	•				ia haina	and		0.31	(18)
Number of sides sheltere	es if a pressurisation test has l ed	oeen done or a	degree air pei	пеаышу	is being u	seu		2	(19)
Shelter factor	,		(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.27	(21)
Infiltration rate modified f	for monthly wind speed								
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7	•	•					•	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a)m = (2	2)m · 4								
Wind Factor $(22a)m = (2(22a)m = 1.27)$ 1.25	2)m ÷ 4 1.23 1.1 1.08	0.95 0.99	5 0.92	1	1.08	1.12	1.18		
(		3.00	0.02	•	L	L <u>~</u>		I	

Adjusted infiltra		·				<del>`                                    </del>	<u> </u>	<u> </u>	0.00	T		1		
0.34 Calculate effec	0.33 Ctive air	0.33 <b>change</b> i	0.29 ate for t	0.29 he appli	0.25 <b>cable ca</b>	0.25 S <b>e</b>	0.25	0.27	0.29	0.3	0.31			
If mechanica		_										(	0	(23
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	wise (23b	) = (23a)			(	0	(23
If balanced with	heat reco	very: effic	ency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				(	0	(23
a) If balance	d mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]		
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24
b) If balance	d mecha	anical ve	ntilation	without	heat red	overy (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)n		<u> </u>	· ·	, ,	ŕ –	· ` `	<del>_``</del>	<u> </u>	· ·	<del>í –</del>		1		(0.
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24
d) If natural if (22b)n									0 51					
(24d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.51 [(2	0.54	0.54	0.54	0.55			(24
Effective air					<u> </u>							J		•
(25)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55			(25
′												l		`
3. Heat losse		·												
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		A) kJ/	
Doors		( )			2	x	1.4		2.8	$\stackrel{\prime}{\Box}$				(26
Nindows Type	· 1				7.661	x1	/[1/( 1.4 )+	0.04] =	10.16	Ħ				(27
Vindows Type					3.819	x1.	/[1/( 1.4 )+	0.04] =	5.06	=				(27
Walls Type1	51.2	7	11.48	3	39.79	_	0.15		5.97	╡ ┌		¬ г		) (29
Nalls Type2	18.8		2		16.82	=	0.14	<b>=</b>	2.38	<b>≓</b> ;		╡╞		](29
Roof	63.8		0	=	63.81	=	0.1	╡ <sub>-</sub> ¦	6.38	<b>=</b>		╡		(30
Total area of e	L				133.9	=	0.1		0.50	[				(3 <sup>,</sup>
for windows and			ffective wi	ndow I I-va			ı formula 1	/[(1/Ll-valu	ne)+0 041 a	as aiven in	naragrant	132		(5
* include the area						atoa aomig	, rormaia r	n no vaic	0)10.04] 0	so giveii iii	paragrapi	7 0.2		
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				32.	.75	(33
leat capacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	136	66.8	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	·TFA) ir	n kJ/m²K			Indica	tive Value	: Low		10	)0	(35
For design assess				constructi	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f			
can be used instea Thermal bridge				ıcina Λn	nandiy l									٦,,,
f details of therma	,	•		• .	•	`						20.	.36	(30
Total fabric he		are not kin	own (30) =	· 0.00 x (0	'')			(33) +	(36) =			53.	.11	(37
/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= 33.74	33.6	33.47	32.84	32.73	32.18	32.18	32.08	32.39	32.73	32.96	33.21			(38
Heat transfer o	coefficier	nt, W/K			•	•	•	(39)m	= (37) + (37)	38)m	•	•		
39)m= 86.84	86.71	86.57	85.95	85.83	85.29	85.29	85.19	85.5	85.83	86.07	86.32			
,														

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
0)m= 1.18	1.18	1.18	1.17	1.17	1.16	1.16	1.16	1.17	1.17	1.17	1.18		
umber of day	s in moi	nth (Tahl	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	1.17	(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 ener	rgy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		32		(42
nnual averag educe the annua ot more that 125	l average	hot water	usage by	5% if the c	lwelling is	designed t			se target c		.09		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
4)m= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5	1120.12	(44
nergy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600			ım(44) <sub>112</sub> = ables 1b, 1	L	1129.13	(44
5)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		
instantaneous w	ater heati	na at noint	of use (no	hot water	r storage)	enter 0 in	hoves (16		Total = Su	ım(45) <sub>112</sub> =		1480.46	(45
6)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46
/ater storage	-										Ŭ		(
torage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47
community hetherwise if no	•			•			` '	ore) onto	or 'O' in <i>(</i>	(17)			
/ater storage		not wate	:i (tili5 ii	iciuues i	iistaiitai	ieous co	ווטט וטוווי	ers) erite	51 U III (	(47)			
i) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(4
emperature fa	actor fro	m Table	2b								0		(49
nergy lost fro		•					(48) x (49)	) =			0		(50
<ul> <li>) If manufact ot water stora</li> </ul>			-								0		(5 <sup>-</sup>
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)	==> (44)			0		(5
ater storage	ioss cai	culated t	or each	montn	i		((56)m = (	55) × (41)	m -				
6)m= 0 cylinder contains	0 dedicate	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (	0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (	0 (H11) is fro	0 m Appendi:	хН	(56
7)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
rimary circuit	loss (an	nual) fro	m Table	3							0		(58
rimary circuit	loss cal	culated f	or each	month (	•	. ,	, ,						
(modified by	factor fi	rom Tabl	le 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 calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	0	0	0	) 0		0	0	0	0	]	(61)
Total heat requi	red for v	water he	eating ca	alculated	L I for ea	 ch month	(62)ı	— n =	0.85 × (	′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
		117.75	102.66	98.5	85	78.76	90.3	_	91.46	106.59	116.35	126.35	]	(62)
Solar DHW input ca	lculated u	sing Appe	endix G or	· Appendix	H (nega	tive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	<b>.</b>	
(add additional I												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from wat	ter heate	er									•	•	•	
(64)m= 130.47	114.11	117.75	102.66	98.5	85	78.76	90.3	38	91.46	106.59	116.35	126.35	]	
	•	•						Outp	ut from wa	ater heate	er (annual) <sub>1</sub>	l12	1258.39	(64)
Heat gains from	water h	neating,	kWh/mo	onth 0.2	5 ´ [0.8	5 × (45)m	+ (6	1)m	i] + 0.8 x	((46)m	+ (57)m	+ (59)m	ı ]	
(65)m= 32.62	28.53	29.44	25.66	24.63	21.25	19.69	22.	6	22.87	26.65	29.09	31.59	]	(65)
include (57)m	in calcu	ulation o	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 gair	ns (see	Table 5	and 5a	):										
Metabolic gains	(Table	5), Watt	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec	]	
(66)m= 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.	.19	116.19	116.19	116.19	116.19	]	(66)
Lighting gains (d	calculate	ed in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee 7	Γable 5				-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.2	8	12.45	15.81	18.45	19.67	]	(67)
Appliances gain	ıs (calcu	lated in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5		-	-	
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.	.16	156.52	167.93	182.32	195.86	]	(68)
Cooking gains (	calculat	ed in Ap	pendix	L, equat	ion L1	or L15a	), als	o se	e Table	5		•	•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.6	62	34.62	34.62	34.62	34.62	]	(69)
Pumps and fans	s gains (	Table 5	ia)										•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(70)
Losses e.g. eva	poration	n (negat	ive valu	es) (Tab	le 5)							-	-	
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.	95	-92.95	-92.95	-92.95	-92.95	]	(71)
Water heating g	ains (Ta	able 5)				-					-	-	-	
(72)m= 43.84	42.45	39.57	35.64	33.1	29.51	26.47	30.3	37	31.76	35.82	40.4	42.46	]	(72)
Total internal g	jains =				(6	6)m + (67)m	า + (68	)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	-	
(73)m= 325.73	324.33	312.91	294.23	274.64	256.3	244.75	248.	.67	258.59	277.41	299.03	315.84	]	(73)
6. Solar gains:														
Solar gains are cal	lculated u	sing solar	flux from	Table 6a	and asso	ciated equa	tions t	о со	nvert to th	e applica		tion.		
Orientation: Ac		actor	Area			ux able 6a		т.	g_ able 6b	т	FF		Gains	
	able 6d		m²			abie 6a		- 1	able ob	_ '	able 6c		(W)	,
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	11.28	X		0.63	x	0.7	=	26.42	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	22.97	X		0.63	x	0.7	=	53.77	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	41.38	X		0.63	x	0.7	=	96.88	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	67.96	X		0.63	x	0.7	=	159.11	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	91.35	X		0.63	X	0.7	=	213.87	(75)

