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 14:54:34

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.54m² Plot Reference: Site Reference : Hermitage Lane Plot 24

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))

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

Dwelling Carbon Dioxide Emission Rate (DER) 11.06 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 37.8 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 31.8 kWh/m²

OK

2 Fabric U-values

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

Floor (no floor)

Roof (no roof)

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

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%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.65m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	

Community heating, heat from boilers - mains gas

Photovoltaic array

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
Address :	F	Property	Address	: Plot 24					
1. Overall dwelling dime	ensions:								
3		Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)
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	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	<u> </u>	0	<u> </u>	0	x2	20 =	0	(6b)
Number of intermittent fa	ins				0	x ²	10 =	0	(7a)
Number of passive vents	3			Ē	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6a)$			aantinua fi	0		÷ (5) =	0	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ia io (17),	otrierwise (conunue ii	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t ngs): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
•	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (45)		0	(15)
Infiltration rate	q50, expressed in cubic metre	se nar h	(8) + (10)				area	0	(16)
,	lity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	ietie oi e	rivelope	aica	0.15	(17)
•	es if a pressurisation test has been do				is being u	sed		00	(- /
Number of sides sheltered	ed		(20) 4	[0.0 7 F //	10)]			3	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			0.78	(20)
Infiltration rate incorporations Infiltration rate modified f	•		(21) = (10) X (20) =				0.12	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	19		1	1		l	
(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 (OC.)	0) 4	•	•	•	•	•	•	•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1 1	1.08	1.12	1.18]	
(220)111= 1.21 1.20	1.20 1.1 1.00 0.95	0.95	0.92	<u> </u>	1.08	1.12	1.10	J	

Adjusted infil	tration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(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 eff		_	rate for t	he appli	cable ca	se	•	•	•	•	•	, 	
If exhaust air			endix N (2	3h) = (23a	a) × Fmv (e	equation (I	N5)) othe	rwise (23h	n) = (23a)			0.5	(23a)
If balanced w) = (20a)			0.5	(23b)
		-	•	_					Oh)m ı ((22h) v [1 (220)	79.05	(23c)
a) If balance (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] - 100]	(24a)
b) If balance	_!	ļ	<u> </u>		<u> </u>	<u> </u>	Į	ļ	<u>Į</u>	ļ	0.24]	(= :=)
(24b)m= 0		0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole					<u> </u>		<u> </u>						•
•)m < 0.5			•	-				.5 x (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natura	 Il ventilatio	on or wh	ole hous	e positiv	/e input	ı ventilatio	on from I	oft	<u> </u>	<u> </u>	<u> </u>	1	
,	m = 1, th								0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective a	ir change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in bo	x (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 loss	es and he	eat loss i	narameti	⊃r·									
ELEMENT			Openin		Net Ar	ea	U-val	IIE	A X U		k-value	Δ Δ	Χk
LLLIVILIVI	area		m		A ,r		W/m2		(W/		kJ/m²-		I/K
Doors					2	X	1.4		2.8				(26)
Windows					8.651	x1	/[1/(1.4)+	0.04] =	11.47				(27)
Walls Type1	19.	7	8.65		11.05	5 x	0.15		1.66	= [(29)
Walls Type2	13.0	04	2		11.04	x	0.14	= ₌ i	1.56	=			(29)
Total area of	elements	 s. m²	L		32.74	_							(31)
* for windows ar		-	effective wi	ndow U-va			g formula 1	/[(1/U-valu	ue)+0.04] á	as given in	paragrapl	h 3.2	(-)
** include the ar								-	, -				
Fabric heat le	oss, W/K	= S (A x	U)				(26)(30)) + (32) =				17.49	(33)
Heat capacit	y Cm = S	(A x k)						((28).	(30) + (3	2) + (32a).	(32e) =	309.2	(34)
Thermal mas	s parame	eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design asse				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
can be used ins Thermal brid				ıcina Δr	nandiv l							4.00	(36)
if details of theri	-				-	`						4.38	(30)
Total fabric h		aro mot no	- (00)	- 0.00 x (0	'/			(33) +	(36) =			21.87	(37)
Ventilation he	eat loss c	alculated	d monthly	y				(38)m	= 0.33 × ((25)m x (5))		
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	coefficie	nt. W/K	!	<u> </u>	<u> </u>	!		(39)m	= (37) + (38)m			
(39)m= 32.42		32.17	31.57	31.45	30.84	30.84	30.72	31.08	31.45	31.69	31.93]	
. ,		<u> </u>	<u> </u>		<u> </u>		<u> </u>		L	Sum(39) ₁	<u> </u>	31.54	(39)
Heat loss pa	rameter (I	HLP), W	/m²K						= (39)m ÷				
(40)m= 0.64	0.64	0.64	0.62	0.62	0.61	0.61	0.61	0.61	0.62	0.63	0.63		
									Average =	Sum(40) ₁	12 /12=	0.62	(40)

Number of days in month (Table 1a)

		- I	<u> </u>	i .	14	1 1	1	Λ	0	0-4	Nan	D.		
(44)	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. Wa	ater heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
		ipancy, l										71		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TI	-A -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)			
Annua	l averag	e hot wa	ater usaç									3.65		(43)
		_	hot water person per			-	-	to achieve	a water us	se target o	f			
not more								T .	0	0.1	NI.		1	
Hot wate	Jan er usage ii	Feb	Mar day for ea	Apr ach month	May $Vd.m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(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		
(44)111–	00.02	00.07	00.23	77.00	73.93	10.19	70.79	73.33		Total = Su	l	l	943.85	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			. ,		0.000	` '
(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		
						ļ.	ļ.	!		Total = Su	m(45) ₁₁₂ =	=	1237.53	(45)
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)				•	
(46)m=	19.25	16.83	17.37	15.14	14.53	12.54	11.62	13.33	13.49	15.72	17.16	18.64		(46)
	storage		includin	na anv so	olar or M	/WHRS	storana	within s	ame ves	امء		0		(47)
_		` ,	ind no ta	•			_		arric ves	301		0		(47)
	-	_	hot wate		-			. ,	ers) ente	er '0' in (47)			
	storage			`					,	`	,			
a) If m	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
•			storage	-				(48) x (49)) =		1	10		(50)
•			eclared of factor fr	-								00		(51)
		•	ee secti		C 2 (KVV)	11/11(10/00	·y /				0.	.02		(31)
	•	from Ta									1.	.03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
		(54) in (5	,								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 cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix 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)
Primar	y circuit	loss (ar	nual) fro	m Table	3							0		(58)
	-		culated t		,	•	. ,	, ,						
,			rom Tab									ı	I	,·
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	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= 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)	
(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	(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) ₁₁₂ 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	(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)
	(00)
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	(69)
	(00)
Pumps and fans gains (Table 5a)	(70)
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	(74)
(71)m= -68.25 -68	(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 = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(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 0.9x 0.77 x 8.65 x 91.35 x 0.63 x 0.7 = 241.51	(75)
Northeast 0.9x 0.77 x 8.65 x 97.38 x 0.63 x 0.7 = 257.47	(75)
Northeast 0.9x 0.77 x 8.65 x 91.1 x 0.63 x 0.7 = 240.86	
0.00 A 91.1 A 0.00 A 91.1	(75)

