#### **Regulations Compliance Report**

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:54:02

Project Information:

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

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 50.54m<sup>2</sup> Plot Reference: Site Reference : Hermitage Lane Plot 36

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

19.76 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 12.69 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.5 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 38.8 kWh/m<sup>2</sup>

OK

2 Fabric U-values

**Element Average Highest** External wall 0.15 (max. 0.30) 0.15 (max. 0.70) OK Floor (no floor) Roof 0.10 (max. 0.20) OK 0.10 (max. 0.35) **Openings** 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

# **Regulations Compliance Report**

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	ок
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.65m <sup>2</sup>	
Ventilation rate:	4.00	
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		

		اعدا	r Details:										
Assessor Name:	Zahid Ashraf	030	Strom	o Nium	bori		STD∪	001082					
Software Name:	Stroma FSAP 2012	2	Softwa					on: 1.0.5.9					
		Proper	ty Address:	Plot 36									
Address:  1. Overall dwelling dimensions:													
Overall dwelling dime	ensions:		(m-2)		A I I .	last (/as)		V - l					
Ground floor		A	rea(m²)	(1a) x		<b>ight(m)</b> 2.5	(2a) =	Volume(m³	(3a)				
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	-		(4)			]` ''	120.00					
Dwelling volume	a) · ( · a) · ( · a) · ( · a)		30.34		)+(3c)+(3c	d)+(3e)+	.(3n) =	126.36	(5)				
				(00) (00)	, , (00) , (00	., (00)	.(0)	120.30	(5)				
2. Ventilation rate:		condary	other		total			m³ per hou	r				
Number of chimneys	heating he	eating +	0	] = [	0	x 4	40 =	0	(6a)				
Number of open flues	0 +	0 +	0	]	0	x	20 =	0	(6b)				
Number of intermittent fa				J L	0	x	10 =	0	(7a)				
Number of passive vents				L	0	x	10 =	0	(7b)				
Number of flueless gas fi				L	0	x	40 =	0	(7c)				
realiser of fideless gas in				L	0			0	(/'C)				
							Air ch	nanges per ho	our				
Infiltration due to chimne	ys, flues and fans = (6a)	)+(6b)+(7a)+(7b	)+(7c) =	Γ	0		÷ (5) =	0	(8)				
	peen carried out or is intended	l, proceed to (17	7), otherwise o	ontinue fr	om (9) to	(16)	ĺ		_ 				
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9)	-1]x0.1 =	0	(9) (10)				
	.25 for steel or timber fr	ame or 0.35	for masonr	y constr	uction	1(0)	17.0.1 -	0	(11)				
	resent, use the value corresp	onding to the gr	eater wall are	a (after			!						
deducting areas of openii	<sup>ngs); if equal user 0.35 floor, enter 0.2 (unseale</sup>	d) or 0.1 (se	aled) else	enter 0			ı	0	(12)				
If no draught lobby, en	•	a, o. o. i (oo	aioa), 0i00	oritor o				0	(13)				
• •	s and doors draught stri	pped						0	(14)				
Window infiltration	-		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)				
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)				
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)				
If based on air permeabil	•							0.15	(18)				
Air permeability value applie  Number of sides sheltere	es if a pressurisation test has i	been done or a	degree air pe	meability	is being u	sed			(19)				
Shelter factor	,		(20) = 1 -	0.075 x (1	19)] =			0.78	(20)				
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.12	(21)				
Infiltration rate modified f	or monthly wind speed												
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec	]					
Monthly average wind sp	eed from Table 7												
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7						
Wind Factor (22a)m = (2.	2)m ÷ 4												
<u> </u>	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18						
		<del>-</del>	•		•	•	•	•					

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
Calculate effect		•	rate for t	he appli	cable ca	se	•				•		
If exhaust air he			andiv N (2	3h) - (23s	a) v Emy (e	acuation (I	N5)) other	wisa (23h	) <i>- (</i> 23a)			0.5	(23a
If balanced with									) = (25a)			0.5	(23b
a) If balance		-	-	_					26\m . /	22h) [	1 (22a)	79.05	(230
(24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	] <del>-</del> 100] ]	(24a
b) If balance							L		<u> </u>	<u> </u>	0.24	]	(=
(24b)m= 0	0	o 0	0	0	0	0	0	0	0	0	0	1	(24b
c) If whole he	<u> </u>		<u> </u>		<u> </u>							J	(=
if (22b)m				•	•				5 × (23b	o)			
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0	1	(240
d) If natural v	——u ∕entilatic	n or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft		ļ.		1	
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 (24k	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	]	(25)
3. Heat losses	s and he	at loss i	paramete	ōt.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	9	ΑΧk
LLLIVILIA	area	_	m		A ,r		W/m2		(W/I	K)	kJ/m²-		kJ/K
Doors					2	X	1.4	=	2.8				(26)
Windows					8.651	x1	/[1/( 1.4 )+	0.04] =	11.47				(27)
Walls Type1	20.9	6	8.65		12.31	X	0.15	=	1.85				(29)
Walls Type2	13.8	8	2		11.88	x	0.14	=	1.68			$\neg$	(29)
Roof	11.39	9	0		11.39	) x	0.1	_ =	1.14				(30)
Total area of el	lements,	, m²			46.23	<u> </u>							(31)
* for windows and	roof windc	ows, use e	effective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	h 3.2	
** include the area				ls and par	titions							_	
Fabric heat los		•	U)				(26)(30)					18.94	(33)
Heat capacity (	•		_					***	(30) + (32	, , ,	(32e) =	441.11	(34)
Thermal mass	•	•		,					tive Value			100	(35)
For design assess can be used instead				construct	ion are no	t known pi	recisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge				using Ap	pendix l	<						9.81	(36)
if details of therma	•	,		Ο.	•								`` '
Total fabric hea	at loss							(33) +	(36) =			28.74	(37)
Ventilation hea	t loss ca	alculatec	monthly	/				(38)m	= 0.33 × (	25)m x (5)		_	<del></del>
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 10.55	10.43	10.31	9.7	9.58	8.97	8.97	8.85	9.22	9.58	9.82	10.06	]	(38)
												_	
Heat transfer c	oefficien	nt, W/K						(39)m	= (37) + (37)	38)m			
Heat transfer c	oefficien 39.17	nt, W/K 39.05	38.44	38.32	37.72	37.72	37.6	(39)m 37.96	38.32	38)m 38.57	38.81	]	

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.78	0.77	0.77	0.76	0.76	0.75	0.75	0.74	0.75	0.76	0.76	0.77		
						l	l		Average =	: Sum(40) <sub>1</sub>	12 /12=	0.76	(40)
Number of day		nth (Tab	le 1a)		ı			1					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		71		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		3.65		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 86.52	83.37	80.23	77.08	73.93	70.79	70.79	73.93	77.08	80.23	83.37	86.52		
									Total = Su	ım(44) <sub>112</sub> =	-	943.85	(44)
Energy content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x C	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 128.31	112.22	115.8	100.96	96.87	83.59	77.46	88.89	89.95	104.82	114.42	124.26		_
If instantaneous v	vator hoati	na at naint	of uso (no	hot water	r storago)	ontor O in	havas (16		Total = Su	ım(45) <sub>112</sub> =	= [	1237.53	(45)
			·	·	· · ·		· · ·	, , , I		1			(40)
(46)m= 19.25 Water storage	16.83 loss:	17.37	15.14	14.53	12.54	11.62	13.33	13.49	15.72	17.16	18.64		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water store</li></ul>			-							0	02		(51)
If community h	-			_ (	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77				0.	.02		( /
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in ( <del></del>	55)								1.	.03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	(H11) is fro	m Appendi	x H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	 3	· · ·	<u> </u>	<u> </u>	<u> </u>			0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss 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 0 0 0 0	(61)										
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m + (62)m + (63)m + (64)m + (64)m + (65)m + (65)m$	. ,										
(62)m= 183.58   162.14   171.07   154.45   152.15   137.08   132.74   144.16   143.44   160.1   167.92   179.53	(62)										
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	(02)										
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)											
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(63)										
Output from water heater											
(64)m= 183.58 162.14 171.07 154.45 152.15 137.08 132.74 144.16 143.44 160.1 167.92 179.53											
Output from water heater (annual) <sub>112</sub> 1888.37	(64)										
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]											
(65)m= 86.88 77.25 82.72 76.36 76.43 70.59 69.98 73.78 72.7 79.08 80.84 85.54	(65)										
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating											
5. Internal gains (see Table 5 and 5a):											
Metabolic gains (Table 5), Watts											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec											
(66)m= 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31 85.31	(66)										
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
(67)m= 13.65 12.12 9.86 7.47 5.58 4.71 5.09 6.62 8.88 11.28 13.16 14.03	(67)										
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
(68)m= 148.65 150.19 146.3 138.03 127.58 117.77 111.21 109.66 113.55 121.83 132.27 142.09	(68)										
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
(69)m= 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53 31.53	(69)										
Pumps and fans gains (Table 5a)											
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(70)										
Losses e.g. evaporation (negative values) (Table 5)											
(71)m= -68.25 -68.25 -68.25 -68.25 -68.25 -68.25 -68.25 -68.25 -68.25 -68.25 -68.25 -68.25	(71)										
Water heating gains (Table 5)											
(72)m= 116.78 114.96 111.19 106.06 102.73 98.04 94.05 99.16 100.98 106.28 112.28 114.97	(72)										
Total internal gains = $(66)m + (67)m + (68)m + (70)m + (71)m + (72)m$	, ,										
(73)m= 327.67 325.87 315.95 300.15 284.49 269.11 258.94 264.03 272 287.98 306.31 319.68	(73)										
6. Solar gains:	, ,										
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.											
Orientation: Access Factor Area Flux g_ FF Gains											
Table 6d m² Table 6a Table 6b Table 6c (W)											
Northeast 0.9x 0.77 x 8.65 x 11.28 x 0.63 x 0.7 = 29.83	(75)										
Northeast 0.9x 0.77 x 8.65 x 22.97 x 0.63 x 0.7 = 60.72	(75)										
Northeast 0.9x 0.77 x 8.65 x 41.38 x 0.63 x 0.7 = 109.4	(75)										
Northeast 0.9x 0.77 x 8.65 x 67.96 x 0.63 x 0.7 = 179.67	(75)										