		_					, ,		_				_
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	97.38	X	0.63	X	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	72.63	x	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	50.42	x	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	28.07	x	0.63	X	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	x	7.6	66	x	14.2	X	0.63	X	0.7	=	33.24	(75)
Northeast <sub>0.9x</sub>	0.77	x	7.6	66	x	9.21	x	0.63	X	0.7	=	21.57	(75)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	36.79	x	0.63	X	0.7	=	42.94	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	62.67	x	0.63	X	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	85.75	x	0.63	X	0.7	=	100.08	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	106.25	x	0.63	X	0.7	=	124.01	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	119.01	x	0.63	x	0.7	=	138.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	118.15	x	0.63	×	0.7	=	137.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	113.91	x	0.63	×	0.7	_ =	132.95	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	104.39	x	0.63	×	0.7	=	121.84	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	х	92.85	x	0.63	×	0.7		108.37	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	69.27	x	0.63	×	0.7	_ =	80.84	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	44.07	x	0.63	×	0.7	=	51.44	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	х	31.49	x	0.63	×	0.7		36.75	(77)
<u> </u>	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m												
(83)m= 69.36		96.97	283.12	352.77	365.9	346.24	291	.88 226.42	146.50	6 84.68	58.32		(83)
Total gains – i (84)m= 395.09		9.88	577.34	627.41	622.21	590.99	540	.55 485.01	423.9	7 383.71	374.17	1	(84)
` '						390.99	340.	.55 405.01	423.9	303.71	374.17		(04)
7. Mean inter	· · · · · · · · · · · · · · · · · · ·		`		/			<b>-</b> :					<b>_</b>
Temperature	Ū	٠.			Ū		ble 9,	Th1 (°C)				21	(85)
Utilisation fac		$\overline{}$			<del>`</del>	<del></del>	٠.			<b>—</b>		1	
Jan	<del></del>	Mar	Apr	May	Jun	Jul	<del>                                     </del>	ug Sep	Oct	+	Dec		(06)
(86)m= 0.97	LL	).94	0.89	0.8	0.67	0.55	0.6	<u> </u>	0.92	0.96	0.98		(86)
Mean interna				· ·	1	i —	т —	1			1	1	
(87)m= 18.43	18.68 1	9.13	19.73	20.28	20.69	20.87	20.8	83 20.5	19.78	19	18.38		(87)
Temperature	during hea	ting p	eriods ir	rest of	dwellin	g from Ta	able 9	9, Th2 (°C)				•	
(88)m= 19.93	19.93	9.94	19.94	19.94	19.95	19.95	19.9	95 19.95	19.94	19.94	19.94		(88)
Utilisation fac	ctor for gain	s for r	est of d	welling,	h2,m (s	ee Table	9a)						
(89)m= 0.97	0.96	0.93	0.87	0.76	0.6	0.44	0.5	5 0.73	0.9	0.96	0.97		(89)
Mean interna	l temperatu	re in t	he rest	of dwell	ing T2 (	follow ste	eps 3	to 7 in Tabl	e 9c)		-	-	
(90)m= 17.59	<del> </del>	8.27	18.86	19.39	19.75	19.89	19.8		18.93	18.16	17.54	]	(90)
		!			•	1		f	LA = Liv	/ing area ÷ (₄	4) =	0.32	(91)
Mean interna	l temperatu	re (fo	r the wh	ole dwe	lling) =	fl A y T1	+ (1	– fl Δ) <b>⊻</b> Τ2					
(92)m= 17.86	<del> </del>	8.55	19.14	19.67	20.05	20.2	20.	<del></del>	19.2	18.43	17.81	]	(92)
					1							•	
Apply adjustr	nent to the	mean	interna	temper	ature fr	om Table	4e, '	where appro	priate	!		ı	

(93)m=	17.86	18.1	18.55	19.14	19.67	20.05	20.2	20.18	19.88	19.2	18.43	17.81		(93)
` '			uirement		10.07	20.00	20.2	20.10	13.00	10.2	10.43	17.01		(00)
					ro obtoir	and at et	op 11 of	Table 9b	o co tha	t Ti m_/	76\m an	d ro colo	ulato	
				using Ta		ieu ai sii	ер птог	i able 9t	), 50 ii ia	t 11,111=(	rojili alli	u re-caic	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	i:	· ·									
(94)m=	0.96	0.94	0.91	0.85	0.75	0.61	0.47	0.52	0.73	0.88	0.94	0.96		(94)
Usefu	l gains,	hmGm	W = (94	4)m x (8	4)m									
(95)m=	378.78	425.23	464.89	491.36	471.45	379.86	277.41	281.6	353.19	373.97	361.89	360.5		(95)
Month	nly avera	age exte	rnal tem	perature	from T	able 8		!						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m-	– (96)m	]				
(97)m=	1177.27	1144.82	1042.8	879.85	684.5	465.01	307.38	321.73	494.46	738	974.83	1174.52		(97)
Space	e heating	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)	m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	594.08	483.57	429.96	279.71	158.51	0	0	0	0	270.84	441.31	605.63		
,				•	•	•	•	Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	3263.61	(98)
Space	e heatin	a require	ement in	kWh/m²	2/vear							[	44.52	(99)
	·	•			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,							L	71.02	
			uiremer		O T									
Calcu				August.	Ĭ .		1	۸۰۰۵	Con	Oct	Nov	Doo		
Hoot	Jan	Feb	Mar	Apr	May S°C into	Jun	Jul	Aug and exte	Sep	Oct	Nov o from T	Dec		
(100)m=	0	0 Ca	0	0	0	801.7	631.13	647.42	0	0	0	0		(100)
		tor for lo				1 001.7	031.13	047.42	Ū	U	Ü	Ů		(100)
(101)m=		0	0	0	0	0.73	0.79	0.76	0	0	0	0		(101)
				100)m x			0.70	0.70	Ů	Ü	Ŭ			(101)
(102)m=	0	0	0	0	0	582.79	499.38	490.75	0	0	0	0		(102)
		_						e Table		Ü	Ů			( - /
(103)m=		0	0	0	0	813.73	775.54	718.08	0	0	0	0		(103)
				l	l			ous ( kW					c (41)m	
				3 × (98		woming,	oomma	040 ( 1111	11) — 0.01	- / / [( / c	(	,02),,,,,,,	( ( 1 / / / / /	
(104)m=	0	0	0	0	0	166.28	205.46	169.13	0	0	0	0		
'				•		•	•		Total	= Sum(	104)	=	540.87	(104)
Cooled	I fraction	1							f C =	cooled	area ÷ (4	1) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b	)										_
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	' = Sum(	104)	= [	0	(106)
	Ť	requirer	nent for	month =	(104)m	× (105)	<del>``</del>	r i						_
(107)m=	0	0	0	0	0	41.57	51.37	42.28	0	0	0	0		
									Total	= Sum(	107)	= [	135.22	(107)
Space	cooling	requirer	nent in k	(Wh/m²/y	/ear				(107)	÷ (4) =			1.84	(108)
8f. Fab	ric En <u>e</u> r	gy Effic	ency (ca	alculate <u>c</u>	l only un	der spe	cial conc	litions, se	ee sect <u>ic</u>	on 11)				
		/ Efficier	, i							+ (108) =	=		46.36	(109)
									•	•		L		_

### **SAP Input**

Address:

**England** Located in: Region: Thames valley

**UPRN:** 

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

New dwelling design stage Assessment type:

New dwelling Transaction type: Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Low

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

PCDF Version: 466

Flat Dwelling type:

Detachment:

2020 Year Completed:

Floor Location: Floor area:

Storey height:

73.311 m<sup>2</sup> 2.5 m Floor 0

23.389 m<sup>2</sup> (fraction 0.319) Living area:

South West Front of dwelling faces:

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

Manufacturer Solid SW NE Manufacturer Windows double-glazed Yes

SE Manufacturer Windows double-glazed Yes

**U-value:** No. of Openings: Name: Gap: Frame Factor: g-value: Area: SW 0 1.4 mm NF 0.7 0.63 1.4 7.661 1 16mm or more

0.63 3.819 SE 16mm or more 0.7 1.4 1

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

Average or unknown Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemen	<u>ts</u>						
External Wall	51.268	11.48	39.79	0.15	0	False	N/A
Corridor Wall	18.817	2	16.82	0.15	0.4	False	N/A
Flat Roof	63.814	0	63.81	0.1	0		N/A

Internal Elements

Party Elements

User-defined (individual PSI-values) Y-Value = 0.152 Thermal bridges:

> Length Psi-value

Other lintels (including other steel lintels) 4.918 0.29 E2

### **SAP Input**

	17.7	0.048	E4	Jamb
	35.117	0.064	E7	Party floor between dwellings (in blocks of flats)
[Approved]	5.8	0.06	E18	Party wall between dwellings
	5.8	0.098	E25	Staggered party wall between dwellings
	8.7	0.085	E16	Corner (normal)
[Approved]	2.9	-0.09	E17	Corner (inverted internal area greater than external area)
	4.259	0.131	E21	Exposed floor (inverted)
	17.679	0.56	E15	Flat roof with parapet
	2.184	0.12	E24	Eaves (insulation at ceiling level - inverted)
	38.438	0	Р3	Intermediate floor between dwellings (in blocks of flats)
	15.495	0.24	P4	Roof (insulation at ceiling level)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 2

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
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

 $Piping \! > = \! 1991, pre\text{-}insulated, low temp, variable flow$ 

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: 0.9 Tilt of collector: 30°

# **SAP Input**

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home:

Nο

		User_[	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 39	)				
Address :									
Overall dwelling dime	ensions:	۸ro	ea(m²)		۸۷ ۵۰	ight(m	\	Volume(m <sup>3</sup>	31
Ground floor				(1a) x		2.5	(2a) =	183.28	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1		73.31	(4)			` ′		`
	a)	,	73.31	J	)+(3c)+(3c	4)*(3°)*	(3n) -		<b>—</b> (5)
Dwelling volume				(3a)+(3b	)+(30)+(30	J)+(3 <del>C</del> )+	(511) =	183.28	(5)
2. Ventilation rate:	main seconda	rv	other		total			m³ per hou	ır
Number of chimneys	heating heating	-, □ + [		7 = [		<u> </u>	(40 =	-	_
Number of chimneys		ᆜᅠ닏	0	╛╘	0		(20 =	0	(6a)
Number of open flues	0 + 0	+	0	] = [	0			0	(6b)
Number of intermittent fa				Ĺ	3		(10 =	30	(7a)
Number of passive vents	3				0	Х	(10 =	0	(7b)
Number of flueless gas fi	ires				0	Х	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+	7a)+(7b)+	(7c) =	Г	20		÷ (5) =		(8)
	peen carried out or is intended, proce			continue fi	30 rom (9) to	(16)	÷ (3) =	0.16	(6)
Number of storeys in the								0	(9)
Additional infiltration						[(9	9)-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
deducting areas of openi	resent, use the value corresponding ngs); if equal user 0.35	o tne grea	ter wall are	ea (anter					
If suspended wooden	floor, enter 0.2 (unsealed) or (	).1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
•	s and doors draught stripped		0.25 - [0.2	) v (14) · 4	1001 -			0	(14)
Window infiltration Infiltration rate			(8) + (10)			+ (15) =		0	(15)
	q50, expressed in cubic metr	es per h					e area	5	(17)
•	lity value, then $(18) = [(17) \div 20] +$	•	•	•		о.ор	<b>.</b>	0.41	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere	ed		(20) = 1 -	[0.075 v./·	10\1			2	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)	`	19)] =			0.85	(20)
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (10	) X (20) =				0.35	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp		1 00.	1 7.09		1 000	1.00	1 200	J	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
`		1	1	<u> </u>	<u> </u>			ı	
Wind Factor $(22a)m = (2a)m =$	<del></del>	T 22-	1 2 2 2	<u> </u>	T 4 0 2		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	J	