Northeas	st _{0.9x}	0.77	x	8.6	65	x	5	50.42	x		0.63	х	0.7	=	133.31	(75)
Northeas	st _{0.9x}	0.77	x	8.6	65	x	2	28.07	x		0.63	_ x _	0.7		74.21	(75)
Northeas	st _{0.9x}	0.77	X	8.6	65	x		14.2	x		0.63	x	0.7	=	37.53	(75)
Northeas	st _{0.9x}	0.77	X	8.6	65	x	9	9.21	x		0.63	_ x _	0.7	=	24.36	(75)
	_								•							_
Solar ga	ains in	watts, ca	alculated	for eacl	h month				(83)m	า = Sเ	um(74)m .	(82)m				
(83)m=	29.83	60.72	109.4	179.67	241.51	1	57.47	240.86	192	.02	133.31	74.21	37.53	24.36		(83)
Total ga	ains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (83)m	, watts					!	!		
(84)m=	357.5	386.59	425.35	479.81	525.99	5	26.58	499.8	456	.05	405.31	362.19	343.84	344.04		(84)
7. Mea	an inter	nal temp	erature	(heating	season)										
		during h					area f	from Tal	ole 9	. Th	1 (°C)				21	(85)
•		tor for g	٠.			·			0.00	,	. ()				21	(0.07
Г	Jan	Feb	Mar	Apr	May	È	Jun	Jul	ΙΔ	ug	Sep	Oct	Nov	Dec		
(86)m=	0.92	0.89	0.83	0.7	0.53	-	0.37	0.27	0.3	Ť	0.51	0.76	0.88	0.93		(86)
` ′ L								<u> </u>		!		0.70	0.00	0.00		()
		l temper						i –					1		Ī	(07)
(87)m=	20.09	20.25	20.51	20.8	20.94	2	20.99	21	2	1	20.96	20.77	20.41	20.07		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Tł	n2 (°C)			_	ī	
(88)m=	20.39	20.4	20.4	20.41	20.41	2	20.42	20.42	20.	42	20.42	20.41	20.41	20.4		(88)
Utilisat	tion fac	tor for g	ains for ı	est of d	welling,	h2.	,m (se	ee Table	9a)							
(89)m=	0.91	0.88	0.82	0.68	0.5	Т	0.34	0.24	0.2	27	0.47	0.73	0.87	0.92		(89)
Moan i	intorna	l temper	ature in t	the rest	of dwalli	ina	T2 (f	ollow etc	nc 3	to 7	7 in Tahl	o 9c)				
(90)m=	19.17	19.4	19.77	20.16	20.35	T	20.41	20.42	20.		20.38	20.13	19.63	19.14		(90)
(00)=	10.17	10.1	10.77	20.10	20.00			20.12		<u></u> _1			g area ÷ (4		0.43	(91)
													3 (,	0.40	(0.)
		l temper	<u> </u>			$\overline{}$	-	1	r `						Ī	(00)
(92)m=	19.57	19.77	20.09	20.44	20.6	_	20.66	20.67	20.		20.63	20.41	19.97	19.54		(92)
· · · · · -		nent to th			· ·			r	·			·		l	Ī	(00)
(93)m=	19.57	19.77	20.09	20.44	20.6	<u> </u>	20.66	20.67	20.	67	20.63	20.41	19.97	19.54		(93)
		ting requ						44 . (T	L - OL	11 -	. T' '	70)	.1	la (a	
		mean int factor fo		•		nea	at ste	ер 11 от	ıabı	ie 90	o, so tha	t 11,m=(76)m an	d re-caid	culate	
Г	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
L Utilisat		tor for g			I III W		ou	1 04.		<u> </u>	Oop		1.101			
(94)m=	0.9	0.87	0.81	0.68	0.51	Π	0.35	0.25	0.2	29	0.48	0.73	0.86	0.91		(94)
Useful	gains,	hmGm ,	W = (94)	I)m x (84	4)m	<u> </u>		<u> </u>	<u> </u>	!				!		
	322.28	337.11	343.31	324.74	268.83	1	85.07	125.14	130	.54	196.52	264.53	295.68	313.09		(95)
Month!	ly aver	age exte	rnal tem	perature	from T	abl	e 8		<u>. </u>							
(96)m=	4.3	4.9	6.5	8.9	11.7	$\overline{}$	14.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Heat Id	oss rate	e for mea	an intern	al tempe	erature,	Lm	1 , W =	-[(39)m	x [(9	3)m-	– (96)m]			1	
	494.91	480.12	437.24	364.18	279.99	_	86.93	125.5	131	_	203.06	308.42	407.79	489.83		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	Wh	/mont	th = 0.02	24 x	 [(97)	m – (95)m] x (4	1)m		l	
· -	128.43	96.1	69.88	28.4	8.3		0	0		Í	0	32.66	80.72	131.5		
_						-		•	•	Total	per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	575.99	(98)
Space	heatin	g require	ement in	kWh/m²	2/vear										11.4	(99)
52400		J . 394111			. , ວັດເ										1117	

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 (Ta			(301)
	able (1) O II HOHE	0	Ⅎ`
Fraction of space heat from community system 1 – (301) =	owe for CHD and up to four other heat courses	the latter	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See		ine 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 communi-	ty heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating		kWh/yea	<u>r</u>
Annual space heating requirement		575.99	_
Space heat from Community boilers	$(98) \times (304a) \times (305) \times (306) =$	604.79	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	n (98) x (301) x 100 \div (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)] =	25.88	(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 our	utside	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 quantity)		-510.48	(333)
Electricity generated by wind turbine (Appendix M) (negative quan	ntity)	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 (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	wo fuels repeat (363) to (366) for the second fu	el 94	(367a)
CO2 associated with heat source 1 [(307b)+(31	0b)] x 100 ÷ (367b) x 0.22	= 594.59	(367)
Electrical energy for heat distribution [(3	13) x 0.52	= 13.43	(372)
Total CO2 associated with community systems (36	53)(366) + (368)(372)	= 608.02	(373)
CO2 associated with space heating (secondary) (30	09) x	= 0	(374)

CO2 associated with water from imme	rsion heater or instanta	aneous heater	(312) x	0.22	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + ((375) =			608.02	(376)
CO2 associated with electricity for pun	nps and fans within dw	elling (331)) x		0.52	=	91.01	(378)
CO2 associated with electricity for ligh	ting	(332))) x		0.52	=	125.12	(379)
Energy saving/generation technologies	s (333) to (334) as app	licable			_		_
Item 1				0.52 x 0.0	01 =	-264.94	(380)
Total CO2, kg/year	sum of (376)(382) =					559.22	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =					11.06	(384)
El rating (section 14)						92.16	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 24

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: 21.9

Summer heat loss coefficient: 188.67 (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 366.65 353.83 610.35 696.41 659.28 (P5) Total summer gains Summer gain/loss ratio 3.69 3.49 3.24 (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 20.99 22.69 22.34 Likelihood of high internal temperature Slight Medium Medium