Northeast <sub>0.9x</sub> 0.77	x	8.6	5	x	97.38	X		0.63	х	0.7	=	257.47	(75)
Northeast <sub>0.9x</sub> 0.77	x	8.6	5	x	91.1	X		0.63	х	0.7	=	240.86	(75)
Northeast <sub>0.9x</sub> 0.77	x	8.6	5	x	72.63	X		0.63	х	0.7	=	192.02	(75)
Northeast <sub>0.9x</sub> 0.77	x	8.6	5	x	50.42	X		0.63	x	0.7	=	133.31	(75)
Northeast <sub>0.9x</sub> 0.77	x	8.6	5	x	28.07	X		0.63	x	0.7	=	74.21	(75)
Northeast <sub>0.9x</sub> 0.77	x	8.6	5	x	14.2	X		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x 0.77	x	8.6	5	x	9.21	X		0.63	x	0.7	=	24.36	(75)
Solar gains in watts, ca	lculated	for each	month			(83)m	n = Si	um(74)m .	(82)m			•	
(83)m= 29.83 60.72		179.67	241.51	257.		192	2.02	133.31	74.21	37.53	24.36		(83)
Total gains – internal a		<del>`                                    </del>		<u>`</u>	· ·				1			1	
(84)m= 357.5 386.59	425.35	479.81	525.99	526.	58 499.8	456	5.05	405.31	362.19	343.84	344.04		(84)
7. Mean internal temp	erature (l	heating	season	)									
Temperature during h	eating pe	eriods in	the livi	ng ar	ea from Ta	ble 9	, Th	1 (°C)				21	(85)
Utilisation factor for ga	ains for liv	ving are	a, h1,m	(see	Table 9a)							1	_
Jan Feb	Mar	Apr	May	Jι	n Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 0.94 0.92	0.87	0.76	0.61	0.4	4 0.33	0.3	37	0.59	0.81	0.91	0.94		(86)
Mean internal tempera	ature in li	ving are	a T1 (fo	ollow	steps 3 to	7 in T	Γable	e 9c)					
(87)m= 19.7 19.88	20.2	20.59	20.85	20.9	96 20.99	20.	.98	20.9	20.57	20.09	19.67		(87)
Temperature during h	eating pe	eriods in	rest of	dwel	ing from Ta	able 9	9, Tł	n2 (°C)	-	-	-	•	
(88)m= 20.27 20.28	20.28	20.29	20.29	20.	<u> </u>	20		20.3	20.29	20.29	20.28		(88)
Utilisation factor for ga	ains for re	est of du	velling	h2 m	(see Table	, 0a)							
(89)m= 0.93 0.91	0.85	0.74	0.57	0.4	<u> </u>	0.3	32	0.54	0.78	0.9	0.94		(89)
` '			المسلمة					7 in Tabl	L 0a\	ļ	ļ		
Mean internal tempera (90)m= 18.52 18.78	19.24	19.79	20.12	ng 1.	<u> </u>	eps 3		20.2	e 9c) 19.77	19.09	18.48	1	(90)
10.02	15.24	10.75	20.12	20.2	20.23	20.	25		<u> </u>	ng area ÷ (4		0.43	(91)
										•	′	0.40	(,
Mean internal tempera	<u> </u>				1	<del>1 `</del>			20.44	10.50	40.00	1	(92)
(92)m= 19.03 19.25	19.65	20.14	20.44	20.		20.		20.5	20.11	19.52	18.99		(92)
Apply adjustment to the (93)m= 19.03 19.25	19.65	20.14	20.44	20.5	1	20.		20.5	20.11	19.52	18.99		(93)
8. Space heating requ		20.11	20.11		20.00	20.		20.0	20.11	10.02	10.00		()
Set Ti to the mean into		peratur	e obtain	ed a	step 11 of	<sup>:</sup> Tabl	le 9b	o, so tha	t Ti.m=(	76)m an	d re-calc	culate	
the utilisation factor fo									, ,				
Jan Feb	Mar	Apr	May	Jι	n Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisation factor for ga	ains, hm:	1		i		i					,	Ī	
(94)m= 0.91 0.89	0.84	0.73	0.58	0.4	1 0.3	0.3	34	0.55	0.78	0.88	0.92		(94)
Useful gains, hmGm,	<del>``</del>	<del>``</del>				T						Ī	(05)
(95)m= 327 344.53		351.31	305.12	218.		15	5	224.61	281.59	303.36	317.21		(95)
Monthly average exte (96)m= 4.3 4.9	6.5	8.9	11.7	14.	i	16	: 4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mea				l					l	I '.1	T.2	1	(00)
(97)m= 578.68 562.23		431.93	334.81	225.	<del></del>	157		243.02	364.62	479.01	574.06		(97)
Space heating require										<u> </u>		I	
(98)m= 187.25 146.29	116.51	58.04	22.09	0		0		0	61.77	126.46	191.1		
				ь					L			I	

	Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	909.51	(98)
Space heating requirement in kWh/m²/year		17.99	(99)
9b. Energy requirements – Community heating scheme	3		
This part is used for space heating, space cooling or wa	ater heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary	•	0	(301)
Fraction of space heat from community system 1 – (30	,	1	(302)
The community scheme may obtain heat from several sources. The includes boilers, heat pumps, geothermal and waste heat from powe	•	he latter	
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	or community heating system	1	(305)
Distribution loss factor (Table 12c) for community heati	ng system	1.05	(306)
Space heating		kWh/yea	r_
Annual space heating requirement		909.51	
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	954.99	(307a)
Efficiency of secondary/supplementary heating system		0	(308
Space heating requirement from secondary/supplement	ntary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		1888.37	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1982.79	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	29.38	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not	enter 0) = (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f) mechanical ventilation - balanced, extract or positive in		175.36	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	175.36	(331)
Energy for lighting (calculated in Appendix L)		241.09	(332)
Electricity generated by PVs (Appendix M) (negative qu	uantity)	-510.48	(333)
Electricity generated by wind turbine (Appendix M) (neg	gative quantity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (no Efficiency of heat source 1 (%)	ot CHP) s CHP using two fuels repeat (363) to (366) for the second fue	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x 0.22	675.06	(367)
Electrical energy for heat distribution	[(313) x 0.52 =	15.25	(372)

Total CO2 associated with community s	ystems	(363)(366) + (368)(37	72) =	690.31	(373)
CO2 associated with space heating (see	condary)	(309) x	0 =	0	(374)
CO2 associated with water from immers	sion heater or instanta	neous heater (312) x	0.22	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =		690.31	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	91.01	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	125.12	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appl	icable	0.52 x 0.01 =	-264.94	(380)
Total CO2, kg/year	sum of (376)(382) =			641.51	(383)
<b>Dwelling CO2 Emission Rate</b>	(383) ÷ (4) =			12.69	(384)
El rating (section 14)				91	(385)

#### **SAP 2012 Overheating Assessment**

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

Property Details: Plot 36

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: No Number of storeys: 1

Front of dwelling faces: South West

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

**Night ventilation:** False

Blinds, curtains, shutters:

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

Overheating Details:

Summer ventilation heat loss coefficient: 166.8 (P1)

Transmission heat loss coefficient: 28.7

Summer heat loss coefficient: 195.54 (P2)

Overhangs:

Orientation: Ratio: Z\_overhangs:

North East (NE) 0 1

Solar shading:

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

Solar gains:

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

Internal gains:

June July **August** 360.45 Internal gains 366.65 353.83 696.41 659.28 610.35 (P5) Total summer gains Summer gain/loss ratio 3.56 3.37 3.12 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Thermal mass temperature increment 1.3 1.3 1.3 (P7) Threshold temperature 20.86 22.57 22.22 Likelihood of high internal temperature Slight Medium Medium

Assessment of likelihood of high internal temperature: Medium

		User_[	Details:										
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012												
		Property	Address										
Address :													
1. Overall dwelling dime	ensions:												
One world floor			ea(m²)	1,, ,		ight(m)	_	Volume(m <sup>3</sup>	_				
Ground floor			50.54	(1a) x	2	2.5	(2a) =	126.36	(3a)				
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	50.54	(4)									
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	126.36	(5)				
2. Ventilation rate:													
	main seconda heating heating	iry	other		total			m³ per hou	r				
Number of chimneys	0 + 0	+	0	] = [	0	X	40 =	0	(6a)				
Number of open flues	0 + 0	_ + [	0	<u> </u>	0	X	20 =	0	(6b)				
Number of intermittent fa	ins				2	X	10 =	20	(7a)				
Number of passive vents	<b>;</b>				0	X	10 =	0	(7b)				
Number of flueless gas fi					0	x	40 =	0	(7c)				
				L					(, o)				
							Air ch	nanges per ho	our				
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =	Γ	20		÷ (5) =	0.16	(8)				
	peen carried out or is intended, proce	ed to (17),	otherwise (	continue fi	rom (9) to	(16)			<u></u>   				
Number of storeys in the Additional infiltration	he dwelling (ns)					1/0	\	0	(9)				
	.25 for steel or timber frame of	r 0 35 fc	or macon	ry coneti	ruction	[(9	)-1]x0.1 =	0	(10)				
	resent, use the value corresponding			•	luction			0	(11)				
deducting areas of opening									_				
·	floor, enter 0.2 (unsealed) or	).1 (seal	ed), else	enter 0				0	(12)				
If no draught lobby, en	s and doors draught stripped							0	(13)				
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(14)				
Infiltration rate					- 12) + (13) ·	+ (15) =		0	(16)				
Air permeability value,	q50, expressed in cubic metr	es per h	our per s	quare m	etre of e	envelope	e area	3	(17)				
If based on air permeabil	lity value, then $(18) = [(17) \div 20] +$	(8), otherv	vise (18) =	(16)				0.31	(18)				
	es if a pressurisation test has been do	one or a de	egree air pe	rmeability	is being u	sed			_				
Number of sides sheltere Shelter factor	ed .		(20) = 1 -	[0.075 x (	19)] =			0.78	(19) (20)				
Infiltration rate incorporate	ting shelter factor		(21) = (18	`	/ ]			0.78	(21)				
Infiltration rate modified f	•		( ) (	, , ,				0.24	(21)				
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]					
Monthly average wind sp		1	<u>,                                     </u>			1	ı	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	]					
	2)	1	1	1	1	•	1	ı					
Wind Factor (22a)m = (2.32)m $= (2.32)$ m	<del></del>	0.05	0.00		1.00	1 4 4 2	1 4 40	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					

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.3	0.3	0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28		
Calculate effec		•	rate for t	he appli	cable ca	se	•	•	•	•	•	· -	
If mechanica			andiv N. (O	2h) (22a	) Fm. / (	auation (	VEVV otho	muiaa (22h	·) (22a)			0	(238
If exhaust air he		0 11		, ,	,	. ,	,, .	,	)) = (23a)			0	(23h
If balanced with		-	-	_								0	(230
a) If balance						<u> </u>	<del>-                                    </del>	<del>í `</del>	<del>-                                    </del>	<del></del>	<del>` ` `</del>	i ÷ 100] 1	(0.4)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24a
b) If balance							<del>, ``</del>	<del>í `</del>	<del>r ´     `</del>	<del>- ´</del>		1	(=
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24)
c) If whole h				•	•				_				
	n < 0.5 x	· · · · ·			<u> </u>		· · · · ·	·	· ·	i	Γ.	1	(0.4)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(240
d) If natural if (22b)n	ventilation $= 1$ , the								0.5]				
(24d)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(240
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)			_	_	
(25)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(25)
3. Heat losse	s and he	at loss i	naramete	or.									
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	IIE	AXU		k-value	۵	ΑΧk
CLEIVICINI	area	-	m	-	A,r		W/m2		(W/I	K)	kJ/m²·l		kJ/K
Doors					2	х	1.4	=	2.8				(26)
Windows					8.651	x1,	/[1/( 1.4 )+	0.04] =	11.47	=			(27)
Walls Type1	20.9	6	8.65		12.31	x	0.15	— _ i	1.85	<b>=</b> [		$\neg \vdash$	(29)
Walls Type2	13.8		2		11.88	=	0.14	<b>=</b>	1.68	<b>=</b>		7 H	(29)
Roof	11.3		0	=	11.39	=	0.1	<b>=</b>	1.14	륵 ¦		<b>-</b>	(30)
Total area of e						=	0.1		1.14				
for windows and			offective wi	ndow I I-vs	46.23		n formula 1	1/[/1/  <b> </b> -valı	د 0.41 مداهر	es aiven in	naragranh	132	(31)
** include the area						atou uomg	, rormaia r	n vaic	10) 10.04] 0	io givoii iii	paragrapi	7 0.2	
Fabric heat los	ss, W/K =	= S (A x	U)				(26)(30)	) + (32) =				18.94	(33
Heat capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	441.11	(34)
Thermal mass	parame	ter (TMF	c = Cm ÷	- TFA) ir	n kJ/m²K			Indica	itive Value	: Low		100	(35)
For design assess				construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f		
can be used inste				icina An	nandiy k	(						0.04	
Thermal bridge	⋾ა. ∪ (L	,		٠.	•	`						9.81	(36)
ŭ	•	are not kn	10Wn (36) -		1)								
if details of therma	al bridging	are not kn	own (36) =	- 0.00 X (0				(33) +	· (36) =			28 74	(37)
Thermal bridge if details of therma Total fabric he Ventilation hea	al bridging at loss									25)m x (5	)	28.74	(37)
f details of therma Total fabric he	al bridging at loss at loss ca	alculated	d monthly	/	·	ابال	Aug	(38)m	= 0.33 × (		i	28.74	(37)
f details of therma Total fabric he Ventilation hea	at loss at loss at loss ca	alculated Mar		/ May	Jun	Jul 21.92	Aug 21.87	(38)m Sep	= 0.33 × (	Nov	Dec	28.74	
if details of thermal Total fabric he Ventilation hea Jan (38)m= 22.78	at loss ca feb	Mar 22.64	monthly Apr	/	·	Jul 21.92	Aug 21.87	(38)m Sep 22.04	Oct 22.23	Nov 22.36	i	28.74	
if details of therma Total fabric he Ventilation hea	at loss ca feb	Mar 22.64	monthly Apr	/ May	Jun		<del></del>	(38)m Sep 22.04	= 0.33 × (	Nov 22.36	Dec	28.74	(38)