		<u> </u>				peed) =	r <del>`</del>	<u>`                                    </u>			1	1	
0.45 Calculate effe	0.44 Ctive air (	0.43 Change i	0.39	0.38 he appli	0.33 cable ca	0.33	0.33	0.35	0.38	0.4	0.41		
If mechanica		-	<i>ato 101 t</i>	по арріі	oabio oa	00						0	(2
If exhaust air h	eat pump ι	ısing Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(2
If balanced with	n heat reco	very: effici	iency in %	allowing f	or in-use f	actor (from	Table 4h	) =				0	(2
a) If balance	ed mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	)m = (22	2b)m + (2	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mecha	anical ve	ntilation	without	heat rec	overy (N	/IV) (24b	)m = (22	2b)m + (2	23b)		•	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n	nouse ext n < 0.5 ×			•	•				5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilation			•	•				0.5]				
4d)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)					
5)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
oors	area	(m²)	m	<b> </b> 2	A ,r	m² X	VV/m2	K 	2	<u>&lt;)</u>	KJ/M²∙I	Λ Ι	KJ/K (2
ooro	area	(m²)	m	<sup>2</sup>	A ,r	_	W/m2		(W/I	<b>⟨</b> )	kJ/m²-l	Λ Ι	۸J/K
indows Type	e 1				7.661	x1,	<u> </u>	0.04] =	10.16	=			(2
indows Type					3.819	=	/[1/( 1.4 )+	0.04] =	5.06	=			(2
alls Type1	51.2	7	11.48	3	39.79	) x	0.18	─ <b> </b>	7.16	Ħ r		<b>–</b>	(2
/alls Type2	18.8		2		16.82	=	0.18	<b>=</b>	3.03	<b>=</b>		<b>-</b>	`(2
oof	63.8	1	0	=	63.81	x	0.13	<b>≓</b> ₌ ˈi	8.3	≓ i		<b>-</b>	<u> </u>
otal area of e					133.9	=							`` (;
or windows and include the area	l roof windo	ows, use e			alue calcul		formula 1	/[(1/U-valu	re)+0.04] a	ns given in	paragraph	3.2	`
abric heat los				/			(26)(30)	+ (32) =				35.7	(;
eat capacity		,	,					((28)	.(30) + (32	2) + (32a).	(32e) =	1366.8	(3
out oupaons		_		TE 4 \ :									
nermal mass	parame	ter (TMF	<sup>2</sup> = Cm <del>-</del>	- I FA) II	n kJ/m²K				tive Value:	Medium		250	(3
	sments wh	ere the de	tails of the	,			ecisely the	Indica			able 1f	250	(3
nermal mass or design assess	sments who ad of a det	ere the det	tails of the ulation.	constructi	ion are not	t known pr	ecisely the	Indica			able 1f	18.45	`
nermal mass or design assess on be used inste nermal bridge details of therma	sments who ead of a det es:S(L al bridging	ere the det tailed calcu x Y) calc	tails of the ulation. culated (	constructius	ion are not pendix l	t known pr	ecisely the	Indica			able 1f		`
nermal mass or design assess on be used inste nermal bridge details of therma otal fabric he	sments who ead of a det es:S(L al bridging e eat loss	ere the det tailed calcu x Y) calcu are not kn	tails of the ulation. culated ( own (36) =	constructiusing Ap	ion are not pendix l	t known pr	ecisely the	Indicative	values of (36) =	TMP in T			
nermal mass or design assess on be used inste nermal bridge details of therma otal fabric he entilation hea	sments who ad of a det es: S (L al bridging eat loss at loss ca	ere the detailed calcu x Y) calcu are not kn	tails of the ulation. culated u own (36) =	constructions and constructions are constructed as the construction of the constructio	ppendix k	t known pr		Indicative (33) + (38)m	(36) = = 0.33 × (	TMP in To	)	18.45	
nermal mass or design assess on be used inste nermal bridge details of thermal otal fabric he entilation hea	sments who ad of a det es : S (L al bridging eat loss at loss ca	ere the detailed calcu x Y) calcu are not known	tails of the ulation. culated u own (36) = I monthly	constructions and constructions are constructed using April 1985 and 1985 a	ppendix ł 1) Jun	t known pr	Aug	Indica e indicative (33) + (38)m Sep	(36) = = 0.33 × (	7MP in 75 25)m × (5 Nov	Dec	18.45	(3
nermal mass or design assess on be used insternal bridge details of thermal otal fabric he entilation hea	sments who ad of a det es: S (L al bridging eat loss at loss ca	ere the detailed calcu x Y) calcu are not kn	tails of the ulation. culated u own (36) =	constructions and constructions are constructed as the construction of the constructio	ppendix k	t known pr		Indicative (33) + (38)m	(36) = = 0.33 × (	TMP in To	)	18.45	(3)
nermal mass or design assess on be used inste nermal bridge details of thermal otal fabric he entilation hea	esments who ad of a det es: S (L al bridging eat loss cat	ere the del tailed calcu x Y) calcu are not know alculated Mar 35.85	tails of the ulation. culated u own (36) = I monthly	constructions and constructions are constructed using April 1985 and 1985 a	ppendix ł 1) Jun	t known pr	Aug	Indicative (33) + (38)m Sep 33.98	(36) = = 0.33 × (	25)m x (5 Nov 34.97	Dec	18.45	(3

Heat loss para	ımeter (l	HLP). W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.23	1.23	1.23	1.21	1.21	1.2	1.2	1.19	1.2	1.21	1.22	1.22		
	<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>	<u> </u>		ı Average =	Sum(40) <sub>1</sub>	12 /12=	1.21	(40)
Number of day	s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed east	IDODOV	N I											(40)
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 ( <sup>-</sup>	TFA -13.		32		(42)
Annual averag	,		,	•	•	_	` ,				.39		(43)
Reduce the annua not more that 125	-		• .		-	-	to achieve	a water us	se target o	r <sup>t</sup>			
		· ·		i		·			<u> </u>	<u> </u>	_		
Jan Hot water usage i	Feb	Mar Mar	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec	I	
	· ·	<u> </u>			1		· <i>´</i>			T			
(44)m= 98.33	94.75	91.18	87.6	84.03	80.45	80.45	84.03	87.6	91.18	94.75	98.33	1070.07	7(44)
Energy content of	hot water	used - cal	culated me	onthly = $4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1072.67	(44)
(45)m= 145.82	127.53	131.6	114.73	110.09	95	88.03	101.02	102.22	119.13	130.04	141.22		
(10)	1 .200	1 .0		1		00.00	101102			m(45) <sub>112</sub> =	l	1406.44	(45)
If instantaneous w	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		· otal	(10)112			` ′
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage	loss:				Į.								
Storage volum	ne (litres)	) includir	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage a) If manufact		aclared I	nee farti	nr is kna	wn (k\//k	n/day).					0		(48)
Temperature f				01 13 1(110	WII (ICVVI	i/day).					0		(49)
Energy lost fro				oar			(48) x (49)	١ _			0		
b) If manufact		-	-		or is not		(40) X (43)	, –			0		(50)
Hot water stor			-								0		(51)
If community h	_		on 4.3										
Volume factor			01								0		(52)
Temperature f											0	 	(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	` , `	,					<b>//&gt;</b>				0	I	(55)
Water storage	loss cal	culated 1	or each	month	Г		((56)m = (	55) × (41)	m ·		· · · · · · · · · · · · · · · · · · ·	ı	
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)	m = (56)m 	x [(50) – (	[H11)] ÷ (5	0), else (5	7)m = (56) 	m where (	(H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit	,	•			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)		1	
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0	0	0	0 0	00) +	T 0	0	T 0	0	0	0	1	(61)
												J (59)m + (61)m	(- /
(62)m= 123.94		111.86	97.52	93.58	80.75	74.83	85.80		101.26	110.54	120.03	]	(62)
Solar DHW input	<u> </u>											J	(- /
(add additiona										morrio wan	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from w	rater hea	ter				-1	!		ļ .	-1	!	ı	
(64)m= 123.94		111.86	97.52	93.58	80.75	74.83	85.80	86.89	101.26	110.54	120.03	]	
		<u> </u>		l .		1	C	utput from w	ater heat	er (annual)	112	1195.47	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61	)m] + 0.8	x [(46)m	n + (57)m	+ (59)m	]	_
(65)m= 30.99	27.1	27.97	24.38	23.39	20.19	18.71	21.4	<del></del>	25.32	27.63	30.01	]	(65)
include (57)	m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is	from com	munity h	neating	
5. Internal g					•						•		
Metabolic gair	ns (Table	e 5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec	]	
(66)m= 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.1	9 116.19	116.19	116.19	116.19		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e Table 5			-	-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.28	12.45	15.81	18.45	19.67	]	(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	lso see Ta	ıble 5	-	_	-	
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.1	6 156.52	167.93	182.32	195.86	]	(68)
Cooking gains	s (calcula	ted in A	ppendix	L, equat	ion L1	or L15a	), also	see Table	5	•	-	•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	]	(69)
Pumps and fa	ns gains	(Table 5	5a)					-			-	-	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(70)
Losses e.g. e	vaporatio	n (negat	tive valu	es) (Tab	le 5)			-		-	-		
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.9	5 -92.95	-92.95	-92.95	-92.95	]	(71)
Water heating	gains (T	able 5)		-				-		-	-		
(72)m= 41.65	40.33	37.59	33.86	31.44	28.04	25.14	28.8	30.17	34.03	38.38	40.33	]	(72)
Total interna	l gains =				(6	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (	71)m + (72)	)m	-	
(73)m= 323.54	322.21	310.94	292.45	272.99	254.83	243.42	247.1	5 257	275.62	297.01	313.72	]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	tions to	convert to the	ne applica		tion.		
Orientation:			Area			ux able 6a		g_ Table 6b	-	FF		Gains	
•	Table 6d		m²			abie 6a	. –	Table 6b		Table 6c		(W)	,
Northeast <sub>0.9x</sub>	0.77	Х	7.6	66	x	11.28	x	0.63	x [	0.7	=	26.42	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	22.97	X	0.63	x	0.7	=	53.77	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	41.38	x	0.63	x [	0.7	=	96.88	(75)
Northeast <sub>0.9x</sub>	0.77	х	7.6	66	x _	67.96	x	0.63	x [	0.7	=	159.11	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	91.35	X	0.63	X	0.7	=	213.87	(75)