Assessment of likelihood of high internal temperature: Medium

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	_ <u> </u>	Strom Softwa					0001082 on: 1.0.5.9	
.	F	roperty	Address	Plot 24					
Address: 1. Overall dwelling dime	ensions:								
The Overall awailing all the		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
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	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	<u> </u>	0	Ī - [0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				2	x ′	10 =	20	(7a)
Number of passive vents	;			Ē	0	x ²	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				L					
				_			Air ch	nanges per ho	_
	ys, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b			continue fr	20		÷ (5) =	0.16	(8)
Number of storeys in t		a 10 (11),	ouror wido (orianao n	om (0) to ((10)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	uction			0	(11)
it both types of wall are p deducting areas of openi	resent, use the value corresponding t ngs); if equal user 0.35	o the grea	ter wall are	a (atter					
If suspended wooden	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	•							0	(13)
•	s and doors draught stripped		0.05 [0.0	v (1.4) · .4	001			0	(14)
Window infiltration Infiltration rate			0.25 - [0.2] (8) + (10)	. ,	-	+ (15) =		0	(15)
	q50, expressed in cubic metre	s ner h					area	3	(16)
,	lity value, then $(18) = [(17) \div 20] + (18)$		•	•	cure or c	листоро	uica	0.31	(18)
Air permeability value applie	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			`
Number of sides sheltered	ed		(00) 4	10.07E (4	10)1			3	(19)
Shelter factor	ting aboltor footor		(20) = 1 -		19)] =			0.78	(20)
Infiltration rate incorporation	•		(21) = (18) X (20) =				0.24	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1	1 00.	1 7.09	Сор	1 000	1101		l	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
	-)	1	1		1	1		ı	
Wind Factor (22a)m = $(2^{23})^{m}$		I 0.05	T 0.00	4	4.00	1 4 4 0	1 10	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Calculate offo	0.3	0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28		
	ctive air	_	rate for t	he appli	cable ca	se			!	!		-	
If mechanical If exhaust air h			andiv N. (2)	3h) - (23a) v Emy (c	auation (N	VEVV otho	nuico (22h) - (232)			0	(2
If balanced with) = (23a)			0	(2
		•	•	_					Ola \	005) [4 (00-)	0	(2
a) If balance	o mecha	o o	ntilation	with nea	at recove		1R) (248	$\frac{1}{0} = (22)$	2b)m + (23b) x [$\frac{1 - (230)}{1}$) ÷ 100]]	(2
b) If balance									l			_	(2
24b)m= 0		o 0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h					<u> </u>							J	(-
,	n < 0.5 ×			•					.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
d) If natural	ventilation	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	<u>!</u>	<u>!</u>	Į	_	
,	n = 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		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(2
3. Heat losse	s and he	eat loss r	paramete	ar.									
LEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	e	ΑΧk
	area	-	m		A ,r		W/m2		(W/I		kJ/m²•		kJ/K
oors					2	X	1.4	= [2.8				(2
Vindows					8.651	х1.	/[1/(1.4)+	0.04] =	11.47				(2
Valls Type1	19.7	7	8.65		11.05	, x	0.15	=	1.66				(2
Valls Type2	13.0)4	2		11.04	x	0.14		1.56				(2
otal area of e	elements	, m²			32.74	<u> </u>							(3
for windows and	l roof wind	ows, use e	ffective wii	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given ir	paragrapi	h 3.2	
* include the area				s and pan	titions								
	3S, VV/K =	= S (A x	U)				(00)	(00)				17.49	
	0 0/	•	,				(26)(30)		(0.0)	-> ()	(0.0.)		
leat capacity	`	(Axk)	ŕ				(26)(30)	((28)	(30) + (32	, , ,	(32e) =	309.2	(3
leat capacity hermal mass	parame	Axk) ter (TMF	P = Cm ÷	•				((28)	tive Value	: Low	` '		
Fabric heat lost leat capacity Thermal mass For design assess and be used inste	s parame sments wh	A x k) ter (TMF ere the de	$P = Cm \div tails of the$	•				((28)	tive Value	: Low	` '	309.2	(3
Heat capacity Thermal mass For design assess	s parame sments wh	(A x k) ter (TMF ere the de tailed calcu	P = Cm ÷ tails of the ulation.	construct	ion are no	t known pr		((28)	tive Value	: Low	` '	309.2	(3
leat capacity hermal mass for design asses: an be used inste	s parame sments wh ead of a dea es: S (L	A x k) ter (TMF ere the de tailed calcu x Y) cal	P = Cm ÷ tails of the ulation. culated t	construct	ion are not pendix l	t known pr		((28)	tive Value	: Low	` '	309.2	(3
leat capacity Thermal mass For design assess an be used inste	s parame sments wh ead of a dea es: S (L al bridging	A x k) ter (TMF ere the de tailed calcu x Y) cal	P = Cm ÷ tails of the ulation. culated t	construct	ion are not pendix l	t known pr		((28) Indica	tive Value	: Low	` '	309.2	(3)
Heat capacity Thermal mass For design assess In be used inste Thermal bridg Thetails of thermal Total fabric he	s parame sments wh ead of a dec es : S (L al bridging eat loss	A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to	construct	ion are not pendix l	t known pr		((28) Indica indicative	ative Value	: Low : TMP in T	able 1f	309.2 100 4.38	(3
leat capacity Thermal mass For design assess In be used inste Thermal bridg details of thermal Total fabric he	s parame sments wh ead of a dec es : S (L al bridging eat loss	A x k) ter (TMF ere the de tailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to	construct	ion are not pendix l	t known pr		((28) Indica indicative	tive Value e values of	: Low : TMP in T	able 1f	309.2 100 4.38	(3)
leat capacity thermal mass for design assess an be used inste thermal bridg details of thermal fotal fabric he tentilation hea	s parame sments wh read of a dec es : S (L al bridging reat loss at loss ca	A x k) ter (TMF ere the de tailed calco x Y) calc are not kn	P = Cm ÷ tails of the ulation. culated to own (36) =	constructiusing Ap	ppendix I	t known pr	ecisely the	((28) Indica e indicative (33) + (38)m	tive Value e values of (36) = = 0.33 × (: Low : TMP in T	Table 1f	309.2 100 4.38	(3
Thermal mass for design assessan be used inste Thermal bridg details of thermal fotal fabric hermal details of the detai	s parame sments wh ead of a dec es : S (L al bridging eat loss at loss ca Feb 22.71	A x k) ter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 22.64	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix I	t known pr	ecisely the	((28) Indica e indicative (33) + (38)m Sep 22.04	(36) = = 0.33 × (25)m x (5 Nov 22.36	Pable 1f	309.2 100 4.38	(3)
Thermal mass for design assess an be used instead details of thermal fotal fabric hermal details of thermal fotal fabric hermal details of thermal details of thermal fabric hermal details of thermal fabric hermal details of the det	s parame sments wh ead of a dec es : S (L al bridging eat loss at loss ca Feb 22.71	A x k) ter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 22.64	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix I	t known pr	ecisely the	((28) Indica e indicative (33) + (38)m Sep 22.04	(36) = = 0.33 × (Oct	25)m x (5 Nov 22.36	Pable 1f	309.2 100 4.38	(3
hermal mass or design assessan be used instelled hermal bridge details of thermal otal fabric hermal fabric hermal fabric hermal selbert transfer (19)m= 44.65	s parame sments wh had of a dec es : S (L al bridging eat loss at loss ca Feb 22.71 coefficier 44.58	ter (TMF ere the de tailed calculated Mar 22.64 etc.)	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 22.29	constructions and constructions with the construction of the const	ppendix I Jun 21.92	t known pr	Aug 21.87	((28) Indicative (33) + (38)m Sep 22.04 (39)m 43.91	(36) = = 0.33 × (Oct 22.23 = (37) + (34.09) Average =	25)m x (5 Nov 22.36 38)m 44.22 Sum(39)	Dec 22.49	309.2 100 4.38	(3)
Thermal mass for design assess an be used instead fabric hermal bridge details of thermal fotal fabric hermal fabr	s parame sments wh had of a dec es : S (L al bridging eat loss at loss ca Feb 22.71 coefficier 44.58	ter (TMF ere the de tailed calculated Mar 22.64 etc.)	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 22.29	constructions and constructions with the construction of the const	ppendix I Jun 21.92	t known pr	Aug 21.87	((28) Indicative (33) + (38)m Sep 22.04 (39)m 43.91	(36) = = 0.33 × (Oct 22.23 = (37) + (34.09)	25)m x (5 Nov 22.36 38)m 44.22 Sum(39)	Dec 22.49	309.2 100 4.38 21.87	(3)

Number of days in month (Table 1a)

Nullibe	ei oi day	5 111 11101	illi (Tab	ie ia)	ı	ı	ī	ī	ı	ı	I	1	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ene	rgy requi	irement:								kWh/ye	ear:	
		ıpancy, l										71		(42)
	FA > 13.9 FA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)		•	
		-	ater usaç	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		78	3.65		(43)
		_	hot water person per			-	-	to achieve	a water us	se target o	f			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea						Sep	l Oct	INOV	Dec		
(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		
					1						m(44) ₁₁₂ =		943.85	(44)
Energy	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,ı	n x nm x E	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		7(45)
If instan	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1237.53	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:												
Storag	e volum	e (litres)	includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	_	ınd no ta		-			` '						
	vise if no storage		hot wate	er (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	_		eclared l	oss facto	or is kno	wn (kWl	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
			eclared o										· I	(=4)
			factor free section		ie z (KVV	n/iitre/ua	ay)					0		(51)
	-	from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	•	(54) in (5	•									0		(55)
		loss cal	culated f					((56)m = (55) × (41)				I	
(56)m=	0	0	0	0	0 (56) ==	0	0	0	0 7\m (FC)	0	0	0 m Append	iv I I	(56)
•							· /- ·		, , , ,	·	· · · · ·		ıx n	(<u>)</u>
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•	`	nual) fro			\	(=a)					0		(58)
	-		culated to rom Tab			•	. ,	, ,		r thermo	etat)			
(59)m=	0	0	0	0	0	0	0		0	0	0	0		(59)
			for each	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>					I	
(61)m=	0	0	o each	0	0	000) - 30	05 × (41)	0	0	0	0	0		(61)
()			<u> </u>	L	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	L	1	(= -/