eat loss para	meter (F	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
0)m= 1.02	1.02	1.02	1.01	1.01	1	1	1	1	1.01	1.01	1.01		
umber of day	s in mor	nth <i>(</i> Tabl	le 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.01	(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/yea	ar:	
ssumed occu											71		(42
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)	)2)] + 0.0	0013 x (	TFA -13.	.9)			
nnual averag	e hot wa										.65		(43
educe the annua ot more that 125	_				_	_	to achieve	a water us	se target o	f			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir								[ ОСР	1 000	1101			
4)m= 86.52	83.37	80.23	77.08	73.93	70.79	70.79	73.93	77.08	80.23	83.37	86.52		
	<i>h</i> = <i>t</i> · · · · = <i>t</i> = <i>u</i>			and by A	400 \/-/		T / 2000			m(44) <sub>112</sub> =		943.85	(4
nergy content of			100.96						104.82	114.42			
5)m= 128.31	112.22	115.8	100.96	96.87	83.59	77.46	88.89	89.95		m(45) <sub>112</sub> =	124.26	1237.53	(4
instantaneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar – ou	111(40)112 =	L	1207.00	
6)m= 0	0	0	0	0	0	0	0	0	0	0	0		(4
/ater storage torage volum		inaludin	a 001/0	olor or M	WHE	otorogo	within or	ama voo	ool				(4
community h	, ,					_		arric ves	301		0		(4
therwise if no	•			•			` '	ers) ente	er '0' in (	47)			
/ater storage					4.144	/ I \							
) If manufact				or is kno	wn (kVVr	n/day):					0		(4
emperature fa							(40) (40)				0		(4
nergy lost fro  ) If manufact		•	•		or is not		(48) x (49)	) =			0		(5
ot water stora	age loss	factor fr	om Tabl								0		(5
community h	_		on 4.3										
olume factor	-		2h							-	0		(5)
emperature fa							(47) (54)	(50) (	<b>50</b> \		0		(5
nergy lost fro Enter (50) or (		_	, KVVh/ye	ear			(47) x (51)	) x (52) x (	53) =	-	0		(5
/ater storage	, ,	,	or each	month			((56)m = (	55) <b>v</b> (41):	m		0		(5
									1		•		/5
6)m= 0 cylinder contains	0 dedicated	0 d solar sto	0 rage, (57)ı	0 n = (56)m	0 x [(50) – (	0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	m where (	0 H11) is fro	0 m Appendix	Н	(5
7)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
´						Ů	Ů				0		(5
	ioss (an	muan tro	บบ เลกเล								., 1		(3)
rimary circuit	•	•			59)m - 1	(58) <u>+</u> 36	S5 ~ (11)	m					
rimary circuit (modified by	loss cal	culated f	or each	month (	•	. ,	, ,		r thermo				

Combi loss calculate	d for each	month (	(61)m =	(60) ÷ 3	65 × (41	)m							
(61)m= 0 0	0	0	0 0	0	00 % (41)	)   0		0	0	T 0	0	]	(61)
Total heat required for	or water h	eating ca	alculated	l for eac	h month	<u> </u>	!			ļ	ļ	J (59)m + (61)m	, ,
(62)m= 109.06 95.38		85.81	82.34	71.05	65.84	75.	_	76.45	89.1	97.26	105.62	]	(62)
Solar DHW input calculate	d using App	endix G o	r Appendix	L H (negat	Iive quantity	y) (ent	er '0'	if no sola	r contribu	I ition to wate	er heating)	1	
(add additional lines											0,		
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from water he	ater						•			•	!	•	
(64)m= 109.06 95.38	98.43	85.81	82.34	71.05	65.84	75.	55	76.45	89.1	97.26	105.62	]	
		Į.	ı	<u> </u>			Outp	ut from wa	ater heat	er (annual)	112	1051.9	(64)
Heat gains from water	er heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (6	1)m	] + 0.8 x	: [(46)m	n + (57)m	+ (59)m	]	
(65)m= 27.26 23.85	24.61	21.45	20.58	17.76	16.46	18.8	89	19.11	22.28	24.32	26.4	]	(65)
include (57)m in ca	alculation	of (65)m	only if c	ylinder i	s in the	dwell	ing (	or hot w	ater is	from com	munity h	neating	
5. Internal gains (s	ee Table 5	and 5a	):									-	
Metabolic gains (Tab			,										
Jan Feb		Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
(66)m= 85.31 85.31	85.31	85.31	85.31	85.31	85.31	85.3	31	85.31	85.31	85.31	85.31	1	(66)
Lighting gains (calcu	lated in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee T	Table 5				•	
(67)m= 13.65 12.12	9.86	7.47	5.58	4.71	5.09	6.6	52	8.88	11.28	13.16	14.03	]	(67)
Appliances gains (ca	lculated ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ole 5	•	•	•	
(68)m= 148.65 150.1	146.3	138.03	127.58	117.77	111.21	109.	.66	113.55	121.83	132.27	142.09	]	(68)
Cooking gains (calcu	lated in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5	•	•	•	
(69)m= 31.53 31.53	31.53	31.53	31.53	31.53	31.53	31.	53	31.53	31.53	31.53	31.53	]	(69)
Pumps and fans gair	ıs (Table క	Ба)	•		•		•			•	•	4	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0	]	(70)
Losses e.g. evapora	ion (nega	tive valu	es) (Tab	le 5)		•	•					•	
(71)m= -68.25 -68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.	.25	-68.25	-68.25	-68.25	-68.25		(71)
Water heating gains	(Table 5)	•	•	•	•	•				•	•	•	
(72)m= 36.65 35.49	33.07	29.8	27.67	24.67	22.12	25.3	39	26.55	29.94	33.77	35.49	]	(72)
Total internal gains	=	•	•	(66	)m + (67)m	n + (68	3)m +	· (69)m + (	70)m + (	71)m + (72)	)m	•	
(73)m= 247.54 246.3	237.83	223.88	209.42	195.74	187.01	190.	.26	197.57	211.64	227.8	240.2	]	(73)
6. Solar gains:	•				,	,	j			•	•		
Solar gains are calculate	d using sola	r flux from	Table 6a	and assoc	iated equa	ations t	to co	nvert to th	e applica	ble orienta	tion.		
Orientation: Access		Area		Flu			_	g_ - b l - Cb	_	FF		Gains	
Table 6	oa 	m²			ble 6a		1 8	able 6b		Table 6c		(W)	_
Northeast 0.9x 0.7	7 ×	8.6	S5	х	11.28	X		0.63	x	0.7	=	29.83	(75)
Northeast 0.9x 0.7	7 ×	8.6	S5	x	22.97	X		0.63	x [	0.7	=	60.72	(75)
Northeast 0.9x 0.7	7 ×	8.6	S5	x	41.38	X		0.63	x [	0.7	=	109.4	(75)
Northeast 0.9x 0.7	7 ×	8.6	65	x (	67.96	X		0.63	x [	0.7	=	179.67	(75)
Northeast 0.9x 0.7	7 ×	8.6	35	x .	91.35	X		0.63	X	0.7	=	241.51	(75)

Northeast <sub>0.9x</sub>	0.77	X	8.6	65	x	97.38	X		0.63	x	0.7	=	257.47	(75)
Northeast <sub>0.9x</sub>	0.77	x	8.6	65	x	91.1	X		0.63	x	0.7	=	240.86	(75)
Northeast <sub>0.9x</sub>	0.77	х	8.6	65	x	72.63	X		0.63	x	0.7	=	192.02	(75)
Northeast <sub>0.9x</sub>	0.77	х	8.6	65	x	50.42	x		0.63	x	0.7	=	133.31	(75)
Northeast <sub>0.9x</sub>	0.77	x	8.6	55	x	28.07	x		0.63	x	0.7	=	74.21	(75)
Northeast <sub>0.9x</sub>	0.77	x	8.6	55	x	14.2	x		0.63	x	0.7		37.53	(75)
Northeast 0.9x	0.77	x	8.6	55	x	9.21	x		0.63	_ x [	0.7		24.36	(75)
Solar gains in	watts, ca	alculated	I for eacl	h month			(83)m	n = Si	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.47	240.86	192	.02	133.31	74.21	37.53	24.36		(83)
Total gains –	internal a	and solar	(84)m =	= (73)m	+ (83)m	, watts								
(84)m= 277.37	307.12	347.23	403.55	450.93	453.21	427.87	382	.28	330.88	285.84	265.33	264.56		(84)
7. Mean inte	rnal temp	perature	(heating	season	)									
Temperature	e during h	neating p	eriods ir	the livi	ng area	from Ta	ble 9,	, Th	1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see T	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 0.97	0.96	0.93	0.87	0.76	0.61	0.48	0.5	54	0.76	0.91	0.96	0.98		(86)
Mean interna	al temper	ature in	living ar	22 T1 (f	llow et	one 3 to	7 in T	-ahla	2 9c)					
(87)m= 18.81	19.02	19.44	20.01	20.51	20.82	20.93	20.		20.63	20	19.31	18.76		(87)
. ,	ļ	<u> </u>												, ,
Temperature (88)m= 20.07	20.07	20.07			20.08	Ť	Т		` ,	20.00	20.07	20.07		(88)
(88)m= 20.07	20.07	20.07	20.08	20.08	20.06	20.08	20.	06	20.08	20.08	20.07	20.07		(00)
Utilisation fa	<del> </del>					1	T						1	
(89)m= 0.97	0.95	0.92	0.85	0.72	0.54	0.39	0.4	15	0.71	0.89	0.95	0.97		(89)
Mean interna	al temper	ature in	the rest	of dwell	ng T2 (	follow ste	eps 3	to 7	7 in Tabl	e 9c)	_			
(90)m= 18.05	18.26	18.68	19.23	19.69	19.96	20.05	20.	03	19.82	19.23	18.55	18.01		(90)
									f	LA = Livir	ng area ÷ (4	4) =	0.43	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1	– fL	A) × T2					
(92)m= 18.38	18.59	19.01	19.57	20.05	20.33	20.43	20.	41	20.17	19.56	18.88	18.33		(92)
Apply adjust	ment to t	he mean	internal	temper	ature fr	om Table	4e,	whe	re appro	priate			l	
(93)m= 18.38	18.59	19.01	19.57	20.05	20.33	20.43	20.	41	20.17	19.56	18.88	18.33		(93)
8. Space he	ating requ	uirement												
Set Ti to the					ned at s	tep 11 of	Tabl	le 9b	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
the utilisation	1				ı .	1					·		1	
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation fa	0.94	o.91	0.84	0.72	0.56	0.43	0.4	10	0.71	0.88	0.94	0.96		(94)
Useful gains					0.50	0.43	0.4	+9	0.71	0.00	0.94	0.90		(04)
(95)m= 265.65	<del>-</del>	316.17	338.1	323.5	254.6	182.36	185	74	235.96	251.93	250.08	254.61		(95)
Monthly ave						102.00	100		200.00	201.00	200.00	201.01		()
(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						1	<u> </u>			]	1	I	I	
(97)m= 725.56	1	642.58	544.46	425.37	290.46	<del></del>	202	<del>_</del>	308.31	456.8	601.9	724.22		(97)
Space heati	ng require	ement fo	r each n	nonth, k	Wh/moi	-10.02	24 x [	<u>_</u> [(97)	m – (95	)m] x (4	1)m	•	1	
(98)m= 342.17	278.75	242.84	148.58	75.79	0	0	0	)	0	152.42	253.31	349.39		
													•	