		_						,		_				_
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	9	7.38	X	0.63	X	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	9	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	7	2.63	X	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	6	X	5	0.42	x	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	2	8.07	x	0.63	X	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	x	7.6	66	x		14.2	x	0.63	X	0.7	=	33.24	(75)
Northeast 0.9x	0.77	x	7.6	66	x	Ç	9.21	x	0.63	X	0.7	=	21.57	(75)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	3	6.79	x	0.63	x	0.7	=	42.94	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	х	6	2.67	x	0.63	x	0.7		73.15	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	х	8	5.75	x	0.63	x	0.7		100.08	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	10	06.25	x	0.63	x	0.7	<u> </u>	124.01	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	1	19.01	x	0.63	x	0.7	=	138.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	х	1	18.15	x	0.63	x	0.7	<u> </u>	137.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	1	13.91	х	0.63	x	0.7	=	132.95	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	х	1(	04.39	x	0.63	x	0.7		121.84	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	9	2.85	x	0.63	×	0.7	_ =	108.37	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	х	6	9.27	x	0.63	×	0.7	_ =	80.84	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	х	4	4.07	x	0.63	×	0.7		51.44	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	3	1.49	x	0.63	×	0.7	<del>-</del>	36.75	(77)
•								•						
Solar gains in	watts, calcu	ulated	for eac	h month	1			(83)m	n = Sum(74)m	(82)m				
(83)m= 69.36		96.97	283.12	352.77	_	65.9	346.24	291	.88 226.42	146.5	6 84.68	58.32	]	(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m	+ (8	33)m	, watts						_	
(84)m= 392.9	449.13 5	07.9	575.56	625.76	62	20.73	589.67	539	.03 483.42	422.1	8 381.69	372.04		(84)
7. Mean inter	nal tempera	ature (	(heating	seasor	1)									
Temperature	during hear	ting p	eriods ir	n the livi	ng a	area 1	from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisation fac	ctor for gains	s for l	iving are	ea, h1,m	า (ระ	ee Ta	ble 9a)							
Jan	Feb	Mar	Apr	May	Ι,	Jun	Jul	Α	ug Sep	Oc	t Nov	Dec	]	
(86)m= 1	1 C	0.99	0.98	0.92	(	).79	0.62	0.6	69 0.91	0.99	1	1	1	(86)
Mean interna	l temperatu	re in I	iving ar	ea T1 (f	ollo	w ste	ns 3 to 7	in T	able 9c)		•	•	_	
(87)m= 19.59		9.99	20.35	20.68	1	0.91	20.98	20.		20.36	3 19.91	19.57	]	(87)
Temperature	during hoo	tina n	oriode ir	roct of	سا	alling	from To	hla (	Th2 (°C)	!			1	
(88)m= 19.89		19.9	19.91	19.91	1	9.92	19.92	19.	<del></del>	19.9	19.91	19.9	1	(88)
` ′		!		!					- 1 .0.02	1	1 .0.01	1 .0.0	J	, ,
Utilisation fac					$\overline{}$				-0 005	1 000	1 4		1	(90)
(89)m= 1	1 0	).99	0.97	0.88		0.7	0.49	0.5	0.85	0.98	1	1		(89)
Mean interna	l temperatu	re in t	he rest	of dwell	ing	T2 (f	ollow ste	ps 3	to 7 in Tab	le 9c)	1	1	7	
(90)m= 18.61	18.75	9.01	19.37	19.69	1	9.88	19.92	19.		19.39	l	18.59		(90)
										tLA = Li	ving area ÷ (	4) =	0.32	(91)
Mean interna	l temperatu	re (fo	r the wh	ole dwe	lling	g) = fl	_A × T1	+ (1	– fLA) × T2				_	
(92)m= 18.92	19.06	9.32	19.69	20.01	2	0.21	20.25	20.	25 20.11	19.7	19.25	18.9		(92)
Apply adjustr	ment to the	mean	interna	l temper	atu	re fro	m Table	4e,	where appr	opriate	<del></del>			

(93)m=   18.92   19.06   19.32   19.69   20.01   20.21   20.25   20.25   20.11   19.7   19.25   18.9		(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate	te	
the utilisation factor for gains using Table 9a		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 1 1 0.99 0.96 0.89 0.72 0.53 0.6 0.86 0.98 1 1		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 392.04 447.12 502.18 554.82 555.98 447.75 312.98 323.35 417.93 413.15 380.05 371.42		(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]		
(97)m= 1322.84 1278.22 1154.13 959.06 737.03 491.98 320.75 337.02 529.54 807.25 1083.24 1316.97		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		
(98)m= 692.52 558.5 485.05 291.05 134.7 0 0 0 0 293.21 506.3 703.49		
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	3664.82	(98)
Space heating requirement in kWh/m²/year	49.99	(99)
		<b>」</b> ` ′
8c. Space cooling requirement		
Calculated for June, July and August. See Table 10b  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)		
(100)m= 0 0 0 0 0 825.07 649.52 665.75 0 0 0 0		(100)
Utilisation factor for loss hm		(100)
(101)m= 0 0 0 0 0 0.82 0.89 0.86 0 0 0 0		(101)
Useful loss, hmLm (Watts) = (100)m x (101)m		, ,
(102)m= 0 0 0 0 0 679.03 580.32 571.73 0 0 0 0		(102)
Gains (solar gains calculated for applicable weather region, see Table 10)		, ,
(103)m= 0 0 0 0 0 812.25 774.21 716.56 0 0 0 0		(103)
Space cooling requirement for month, whole dwelling, continuous ( $kWh$ ) = 0.024 $x$ [(103) $m$ – (102) $m$ ] $x$ (4	(1)m	` ,
set (104)m to zero if (104)m < $3 \times (98)$ m	,,,,,	
(104)m= 0 0 0 0 0 95.92 144.26 107.75 0 0 0 0		
Total = Sum(1.04) =	347.93	(104)
Cooled fraction $f C = cooled area \div (4) =$	1	(105)
Intermittency factor (Table 10b)		_
(106)m= 0 0 0 0 0 0.25 0.25 0 0 0 0		_
Total = Sum(1,0.4) =	0	(106)
Space cooling requirement for month = $(104)$ m × $(105)$ × $(106)$ m		_
(107)m= 0 0 0 0 0 23.98 36.06 26.94 0 0 0 0		_
Total = Sum(107) =	86.98	(107)
Space cooling requirement in kWh/m²/year (107) ÷ (4) =	1.19	(108)
8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)		
Fabric Energy Efficiency (99) + (108) =	51.18	(109)
Target Fabric Energy Efficiency (TFEE)	58.85	(109)
		<b>」</b> ` ′

		l lea	er Details:						
Access at Name.	Zahid Ashraf	USC		n Mirron	<b>b</b> a v .		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012	)	Stroma Softwa					001082 on: 1.0.5.9	
Contware Hame.	Ottoma 1 O/ (1 2012		rty Address:				V 01010	7.0.0.0	
Address :		·	·						
1. Overall dwelling dime	ensions:								
Ground floor		<i>,</i>	Area(m²)	(1a) x		ight(m)	(2a) =	Volume(m³	(3a)
	a) . (4 b) . (4 a) . (4 d) . (4 a)	. (45)				2.5	(2a) =	183.28	(Sa)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n)	73.31	(4)	\	I) (O )	(0.)		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
Number of allignments	heating	eating		1 _ F			40 =		_
Number of chimneys			0	] = [	0			0	(6a)
Number of open flues	0 +	0 +	0	] = [	0		20 =	0	(6b)
Number of intermittent fa				Ĺ	0		10 =	0	(7a)
Number of passive vents	<b>;</b>			L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a	)+(6b)+(7a)+(7	b)+(7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended			ontinue fr			- (3) =	0	(0)
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fr resent, use the value corresp			•	uction			0	(11)
deducting areas of openi		onaing to the g	reater wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 (se	ealed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
· ·	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubi	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	es if a pressurisation test has				is heina u	sad		0.15	(18)
Number of sides sheltere		boon done or c	a dogree dir per	modelinty	io boiling a	50 <b>u</b>		2	(19)
Shelter factor			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified f	or monthly wind speed						•		
Jan Feb	Mar Apr May	Jun Ju	ıl 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	8 3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2\m <i>÷ 4</i>								
	1.23 1.1 1.08	0.95 0.9	0.92	1	1.08	1.12	1.18		
, ,,		3.0	1	•				J	