Total heat rec	uired for	water he	eating ca	alculated	d fo	r each mont	n (62))m =	0.85 × (45)m -	- (46)m +	(57)m +	(59)m + (61)m	
(62)m= 109.06	95.38	98.43	85.81	82.34	7	1.05 65.84	75	.55	76.45	89.1	97.26	105.62		(62)
Solar DHW input	calculated	using App	endix G o	Appendi:	хН	(negative quant	ty) (en	ter '0	if no solar	contrib	ution to wate	er heating)	•	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	3 ap	oplies, see A	ppen	dix C	3)					
(63)m= 0	0	0	0	0		0 0		0	0	0	0	0		(63)
Output from w	ater hea	iter												
(64)m= 109.06	95.38	98.43	85.81	82.34	7	1.05 65.84	75	.55	76.45	89.1	97.26	105.62		
								Outp	out from wa	iter heat	er (annual) ₁	12	1051.9	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ′	$[0.85 \times (45)]$ r	n + (6	61)m	n] + 0.8 x	[(46)n	n + (57)m	+ (59)m]	
(65)m= 27.26	23.85	24.61	21.45	20.58	1	7.76 16.46	18	.89	19.11	22.28	24.32	26.4		(65)
include (57)	m in cal	culation of	of (65)m	only if o	Cylii	nder is in the	dwel	ling	or hot wa	ater is	from com	munity h	i leating	
5. Internal g			. ,									•		
Metabolic gair	·			<i>/-</i>										
Jan	Feb	Mar	Apr	May	Т	Jun Jul	T A	ug	Sep	Oct	Nov	Dec		
(66)m= 85.31	85.31	85.31	85.31	85.31	Ę	5.31 85.31	+	.31	85.31	85.31	85.31	85.31		(66)
Lighting gains	. (calcula	ted in Ar	<u> </u>	l equat	tion	 I 9 or I 9a)								
(67)m= 13.65	12.12	9.86	7.47	5.58	_	4.71 5.09	_	62	8.88	11.28	13.16	14.03		(67)
Appliances ga	1	l	l	l							1		l	,
(68)m= 148.65	- `	146.3	138.03	127.58		17.77 111.21		9.66	113.55	121.83	132.27	142.09	1	(68)
` '	<u> </u>	ļ	<u> </u>	<u> </u>		!			LI		102.21	142.00		(00)
Cooking gains (69)m= 31.53	31.53	31.53	31.53	1.53	_	1.53 31.53	i 	.53	31.53	31.53	31.53	31.53		(69)
` '			<u> </u>	31.03		01.00	31	.55	31.55	31.33	31.55	31.33		(00)
Pumps and fa		r `			_	0 1 0	1	0	_		1 0		1	(70)
(70)m= 0	0	0	0	0	Ļ	0 0		0	0	0	0	0		(70)
Losses e.g. e		_ ` 		- ^ `	_		1				T		1	(74)
(71)m= -68.25	-68.25	-68.25	-68.25	-68.25	-	68.25 -68.25	-68	3.25	-68.25	-68.25	-68.25	-68.25		(71)
Water heating	` ` `	- 	ı	ı	_								ı	
(72)m= 36.65	35.49	33.07	29.8	27.67	2	22.12		.39	26.55	29.94	33.77	35.49		(72)
Total interna	l gains =	:			_	(66)m + (67)	m + (6	8)m +	+ (69)m + (70)m +	(71)m + (72)	m	•	
(73)m= 247.54		237.83	223.88	209.42	1	95.74 187.01	190	0.26	197.57	211.64	227.8	240.2		(73)
6. Solar gain														
Solar gains are		•			and	·	ations	to co	nvert to the	e applica		ion.		
Orientation:	Access F Table 6d		Area m²			Flux Table 6a		Т	g_ able 6b		FF Table 6c		Gains (W)	
Northeast _{0.9x}	0.77	x	8.6	35	X	11.28	7 x		0.63	_ x [0.7		29.83	(75)
Northeast _{0.9x}	0.77	X	8.6		x	22.97	d x		0.63	x	0.7	= =	60.72	(75)
Northeast _{0.9x}	0.77		8.6		x	41.38	i x		0.63	_	0.7	= =	109.4] (75)
Northeast 0.9x	0.77	×			x	67.96	ا ا		0.63		0.7	= =	179.67](75)
Northeast 0.9x	0.77	×			x	91.35	^ x	\vdash	0.63	^ [_ x [0.7	=	241.51](75)
Northeast 0.9x	0.77	_			x	97.38	^ x	\vdash	0.63	^ [_ x [0.7	_	257.47](75)
Northeast 0.9x		×	8.6		X	91.1	-		0.63	_	0.7	_	240.86](75)
Northeast 0.9x	• • • • • • • • • • • • • • • • • • • •	_					╡	\vdash		≓ ¦		=		╡
THORETOGOL U.9X	0.77	X	8.6	oo	X	72.63	X	1	0.63	X	0.7	=	192.02	(75)

Northea	ast _{0.9x}	0.77	x	8.6	S5	x	50	.42	x		0.63	X	0.7	=	133.31	(75)
Northea	ast _{0.9x}	0.77	X	8.6	35	x	28	3.07	×		0.63	X	0.7	=	74.21	(75)
Northea	ast _{0.9x}	0.77	x	8.6	65	x	14	4.2	x		0.63	X	0.7	=	37.53	(75)
Northea	ast _{0.9x}	0.77	х	8.6	35	x	9.	21	×		0.63	X	0.7	=	24.36	(75)
	_															
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m	= Su	ım(74)m .	(82)m			_	
(83)m=	29.83	60.72	109.4	179.67	241.51	257	7.47	240.86	192.0	02	133.31	74.21	37.53	24.36		(83)
Total g	ains – ir	nternal a	and solar	(84)m =	= (73)m ·	+ (8	3)m ,	watts								
(84)m=	277.37	307.12	347.23	403.55	450.93	453	3.21	427.87	382.2	28	330.88	285.84	265.33	264.56		(84)
7. Me	an inter	nal temp	perature	(heating	season)										
Temp	erature	during h	neating p	eriods ir	n the livii	ng a	rea fr	om Tab	ole 9,	Th1	1 (°C)				21	(85)
•		•	ains for I			-					` ,					
	Jan	Feb	Mar	Apr	May	r	Jun	Jul	Au	ıa	Sep	Oct	Nov	Dec	7	
(86)m=	0.97	0.96	0.93	0.85	0.72	0.	.56	0.43	0.49	- 	0.72	0.9	0.96	0.97	1	(86)
Maan	intorno	ltompor	oturo in	living or	OO T4 /fa	سادالد	u oton	0 2 to 7	l	مامد	. 00)				J	
(87)m=	19.14	19.35	ature in	20.25	20.67	_).89	20.96	20.9	_	20.75	20.21	19.59	19.1	7	(87)
			<u> </u>		<u> </u>				<u> </u>	_		20.21	19.59	13.1	J	(01)
_			eating p						r –	-				1	7	(00)
(88)m=	20.18	20.18	20.18	20.19	20.19	20	0.2	20.2	20.2	2	20.19	20.19	20.19	20.19	_	(88)
Utilisa	ation fac	tor for g	ains for ı	rest of d	welling,	h2,n	n (see	e Table	9a)						_	
(89)m=	0.97	0.95	0.92	0.83	0.68	0).5	0.36	0.42	2	0.67	0.88	0.95	0.97		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng 7	T2 (fol	llow ste	ps 3	to 7	in Tabl	e 9c)				
(90)m=	18.46	18.67	19.05	19.55	19.93	Ť).13	20.18	20.1	Т	20.02	19.52	18.91	18.42	1	(90)
ı											f	LA = Liv	ing area ÷ (4) =	0.43	(91)
Moon	intorna	l tompor	ature (fo	r tho wh	olo dwo	lling	ı\ _ fl .	Λ ν Τ1	. (1	fl	۸) ی T2					
(92)m=	18.76	18.96	19.35	19.85	20.25	-), = 1L/).46	20.52	20.5	_	20.33	19.82	19.21	18.71	7	(92)
			he mean										10.21	10.71	J	()
(93)m=	18.76	18.96	19.35	19.85	20.25	г —	0.46	20.52	20.5	-	20.33	19.82	19.21	18.71	1	(93)
			uirement										1			
•		·			re obtair	ned a	at ster	p 11 of	Table	9b	o, so tha	t Ti.m=	:(76)m an	ıd re-cal	culate	
			or gains								,		(_	
	Jan	Feb	Mar	Apr	May	J	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										_	_	
(94)m=	0.96	0.94	0.9	0.82	0.69	0.	.52	0.39	0.45	5	0.68	0.87	0.94	0.96		(94)
Usefu	_	hmGm	W = (94)	1)m x (8	4)m									,	_	
(95)m=	265.43	288.99	313.92	331.31	309.29	23	5.89	165.61	170.2	26	225.67	248.96	249.44	254.5		(95)
Month			rnal tem			able	8			_					7	
(96)m=	4.3	4.9	6.5	8.9	11.7	<u> </u>	4.6	16.6	16.4		14.1	10.6	7.1	4.2		(96)
			an intern			_		,	- ` 	_	` ,	Ī		Г	7	
(97)m=	645.56	626.84	571.78	483.75	376.95			171.59	179.5		273.74	406.5		643.8		(97)
			ement fo		r					97) T	<u> </u>				7	
(98)m=	282.82	227.04	191.85	109.76	50.34		0	0	0		0	117.24		289.64		7,000
									Т	otal	per year	(kWh/ye	ar) = Sum(9	98) _{15,912} =	1474.55	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year										29.17	(99)