								Tota	l per year	(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	1843.27	(98)
Space	heatin	g require	ement in	kWh/m²	<sup>2</sup> /year								36.47	(99)
8c. Sp	ace co	oling req	uiremer	nt										
Calcul	ated fo	r June, J	July and	August.	See Tal	ole 10b	_				_	_	_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	oerature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	476.28	374.94	384.65	0	0	0	0		(100)
Utilisat	tion fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.82	0.87	0.83	0	0	0	0		(101)
Useful	loss, h	mLm (V	/atts) = (	(100)m x	(101)m		-						•	
(102)m=	0	0	0	0	0	388.43	325.23	321	0	0	0	0		(102)
Gains	(solar	gains cal	lculated	for appli	cable we	eather re	egion, se	e Table	10)				•	
(103)m=	0	0	0	0	0	594.22	563.42	511.11	0	0	0	0		(103)
		g require zero if (				lwelling,	continu	ous ( kW	h' = 0.02	24 x [(10	03)m – (	102)m].	x (41)m	
(104)m=	0	0	0	0	0	148.17	177.21	141.44	0	0	0	0		
_		•							Total	= Sum(	104)	=	466.82	(104)
Cooled	fraction	n							f C =	cooled	area ÷ (4	<b>1</b> ) =	1	(105)
Intermi <u>t</u>	tency f	actor (Ta	able 10b	)									•	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	I = Sum(	104)	=	0	(106)
Space o	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n					•	
(107)m=	0	0	0	0	0	37.04	44.3	35.36	0	0	0	0		
									Total	= Sum(	107)	=	116.71	(107)
Space o	cooling	requirer	ment in k	kWh/m²/y	/ear				(107)	÷ (4) =			2.31	(108)
8f. Fabr	ric Ene	rgy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabric	Energ	y Efficier	псу						(99) -	+ (108) =	=		38.78	(109)

#### **SAP Input**

Property Details: Plot 36

Address:

Located in: England Region: Thames valley

**UPRN:** 

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

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown
No related party
Indicative Value Low

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

PCDF Version: 466

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 50.545 m<sup>2</sup> 2.5 m

Living area: 21.831 m<sup>2</sup> (fraction 0.432)

Front of dwelling faces: South West

Opening types:

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

SW Manufacturer Solid

NE Manufacturer Windows double-glazed Yes

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

Name: Type-Name: Location: Orient: Width: Height:

SW Corridor Wall South West 0 0
NE External Wall North East 0 0

Overshading: Average or unknown

Opaque Elements:

Type: Gross area: Openings: Net area: U-value: Ru value: Curtain wall: Kappa: **External Elements** External Wall 20.964 8.65 12.31 0.15 0 False N/A Corridor Wall 13.875 2 11.88 0.15 0.4 False N/A Flat Roof 11.386 0 11.39 0.1 0 N/A

Internal Elements
Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.2122

LengthPsi-value4.7950.289E2Other lintels (including other steel lintels)13.20.047E4Jamb16.7980.063E7Party floor between dwellings (in blocks of flats)

### **SAP Input**

11.6	0.055	E18	Party wall between dwellings
12.646	0.103	E24	Eaves (insulation at ceiling level - inverted)
7.229	0.56	E15	Flat roof with parapet
20.271	0	P3	Intermediate floor between dwellings (in blocks of flats)
3.15	0.24	P4	Roof (insulation at ceiling level)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

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

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

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

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

Boiler interlock: Yes

Main heating Control:

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

thermostats Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

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

Others:

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

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.62 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

Stroma Name:   Stroma FSAP 2012   Stroma Number:   STR0001082			User_l	Details:						
## Arca(m²)   Av. Height(m)   Volume(m²)										
Area(m²)			Property	Address	: Plot 36	;				
Area(m²)   Av. Height(m)   Volume(m²)	Address :									
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)   So.54   (1a) x   Z.5   (2a)   = 126.36   (3a)	1. Overall dwelling dime	ensions:								
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)	Cround floor				14-2		- '	_		<u>-</u>
Number of chimneys				50.54	<u> </u>		2.5	(2a) =	126.36	(3a)
2. Ventilation rate:    main   heating   heating   heating   heating	Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	In)	50.54	(4)					
Number of chimneys	Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+.	(3n) =	126.36	(5)
Number of chimneys 0 + 0 + 0 = 0 x40 = 0 (8a)  Number of open flues 0 + 0 + 0 = 0 x20 = 0 (8b)  Number of intermittent fans 2 x10 = 20 (7a)  Number of intermittent fans 2 x10 = 0 (7b)  Number of passive vents 0 x40 = 0 (7b)  Number of gassive vents 0 x40 = 0 (7c)  Number of flueless gas fires 0 x40 = 0 (7c)  Air changes per hour  Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7b) = 20 (7c)  Number of storeys in the dwelling (ns)  Additional infiltration  Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  Percentage of windows and doors draught stripped  Window infiltration rate 0.05, else enter 0  Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 (15)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)  Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Number of sides sheltered  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Air permeability alone applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  5	2. Ventilation rate:									
Number of chimneys				other		total			m³ per hou	ır
Number of intermittent fans    2	Number of chimneys			0	] = [	0	)	< 40 =	0	(6a)
Number of passive vents	Number of open flues	0 + 0	<b>=</b> +	0	<u> </u>	0	,	(20 =	0	(6b)
Number of flueless gas fires    0	Number of intermittent fa	ins				2	,	c 10 =	20	(7a)
Number of flueless gas fires	Number of passive vents	3			F	0	<del></del>	c 10 =		(7b)
Air changes per hour	·				L		=	< 40 =		╡``
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20	Number of flueless gas in	1163				0			0	(70)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)   Number of storeys in the dwelling (ns)								Air ch	nanges per ho	our
Number of storeys in the dwelling (ns)	Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+	(7a)+(7b)+	(7c) =	Γ	20		÷ (5) =	0.16	(8)
Additional infiltration	If a pressurisation test has b	een carried out or is intended, proce	ed to (17),	otherwise (	continue fi	rom (9) to	(16)			``
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction  if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - $[0.2 \times (14) \div 100] =$ Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = $[(17) \div 20] \div (8)$ , otherwise (18) = (16)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor  (20) = 1 - $[0.075 \times (19)] =$ 0.32  (21)  Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7  (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7  Wind Factor (22a)m = (22)m ÷ 4	•	he dwelling (ns)							0	(9)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35  If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0  If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 × (14) ÷ 100] =  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) =  O (15)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor  (20) = 1 - [0.075 × (19)] =  0.78  (20)  Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7  (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7  Wind Factor (22a)m = (22)m ÷ 4							[(9	9)-1]x0.1 =	0	= ' '
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0   0 (12)					•	ruction			0	(11)
If no draught lobby, enter 0.05, else enter 0  Percentage of windows and doors draught stripped  Window infiltration  0.25 - [0.2 x (14) ÷ 100] = 0 (15)  Infiltration rate  (8) + (10) + (11) + (12) + (13) + (15) = 0 (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor  (20) = 1 - [0.075 x (19)] = 0.78 (20)  Infiltration rate incorporating shelter factor  (21) = (18) x (20) = 0.32 (21)  Infiltration rate modified for monthly wind speed  Monthly average wind speed from Table 7  (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7  Wind Factor (22a)m = (22)m ÷ 4	• • • • • • • • • • • • • • • • • • • •	•	to the gree	ner wan are	a (anter					
Percentage of windows and doors draught stripped  Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times$	If suspended wooden	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.015$ Infiltration rate $(8) \div (10) \div (11) \div (12) \div (13) \div (15) = 0.016$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $5.017$ If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ $0.41$	•								0	(13)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)  Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.41 (18)  Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.78$ (20)  Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.32$ (21)  Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7  (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor $(22a)m = (22)m \div 4$	•	s and doors draught stripped		0.05 [0.0	(4.4) 4	1001			0	= ' '
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area  If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor $(20) = 1 - [0.075 \times (19)] = $ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = $ Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7 $(22)m = 5.1  5  4.9  4.4  4.3  3.8  3.8  3.7  4  4.3  4.5  4.7$ Wind Factor $(22a)m = (22)m \div 4$							± (15) =			= ' '
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $(21) = (18) \times (20) =$ Monthly average wind speed from Table 7 $(22)m = 5.1  5  4.9  4.4  4.3  3.8  3.8  3.7  4  4.3  4.5  4.7$ Wind Factor $(22a)m = (22)m \div 4$		a50 expressed in cubic met	as nar h					e area		= ' '
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used  Number of sides sheltered  Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.78  (20)$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.32  (21)$ Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7 $(22)m = 5.1  5  4.9  4.4  4.3  3.8  3.8  3.7  4  4.3  4.5  4.7$ Wind Factor $(22a)m = (22)m \div 4$		• • •	•	•	•	ietie oi e	rivelop	e area		=
Shelter factor $ (20) = 1 - [0.075 \times (19)] = 0.78 $ (20) Infiltration rate incorporating shelter factor $ (21) = (18) \times (20) = 0.32 $ (21) Infiltration rate modified for monthly wind speed	•	•				is being u	sed		0.41	()
Infiltration rate incorporating shelter factor		ed							3	(19)
Infiltration rate modified for monthly wind speed  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Monthly average wind speed from Table 7  (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$ Wind Factor (22a)m = (22)m $\div$ 4				` /	`	19)] =			0.78	(20)
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Monthly average wind speed from Table 7           (22)m=         5.1         5         4.9         4.4         4.3         3.8         3.7         4         4.3         4.5         4.7           Wind Factor (22a)m = (22)m ÷ 4	·	•		(21) = (18	s) x (20) =				0.32	(21)
Monthly average wind speed from Table 7 (22)m= $\begin{bmatrix} 5.1 & 5 & 4.9 & 4.4 & 4.3 & 3.8 & 3.8 & 3.7 & 4 & 4.3 & 4.5 & 4.7 \end{bmatrix}$ Wind Factor (22a)m = (22)m $\div$ 4		<del></del>	<del></del>	Ι.			<del></del>	T _	1	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			Jul	Aug	Sep	Oct	Nov	Dec		
Wind Factor (22a)m = (22)m ÷ 4	<del> </del>		1 00	1 07	<del></del>	1 40	1 45	1 4 7	1	
	(22)M= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	<u> </u>	4.3	4.5	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	Wind Factor (22a)m = (2	2)m ÷ 4								
	(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.4	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37		
Calculate effect If mechanica		•	rate for t	he appli	cable ca	se	-	-	-	-		· -	
If exhaust air h			andiv N (2	3h) - (23a	a) × Emy (e	aguation (1	VSV) othe	rwica (23h	) = (23a)			0	(23
If balanced with		0 11		, ,	,	. ,	,, .	,	) = (23a)			0	(23
		-	-	_					Ola \	00h) [	4 (00-)	0	(23
a) If balance					at recove	<del>- ` `                                 </del>	<del>-                                    </del>	ŕ	<del>,                                    </del>	<del>-                                    </del>	<u>`</u>	÷ 100] I	(24
(24a)m= 0			0	0		0	0	0	0	0	0		(24)
b) If balance						<del>-                                    </del>	<del>ÉÉÉ</del>	ŕ	<del>r ´     `</del>	<del></del>	Ι .	I	(0.4
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				•	•				F (00l-	. \			
	0.5 ×	(230), t	nen (240	(230) = (230)	o); otherv	wise (24 0	C) = (220)	r e	· ·	i	1 0	Ī	(24
		<u> </u>			0	<u> </u>	<u> </u>	0	0	0	0		(24
d) If natural if (22b)n				•	rwise (2				0.5]				
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)					
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25
3. Heat losse	s and he	at loss i	naramete	or.									
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	IIE	AXU		k-value	2	AXk
ELEIVIEINI	area	_	m	-	A,r		W/m2		(W/I	K)	kJ/m²·l		kJ/K
Doors					2	х	1	=	2				(26
Vindows					8.651	x1	/[1/( 1.4 )+	0.04] =	11.47	Ħ			(27
Walls Type1	20.9	96	8.65		12.31	X	0.18	i	2.22	<b>=</b>		$\neg \vdash$	(29
Nalls Type2	13.8		2		11.88	=	0.18	<u> </u>	2.14	<b>=</b>		<b>-</b>	(29
Roof	11.3		0	=	11.39	=	0.13	<u>-</u>	1.48	륵 ;		ᅱ 늗	(30
Total area of e						_	0.13		1.40				
for windows and			offoctivo wi	ndow I I ve	46.23		ı formula 1	/[/1/    val	(0) 1 0 041 6	ne aivon in	naragranh	. 2 2	(31
* include the area						ateu using	i ioiiiiula i	/[(1/O-vaic	16)+0.04] 6	is giveri iii	paragrapi	1 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	) + (32) =				19.3	(33
Heat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	441.11	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
For design assess	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
can be used inste	ad of a de	tailed calc	ulation.										
Thermal bridge	es : S (L	x Y) cal	culated (	using Ap	pendix ł	<						10.23	(36
f details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(0.0)	(0.0)				
Fotal fabric he									(36) =			29.54	(37
entilation hea			·			_			= 0.33 × (		i	Ī	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		2.
38)m= 24.24	24.11	23.98	23.38	23.26	22.73	22.73	22.64	22.94	23.26	23.49	23.73		(38
Heat transfer of	oefficier	nt, W/K						(39)m	= (37) + (	38)m		-	
	E2 CE	53.52	52.91	52.8	52.27	52.27	52.17	52.47	52.8	53.03	F2 27		
(39)m= 53.78	53.65	55.52	32.91	32.0	52.21	02.21	02.17	52.47	32.0	55.05	53.27		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05		
		!	<u>.                                    </u>	!	<u>.                                    </u>	!	!		Average =	Sum(40) <sub>1</sub>	12 /12=	1.05	(40)
Number of day	<u> </u>	<u> </u>	· ·	·	i .	<del></del>				<del></del>			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4 344 4 1											1.3.671. /		
4. Water hea	ting ene	rgy requ	rement:								kWh/ye	ear:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		71		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $c$	lwelling is	designed			se target o		.72		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea				Table 1c x		<u>'</u>	!	!	<u> </u>		
(44)m= 82.19	79.2	76.22	73.23	70.24	67.25	67.25	70.24	73.23	76.22	79.2	82.19		
					100 - 1/-/-		·			m(44) <sub>112</sub> =		896.65	(44)
Energy content of													
(45)m= 121.89	106.61	110.01	95.91	92.03	79.41	73.59	84.44	85.45	99.58	108.7	118.04	4475.00	(45)
If instantaneous v	vater heati	ing at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		10tal = Su	m(45) <sub>112</sub> =	•	1175.66	(43)
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage			<u> </u>	!	<u> </u>	!	!	!	!	<u> </u>			
Storage volum	`	,				Ū		ame ves	sel		150		(47)
If community hotherwise if no	•			•			` '	ore) onto	or 'O' in <i>(</i>	′ <b>17</b> \			
Water storage		not wate	:i (iiii5 ii	iciuues i	HStaritai	ieous cc	ווטט וטווונ	ers) erite	ei O III (	(47)			
a) If manufact		eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =			0		(50)
<ul><li>b) If manufact</li><li>Hot water stor</li></ul>			-										(E1)
If community h	•			ic Z (KVV	ii/iitiG/G6	xy <i>)</i>					0		(51)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		•	, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or	` , ` `	,						,			0		(55)
Water storage	loss cal	Iculated 1	or each	month			((56)m = (	(55) × (41)	m ·	1			
(56)m= 0	0	0	0	0 (50) ==	0	0	0	0 (50)	0	0	0	51.1	(56)
If cylinder contain		1			1							IX II	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	•	•									0		(58)
Primary circuit (modified by					•	. ,	, ,		r tharma	stat)			
(59)m= 0	0	0	0	0	olar wa	o lei neatii			0	0	0		(59)
(00)													(50)