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calculate effect		_	rate for t	he appli	cable ca	se		•					(23a
If exhaust air he			endix N. (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) . othe	rwise (23b	) = (23a)			0.5	(23a
If balanced with									(200)			79.05	<del></del> -
a) If balance		•	•	Ū		,		•	2h)m + (	23h) 🗴 [	1 – (23c)		(230
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25	]	(24a
b) If balance	d mecha	anical ve	ntilation	without	heat rec	coverv (N	л ЛV) (24b	m = (22)	2b)m + (	23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b
c) If whole he				•	•				.5 × (23k	) )	!	4	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
d) If natural v				•	•				0.5]	!	!	4	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
Effective air	change	rate - er	ter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. Heat losses	s and he	eat loss r	paramete	er:									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ue	ΑXU		k-value	e	ΑΧk
	area	(m²)	'n		A ,r	n²	W/m2	2K	(W/	K)	kJ/m²-	K	kJ/K
Doors					2	X	1.4	=	2.8				(26)
Windows Type	1				7.661	x1/	/[1/( 1.4 )+	0.04] =	10.16				(27)
Windows Type	2				3.819	x1/	/[1/( 1.4 )+	0.04] =	5.06				(27)
Walls Type1	51.2	7	11.4	3	39.79	) X	0.15	=	5.97				(29)
Walls Type2	18.8	2	2		16.82	<u>x</u>	0.14	=	2.38				(29)
Roof	63.8	1	0		63.81	X	0.1	=	6.38				(30)
Total area of el	lements	, m²			133.9	)							(31)
* for windows and ** include the area						ated using	formula 1	I/[(1/U-valu	ue)+0.04] á	as given in	paragrapl	h 3.2	
Fabric heat los				s anu pan	auoris		(26)(30)	) + (32) =				32.75	(33)
Heat capacity (		,	<b>O</b> )						(30) + (32	2) + (32a).	(32e) =	1366.8	<del></del>
Thermal mass	•	•	P = Cm -	- TFA) ir	n kJ/m²K			***	itive Value	, , ,	(2-2)	100	(35)
For design assess	•	`		,			ecisely the	e indicative	e values of	TMP in T	able 1f	100	(00)
can be used instea													
Thermal bridge	es : S (L	x Y) cal			•	<						20.36	(36)
_				- N N5 v /3	1)								
if details of therma		are not kn	own (36) =	- 0.00 x (0	,			(33) +	(36) =			EO 44	(27)
if details of therma Total fabric hea	at loss				,				$(36) = 0.33 \times 0$	(25)m x (5	)	53.11	(37)
if details of therma Total fabric hea Ventilation hea	at loss at loss ca	alculated	monthly	/		,lul,	Aug	(38)m	= 0.33 × (	1	_	53.11	(37)
if details of therma Total fabric hea Ventilation hea	at loss				Jun 13.66	Jul 13.66	Aug 13.47			(25)m x (5 Nov 15.01	Dec 15.4	53.11	
if details of therma Total fabric hea Ventilation hea  Jan (38)m= 16.17	et loss et loss ca Feb 15.97	Mar 15.78	monthly Apr	/ May	Jun		<u> </u>	(38)m Sep 14.05	Oct 14.63	Nov 15.01	Dec	53.11	
if details of therma Total fabric hea Ventilation hea	et loss et loss ca Feb 15.97	Mar 15.78	monthly Apr	/ May	Jun		<u> </u>	(38)m Sep 14.05	= 0.33 × (	Nov 15.01	Dec	53.11	(37)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.94	0.94	0.94	0.93	0.92	0.91	0.91	0.91	0.92	0.92	0.93	0.93		
				ı		ı	l		Average =	: Sum(40) <sub>1</sub>	12 /12=	0.93	(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	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		32		(42)
if TFA £ 13.	•	-1			V/.L -		(O.F. N.I.)	. 00					
Annual average Reduce the annual									se target o		.09		(43)
not more that 125	_				-	-			Ü				
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= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5		
	!			ļ.		ļ.	ļ.		Total = Su	ım(44) <sub>112</sub> =	=	1129.13	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		
									Total = Su	im(45) <sub>112</sub> =	=	1480.46	(45)
If instantaneous v	vater heati	ing at point	of use (no	hot water	storage),	enter 0 in	boxes (46	to (61)					
(46)m= 23.02	20.14	20.78	18.12	17.38	15	13.9	15.95	16.14	18.81	20.53	22.3		(46)
Water storage		الماليطنير		olor or M	MALLIDO	otoro ao	within o		aal				(47)
Storage volum	` .	•				•		anie ves	5 <del>C</del> I		0		(47)
If community hotherwise if no	-			_			, ,	ers) enta	er '∩' in <i>(</i>	<b>(47</b> )			
Water storage		not wate	) (tillo li	1014400 1	iiotaiitai	10000 00	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Croy Crit	JI O III (	(-1)			
a) If manufact		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
b) If manufact	turer's d	eclared o	cylinder l	loss fact	or is not	known:							, ,
Hot water stor	•			le 2 (kW	h/litre/da	ay)				0.	.02		(51)
If community he Volume factor	•		on 4.3								1		(50)
Temperature f			2h							-	.6		(52) (53)
·				oor			(47) v (51)	) x (52) x (	52) _				, ,
Energy lost fro Enter (50) or		_	, KVVII/y	zai			(47) X (31)	) X (32) X (	JJ) =	-	.03		(54) (55)
Water storage	` , ` `	,	for each	month			((56)m = (	(55) × (41)	m		.03		(00)
		1			00.00		. , ,	. , , ,	ı	1 00 00	00.04		(EC)
(56)m= 32.01 If cylinder contain	28.92	32.01	30.98	32.01 m = (56)m	30.98	32.01	32.01	30.98 7)m = (56)	32.01	30.98 (H11) is fro	32.01	iv H	(56)
										1			(==)
(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	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	` '	, ,						
(modified by			ı —				<del></del>	<u> </u>		<del>-                                    </del>			/==-
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss ca	lculated	for each	month (	(61)m –	(60) :	365 v (41	/m							
(61)m= 0	0	0	0	01)111 =	00) +	0	) i i	)	0	0	0	0	1	(61)
	<u> </u>								<u> </u>			<u> </u>	J · (59)m + (61)m	(- )
(62)m= 208.77	184.17	193.81	174.27	171.16	153.49		161		161.1	180.68	190.38	203.93	]	(62)
Solar DHW input			<u> </u>	<u> </u>	<u> </u>		ļ						<u></u>	` '
(add additiona												-: ····································		
(63)m= 0	0	0	0	0	0	0	C		0	0	0	0	7	(63)
Output from w	ater hea	ter	ı			-!	!						_	
(64)m= 208.77	184.17	193.81	174.27	171.16	153.49	147.94	161	.61	161.1	180.68	190.38	203.93	]	
			ı	ı				Outp	out from w	ater heate	er (annual)	112	2131.3	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	า + (6	31)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	 n ]	
(65)m= 95.26	84.58	90.28	82.95	82.75	76.04	75.03	79.	58	78.57	85.92	88.31	93.65	]	(65)
include (57)	m in calc	culation	of (65)m	only if c	ylinder	is in the	dwell	ling	or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a	):										
Metabolic gair	ns (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(66)m= 139.43	139.43	139.43	139.43	139.43	139.43	139.43	139	.43	139.43	139.43	139.43	139.43	]	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5				_	
(67)m= 47.85	42.5	34.56	26.17	19.56	16.51	17.84	23.	19	31.13	39.53	46.13	49.18	]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a),	alsc	see Ta	ble 5			_	
(68)m= 305.82	308.99	300.99	283.97	262.48	242.28	228.79	225	.61	233.61	250.64	272.13	292.32	]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a	), als	o se	ee Table	5				
(69)m= 51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.	27	51.27	51.27	51.27	51.27		(69)
Pumps and fa	ns gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	C	)	0	0	0	0	]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92	.95	-92.95	-92.95	-92.95	-92.95	]	(71)
Water heating	gains (T	able 5)											_	
(72)m= 128.03	125.86	121.35	115.21	111.23	105.62	100.85	106	.96	109.13	115.48	122.65	125.87	]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68	3)m +	+ (69)m +	(70)m + (7	71)m + (72)	)m	_	
(73)m= 579.44	575.09	554.65	523.09	491.01	462.15	445.22	453	.51	471.61	503.38	538.65	565.11		(73)
6. Solar gains														
Solar gains are		•				•	ations	to co		ne applica		tion.		
Orientation: /	Access F Table 6d	actor	Area m²			lux able 6a		Т	g_ able 6b	Т	FF able 6c		Gains (W)	
_					_		1					_	. ,	1,75
Northeast 0.9x	0.77	X			X	11.28	] X	_	0.63	X	0.7	=	26.42	(75)
Northeast 0.9x	0.77	X			x	22.97	] X ] .,		0.63		0.7	=	53.77	](75) ] <sub>(75)</sub>
Northeast 0.9x	0.77	X	7.6		x	41.38	] X ]	_	0.63	×	0.7	=	96.88	[(75)
Northeast 0.9x	0.77	X	7.6		X	67.96	] X ]		0.63	×	0.7	=	159.11	](75) ] <sub>(75)</sub>
Northeast <sub>0.9x</sub>	0.77	X	7.6	56	X	91.35	X		0.63	X	0.7	=	213.87	(75)