8c. Space cooling requirement														
Calcu	lated fo	r June, c	July and	August.	See Tal	ole 10b							i	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	loss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	411.65	324.06	332.4	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm										•	
(101)m=	0	0	0	0	0	0.88	0.92	0.89	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = (100)m x	(101)m								•	
(102)m=	0	0	0	0	0	360.46	297.04	296.2	0	0	0	0		(102)
Gains (solar gains calculated for applicable weather region, see Table 10)														
														(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m < $3 \times (98)m$														
(104)m=	0	0	0	0	0	168.31	198.18	159.89	0	0	0	0		
•									Total	= Sum(104)	=	526.38	(104)
	I fraction	-							f C =	cooled	area ÷ (4	4) =	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		_
_									Tota	l = Sum(104)	=	0	(106)
		_ ·	ment for				<u> </u>							
(107)m=	0	0	0	0	0	42.08	49.55	39.97	0	0	0	0		_
									Total	= Sum(107)	=	131.6	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	/ear				(107)	\div (4) =			2.6	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	lculated	only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabrio	Energ	y Efficier	псу						(99)	+ (108) =	=		31.78	(109)

SAP Input

Property Details: Plot 24

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 m² 2.5 m

Living area: 21.831 m² (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 19.699 8.65 11.05 0.15 0 False N/A Corridor Wall 13.038 2 11.04 0.15 0.4 False N/A

Internal Elements

Party Elements

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1338

Length Psi-value Other lintels (including other steel lintels) 4.795 0.289 E2 E4 13.2 0.047 Party floor between dwellings (in blocks of flats) 24.027 0.065 E7 Party wall between dwellings 10.9 0.055 E18

SAP Input

2.445 0.087 E21 Exposed floor (inverted)

23.421 0 P3 Intermediate floor between dwellings (in blocks of flats)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 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 :heat from boilers - 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

		User	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			0001082 on: 1.0.5.9	
Address :	F	Property	Address	: Plot 24					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
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	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	_ + [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				2	x ′	10 =	20	(7a)
Number of passive vents	3			Ē	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				20		÷ (5) =	0.16	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otherwise (continue ti	rom (9) to	(16)		0	(9)
Additional infiltration	no awaiing (no)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fc	r masoni	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding to	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	,	`	,,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)					0	(16)
,	q50, expressed in cubic metre	-	•	•	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] + (6)$ es if a pressurisation test has been do.				is haina u	sad		0.41	(18)
Number of sides sheltere		ie or a de	gree an pe	тпеаышу	is being u	seu		3	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.78	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.32	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
-		•	•	•	•	•	•	•	

Adjusted infiltration i	ate (allow	ing for sh	nelter an	d 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 effective a	•	rate for t	he appli	cable ca	ise				•			
If mechanical vent		and the NL (O) (00 -			NEW - th-) (00-)			0	(23a
If exhaust air heat pur) = (23a)			0	(23b
If balanced with heat re	-		_								0	(230
a) If balanced med		1			- 	, 	ŕ	- 	` 	' ' ') ÷ 100] 1	(0.4
(24a)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(24a
b) If balanced med		1	i	i	1	1	<u> </u>	<u> </u>	1	i	1	
(24b)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(24h
c) If whole house if (22b)m < 0.5			•	•				.5 × (23k	o)		_	
(24c)m = 0 0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural ventila if (22b)m = 1,			•	•				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		(240
Effective air chang	e rate - e	nter (24a) or (24b	o) or (24	c) or (24	ld) in bo	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 and	heat loss	naramet	≏r·									
	oss	Openin		Net Ar	rea	U-val	ue	ΑXU		k-value	Δ	ΑΧk
	a (m²)	m		A ,r		W/m2		(W/		kJ/m²-		kJ/K
Doors				2	X	1	=	2				(26)
Windows				8.651	1 x1	/[1/(1.4)+	0.04] =	11.47				(27)
Walls Type1	9.7	8.65	5	11.05	5 X	0.18	─	1.99			\neg	(29)
Walls Type2 1	3.04	2	=	11.04	4 x	0.18	-	1.99	= i		7 F	(29)
Total area of elemer	ts, m²			32.74	4							(31)
* for windows and roof wi ** include the areas on bo				alue calcul		g formula 1	/[(1/U-valu	ue)+0.04] á	as given ir	paragrapi	h 3.2	, ,
Fabric heat loss, W/	< = S (A x	U)				(26)(30) + (32) =				17.44	(33)
Heat capacity Cm =	S(A x k)						((28).	(30) + (3	2) + (32a)	(32e) =	309.2	(34)
Thermal mass parar	neter (TM	P = Cm -	: TFA) ir	n kJ/m²K			Indica	itive Value	: Medium		250	(35)
For design assessments can be used instead of a			construct	ion are no	t known pi	recisely the	e indicative	e values of	f TMP in T	able 1f		
Thermal bridges : S	(L x Y) ca	culated (using Ap	pendix I	K						4.02	(36)
if details of thermal bridgi	-	nown (36) =	= 0.05 x (3	1)								
Total fabric heat loss	i						(33) +	(36) =			21.46	(37)
Ventilation heat loss	calculated	d monthly	у				(38)m	= 0.33 × ((25)m x (5)	,	
Jan Fel) Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 24.24 24.1°	23.98	23.38	23.26	22.73	22.73	22.64	22.94	23.26	23.49	23.73]	(38)
Heat transfer coeffic	ent, W/K						(39)m	= (37) + ((38)m			
(39)m= 45.71 45.57	45.44	14.04	44.72	44.2	44.2	44.1	44.4	44.72	44.95	45.19	1	
		44.84	44.72					L				
Heat loss parameter			44.72		1	144.1		Average = = (39)m ÷	Sum(39)		44.84	(39)
Heat loss parameter (40)m= 0.9 0.9			0.88	0.87	0.87	0.87		L Average =	Sum(39)		44.84	(39)

Number of days in month (Table 1a)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec														
	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. Wa	ater heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assum	ed occu	ıpancy, l	N								1.	71		(42)
			+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)		l	
	A £ 13.9 Laverag	-	ater usag	ne in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		74	.72		(43)
Reduce	the annua	al average	hot water	usage by	5% if the c	lwelling is	designed			se target o		2		(40)
not more	e that 125	litres per _l	person per	day (all w	ater use, i	hot and co	ld)	,		ı	,		•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			day for ea							i	i		ı	
(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		7
Energy o	content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,ı	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		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>		<u> </u>		l	m(45) ₁₁₂ =	 =	1175.66	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)		, ,	ļ		
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		مالم بالمصا			WALLDO	-1	م ماطالات					1	(47)
•		` ,	includin	•			_		ame ves	sei		150		(47)
		_			-			` '	are) ante	ar '∩' in <i>(</i>	47)			
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss:														
	_		eclared l	oss facto	or is kno	wn (kWl	n/day):					0		(48)
														(49)
•			· storage	-				(48) x (49)) =			0		(50)
			eclared o										- 	(54)
			factor free section		ie z (KVV	H/HHE/Ua	1y <i>)</i>					0		(51)
	-	from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	. ,	(54) in (5	•									0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er 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 Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
	-		culated t			•	. ,	, ,						
,			rom Tab								- 		Ī	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	culated	for each	month ((61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Gegins 103.61 90.62 93.51 81.52 78.22 67.5 62.55 71.77 72.63 84.65 92.4 100.34
(63)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Cost
Output from water heater (64)ms 103.61 90.62 93.51 81.52 78.22 67.5 62.55 71.77 72.63 84.65 92.4 100.34 Output from water heater 103.61 90.62 93.51 81.52 78.22 67.5 62.55 71.77 72.63 84.65 92.4 100.34 Dupt from water heater 103.61 90.62 93.51 81.52 78.22 67.5 62.55 71.77 72.63 84.65 92.4 100.34 Output from water heater 103.61 90.62 93.51 81.52 78.22 67.5 62.55 71.77 72.63 84.65 92.4 100.34 Heat gains from water heating, kWh/morth 0.25 ' [0.85 × (45)m + (61)m] + 0.8 × (46)m + (57)m + (59)m (65)m (65)m 25.5 22.65 23.38 20.38 19.56 16.87 15.64 17.94 18.16 21.16 23.1 25.08 (65)m (65
Couput from water heater (annual)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m 25.9 22.65 23.38 20.38 19.56 16.87 15.64 17.94 18.16 21.16 23.1 25.08 (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 (Table 5), Watts Metabolic gains (Calculated in Appendix L, equation L9 or L9a), also see Table 5 (66)m 85.31 85.3
(65)me 25.9 22.65 23.38 20.38 19.56 16.87 15.64 17.94 18.16 21.16 23.1 25.08 (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
Statemal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 85.31
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 85.31
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 13.65
(67)m=
(67)m=
(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 31.5
(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 31.5
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 31.53
Company Street
Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Comparison (negative values) (Table 5) (Comparison (negative values) (Table 6) (Comparison (negative values) (No. 1) (Comparison (negative values) (No. 1) (Comparison (negative values) (No. 1) (Co
Losses e.g. evaporation (negative values) (Table 5) (71)m=
(71)m=
Water heating gains (Table 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 =
(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 =
Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (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 gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area May 1.28 Flux May 2.29 FF Gains Table 6c Gains (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)
(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 gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d Area m² Flux 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)
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 m^2 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 41.38 x 0.63 x 0.7 x
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation. Orientation: Access Factor Table 6d m^2 Table 6a $Table 6b$ Table 6b Table 6c m^2 Table 6a Table 6b Table 6c m^2 Table 6a m^2 Table 6a m^2 Table 6b Table 6c m^2 Table 6b Table 6c m^2 Table 6c $m^$
Orientation: Access Factor Table 6d Area m² Flux Table 6a g_{-} Table 6b FF Table 6c Gains (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)
Table 6d m ² 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 0.9x
Northeast 0.9x
Northeast 0.9x 0.77
Northeast 0.9x 0.77 x 8.65 x 67.96 x 0.63 x 0.7 = 179.67 (75)
Northeast 0.9x 0.77 x 8.65 x 91.35 x 0.63 x 0.7 = 241.51 (75)
Northeast 0.9x
Northeast 0.9x
Northeast 0.9x