Combi loss ca	lculated	for each	month (	′61)m =	(60) ± 3	865 <b>v</b> (41	)m							
(61)m= 0	0	0	0	0	0	0	)   0		0	0	0	0	]	(61)
	uired for	water h	eating ca	alculated	l for ead	ch month	(62)ı	—— m =	0.85 × (	(45)m +	(46)m +	(57)m +	נ · (59)m + (61)m	
(62)m= 103.61	90.62	93.51	81.52	78.22	67.5	62.55	71.	_	72.63	84.65	92.4	100.34	1	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	H (nega	tive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	er heating)	)	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	applie	s, see Ap	pend	lix C	3)					
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from w	ater hea	ter												
(64)m= 103.61	90.62	93.51	81.52	78.22	67.5	62.55	71.	77	72.63	84.65	92.4	100.34		_
								Outp	out from wa	ater heate	er (annual)	112	999.31	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	1)m	] + 0.8 x	( [(46)m	+ (57)m	+ (59)m	<u>]</u> ]	
(65)m= 25.9	22.65	23.38	20.38	19.56	16.87	15.64	17.9	94	18.16	21.16	23.1	25.08		(65)
include (57)	m in cald	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a	):										
Metabolic gair	ns (Table	5), Wat	ts	_			_			_			_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(66)m= 85.31	85.31	85.31	85.31	85.31	85.31	85.31	85.3	31	85.31	85.31	85.31	85.31	]	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 d	or L9a), a	lso s	ee ¯	Table 5				_	
(67)m= 13.65	12.12	9.86	7.47	5.58	4.71	5.09	6.6	2	8.88	11.28	13.16	14.03	]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation l	_13 or L1	3a), a	also	see Tal	ble 5				
(68)m= 148.65	150.19	146.3	138.03	127.58	117.77	111.21	109	.66	113.55	121.83	132.27	142.09	]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5			_	
(69)m= 31.53	31.53	31.53	31.53	31.53	31.53	31.53	31.	53	31.53	31.53	31.53	31.53	]	(69)
Pumps and fa	ns gains	(Table 5	ōa)										_	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.	.25	-68.25	-68.25	-68.25	-68.25	]	(71)
Water heating	gains (T	able 5)											_	
(72)m= 34.81	33.71	31.42	28.31	26.28	23.44	21.02	24.	12	25.22	28.44	32.08	33.72	]	(72)
Total internal	gains =				(66	6)m + (67)m	า + (68	3)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 245.71	244.62	236.18	222.39	208.04	194.51	185.91	188	.99	196.24	210.14	226.11	238.43		(73)
6. Solar gain														
Solar gains are		•				•	ations 1	to co		e applica		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		Т	g_ able 6b	Т	FF able 6c		Gains (W)	
_							1 1					_	. ,	٦
Northeast 0.9x	0.77	X	8.6		X	11.28	X 1		0.63	×	0.7	_ =	29.83	(75)
Northeast 0.9x	0.77	X	8.6			22.97	X		0.63	X	0.7	=	60.72	(75)
Northeast 0.9x	0.77	X	8.6		<b>—</b>	41.38	X 1		0.63		0.7	=	109.4	(75)
Northeast 0.9x	0.77	X	8.6		-	67.96	X 1		0.63	×	0.7	=	179.67	(75)
Northeast <sub>0.9x</sub>	0.77	X	8.6	35	X	91.35	X		0.63	X	0.7	=	241.51	(75)

Northeast <sub>0.9x</sub>	0.77	X	8.6	65	X	97.38	] x [	0.63	х	0.7	=	257.47	(75)
Northeast <sub>0.9x</sub>	0.77	x	8.6	65	x	91.1	_ x [	0.63	x	0.7	=	240.86	(75)
Northeast <sub>0.9x</sub>	0.77	х	8.6	55	x	72.63	x [	0.63	х	0.7	=	192.02	(75)
Northeast <sub>0.9x</sub>	0.77	х	8.6	65	X .	50.42	] x [	0.63	х	0.7	=	133.31	(75)
Northeast <sub>0.9x</sub>	0.77	Х	8.6	55	x	28.07	x	0.63	x	0.7		74.21	(75)
Northeast <sub>0.9x</sub>	0.77	x	8.6	55	x	14.2	×	0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	х	8.6	65	х	9.21	i × i	0.63	x	0.7	=	24.36	(75)
•							_						
Solar gains in	watts, ca	alculated	I for eacl	h month			(83)m	= Sum(74)m	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.47	240.86	192.0	02 133.31	74.21	37.53	24.36		(83)
Total gains –	internal a	and solar	(84)m =	= (73)m	+ (83)m	, watts						•	
(84)m= 275.54	305.34	345.58	402.06	449.55	451.98	426.77	381.0	329.55	284.34	263.64	262.79		(84)
7. Mean inte	rnal temp	perature	(heating	season	)								
Temperature	during h	neating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	living are	ea, h1,m	(see Ta	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.97	0.88	0.7	0.53	0.61	0.88	0.99	1	1		(86)
Mean interna	al temper	ature in	living ar	22 T1 (f	ollow etc	one 3 to 3	7 in Ta	ahla Oc)					
(87)m= 19.82	19.94	20.18	20.53	20.82	20.96	20.99	20.9		20.49	20.1	19.8		(87)
` '	ļ	<u> </u>			<u> </u>	<u> </u>		<u> </u>					, ,
Temperature (88)m= 20.03	20.03	eating p	eriods ir 20.04		20.05	1	1		1 20 0E	T 20.04	20.04	Ī	(88)
(88)m= 20.03	20.03	20.03	20.04	20.05	20.05	20.05	20.0	6 20.05	20.05	20.04	20.04		(00)
Utilisation fa	ctor for g	ains for i			h2,m (s	ee Table	9a)		1		1	i	
(89)m= 1	1	0.99	0.96	0.84	0.61	0.42	0.5	0.82	0.98	1	1		(89)
Mean interna	al temper	ature in	the rest	of dwell	ng T2 (t	follow ste	eps 3	to 7 in Tab	ole 9c)				
(90)m= 18.95	19.07	19.31	19.66	19.92	20.04	20.05	20.0	5 19.97	19.63	19.24	18.94		(90)
									fLA = Livi	ng area ÷ (	4) =	0.43	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 -	- fLA) × T2	2				
(92)m= 19.33	19.45	19.69	20.03	20.31	20.44	20.46	20.4	<del>-                                    </del>	20	19.61	19.31		(92)
Apply adjust	ment to t	he mean	internal	temper	ature fro	om Table	4e, v	vhere appi	ropriate	1		l	
(93)m= 19.33	19.45	19.69	20.03	20.31	20.44	20.46	20.4	6 20.36	20	19.61	19.31		(93)
8. Space hea	ating requ	uirement											
Set Ti to the					ed at st	ep 11 of	Table	9b, so the	at Ti,m=	(76)m an	d re-calc	culate	
the utilisation	1				<del>.</del>	<del></del>	1 .		1 -	T	Ι_	Ī	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
Utilisation fac	ctor for g	ains, nm	0.96	0.85	0.65	0.47	0.55	5 0.84	0.98	Τ ,	1		(94)
(94)m= 1 Useful gains					0.65	0.47	0.50	0.04	0.90	1	_ '		(34)
(95)m= 274.96	1	341.73	384.45	381.76	292.62	199.95	207.7	77 278.03	278.29	262.57	262.37		(95)
Monthly avei	ļ					100.00	207.	270.00	270.20	202.07	202.07		(55)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	<u> </u>				l	<u> </u>							
(97)m= 808.25	780.56	705.8	588.98	454.6	305.13	201.72	211.5		<del>-</del>	663.54	805.03		(97)
Space heatir	ng require	ement fo	r each n	nonth, k		th = 0.02	24 x [(	97)m – (9	5)m] x (4	·1)m		ı	
(98)m= 396.77	320.16	270.87	147.26	54.19	0	0	0	0	162.25	288.7	403.74		
							•	•	•			•	