		_			_		, ,						_
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	97.38	X	0.63	×	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	72.63	X	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	50.42	X	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	28.07	x	0.63	X	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	14.2	x	0.63	X	0.7	=	33.24	(75)
Northeast 0.9x	0.77	X	7.6	66	x	9.21	x	0.63	x	0.7	=	21.57	(75)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	36.79	x	0.63	X	0.7	=	42.94	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	62.67	x	0.63	x	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	85.75	x	0.63	x	0.7	=	100.08	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	106.25	x	0.63	x	0.7		124.01	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	119.01	x	0.63	x	0.7		138.9	(77)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	118.15	x	0.63	x	0.7	<del>-</del>	137.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	113.91	x	0.63	x	0.7		132.95	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	104.39	x	0.63	x	0.7	<del>-</del>	121.84	(77)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	92.85	х	0.63	x	0.7	=	108.37	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	69.27	х	0.63	x	0.7	<del>-</del>	80.84	(77)
Southeast 0.9x	0.77	×	3.8	32	x	44.07	х	0.63	x	0.7	=	51.44	(77)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	31.49	x	0.63	x	0.7	<del>-</del>	36.75	(77)
-							•						_
Solar gains in	watts, calcu	ılated	for eac	h month	l		(83)m	ı = Sum(74)m .	(82)m				
(83)m= 69.36	126.92 19	6.97	283.12	352.77	365.9	346.24	291.	.88 226.42	146.56	84.68	58.32		(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m	+ (83)n	n , watts						•	
(84)m= 648.8	702.01 75	1.61	806.2	843.78	828.06	791.46	745	.39 698.03	649.94	623.33	623.44		(84)
7. Mean inter	nal tempera	ature	(heating	seasor	1)								
Temperature	during hear	ting p	eriods ii	n the livi	ng area	a from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gain	s for I	iving are	ea, h1,m	(see T	able 9a)							_
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 0.91	0.89	).84	0.76	0.63	0.48	0.36	0.3	9 0.58	0.78	0.88	0.92		(86)
Mean interna	l temperatu	re in I	iving ar	ea T1 (f	ollow st	eps 3 to 7	7 in T	able 9c)					
(87)m= 19.52	<del> </del>	0.04	20.44	20.75	20.92	20.98	20.9		20.48	19.95	19.48		(87)
Temperature	during heat	tina n	eriods i	rest of	dwellin	a from Ta	able 9	) Th2 (°C)		•	!		
(88)m= 20.13		0.13	20.15	20.15	20.16	20.16	20.		20.15	20.14	20.14		(88)
Litilization for	tor for goin	o for r	oot of d	L	h2 m /		. 00)		<u> </u>	ļ			
Utilisation fac		0.82	0.73	0.59	0.43	0.29	0.3	3 0.53	0.75	0.86	0.91		(89)
` ′	<u> </u>	!		<u> </u>	!	_!	<u> </u>	<u> </u>		0.00			()
Moon intorno	I temperatu	re in t		ı	,	(follow ste	ri —	to 7 in Tabl		140.70	1044	1	(00)
	<del> </del>	۰					1 20	14 20.01	19.53	18.79	18.11		(90)
(90)m= 18.16	<del> </del>	8.9	19.46	19.87	20.09	20.14			<u>Ι</u> ΙΔ – ΙΈ	ing area : /	<u> </u>	2.22	7/04
	<del> </del>	8.9	19.46	19.67	20.09	20.14	1 20.	f	L FLA = Liv	ring area ÷ (	<u> </u>	0.32	(91)
(90)m= 18.16  Mean interna	18.45 1	re (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1	– fLA) × T2	<b>.</b>		4) =	0.32	
(90)m= 18.16	18.45 1  I temperatu  18.85 1	re (fo 9.27	r the wh	ole dwe	elling) =	fLA × T1	+ (1	- fLA) × T2	19.83	19.16	<u> </u>	0.32	(91)

(93)m= 18.59 18.85 19.27 19.78 20.15 20.35 20.41 20.4 20.28 19.83 19.16 18.55 (93)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.88 0.85 0.8 0.72 0.59 0.44 0.31 0.35 0.54 0.74 0.84 0.89 (94)  Useful gains, hmGm , W = (94)m x (84)m
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  (94)m= 0.88 0.85 0.8 0.72 0.59 0.44 0.31 0.35 0.54 0.74 0.84 0.89 (94)
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Utilisation factor for gains, hm:           (94)m=         0.88         0.85         0.8         0.72         0.59         0.44         0.31         0.35         0.54         0.74         0.84         0.89         (94)
Utilisation factor for gains, hm: (94)m= 0.88 0.85 0.8 0.72 0.59 0.44 0.31 0.35 0.54 0.74 0.84 0.89 (94)
(94)m= 0.88 0.85 0.8 0.72 0.59 0.44 0.31 0.35 0.54 0.74 0.84 0.89 (94)
Useful gains, hmGm , W = (94)m x (84)m
(95)m= 570.04 597.87 603.96 577.46 499.46 363.08 248.65 258.78 375 478.04 524.77 553.34 (95)
Monthly average external temperature from Table 8
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]
(97)m= 990.26 963.76 879.44 738.76 572.1 384.05 254.21 266.41 414.85 625.16 821.43 982.98 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m
(98)m= 312.64 245.88 204.96 116.14 54.05 0 0 0 109.46 213.59 319.65
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> = 1576.36 (98)
Space heating requirement in kWh/m²/year 21.5 (99)
9b. Energy requirements – Community heating scheme
This part is used for space heating, space cooling or water heating provided by a community scheme.
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 0 (301)
Fraction of space heat from community system 1 – (301) =
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.
Fraction of heat from Community boilers 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 kWh/year
Annual space heating requirement 1576.36
Space heat from Community boilers (98) x (304a) x (305) x (306) = 1655.18 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  0 (308)
Space heating requirement from secondary/supplementary system $(98) \times (301) \times 100 \div (308) = 0$ (309)
Water heating
Annual water heating requirement 2131.3
If DHW from community scheme:
Water heat from Community boilers $(64) \times (303a) \times (305) \times (306) =$ 2237.87 (310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = 38.93$ (313)
Cooling System Energy Efficiency Ratio 0 (314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$ 0 (315)
Electricity for pumps and fans within dwelling (Table 4f):  mechanical ventilation - balanced, extract or positive input from outside  285.09 (330a)

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/yea	r	=(330a) + (330b) + (330g) =	285.09	(331)
Energy for lighting (calculated in Apper	ndix L)		338.01	(332)
Electricity generated by PVs (Appendix	(M) (negative quantity)		-741.01	(333)
Electricity generated by wind turbine (A	appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heating	scheme			
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 x 0.	01 = 70.18	(340a)
Water heating from CHP	(310a) x	4.24 x 0.	01 = 94.89	(342a)
		Fuel Price		
Pumps and fans	(331)	13.19 x 0.	01 = 37.6	(349)
Energy for lighting	(332)	13.19 x 0.	01 = 44.58	(350)
Additional standing charges (Table 12)			120	(351)
Energy saving/generation technologies  Total energy cost	= (340a)(342e) + (345)(354) =		367.25	(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)			81.81	(358)
12b. CO2 Emissions – Community hea	ting scheme			
		ergy Emission fac h/year kg CO2/kWh	ctor Emissions kg CO2/year	
CO2 from other sources of space and v		, sa	ng 002/jour	
Efficiency of heat source 1 (%)		s repeat (363) to (366) for the second	nd fuel 94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x 0.22	= 894.57	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 20.2	(372)
Total CO2 associated with community				
Total OOZ accordated with community	systems (363)(3	66) + (368)(372)	= 914.78	(373)
CO2 associated with space heating (se		66) + (368)(372)	914.70	(373) (374)
•	econdary) (309) x	0	= 0	
CO2 associated with space heating (se	econdary) (309) x rsion heater or instantaneous hea	0	= 0	(374)
CO2 associated with space heating (se	econdary) (309) x rsion heater or instantaneous heavater heating (373) + (3	0 ater (312) x 0.22 74) + (375) =	= 0 ( 914.78	(374) (375)
CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and water from immer contact to the contact of t	econdary) (309) x rsion heater or instantaneous heavater heating (373) + (3 ups and fans within dwelling (331	0 ater (312) x 0.22 74) + (375) =	= 0 = 0 = 0 914.78 = 147.96	(374) (375) (376)
CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and vertical CO2 associated with electricity for pure CO2 associated with electricity for light Energy saving/generation technologies	econdary) (309) x rsion heater or instantaneous heavater heating (373) + (3 ups and fans within dwelling (331 ing (332))) x	0 ater (312) x 0.22 74) + (375) = )) x 0.52	= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(374) (375) (376) (378) (379)
CO2 associated with space heating (see CO2 associated with water from immer Total CO2 associated with space and water CO2 associated with electricity for pure CO2 associated with electricity for light	econdary) (309) x rsion heater or instantaneous heavater heating (373) + (3 ups and fans within dwelling (331 ing (332))) x	0 ater (312) x 0.22 74) + (375) = )) x 0.52	$ \begin{vmatrix}                                    $	(374) (375) (376) (378)