Northeast _{0.9x}	0.77	X	8.6	5	x	50.42	x	0.63	x	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	x	8.6	5	x	28.07	x [0.63	x	0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	x	8.6	5	x	14.2	x	0.63	х	0.7	=	37.53	(75)
Northeast _{0.9x}	0.77	x	8.6	5	x	9.21	x	0.63	х	0.7	=	24.36	(75)
													_
Solar gains in w	atts, ca	lculated	for eacl	n month			(83)m =	Sum(74)m	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.	47 240.86	192.02	133.31	74.21	37.53	24.36		(83)
Total gains – int	ternal a	nd solar	(84)m =	(73)m -	· (83))m , watts	•	•	•	•		1	
(84)m= 275.54	305.34	345.58	402.06	449.55	451.	98 426.77	381.01	329.55	284.34	263.64	262.79		(84)
7. Mean interna	al temp	erature (heating	season)								
Temperature d	during h	eating pe	eriods ir	the livir	ng ar	ea from Tal	ole 9, T	h1 (°C)				21	(85)
Utilisation factor	•				•			, ,					_
Jan	Feb	Mar	Apr	May	Ju		Aug	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.95	0.83	0.6	_	0.53	0.83	0.98	1	1		(86)
NA sus internal d				- T4 /6-		-1	7 : T	.1- 0-)	<u> </u>	<u> </u>	<u> </u>	l	
Mean internal t						i			1 20 64	1 00 00	20.03	Ī	(87)
(87)m= 20.05	20.16	20.38	20.69	20.91	20.9	99 21	21	20.94	20.64	20.29	20.03		(07)
Temperature d	during h	eating pe	eriods ir	rest of	dwell	ling from Ta	able 9,	Th2 (°C)				•	
(88)m= 20.16	20.17	20.17	20.18	20.18	20.1	19 20.19	20.19	20.19	20.18	20.18	20.17		(88)
Utilisation facto	or for ga	ains for re	est of d	welling, l	12,m	(see Table	9a)						
(89)m= 1	1	0.99	0.94	0.78	0.5	`	0.44	0.76	0.97	1	1		(89)
Mean internal t	temnera	ature in t	he rest	of dwelli	na Tí	2 (follow ste	ns 3 to	7 in Tah	le 9c)	!	!	J	
(90)m= 19.29	19.4	19.62	19.93	20.12	20.1	`	20.19	20.15	19.88	19.54	19.28		(90)
(11)										l g area ÷ (4		0.43	(91)
											•	0.10	
Mean internal t										1 40 07	100	1	(02)
(92)m= 19.62	19.73	19.95	20.26	20.46	20.5		20.54	20.49	20.21	19.87	19.6		(92)
Apply adjustme	r						1		·	1 40 07	100	I	(02)
(93)m= 19.62	19.73	19.95	20.26	20.46	20.5	53 20.54	20.54	20.49	20.21	19.87	19.6		(93)
8. Space heati	Ĭ.						T	21 41	/	70)			
Set Ti to the m the utilisation fa					ed at	t step 11 of	l able s	9b, so tha	it II,m=(76)m an	d re-cald	ulate	
Jan	Feb	Mar	Apr	May	Ju	ın Jul	Aug	Sep	Oct	Nov	Dec	1	
Utilisation factor			•	iviay	30	111 301	_L Aug	Тоер	1 001	1400	Dec	l	
(94)m= 1	1	0.99	0.94	0.8	0.5	7 0.41	0.48	0.79	0.97	1	1		(94)
Useful gains, h	mGm							1		!	ļ	ı	, ,
	304.06	341	378.28	358	258.	52 173.71	181.57	260.43	276.62	262.5	262.39		(95)
Monthly average		rnal temr	perature	from Ta							Į	l	, ,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.	1	16.4	14.1	10.6	7.1	4.2	ĺ	(96)
Heat loss rate							l				I	İ	,
	675.98	611.32	509.25	391.99	262.	- ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	182.49		429.76	573.93	696.14	1	(97)
Space heating									<u> </u>	<u> </u>	1 330.14		Λ= <i>/</i>
· — ř	249.93	201.12	94.3	25.29	0		0	7)111 — (93) 1 0	113.93	224.23	322.71		
010.20	5.55		5 1.0	_5.20				tal per year	<u> </u>	<u> </u>		1547.8	(98)
Constant			LAA/I- / 0	h.a			.0	por your	,vii y oai	, camo	- j15,812 —		╡
Space heating	require	inent in	KVVN/M²	/year								30.62	(99)

8c. Space cooling requirement														
Calcu	lated fo	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	e Lm (ca	lculated	using 2	5°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	415.45	327.05	335.15	0	0	0	0		(100)
Utilisa	ition fac	tor for lo	ss hm									_		
(101)m=	0	0	0	0	0	0.97	0.99	0.97	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = ((100)m x	(101)m								•	
(102)m=	0	0	0	0	0	401.13	322.45	326.6	0	0	0	0		(102)
Gains (solar gains calculated for applicable weather region, see Table 10)														
														(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 \times [(103) m – (102) m] \times (41) m set (104) m to zero if (104) m < 3 \times (98) m														
(104)m= 0 0 0 0 0 138.14 178.46 136.33 0 0 0														
Total = Sum(1.04) = 452.92 (1														(104)
Cooled	Cooled fraction $f C = cooled area \div (4) = 1$													
1		actor (Ta	able 10b)								,	1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
_									Total	l = Sum(104)	=	0	(106)
		requirer								_	_	Ι -	1	
(107)m=	0	0	0	0	0	34.53	44.61	34.08	0	0	0	0		–
									Total	= Sum(107)	=	113.23	(107)
Space	cooling	requirer	nent in k	:Wh/m²/y	/ear				(107)	\div (4) =			2.24	(108)
8f. Fab	ric Ener	rgy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Energy	y Efficier	псу						(99) -	+ (108) =	=		32.86	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								37.79	(109)