Total per year (kWh/year) = $Sum(98)_{15,912}$												8) <sub>15,912</sub> =	2043.95	(98)
Space	e heating	g require	ement in	kWh/m²	<sup>2</sup> /year								40.44	(99)
8c. Sp	pace cod	oling req	uiremen	it										
Calcu	lated for	r June, J	luly and	August.	See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	Lm (ca	lculated	using 25	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	491.34	386.8	396.51	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm										,	
(101)m=	0	0	0	0	0	0.91	0.96	0.93	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = (	100)m x	(101)m								,	
(102)m=	0	0	0	0	0	448.63	369.73	368.9	0	0	0	0		(102)
Gains	(solar g	gains cal	culated	for appli	cable we	eather re	gion, se	e Table	10)				-	
(103)m=	0	0	0	0	0	592.99	562.31	509.84	0	0	0	0		(103)
	Space cooling requirement for month, whole dwelling, continuous ( $kWh$ ) = 0.024 x [(103) $m$ - (102) $m$ ] as the set (104) $m$ to zero if (104) $m$ < 3 × (98) $m$													
(104)m=		0	0	0	0	103.94	143.28	104.85	0	0	0	0		
•									Total	= Sum(	104)	=	352.08	(104)
Cooled	I fraction	1							f C =	cooled	area ÷ (4	<b>4)</b> =	1	(105)
		actor (Ta	able 10b	)			1						1	_
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	I = Sum(	(104)	=	0	(106)
· .					<u> </u>		× (106)r				Г	Г	1	
(107)m=	0	0	0	0	0	25.99	35.82	26.21	0	0	0	0		_
									Total	= Sum(	1.0.7)	=	88.02	(107)
Space	cooling	requirer	nent in k	:Wh/m²/y	/ear				(107)	÷ (4) =			1.74	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Fabric Energy Efficiency (99) + (108) =											42.18	(109)	
Targe	et Fabrio	Energ	y Efficie	ency (TF	EE)								48.51	(109)

User Details:	
Assessor Name: Zahid Ashraf Stroma Number: STRO00 Software Name: Stroma FSAP 2012 Software Version: Version	
Property Address: Plot 36  Address:	
1. Overall dwelling dimensions:	
Area(m²) Av. Height(m)	Volume(m³)
Ground floor 50.54 (1a) x 2.5 (2a) =	126.36 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 50.54 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	126.36 (5)
2. Ventilation rate:	
main secondary other total heating heating	m³ per hour
Number of chimneys $0 + 0 = 0 \times 40 =$	0 (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	0 (6b)
Number of intermittent fans  0 × 10 =	0 (7a)
Number of passive vents  0 x 10 =	0 (7b)
Number of flueless gas fires	0 (7c)
Air cha	nges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ $\div (5) = $	0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)  Number of storeys in the dwelling (ns)	0 (9)
Additional infiltration [(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)
If no draught lobby, enter 0.05, else enter 0	0 (13)
Percentage of windows and doors draught stripped	0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$	0 (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	3 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.15 (18)
Number of sides sheltered	3 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.78 (20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.12 (21)
Infiltration rate modified for monthly wind speed	
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	
Wind Factor (22a)m = (22)m ÷ 4	

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effect If mechanica		_	rate for t	he appli	cable ca	se	-	-	-	-	-	0.5	(23
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				79.05	(23
a) If balance	d mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24
b) If balance	d mecha	anical ve	entilation	without	heat red	overy (I	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 he if (22b)m					•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural v				•	•				0.5]			•	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)	-	-	-		
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
3. Heat losses	s and he	eat loss i	paramete	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	K)	k-value kJ/m²·		A X k kJ/K
oors					2	x	1.4	=	2.8	Ì			(2
Vindows					8.651	x1	/[1/( 1.4 )+	0.04] =	11.47				(2
Valls Type1	20.9	96	8.65	;	12.31	X	0.15	= [	1.85				(2
Valls Type2	13.8	88	2		11.88	x	0.14	=	1.68				(2
Roof	11.3	9	0		11.39	) X	0.1	=	1.14			$\exists$	(3
otal area of e	ements	, m²			46.23								(3
for windows and include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	n 3.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				18.94	(3
eat capacity (	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	441.11	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design assess an be used instea				construct	ion are no	known pi	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge				usina An	pendix l	<						9.81	(3
details of therma	`	,		• .	•	•						3.01	(°
otal fabric hea	at loss							(33) +	(36) =			28.74	(3
entilation hea	t loss ca	alculated	monthly	У				(38)m	= 0.33 × (	25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
88)m= 10.55	10.43	10.31	9.7	9.58	8.97	8.97	8.85	9.22	9.58	9.82	10.06		(3
eat transfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
39.29 39.29	39.17	39.05	38.44	38.32	37.72	37.72	37.6	37.96	38.32	38.57	38.81	]	
· L I													

Heat loss para	ımeter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.78	0.77	0.77	0.76	0.76	0.75	0.75	0.74	0.75	0.76	0.76	0.77		
						l	l		Average =	: Sum(40) <sub>1</sub>	12 /12=	0.76	(40)
Number of day		nth (Tab	le 1a)		ı			1					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		71		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		3.65		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 86.52	83.37	80.23	77.08	73.93	70.79	70.79	73.93	77.08	80.23	83.37	86.52		
									Total = Su	ım(44) <sub>112</sub> =	-	943.85	(44)
Energy content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 128.31	112.22	115.8	100.96	96.87	83.59	77.46	88.89	89.95	104.82	114.42	124.26		_
If instantaneous v	vator hoati	na at naint	of uso (no	hot water	r storago)	ontor O in	havas (16		Total = Su	ım(45) <sub>112</sub> =	= [	1237.53	(45)
			·	·	· · ·		· · ·	, , , I	l	1			(40)
(46)m= 19.25 Water storage	16.83 loss:	17.37	15.14	14.53	12.54	11.62	13.33	13.49	15.72	17.16	18.64		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•					(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water store</li></ul>			-							0	02		(51)
If community h	-			_ (	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-77				0.	.02		( /
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in ( <del></del>	55)								1.	.03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	(H11) is fro	m Appendi	x H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	loss (ar	nnual) fro	m Table	 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	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss o	ealculated	for each	month (	(61)m –	(60) <i>- '</i>	R65 <b>v</b> (41	)m							
(61)m= 0	0	0	0	01)111 =	00) - (	1 0	) T o		0	0	0	0	1	(61)
				alculated	for ea	ch month						<u> </u>	J · (59)m + (61)m	` ,
(62)m= 183.5	<u> </u>	171.07	154.45	152.15	137.08		144	_	143.44	160.1	167.92	179.53	1	(62)
Solar DHW inpu		<u> </u>	<u> </u>	<u> </u>	H (nega		<u> </u>					er heating	<u></u>	` ,
(add addition												-: ····································		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	7	(63)
Output from	water hea	ter	ı	ı		_							_	
(64)m= 183.5		171.07	154.45	152.15	137.08	132.74	144.	.16	143.44	160.1	167.92	179.53	1	
		ı	ı	ı		-1		Outp	out from wa	ater heate	er (annual)	112	1888.37	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	ı + (6	1)m	n] + 0.8 x	د [(46)m	+ (57)m	+ (59)m	 n ]	_
(65)m= 86.88	77.25	82.72	76.36	76.43	70.59	69.98	73.	78	72.7	79.08	80.84	85.54	1	(65)
include (57	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):										
Metabolic ga	ins (Table	5), Wat	ts										_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(66)m= 102.3	7 102.37	102.37	102.37	102.37	102.37	102.37	102	.37	102.37	102.37	102.37	102.37	]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee -	Table 5					
(67)m= 34.13	30.31	24.65	18.66	13.95	11.78	12.73	16.	54	22.2	28.19	32.9	35.08	]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation	_13 or L1	3a), a	also	see Ta	ble 5			_	
(68)m= 221.8	6 224.17	218.37	206.01	190.42	175.77	165.98	163	.68	169.48	181.83	197.42	212.08	]	(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L1	or L15a	), als	o se	e Table	5				
(69)m= 46.94	46.94	46.94	46.94	46.94	46.94	46.94	46.9	94	46.94	46.94	46.94	46.94		(69)
Pumps and f	ans gains	(Table 5	5a)											
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)									
(71)m= -68.25	5 -68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.	.25	-68.25	-68.25	-68.25	-68.25	]	(71)
Water heatin	g gains (T	able 5)											_	
(72)m= 116.7	8 114.96	111.19	106.06	102.73	98.04	94.05	99.	16	100.98	106.28	112.28	114.97	]	(72)
Total interna	al gains =				(6	6)m + (67)n	า + (68	8)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 453.8	4 450.51	435.27	411.8	388.17	366.65	353.83	360	.45	373.72	397.37	423.67	443.19		(73)
6. Solar gai														
Solar gains are		•					ations 1	to co		e applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		Т	g_ able 6b	т	FF able 6c		Gains (W)	
North coat a c					_		1 1					_	. ,	1,
Northeast 0.9		X			X	11.28	X		0.63	×	0.7	=	29.83	(75)
Northeast 0.9		×			x	22.97	] X ] ,,		0.63	_	0.7	=	60.72	](75) ] <sub>(75)</sub>
Northeast 0.9		X	8.6		x	41.38	X 1		0.63	×	0.7	=	109.4	[(75)
Northeast 0.9		X	8.6		x	67.96	X ]		0.63	×	0.7	=	179.67	](75) ] <sub>(75)</sub>
Northeast 0.9	0.77	X	8.6	65	X	91.35	X		0.63	X	0.7	=	241.51	(75)

Northeast <sub>0.9x</sub>	0.77	X	8.6	55	x	9	7.38	x		0.63	x	0.7		257.47	(75)
Northeast <sub>0.9x</sub>	0.77	X	8.6	55	x	9	91.1	x		0.63	x	0.7	=	240.86	(75)
Northeast <sub>0.9x</sub>	0.77	X	8.6	55	x	7	2.63	x		0.63	x	0.7	=	192.02	(75)
Northeast <sub>0.9x</sub>	0.77	X	8.6	55	x	5	0.42	x		0.63	x	0.7	=	133.31	(75)
Northeast <sub>0.9x</sub>	0.77	X	8.6	55	x	2	8.07	х		0.63	x [	0.7		74.21	(75)
Northeast <sub>0.9x</sub>	0.77	X	8.6	55	x [	1	14.2	x		0.63	×	0.7	= =	37.53	(75)
Northeast 0.9x	0.77	x	8.6	55	x [	9	9.21	x		0.63		0.7	= =	24.36	(75)
_								•							
Solar gains in v	watts, ca	lculated	for eacl	n month				(83)m	n = Si	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	25	7.47	240.86	192	.02	133.31	74.21	37.53	24.36		(83)
Total gains – ir	nternal a	nd solar	(84)m =	(73)m	+ (8	3)m	, watts							•	
(84)m= 483.67	511.23	544.67	591.47	629.68	62	4.12	594.69	552	.46	507.03	471.58	461.21	467.55		(84)
7. Mean intern	nal temp	erature	(heating	season	)										
Temperature						area f	rom Tab	ole 9	, Th	1 (°C)				21	(85)
Utilisation fac	•	٠.			_				,	( )					``
Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 0.87	0.85	0.79	0.67	0.53	0	.38	0.28	0.3	Ť	0.49	0.71	0.83	0.88		(86)
Moan internal	tompor	atura in	living or	no T1 /f/	سادالد	v cto	oc 2 to 7	Tin T	I	2 () ()		1			
Mean internal	20.19	20.44	20.73	20.9	_	v Ste 0.98	20.99	20.		20.94	20.73	20.37	20.02		(87)
` '					<u> </u>						20.70	1 20.07	20.02		(- /
Temperature					_	Ť				<u> </u>	00.00	T 00 00		Ī	(00)
(88)m= 20.27	20.28	20.28	20.29	20.29	2	0.3	20.3	20	.3	20.3	20.29	20.29	20.28		(88)
Utilisation fac	tor for ga	ains for I	est of d	welling,	h2,r	m (se	e Table	9a)						•	
(89)m= 0.86	0.83	0.77	0.65	0.49	0	.34	0.23	0.2	26	0.45	0.68	0.81	0.87		(89)
Mean_internal	tempera	ature in	the rest	of dwelli	ng -	T2 (fc	ollow ste	eps 3	8 to 7	in Tabl	e 9c)				
(90)m= 19.02	19.22	19.56	19.96	20.18	20	0.28	20.3	20	.3	20.24	19.97	19.48	18.98		(90)
										f	LA = Livi	ng area ÷ (	4) =	0.43	(91)
Mean internal	tempera	ature (fo	r the wh	ole dwe	lling	a) = fL	_A × T1	+ (1	– fL	A) × T2					
(92)m= 19.46	19.64	19.94	20.29	20.49	$\overline{}$	0.58	20.6	20		20.55	20.3	19.86	19.43		(92)
Apply adjustm	nent to th	ne mean	internal	temper	atur	re fro	m Table	4e,	whe	re appro	priate				
(93)m= 19.46	19.64	19.94	20.29	20.49	20	0.58	20.6	20	.6	20.55	20.3	19.86	19.43		(93)
8. Space heat	ting requ	iirement													
Set Ti to the r					ed	at ste	ep 11 of	Tabl	le 9b	o, so tha	t Ti,m=	(76)m an	d re-calc	culate	
the utilisation						. 1						1		l	
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation faction (94)m= 0.84	0.82	0.76	0.65	0.5	<u> </u>	.35	0.25	0.2	20	0.46	0.68	0.8	0.85		(94)
Useful gains,						.55	0.23	0.2	20	0.40	0.00	0.8	0.83		(04)
(95)m= 408.59	417.53	412.92	382.94	317.59	22	1.37	149.83	156	34	234.12	318.55	368.35	399.45		(95)
Monthly avera							0.00	100			0.0.00	1 000.00	000.10		, ,
(96)m= 4.3	4.9	6.5	8.9	11.7		4.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	for mea	an intern	al tempe	erature.	L Lm	. W =	-[(39)m :	x [(9:	 3)m-	– (96)m	]	<u> </u>			
(97)m= 595.79	577.4	524.94	437.93	337.01	_	5.58	150.78	157	_	244.65	371.74	492.29	591.17		(97)
Space heating	g require	ement fo	r each m	nonth, k	Wh/	mont/	h = 0.02	<u>2</u> 4 x	 [(97)	m – (95	)m] x (4	1)m		1	
(98)m= 139.28	107.43	83.34	39.6	14.45		0	0	C		0	39.57	89.24	142.65		
<u></u>								•	-			•	•	•	

	Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	655.55	(98)
Space heating requirement in kWh/m²/year		12.97	(99)
9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (T		0	(301)
Fraction of space heat from community system $1 - (301) =$		1	(302)
The community scheme may obtain heat from several sources. The procedure as includes boilers, heat pumps, geothermal and waste heat from power stations. S		e latter	<u> </u>
Fraction of heat from Community boilers	<u>L</u>	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 commun	nity heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	n	1.05	(306)
Space heating	-	kWh/yea	r ¬
Annual space heating requirement	[	655.55	
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	688.33	(307a)
Efficiency of secondary/supplementary heating system in % (from		0	(308
Space heating requirement from secondary/supplementary syste	em (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		1888.37	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1982.79	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	26.71	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from or	putside	175.36	(330a)
warm air heating system fans	Ī	0	(330b
pump for solar water heating	Ī	0	(330g
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	175.36	(331)
Energy for lighting (calculated in Appendix L)	Ī	241.09	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	Ī	-510.48	(333)
Electricity generated by wind turbine (Appendix M) (negative qua	antity)	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 × 0.01 =	29.19	(340a
Water heating from CHP (310a) x	4.24 × 0.01 =	84.07	(342a)

			Fuel Price		
Pumps and fans	(331)		13.19 x 0.01	= 23.13	(349)
Energy for lighting	(332)		13.19 x 0.01	= 31.8	(350)
Additional standing charges (Table 12)				120	(351)
Energy saving/generation technologies  Total energy cost	= (340a)(342e) + (345)(3	354) =		288.18	(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] =	=		1.27	(357)
SAP rating (section12)				82.33	(358)
12b. CO2 Emissions - Community hea	ting scheme				
		Energy kWh/year	Emission facto	or Emissions kg CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)	• • • • • • • • • • • • • • • • • • • •	g two fuels repeat (36	(3) to (366) for the second f	iuel 94	(367a)
CO2 associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b	0.22	= 613.79	(367)
Electrical energy for heat distribution	I	(313) x	0.52	= 13.86	(372)
Total CO2 associated with community s	systems	(363)(366) + (368).	(372)	= 627.65	(373)
CO2 associated with space heating (se	condary)	(309) x	0	= 0	(374)
CO2 associated with water from immer	sion heater or instantane	ous heater (312	2) x 0.22	= 0	(375)
Total CO2 associated with space and v	vater heating	(373) + (374) + (375)	=	627.65	(376)
CO2 associated with electricity for pum	ps and fans within dwelli	ng (331)) x	0.52	= 91.01	(378)
CO2 associated with electricity for light	ing	(332))) x	0.52	= 125.12	(379)
Energy saving/generation technologies Item 1	(333) to (334) as applica	able	0.52 x 0.01	-264.94	(380)
Total CO2, kg/year	sum of (376)(382) =			578.85	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			11.45	(384)
El rating (section 14)				91.88	(385)
13b. Primary Energy – Community hea	ting scheme	<b>F</b>	Duine	D.F.	
		Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space an Efficiency of heat source 1 (%)			3) to (366) for the second f	iuel 94	(367a)
Energy associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b	o) x 1.22	= 3466.77	(367)
Electrical energy for heat distribution	I	((313) x		= 82	(372)
Total Energy associated with community	ty systems	(363)(366) + (368).	(372)	= 3548.78	(373)
if it is negative set (373) to zero (unle	ess specified otherwise, s	see C7 in Append	dix C)	3548.78	(373)
Energy associated with space heating	(secondary)	(309) x	0	= 0	(374)

Energy associated with water from immersion heater or instal	ntaneous heater(312) x	1.22	=	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =			3548.78	(376)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Energy associated with electricity for pumps and fans within o	dwelling (331)) x	3.07	=	538.35	(378)
Energy associated with electricity for lighting	(332))) x	3.07	=	740.13	(379)
Energy saving/generation technologies Item 1		3.07 × 0.0	1 =	-1567.16	(380)
Total Primary Energy, kWh/year sum of (376	5)(382) =			3260.1	(383)

		User I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					001082 on: 1.0.5.9	
Address :	F	Property	Address	Plot 36					
1. Overall dwelling dime	ensions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor			50.54	(1a) x	2	2.5	(2a) =	126.36	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (	50.54	(4)					
Dwelling volume				(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	126.36	(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> [	0	x	20 =	0	(6b)
Number of intermittent fa	ns				2	x '	10 =	20	(7a)
Number of passive vents				Ē	0	x .	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	anges per ho	our 
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)$				20		÷ (5) =	0.16	(8)
Number of storeys in the	een carried out or is intended, proceen ne dwelling (ns)	iu io (17),	otrierwise (	onunue n	om (9) to (	(10)		0	(9)
Additional infiltration	<b>3</b> (					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are pu deducting areas of openir	resent, use the value corresponding to pas): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
<u>-</u>	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	(45)		0	(15)
Infiltration rate	aEO everegged in cubic mater	aa nar h	(8) + (10)				oroo	0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	etre or e	rivelope	area	0.41	(17)
•	es if a pressurisation test has been do				is being u	sed		0.41	(10)
Number of sides sheltere	ed							3	(19)
Shelter factor			(20) = 1 -		19)] =			0.78	(20)
Infiltration rate incorporat	•		(21) = (18	) x (20) =				0.32	(21)
Infiltration rate modified for	<del>- 1                                   </del>	Jul	Διια	Son	Oct	Nov	Doo	]	
Jan Feb	1 ' 1 ' 1	Jui	Aug	Sep	Oct	I NOV	Dec		
Monthly average wind sp (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 3 1 310	1	1	<u> </u>	1	<u> </u>	I .	I	
Wind Factor $(22a)m = (22a)m $	<del>'                                    </del>	Ι.	T <u>-</u>		Ι.	Γ.	<u> </u>	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		

Adjusted infiltra	ation rate	e (allowi	ng for sh	nelter an	nd wind s	speed) =	(21a) x	(22a)m						
0.4	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37			
Calculate effect		•	rate for t	he appli	cable ca	se	•	•	•	•		- 		٦,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
If exhaust air he			andiv N (2	3h) - (23a	a) v Emy (4	aguation (I	N5N othe	nvica (23h	n) = (23a)			0		(23a)
If balanced with									) = (25a)			0		(23b)
a) If balance		-	-	_					Oh)m ı (	22h) v [	1 (226)	) : 100]		(23c)
(24a)m= 0	0	o O	0	0	0	0	0	$\frac{1}{0}$	0	23b) <b>x</b> [	$\frac{1-(230)}{0}$	) <del>-</del> 100] ]		(24a)
b) If balance						<u> </u>						_		(= .a)
(24b)m= 0	0	o 0	0	0	0	0	0 0	0	0	0	0	1		(24b)
c) If whole h			<u> </u>		<u> </u>			<u> </u>				J		(= .0)
if (22b)m				•	•				.5 <b>x</b> (23b	o)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1		(24c)
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	loft				_		
if (22b)m				•	•				0.5]			_		
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(24d)
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_		
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(25)
3. Heat losses	s and he	eat loss i	naramete	ōt.										
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	ue	AXU		k-value	e	АХ	k
LLLIVILIAI	area	_	m		A ,r		W/m2		(W/	K)	kJ/m²•		kJ/k	
Doors					2	X	1		2					(26)
Windows					8.651	<sub>1</sub> x1	/[1/( 1.4 )+	0.04] =	11.47					(27)
Walls Type1	20.9	6	8.65	;	12.31	X	0.18	=	2.22					(29)
Walls Type2	13.8	8	2		11.88	3 x	0.18	<u> </u>	2.14	₹ i		$\lnot$ $\lnot$		(29)
Roof	11.3	9	0		11.39	) x	0.13	<del>-</del>	1.48	₹ i		<b>-</b>		(30)
Total area of e	lements	, m²			46.23	<u> </u>								(31)
* for windows and	roof windo	ows, use e	effective wi	ndow U-va			g formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragrapi	h 3.2		
** include the area				ls and par	titions									_
Fabric heat los		•	U)				(26)(30)	) + (32) =				19	3	(33)
Heat capacity	,		_					., ,	(30) + (32	, , ,	(32e) =	441	.11	(34)
Thermal mass	•	•		•					tive Value			25	0	(35)
For design assess can be used instead				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f			
Thermal bridge				using Ar	pendix I	<						10.	23	(36)
if details of therma	,	,			•									<b>」</b> `
Total fabric hea								(33) +	(36) =			29.	54	(37)
Ventilation hea	at loss ca	alculated	d monthly	<u>/</u>				(38)m	= 0.33 × (	25)m x (5	)			-
v en ilialion nea											T			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_		
	Feb 24.11	Mar 23.98	Apr 23.38	May 23.26	Jun 22.73	Jul 22.73	Aug 22.64	Sep 22.94	Oct 23.26	Nov 23.49	23.73	]		(38)
Jan	24.11	23.98	<del></del>	_	<del> </del>	-	<del>l                                     </del>	22.94	<del> </del>	23.49	<del> </del>	]		(38)
(38)m= 24.24	24.11	23.98	<del></del>	_	<del> </del>	-	<del>l                                     </del>	22.94	23.26	23.49	<del> </del>	<u> </u>   		(38)