Dwelling CO2 Emission Rate (383) ÷ (4) =				11.64	(384)
El rating (section 14)				90.33	(385)
13b. Primary Energy – Community heating scheme					
	Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and water heating (not Cl Efficiency of heat source 1 (%)	HP) ing two fuels repeat (363) to	(366) for the second t	uel	94	(367a)
Energy associated with heat source 1 [(307b	)+(310b)] x 100 ÷ (367b) x	1.22	= [	5052.67	(367)
Electrical energy for heat distribution	[(313) x		= [	119.52	(372)
Total Energy associated with community systems	(363)(366) + (368)(37	2)	= [	5172.19	(373)
if it is negative set (373) to zero (unless specified otherwise	, see C7 in Appendix C	C)	[	5172.19	(373)
Energy associated with space heating (secondary)	(309) x	0	= [	0	(374)
Energy associated with water from immersion heater or instar	ntaneous heater(312) x	1.22	= [	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =		[	5172.19	(376)
Energy associated with space cooling	(315) x	3.07	= [	0	(377)
Energy associated with electricity for pumps and fans within d	welling (331)) x	3.07	= [	875.22	(378)
Energy associated with electricity for lighting	(332))) x	3.07	= [	1037.69	(379)
Energy saving/generation technologies Item 1		3.07 × 0.01	= _	-2274.91	(380)
Total Primary Energy, kWh/year sum of (376	)(382) =			4810.18	(383)

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					001082 on: 1.0.5.9	
Address :	F	Property	Address	Plot 39					
1. Overall dwelling dime	nsions:								
3		Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	<sup>3</sup> )
Ground floor			73.31	(1a) x	2	2.5	(2a) =	183.28	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) =	73.31	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(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	<b>-</b> + -	0	Ī <b>-</b> Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ns			, <u> </u>	3	x '	10 =	30	(7a)
Number of passive vents				F	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			_ [	0	X	40 =	0	(7c)
-				L					
							Air ch	anges per ho	our
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$			[	30		÷ (5) =	0.16	(8)
Number of storeys in the	een carried out or is intended, procee ne dwelling (ns)	ed to (17),	otnerwise (	continue tr	om (9) to	(16)		0	(9)
Additional infiltration	io anoming (no)					[(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 pri deducting areas of openir	resent, use the value corresponding t	o the grea	ter wall are	a (after					
,	loor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	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 ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	etre of e	envelope	area	5	(17)
•	s if a pressurisation test has been do				is being u	sed		0.41	(18)
Number of sides sheltere			,	,	J			2	(19)
Shelter factor			(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.85	(20)
Infiltration rate incorporat	_		(21) = (18	) x (20) =				0.35	(21)
Infiltration rate modified for	<del>-                                    </del>		1					1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	<del> </del>	1	T		T	1		1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.45	0.44	e (allowi	0.39	0.38	0.33	0.33	0.33	0.35	0.38	0.4	0.41	1	
Calculate effec	-						0.00	0.00	0.50	0.4	0.41	J	
If mechanica	ıl ventila	tion:										0	(
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b	) = (23a)			0	(
If balanced with	heat reco	very: effic	ency in %	allowing f	or in-use fa	actor (fron	n Table 4h	) =				0	(
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (2	23b) × [	1 – (23c)	) ÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(
b) If balance			ntilation		ı	overy (N	ЛV) (24b	<u> </u>	<del> </del>	<del></del>		7	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(
c) If whole he				•	•				F (00)	,			
if (22b)m		(23b), t	· ·	$\frac{(230)}{0}$	o); otherv		ŕ	0) m + 0.	· ` `	<del></del>	Ι ,	1	(
24c)m= 0	0		0			0	0		0	0	0	J	(
d) If natural v if (22b)m									0.51				
24d)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	1	(
Effective air	change	rate - er	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	I.	<u>I</u>	<u>!</u>	1	
25)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	1	(
											L	1	
3. Heat losses	_	·			NIat A.		11		A 3/ 11		la condicio	_	A V I-
LEMENT	Gros area	_	Openin m		Net Ar A ,n		U-valı W/m2		A X U (W/I	<b>〈</b> )	k-value kJ/m²-		A X k kJ/K
Doors		` ,			2	х	1	=	2	<u></u>			(
Vindows Type	1				7.661	x1.	/[1/( 1.4 )+	0.04] =	10.16	=			(
Vindows Type	2				3.819	x1.	/[1/( 1.4 )+	0.04] =	5.06	=			(
Valls Type1	51.2	7	11.48	3	39.79	x	0.18	[	7.16	<b>=</b>		— г	(
Valls Type2	18.8		2		16.82	=	0.18	<b>=</b>	3.03	<b>=</b>		<b>-</b>	(
Roof	63.8		0		63.81	=	0.13	<b>-</b>	8.3	<b>=</b>		╡ ト	(
otal area of e					133.9	=	00		0.0				) ` (
for windows and			ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	ns aiven in	paragrapi	h 3.2	(
* include the area								2(	,	<b>J</b>	7		
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				35.	7
leat capacity	Cm = S(	Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	1366	6.8
hermal mass	parame	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	) (c
or design assess				construct	ion are not	known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used instea Thermal bridge				ıcina Δr	nandiv k	(						40.4	. <u>.                                   </u>
details of therma	,	•		• .	•	`						18.4	15 (
otal fabric hea		are not an	own (00) -	· 0.00 x (0	'/			(33) +	(36) =			54.1	16 (
entilation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × (	25)m x (5)	)		`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
38)m= 36.32	36.08	35.85	34.77	34.56	33.62	33.62	33.44	33.98	34.56	34.97	35.4	1	(
leat transfer c	oefficier	nt, W/K					•	(39)m	= (37) + (3	38)m	•	•	
		.,							·		00.50	1	
39)m= 90.48	90.24	90.01	88.92	88.72	87.77	87.77	87.6	88.14	88.72	89.13	89.56		

Heat loss para	meter (l	-II P) \//	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.23	1.23	1.23	1.21	1.21	1.2	1.2	1.19	1.2	1.21	1.22	1.22		
(10)=	1.20	1.20	1 1							Sum(40) <sub>1</sub> .		1.21	(40)
Number of day	s in mo	nth (Tab	le 1a)							<b>J</b> ann(10)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 heat	ina ene	rav reaui	rement								kWh/ye	ear:	
n water near	9 01101	.gy 10qui									icovii,, y c		
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.		32		(42)
Annual averag									(		.39		(43)
Reduce the annua not more that 125	-				-	-	o acnieve	a water us	se target o	οτ			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in				<u></u>				Sep	001	1400	Dec		
(44)m= 98.33	94.75	91.18	87.6	84.03	80.45	80.45	84.03	87.6	91.18	94.75	98.33		
(44)1112 30.00	04.70	01.10	07.0	04.00	00.40	00.40	04.00		<u> </u>	m(44) <sub>112</sub> =	l	1072.67	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x C	OTm / 3600			. ,		1072.07	(/
(45)m= 145.82	127.53	131.6	114.73	110.09	95	88.03	101.02	102.22	119.13	130.04	141.22		
						I	l		Total = Su	m(45) <sub>112</sub> =	=	1406.44	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)			'		_
(46)m= 21.87	19.13	19.74	17.21	16.51	14.25	13.2	15.15	15.33	17.87	19.51	21.18		(46)
Water storage													
Storage volum	, ,					_		ame ves	sel		150		(47)
If community h	_			-			, ,		(01 ! /	(A <b>-7</b> )			
Otherwise if no Water storage		not wate	er (tnis ir	iciuaes i	nstantar	ieous co	mbi boli	ers) ente	er o in (	(47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/dav):				1	39		(48)
Temperature fa					(	,,.					54		(49)
Energy lost fro				ear			(48) x (49)	) =			75		(50)
b) If manufact		_	-		or is not		(10) x (10)	, –		0.	75		(30)
Hot water stora	age loss	factor fr	om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If community h	_		on 4.3										
Volume factor			OI-								0		(52)
Temperature fa											0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	, ,	,					((50) (	FE) (44)		0.	75		(55)
Water storage		culated i					((56)M = (	55) × (41)ı	m 				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)i	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	/)m = (56)	m where (	H11) is fro	m Append	IX H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,						
(modified by							<u> </u>			<del>-                                    </del>			(=-)
(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 $(61)m = (60) \div 365 \times (41)m$													
$\begin{array}{c c} \text{Combinoss c} \\ \hline (61)\text{m} = & 0 \end{array}$	alculated	or each	month (	(61)m =	(6U) ÷ 30	05 × (41)	)m   0	0	0	Ο	0	]	(61)
		ļ					<u> </u>	Ļ		ļ		(50) (64)	(01)
(62)m= 192.4	<u> </u>	178.2	159.83	156.69	140.09	134.63	(6∠)m =	147.32	(45)III + 165.73	175.13	(57)m + 187.81	(59)m + (61)m	(62)
` '								1				l	(02)
Solar DHW inputation									r contribut	ion to wate	er neaung)		
(63)m= 0	0	0	0	0	0	0	0	0)   0	0	0	0	1	(63)
Output from								1				I	()
(64)m= 192.4		178.2	159.83	156.69	140.09	134.63	147.61	147.32	165.73	175.13	187.81	]	
	_!						Out	put from w	ater heate	<u>r</u> (annual)₁	12	1955.06	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m ]												•	
(65)m= 85.76	1	81.03	74.22	73.88	67.66	66.55	70.86	70.06	76.89	79.31	84.23	ĺ	(65)
include (57	7)m in cal	culation o	of (65)m	onlv if c	vlinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	<u> </u>			•								<u> </u>	
Metabolic ga													
Jan	T '	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 116.1	9 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5		-		-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.28	12.45	15.81	18.45	19.67		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5	•		•	
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.16	156.52	167.93	182.32	195.86		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a	), also s	ee Table	5	-		•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62		(69)
Pumps and f	ans gains	(Table 5	5a)							-		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)				-		-		
(71)m= -92.95	5 -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95		(71)
Water heatin	g gains (1	Table 5)		-		-	-		-	-	-		
(72)m= 115.2°	7 113.2	108.92	103.09	99.3	93.97	89.44	95.25	97.31	103.34	110.16	113.21		(72)
Total interna	al gains =	:			(66)	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	(1)m + (72)	)m	•	
(73)m= 400.1	6 398.08	385.26	364.67	343.84	323.76	310.73	316.54	327.14	347.94	371.79	389.6		(73)
6. Solar gai	ns:	•				•			•		•		
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu			g_ 	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_	able 6c		(W)	-
Northeast 0.9x		X	7.6	66	x1	11.28	x	0.63	x	0.7	=	26.42	(75)
Northeast 0.9x		X	7.6	66	x2	22.97	X	0.63	x	0.7	=	53.77	(75)
Northeast 0.9x	<b>U</b> 1111	X	7.6	66	x	11.38	х	0.63	x	0.7	=	96.88	(75)
Northeast 0.9x		X	7.6	6	x 6	67.96	×	0.63	x	0.7	=	159.11	(75)
Northeast 0.9x	0.77	X	7.6	66	x 9	91.35	Х	0.63	х	0.7	=	213.87	(75)