		Hear	Details:									
Access Name:	Zahid Ashraf	USEI		. Mirros	hau.		CTDO	001000				
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	-				0001082 on: 1.0.5.9				
			y Address:									
Address :												
1. Overall dwelling dime	ensions:	_										
Ground floor		Ar	ea(m²)	(1a) x		ight(m) 2.5	(2a) =	Volume(m³	(3a)			
	0) ((1b) ((10) ((1d) ((10)	(1p)				2.5	(2α) –	120.30				
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(111)	50.54	(4)) . (2-) . (2-	4) . (2 -) .	(2-)		_			
Dwelling volume				(3a)+(3b))+(3C)+(3C	d)+(3e)+	.(3h) =	126.36	(5)			
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r			
Number of chimneys	heating he	ating		1 ₌ [40 =		_			
Number of chimneys			0	<u> </u>	0		20 =	0	(6a)			
Number of open flues	0 +	0 +	0] = [0			0	(6b)			
Number of intermittent fa				Ĺ	0		10 =	0	(7a)			
Number of passive vents					0		10 =	0	(7b)			
Number of flueless gas f	ires				0	X 4	40 =	0	(7c)			
Air changes per hour												
Infiltration due to chimne	vs_flues and fans = (6a)	+(6b)+(7a)+(7b)	+(7c) =	Г	0		÷ (5) =	0	(8)			
	peen carried out or is intended			ontinue fr			. (0) –	0				
Number of storeys in t	he dwelling (ns)							0	(9)			
Additional infiltration						[(9)	-1]x0.1 =	0	(10)			
	0.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)			
deducting areas of openi		orialing to the gre	ater wan are	a (anoi								
If suspended wooden	floor, enter 0.2 (unseale	d) or 0.1 (sea	iled), else	enter 0				0	(12)			
If no draught lobby, en								0	(13)			
· ·	s and doors draught stri	pped	0.05 10.0	(4.4)	001			0	(14)			
Window infiltration			0.25 - [0.2	, ,	_	. (45)		0	(15)			
Infiltration rate	aEO ayaraaadin aybi		(8) + (10)	, , ,	, , ,	, ,		0	(16)			
If based on air permeabil	q50, expressed in cubic	•	•	•	etre or e	rivelope	area	3	$= \begin{pmatrix} (17) \\ (49) \end{pmatrix}$			
·	es if a pressurisation test has b				is beina u	sed		0.15	(18)			
Number of sides sheltered			.,	,	J			3	(19)			
Shelter factor			(20) = 1 - [0.075 x (1	9)] =			0.78	(20)			
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.12	(21)			
Infiltration rate modified f	for monthly wind speed							_				
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind sp	peed from Table 7							_				
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7					
Wind Factor (22a)m = (2	2)m ∸ 4											
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18]				
					Ц	Ц	I	J				

	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effe		_	rate for t	he appli	cable ca	se							
If mechanical If exhaust air h			endix N (2	3h) <i>– (2</i> 3a	a) × Fmv (e	equation (N	NS)) othe	rwise (23h) = (23a)			0.5	(23
If balanced with) = (25a)			0.5	== (23
a) If balance		•	•	_					2h\m + (23h) ~ [1 _ (23c)	79.05	(2:
24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24]	(2
b) If balance		<u> </u>			<u> </u>		l				<u> </u>	J	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h	ouse ex	tract ver	tilation o	or positiv	re input v	ventilatio	n from o	utside	ļ	ļ		ı	
,	n < 0.5 ×			•	•				5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural					•				-	-	-		
	n = 1, the	r ` í	· ·		·				-		1	1	10
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			<u> </u>	` `	´``	_		`				1	(6
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(2
3. Heat losse	s and he	at loss p	paramete	er:									
LEMENT	Gros	_	Openin		Net Ar		U-val		AXU	•	k-value		Χk
	area	(m²)	m	2	A ,r		W/m2	K .	(W/I	<) 	kJ/m²-	K k	J/K
oors					2	×	1.4	= [2.8	╡			(2
Vindows					8.651	x1,	/[1/(1.4)+	0.04] = [11.47	릴 ,			(2 —
Valls Type1	19.7	7	8.65		11.05	5 X	0.15	=	1.66	<u> </u>		_	(2
Valls Type2	13.0	14	2		11.04	X	0.14	=	1.56				(2
otal area of e					32.74								(3
for windows and * include the are						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	1 3.2	
abric heat los				o ana pan	1110110		(26)(30)	+ (32) =				17.49	(3
		•	-,					((28)	(30) + (32	2) + (32a).	(32e) =	309.2	—\`
leat capacity	,	,		TEA) is					, , ,	·Low		100	=
	parame	ter (TMF	: Cm = ر	- I F A) II	n kJ/m²K			Indica	tive Value	. LOW			- 110
hermal mass	•	•		•			ecisely the				able 1f		(
hermal mass	sments wh	ere the de	tails of the	•			ecisely the				able 1f		(
Heat capacity Thermal mass For design assess an be used inste Thermal bridg	sments wh ad of a dea es:S(L	ere the de tailed calcu x Y) cal	tails of the ulation. culated u	construct	ion are not pendix l	t known pr	ecisely the				able 1f	4.38	(3
Thermal mass for design assess an be used inste Thermal bridg details of therma	sments whead of a decent set : S (L	ere the de tailed calcu x Y) cal	tails of the ulation. culated u	construct	ion are not pendix l	t known pr	ecisely the	e indicative	e values of		able 1f		(3
Thermal mass for design assess an be used inste Thermal bridg details of thermal Total fabric he	sments whead of a decent of a	ere the de tailed calcu x Y) calcu are not kn	tails of the ulation. culated u own (36) =	constructiusing Ap	ion are not pendix l	t known pr	ecisely the	e indicative	e values of (36) =	TMP in T		4.38	(3
Thermal mass for design assess an be used inste Thermal bridg details of thermal otal fabric hermal destails of thermal otal fabric hermal design and the thermal design as the the thermal design as the thermal design as the thermal design as	sments wh ad of a der es: S (L al bridging at loss at loss ca	ere the de tailed calcu x Y) calcu are not kn	tails of the ulation. culated u own (36) =	constructions and constructions are constructed using April 20.05 x (3	ppendix I	t known pr	,	(33) + (38)m	(36) = = 0.33 × (TMP in To)		(3
thermal mass or design assess an be used inste thermal bridg details of thermal total fabric hermal dentilation d	es : S (L al bridging at loss at loss ca	ere the de tailed calculated are not kn alculated Mar	tails of the ulation. culated to own (36) = I monthly	constructs using Ap = 0.05 x (3	ppendix I	t known pr	Aug	(33) + (38)m Sep	(36) = = 0.33 × (7MP in 7. 25)m x (5.	Dec		(3
Thermal mass for design assess an be used instead fabric hermal bridg details of thermal fotal fabric hermal fabri	es : S (L al bridging at loss at loss ca Feb	ere the de tailed calculated are not kn Alculated Mar 10.31	tails of the ulation. culated u own (36) =	constructions and constructions are constructed using April 20.05 x (3	ppendix I	t known pr	,	(33) + (38)m Sep 9.22	(36) = = 0.33 × (Oct 9.58	25)m x (5 Nov 9.82)		(3
Thermal mass for design assessan be used instead for thermal bridg details of thermal fotal fabric hermal dentilation hermal salphan 10.55	sments whad of a deces: S (Leal bridging at loss cat loss	ere the de tailed calculare not kn Alculated Mar 10.31	tails of the ulation. culated u own (36) = I monthly Apr 9.7	constructions are constructed using April 19.05 x (3) May 9.58	ppendix I Jun 8.97	Jul	Aug 8.85	(33) + (38)m Sep 9.22 (39)m	(36) = = 0.33 × (Oct = (37) + (3	25)m x (5 Nov 9.82 38)m	Dec 10.06		(3
Thermal mass for design assess an be used inste Thermal bridg details of thermatotal fabric hermatotal	es : S (L al bridging at loss at loss ca Feb	ere the de tailed calculated are not kn Alculated Mar 10.31	tails of the ulation. culated to own (36) = I monthly	constructs using Ap = 0.05 x (3	ppendix I	t known pr	Aug	(33) + (38)m Sep 9.22 (39)m 31.08	(36) = = 0.33 × (Oct 9.58 = (37) + (3	25)m x (5 Nov 9.82 38)m 31.69	Dec 10.06	21.87	(3
Thermal mass for design assess an be used insternal bridge details of thermal fotal fabric hermal dentilation hermal salphan and the design a	es : S (L al bridging at loss cat loss cat loss cat loss coefficier 32.3	x Y) calconnected with the second control of	tails of the ulation. culated to own (36) = I monthly Apr 9.7	constructions are constructed using April 19.05 x (3) May 9.58	ppendix I Jun 8.97	Jul	Aug 8.85	(33) + (38)m Sep 9.22 (39)m 31.08	(36) = = 0.33 × (Oct = (37) + (3	25)m x (5) Nov 9.82 38)m 31.69 Sum(39) ₁	Dec 10.06		(3
Thermal mass for design assessan be used instead for thermal bridg details of thermal fotal fabric hermal dentilation hermal salphan 10.55	es : S (L al bridging at loss cat loss cat loss cat loss coefficier 32.3	x Y) calconnected with the second control of	tails of the ulation. culated to own (36) = I monthly Apr 9.7	constructions are constructed using April 19.05 x (3) May 9.58	ppendix I Jun 8.97	Jul	Aug 8.85	(33) + (38)m Sep 9.22 (39)m 31.08	(36) = = 0.33 × (Oct 9.58 = (37) + (3) 31.45 Average =	25)m x (5) Nov 9.82 38)m 31.69 Sum(39) ₁	Dec 10.06	21.87	(3