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.06	1.06	1.06	1.05	1.04	1.03	1.03	1.03	1.04	1.04	1.05	1.05		
` /				<u> </u>		<u> </u>	<u> </u>	<u> </u>	L Average =	Sum(40) <sub>1</sub> .	12 /12=	1.05	(40)
Number of day	s in mo	nth (Tab	le 1a)						J	, ,	L		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		71		(42)
Annual average Reduce the annual	e hot wa al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed t			se target o		.72		(43)
not more that 125	litres per	person per	day (all w	ater use, l	not and co	ld) 							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	_					
(44)m= 82.19	79.2	76.22	73.23	70.24	67.25	67.25	70.24	73.23	76.22	79.2	82.19		
Energy content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	896.65	(44)
(45)m= 121.89	106.61	110.01	95.91	92.03	79.41	73.59	84.44	85.45	99.58	108.7	118.04		
<u> </u>			l .		l .	<u>I</u>	<u>I</u>		Total = Su	m(45) <sub>112</sub> =	=	1175.66	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)			•		
(46)m= 18.28	15.99	16.5	14.39	13.8	11.91	11.04	12.67	12.82	14.94	16.31	17.71		(46)
Water storage		•				<u>.</u>	<u>.</u>			· 	·		
Storage volum	e (litres)	) includin	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	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage  a) If manufactor		aclared l	occ fact	or ie kno	wn (k\\/k	v/dav/).					00		(40)
•				JI IS KIIU	wii (Kvvi	i/uay).					39		(48)
Temperature fa							(40) (40)				.54		(49)
Energy lost from b) If manufaction		_	-		or is not		(48) x (49)	) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	-			- (		,					<u> </u>		(- /
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or (	54) in (	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains												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	nnual) fro	m Table	 e 3							0		(58)
Primary circuit	loss cal	culated f	for each	month (	•	. ,	, ,		r tharma	etat)			
(modified by						ı —		<u> </u>		<del>-                                    </del>	22.22		(50)
(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 of	aclaulatad	for oach	month /	(61)m -	(60) · 2(	SE (41	١m						
(61)m= 0	0	0	0	0	00) + 3	0 7 (41)	0	T 0	0	0	0	1	(61)
(3)	!						<u> </u>	ļ		ļ	<u> </u>	J · (59)m + (61)m	(- /
(62)m= 168.4	<del></del>	156.6	141	138.62	124.5	120.18	131.04		146.18	153.79	164.64	1 (39)III + (01)IIII ]	(62)
Solar DHW inpu										ļ		]	(- /
(add addition											o:ag)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from	water hea	ter				ļ.	Į.	•		•			
(64)m= 168.4		156.6	141	138.62	124.5	120.18	131.04	130.54	146.18	153.79	164.64	1	
	Į.	<u> </u>					Ou	put from w	ater heate	r (annual) <sub>1</sub>	112	1724.27	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	n ]	_
(65)m= 77.8	1	73.85	67.96	67.87	62.48	61.74	65.35	64.49	70.39	72.22	76.53	]	(65)
include (5	7)m in cal	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is fı	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a	):								_	
Metabolic ga													
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(66)m= 85.3°	1 85.31	85.31	85.31	85.31	85.31	85.31	85.31	85.31	85.31	85.31	85.31	1	(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 13.65	5 12.12	9.86	7.47	5.58	4.71	5.09	6.62	8.88	11.28	13.16	14.03	]	(67)
Appliances (	gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5	•	•	•	
(68)m= 148.6	5 150.19	146.3	138.03	127.58	117.77	111.21	109.66	113.55	121.83	132.27	142.09	]	(68)
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a	, also s	ee Table	5	•	•	•	
(69)m= 31.53	31.53	31.53	31.53	31.53	31.53	31.53	31.53	31.53	31.53	31.53	31.53		(69)
Pumps and	fans gains	(Table 5	ia)					•		•	•	•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	]	(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)		•	•	•	•		-	
(71)m= -68.2	5 -68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.25	-68.25		(71)
Water heating	ng gains (T	Table 5)		-		-	-		-	-	-	_	
(72)m= 104.5	8 102.85	99.27	94.39	91.23	86.77	82.99	87.84	89.56	94.61	100.3	102.86	]	(72)
Total intern	al gains =				(66)	)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72)	)m	_	
(73)m= 318.4	7 316.76	307.02	291.48	275.99	260.84	250.88	255.71	263.59	279.3	297.33	310.57	]	(73)
6. Solar gai	ins:												
Solar gains ar	e calculated	using solar	flux from	Table 6a		•	itions to d	onvert to th	ne applicat		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF		Gains	
						Die da	. –	able ob	_ '	able 6c		(W)	7
Northeast 0.9		X	8.6	35	x 1	1.28	X	0.63	x	0.7	=	29.83	(75)
Northeast 0.9	0	X	8.6	35	X 2	22.97	X	0.63	x	0.7	=	60.72	(75)
Northeast 0.9	0	X	8.6	S5	X	11.38	x	0.63	x	0.7	=	109.4	(75)
Northeast 0.9		X	8.6	35	x 6	67.96	x	0.63	x	0.7	=	179.67	(75)
Northeast 0.9	× 0.77	X	8.6	65	x 9	91.35	X	0.63	X	0.7	=	241.51	(75)

Northeast <sub>0.9x</sub>	0.77	x	8.6	55	x	g	7.38	X		0.63	x	0.7	=	257.47	(75)
Northeast <sub>0.9x</sub>	0.77	х	8.6	55	x	Ç	91.1	X		0.63	х	0.7	=	240.86	(75)
Northeast <sub>0.9x</sub>	0.77	X	8.6	55	x	7	72.63	X		0.63	×	0.7		192.02	(75)
Northeast <sub>0.9x</sub>	0.77	x	8.6	55	x	5	50.42	X		0.63	×	0.7		133.31	(75)
Northeast <sub>0.9x</sub>	0.77	x	8.6	55	x	2	28.07	x		0.63	= x	0.7	<del>=</del>	74.21	(75)
Northeast <sub>0.9x</sub>	0.77	x	8.6	55	x		14.2	X		0.63	= x	0.7		37.53	(75)
Northeast 0.9x	0.77	x	8.6	55	x	,	9.21	x		0.63	= x [	0.7	╡ -	24.36	(75)
<b>L</b>															
Solar gains in	watts, ca	alculated	for eac	n month				(83)m	n = S	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	2	57.47	240.86	192	2.02	133.31	74.21	37.53	24.36		(83)
Total gains – i	nternal a	nd solar	(84)m =	(73)m	+ (8	33)m	, watts							' -	
(84)m= 348.3	377.48	416.42	471.15	517.49	5′	18.31	491.74	447	'.73	396.89	353.51	334.86	334.93		(84)
7. Mean inter	nal temp	erature	(heating	season	)										
Temperature			`			area t	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisation fac	_	•			-				,	( )					``
Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.94	0.82	(	0.62	0.46	0.5	Ŭ	0.8	0.97	0.99	1		(86)
Mean interna	l tompor	aturo in	living or	no T1 /f/	ســــــــــــــــــــــــــــــــــــ	w cto	ne 2 to 7	7 in T		2 (10)	<u> </u>		<u> </u>	I	
(87)m= 19.96	20.08	20.31	20.63	20.88	_	0.98	21	20.		20.92	20.61	20.23	19.94		(87)
` ′	<u> </u>				_							20.20	10.01		(- /
Temperature					_			1		· · ·	00.05	T		l	(00)
(88)m= 20.03	20.03	20.03	20.04	20.05		0.05	20.05	20.	.06	20.05	20.05	20.04	20.04		(88)
Utilisation fac	tor for g	ains for i	est of d	welling,	h2,	m (se	e Table	9a)			ı	_	1	1	
(89)m= 0.99	0.99	0.98	0.92	0.77	(	0.54	0.37	0.4	42	0.73	0.95	0.99	1		(89)
Mean interna	l temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	eps 3	to 7	7 in Tabl	e 9c)			_	
(90)m= 18.65	18.82	19.16	19.61	19.93	2	0.04	20.05	20.	.05	19.99	19.59	19.06	18.63		(90)
										f	fLA = Livi	ng area ÷ (4	4) =	0.43	(91)
Mean interna	ıl temper	ature (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1	– fL	.A) × T2					
(92)m= 19.22	19.36	19.65	20.05	20.34	_	0.45	20.46	20.		20.39	20.03	19.57	19.19		(92)
Apply adjustr	nent to t	he mean	interna	temper	atu	re fro	m Table	4e,	whe	re appro	opriate	-!		I	
(93)m= 19.22	19.36	19.65	20.05	20.34	2	0.45	20.46	20.	.46	20.39	20.03	19.57	19.19		(93)
8. Space hea	ıting requ	uirement													
Set Ti to the					ned	at ste	ep 11 of	Tab	le 9b	o, so tha	t Ti,m=	(76)m an	d re-cald	ulate	
the utilisation	1				_		<del></del>					1	Ι_	l	
Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	o.97	0.92	0.79	, I	0.58	0.41	0.4	17	0.76	0.95	0.99	0.99	[	(94)
Useful gains,						J.30	0.41	0.2	+1	0.70	0.93	0.99	0.99		(04)
(95)m= 346.02	1	405.92	434.49	407.07	29	98.39	200.9	209	93	300.88	335.58	330.65	333.13		(95)
Monthly aver					Ц_					000.00	000.00	1 000.00	1 0000		, ,
(96)m= 4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16	5.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for mea		al tempe		<u> </u>		=[(39)m	l		– (96)m	 ]		<u> </u>	<u>I</u>	
(97)m= 802.14	775.95	703.96	590.06	456.04	_	05.57	201.8	211	_	330.06	497.95	661.05	798.64		(97)
Space heating	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	24 x	[(97	m – (95	)m] x (4	11)m	•	I	
(98)m= 339.35	270.54	221.74	112.01	36.43		0	0			0	120.8	237.89	346.34		
	•				_		•	•			•	•	•	1	

											<b>–</b> 1
					Tota	ıl per year	(kWh/yea	r) = Sum(9	18)15,912 =	1685.11	(98)
Space heating requirement in	kWh/m²	²/year								33.34	(99)
9a. Energy requirements – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:		/		(							¬,,,,,,
Fraction of space heat from s			mentary	•	(000) 4	(004)				0	(201)
Fraction of space heat from n	•	` '			(202) = 1	, ,	(0.00)			1	(202)
Fraction of total heating from	•				(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heat	•									93.5	(206)
Efficiency of secondary/suppl	ementar	y heating	g systen	n, %						0	(208)
Jan Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requirement (c	1									1	
339.35 270.54 221.74	112.01	36.43	0	0	0	0	120.8	237.89	346.34	İ	
$(211)$ m = {[(98)m x (204)] } x 1	T						100.0	054.40	070.44	1	(211)
362.94 289.34 237.16	119.8	38.97	0	0	0 Tota	0 (k\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	129.2	254.43 211) <sub>15,1012</sub>	370.41	4000.05	(211)
Change heating fuel (accorder	n ( )   ( ) ( ) ( ) ( )	month			1010	ii (ittviii) yot	ur) –ourn	<b></b> 1,5,1012	2	1802.25	(211)
Space heating fuel (secondar = $\{[(98)m \times (201)]\} \times 100 \div (201)$	• •	monun									
(215)m =	0	0	0	0	0	0	0	0	0		
l l		ļ	ļ.		Tota	l (kWh/yea	ar) =Sum(	215) <sub>15,1012</sub>	 <sub>2</sub> =	0	(215)
Water heating											
Output from water heater (calc	ĭ	i e	ı		<b>I</b>	ı		<u> </u>	ı	1	
168.49 148.69 156.6	141	138.62	124.5	120.18	131.04	130.54	146.18	153.79	164.64		<b>–</b>
Efficiency of water heater	T						T	T	T	79.8	(216)
(217)m= 86.65   86.39   85.74	84.21	81.81	79.8	79.8	79.8	79.8	84.31	85.97	86.75	İ	(217)
Fuel for water heating, kWh/m $(219)$ m = $(64)$ m x $100 \div (217)$											
(219)m= 194.45 172.11 182.65		169.44	156.02	150.6	164.21	163.59	173.38	178.89	189.78		
	•	•	•	•	Tota	I = Sum(2	19a) <sub>112</sub> =	•	•	2062.55	(219)
Annual totals							k	Wh/yeaı	r	kWh/yea	<u></u>
Space heating fuel used, main	system	1								1802.25	
Water heating fuel used										2062.55	
Electricity for pumps, fans and	electric	keep-ho	t								
central heating pump:									30		(230c)
boiler with a fan-assisted flue									45	1 	(230e
Total electricity for the above,		ır			sum	of (230a).	(230g) =	•		]   75	(231)
Electricity for lighting	,									241.09	(232)
12a. CO2 emissions – Individ	lual heat	ina svste	ems inclu	udina mi	cro-CHF	)					
		g. e	En	ergy				ion fac	tor	Emission	
				/h/year			kg CO	2/kWh		kg CO2/ye	∍ar —
Space heating (main system 1	)		(21	1) x			0.2	16	=	389.29	(261)

Space heating (secondary)	(215) x	0.519 =	0 (2	263)
Water heating	(219) x	0.216 =	445.51 (2	264)
Space and water heating	(261) + (262) + (263) + (264) =		834.8	265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93	267)
Electricity for lighting	(232) x	0.519 =	125.12 (2	268)
Total CO2, kg/year	sum	of (265)(271) =	998.85 (2	272)

TER = 19.76 (273)