		_						,					_	_
Northeast <sub>0.9x</sub>	0.77	X	7.6	6	X	9	7.38	X	0.63	X	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	(	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	7	2.63	X	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	5	0.42	X	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	2	8.07	X	0.63	X	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x		14.2	X	0.63	X	0.7	=	33.24	(75)
Northeast 0.9x	0.77	X	7.6	66	x	(	9.21	x	0.63	X	0.7	=	21.57	(75)
Southeast 0.9x	0.77	X	3.8	2	x	3	6.79	X	0.63	X	0.7	=	42.94	(77)
Southeast 0.9x	0.77	X	3.8	2	x	6	2.67	x	0.63	X	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	8	5.75	x	0.63	X	0.7	=	100.08	(77)
Southeast 0.9x	0.77	x	3.8	2	x	10	06.25	x	0.63	X	0.7		124.01	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	1	19.01	x	0.63	X	0.7		138.9	(77)
Southeast 0.9x	0.77	×	3.8	2	х	1	18.15	x	0.63	x	0.7	<del></del> =	137.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	2	x	1	13.91	x	0.63	x	0.7		132.95	(77)
Southeast 0.9x	0.77	x	3.8	2	х	10	04.39	x	0.63	x	0.7	=	121.84	(77)
Southeast 0.9x	0.77	×	3.8	2	х	9	2.85	x	0.63	x	0.7	=	108.37	(77)
Southeast 0.9x	0.77	x	3.8	2	х	6	9.27	x	0.63	x	0.7	=	80.84	(77)
Southeast 0.9x	0.77	x	3.8	2	х	4	4.07	x	0.63	x	0.7	=	51.44	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	3	1.49	x	0.63	x	0.7		36.75	(77)
Solar gains in $(83)$ m= $69.36$ Total gains – i $(84)$ m= $469.52$	126.92 19	96.97	283.12	352.77	30 + (8	65.9 33)m	346.24	(83)m 291	<u> </u>	146.5	66 84.68	58.32	]	(83)
(84)m= 469.52	525.01 50	02.23	047.70	090.01	00	9.07	000.97	000	.42   555.56	494.4	9 450.47	447.92	J	(04)
7. Mean inter			`		′									_
Temperature	Ū	٠.			·			ole 9	, Th1 (°C)				21	(85)
Utilisation fac	<del></del>	T			ì				<u> </u>		1	l _	1	
Jan		Mar	Apr	May	+	Jun	Jul	_	ug Sep	+	+	Dec	1	(00)
(86)m= 1	0.99	).99	0.96	0.89	0	).73	0.57	0.6	0.87	0.98	0.99	1	]	(86)
Mean interna	l temperatu	re in I	iving are	ea T1 (fo	ollo	w ste	ps 3 to 7	in T	able 9c)			1	-	
(87)m= 19.68	19.83 2	80.0	20.43	20.74	20	0.93	20.98	20.	97 20.84	20.4	4 20.01	19.66	]	(87)
Temperature	during hea	ting p	eriods ir	rest of	dw	elling	from Ta	able 9	9, Th2 (°C)				_	
(88)m= 19.89	19.9	19.9	19.91	19.91	19	9.92	19.92	19.	92 19.92	19.9	1 19.91	19.9		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,	m (se	e Table	9a)						
(89)m= 1	0.99	0.98	0.95	0.85	0	0.64	0.44	0.	5 0.8	0.96	0.99	1	]	(89)
Mean interna	l temperatu	re in 1	he rest	of dwell	ina	T2 (f	ollow ste	ens 3	to 7 in Tal	ole 9c)	•	•	_	
(90)m= 18.15	· · ·	8.73	19.23	19.65	Ť	9.88	19.92	19.		19.2	18.63	18.13	]	(90)
	ı	!					<u> </u>	<u> </u>	<u> </u>	fLA = L	ving area ÷ (	4) =	0.32	(91)
Moon interna	l tomperat:	ro /fo	r tha we	مام طیب	ء منال	م/ _ tı	Λ Τ4	. /4	fl A\ T	2				
Mean interna (92)m= 18.64	<del> </del>	9.16	19.61	ole dwe	$\overline{}$	رو ( <u>)</u> 0.21	20.26	+ (1 20.	<del></del>	19.6	4 19.07	18.62	1	(92)
					<u> </u>							10.02	]	(02)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate														

											1	l	
(93)m= 18.64	18.83	19.16	19.61	20	20.21	20.26	20.25	20.12	19.64	19.07	18.62		(93)
8. Space he													
Set Ti to the the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa			•	iviay	Odii	<u> </u>	_ / tug	СОР	000	1101	500		
(94)m= 0.99	0.99	0.98	0.94	0.85	0.67	0.48	0.54	0.81	0.96	0.99	1		(94)
Useful gains	, hmGm	, W = (9 <sup>4</sup>	4)m x (8	4)m	<u> </u>	ļ						l	
(95)m= 467.12	520.18	570.41	611.62	592.48	460.8	315.88	328.67	448.95	474.94	452.03	446.08		(95)
Monthly ave	rage exte	ernal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra	te for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]	-		•	
` '	2 1256.67	1139.31	952.8	736.42	492.58	320.99	337.43	530.57	802.02	1066.89	1291.09		(97)
Space heati		1			Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m	1		
(98)m= 617.74	494.92	423.26	245.65	107.09	0	0	0	0	243.34	442.7	628.68		_
							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	3203.4	(98)
Space heati	ng requir	ement in	kWh/m²	<sup>2</sup> /year								43.7	(99)
9a. Energy re	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heat	ing:			<u> </u>		J							
Fraction of s	pace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$										1	(202)		
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] =										1	(204)		
Efficiency of main space heating system 1										93.5	(206)		
•	Efficiency of secondary/supplementary heating system, %										0	(208)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」` ′
Space heati			•			Jui	<sub>1</sub> Aug	ОСР	Oct	1404	Dec	KVVIII y C	AI
617.74	<del></del>	423.26	245.65	107.09	0	0	0	0	243.34	442.7	628.68		
(211)m = {[(9	8)m x (20	)4)]	00 ÷ (20	)6)		ļ	<u> </u>	ļ		<u> </u>			(211)
660.68	<del>í `</del>	452.69	262.73	114.54	0	0	0	0	260.26	473.47	672.39		(= )
							Tota	l I (kWh/yea	ar) =Sum(2	L 211) <sub>15.1012</sub>	<u> </u>	3426.09	(211)
Space heati	na fuel (s	econdar	v) kWh/	month							l		
$= \{[(98) \text{m x } (2)\}$	•		• •										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
	•	•					Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<u></u>	0	(215)
Water heatin	g												_
Output from v	vater hea	ter (calc	ulated a	bove)									
192.41	169.62	178.2	159.83	156.69	140.09	134.63	147.61	147.32	165.73	175.13	187.81		_
Efficiency of v	water hea	ater										79.8	(216)
(217)m= 87.71	87.51	87.04	85.96	83.82	79.8	79.8	79.8	79.8	85.84	87.19	87.79		(217)
Fuel for water	•												
(219)m = (64) (219)m = 219.38		) ÷ (217) 204.73	m 185.94	186.92	175.55	168.7	184.98	184.61	193.07	200.87	213.93		
(210)111- 213.30	190.04	204.13	100.34	100.82	170.00	100.7		I = Sum(2°		200.01	210.80	2312.52	(210)
Annual totals	•						1010	• • • • • • • • • • • • • • • • • •		Wh/year		kWh/year	(219)
Space heating		ed, main	system	1					ĸ	••ii/yedi		3426.09	7
•	_	•	•										J

				_									
			2312.52										
		30	]	(230c)									
boiler with a fan-assisted flue													
sum of (23	sum of (230a)(230g) =												
			338.01	(232)									
12a. CO2 emissions – Individual heating systems including micro-CHP													
<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	tor	Emissions kg CO2/ye										
(211) x	0.216	=	740.04	(261)									
(215) x	0.519	=	0	(263)									
(219) x	0.216	=	499.5	(264)									
(261) + (262) + (263) + (264)	=		1239.54	(265)									
(231) x	0.519	=	38.93	(267)									
(232) x	0.519	=	175.43	(268)									
S	um of (265)(271) =		1453.89	(272)									
	Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (264) (231) x (232) x	Energy kWh/year kg CO2/kWh  (211) x 0.216  (215) x 0.519  (219) x 0.216  (261) + (262) + (263) + (264) =  (231) x 0.519	sum of (230a)(230g) =    Solution	sum of (230a)(230g) = 75  338.01  This including micro-CHP  Energy Emission factor kg CO2/kWh kg CO2/ye  (211) x 0.216 = 740.04  (215) x 0.519 = 0  (219) x 0.216 = 499.5  (261) + (262) + (263) + (264) = 1239.54  (231) x 0.519 = 38.93  (232) x 0.519 = 175.43									

TER =

(273)

19.83