Numbe	er of day	s in moi	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
						•				•				
4. Wa	ater heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assum	ned occu	nancy I	N									.71		(42)
if TF	A > 13.9	0, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		.7 1		(42)
	A £ 13.9	•	otor upoc	ao io litro	o por de	w Vd ov	orogo –	(25 v NI)	. 26					(40)
	I averag the annua									se target o		3.65		(43)
not more	e that 125	litres per p	person per	day (all w	ater use, i	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(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		
Energy (content of	hot water	used - cal	culated mo	onthly = 4	190 x Vd r	тхптхГ)Tm / 3600			m(44) ₁₁₂ =		943.85	(44)
	128.31	112.22	115.8	100.96	96.87	83.59	77.46	88.89	89.95	104.82	114.42	124.26		
(45)m=	120.31	112.22	115.6	100.96	90.07	65.59	17.40	00.09			m(45) ₁₁₂ =	l	1237.53	(45)
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		rotal – ou	III(4 0) 112		1207.00	(```
(46)m=	19.25	16.83	17.37	15.14	14.53	12.54	11.62	13.33	13.49	15.72	17.16	18.64		(46)
	storage										!	!		
_	je volum	` ,					_		ame ves	sel		0		(47)
	munity h vise if no	_			_				are) ante	ar '∩' in <i>(</i>	47)			
	storage		not wate	i (uno n	iciuues i	nstantai	ieous cc	ATTIOL DOIL	ers) erik	51 0 111 (71)			
	nanufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
Energy	y lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
,	nanufact			•										(-1)
	ater stora munity h	-			e z (KVV	n/iitre/da	ay)				0.	.02		(51)
	e factor	•		011 1.0							1.	.03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
Energy	y lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter	(50) or (54) in (5	55)								1.	.03		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
	y circuit				,	•	` '	, ,						
•	dified by											00.5		(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)
	loss cal	culated	for each	month ((61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for w	ater he	ating ca	alculated	l foi	r each month	(62)	m =	0.85 × (4	45)m +	- (46)m +	(57)m +	(59)m + (61)m	
(62)m= 183.58 162.14	171.07	154.45	152.15	13	37.08 132.74	144	.16	143.44	160.1	167.92	179.53		(62)
Solar DHW input calculated us	ing Appe	endix G or	Appendix	H (negative quantity	/) (ent	er '0'	if no solar	contribu	ition to wate	er heating)	•	
(add additional lines if Fo	GHRS a	and/or V	VWHRS	ар	plies, see Ap	pend	dix G	5)		_			
(63)m= 0 0	0	0	0		0 0	C)	0	0	0	0		(63)
Output from water heate	r												
(64)m= 183.58 162.14	171.07	154.45	152.15	13	37.08 132.74	144	.16	143.44	160.1	167.92	179.53		
	-				-		Outp	ut from wa	ter heat	er (annual)₁	12	1888.37	(64)
Heat gains from water he	eating,	kWh/mo	onth 0.2	5 ′	[0.85 × (45)m	+ (6	1)m] + 0.8 x	[(46)n	n + (57)m	+ (59)m]	
(65)m= 86.88 77.25	82.72	76.36	76.43	70	0.59 69.98	73.	78	72.7	79.08	80.84	85.54		(65)
include (57)m in calcul	lation o	of (65)m	only if c	ylin	der is in the	dwell	ing (or hot wa	ater is	from com	munity h	eating	
5. Internal gains (see T	able 5	and 5a):	-							•		
Metabolic gains (Table 5		·	,										
Jan Feb	Mar	Apr	May	Γ.	Jun Jul	Α	ug	Sep	Oct	Nov	Dec		
 	102.37	102.37	102.37	_	2.37 102.37	102	-	102.37	102.37	+	102.37		(66)
Lighting gains (calculate													
	24.65	18.66	13.95	_	1.78 12.73	16.	_	22.2	28.19	32.9	35.08		(67)
Appliances gains (calcul										1			, ,
	218.37	206.01	190.42	_	75.77 165.98	163		169.48	181.83	197.42	212.08	1	(68)
` '				!					137.42	212.00		(00)	
Cooking gains (calculate	46.94	46.94	L, equal	_	6.94 46.94	, ais		46.94	5 46.94	46.94	46.04	Ī	(69)
` '			46.94	40	0.94 40.94	46.	94	40.94	46.94	46.94	46.94		(09)
Pumps and fans gains (7				_	<u> </u>		. 1			1 0		I	(70)
(70)m= 0 0	0	0	0		0 0	C)	0	0	0	0		(70)
Losses e.g. evaporation	` 			_						_		1	(74)
()	-68.25	-68.25	-68.25	-6	8.25 -68.25	-68	.25	-68.25	-68.25	-68.25	-68.25		(71)
Water heating gains (Tal				_	Т	ı					ı	•	
(72)m= 116.78 114.96 7	111.19	106.06	102.73	98	8.04 94.05	99.	16	100.98	106.28	112.28	114.97		(72)
Total internal gains =					(66)m + (67)m	+ (68	3)m +	(69)m + (7	70)m + (71)m + (72)	m	•	
` '	435.27	411.8	388.17	36	66.65 353.83	360	.45	373.72	397.37	423.67	443.19		(73)
6. Solar gains:													
Solar gains are calculated us	•			and	•	tions	to co	nvert to the	e applica		ion.		
Orientation: Access Fac Table 6d	ctor	Area m²			Flux Table 6a		т.	g_ able 6b	-	FF Table 6c		Gains (W)	
				,	Table 0a					able oc		((V)	_
Northeast _{0.9x} 0.77	X	8.6	5	X	11.28	X		0.63	X	0.7	=	29.83	(75)
Northeast 0.9x 0.77	lortheast 0.9x 0.77 x			x	22.97	х		0.63	X	0.7	=	60.72	(75)
Northeast _{0.9x} 0.77	ortheast 0.9x 0.77 x			x	41.38	X		0.63	X	0.7	=	109.4	(75)
Northeast 0.9x 0.77	X	8.6	55	x [67.96	X		0.63	X	0.7	=	179.67	(75)
Northeast 0.9x 0.77	x	8.6	55	x [91.35	X		0.63	x [0.7	=	241.51	(75)
Northeast _{0.9x} 0.77			55	x	97.38	x		0.63	x [0.7	=	257.47	(75)
Northeast _{0.9x} 0.77	х	8.6	5	x [91.1	x		0.63	x [0.7	=	240.86	(75)
Northeast 0.9x 0.77	x	8.6	55	x [72.63	x		0.63	×	0.7	=	192.02	(75)

Northeast 0	.9x 0.77	X	8.6	55	x	50.42	X	0.63	×	0.7		133.31	(75)
Northeast 0	.9x 0.77	х	8.6	65	x	28.07	X	0.63	х	0.7	=	74.21	(75)
Northeast 0	.9x 0.77	x	8.6	65	x	14.2	X	0.63	х	0.7	=	37.53	(75)
Northeast 0	.9x 0.77	x	8.6	65	x	9.21	X	0.63	х	0.7	=	24.36	(75)
													_
Solar gains	s in watts, c	alculated	for eacl	h month			(83)m = 8	Sum(74)m .	(82)m				
(83)m= 29	.83 60.72	109.4	179.67	241.51	257.47	7 240.86	192.02	133.31	74.21	37.53	24.36		(83)
Total gains	s – internal a	and solar	(84)m =	= (73)m -	+ (83)n	n , watts	•			•	•		
(84)m= 483	3.67 511.23	544.67	591.47	629.68	624.12	594.69	552.46	507.03	471.58	461.21	467.55		(84)
7. Mean i	nternal tem	perature ((heating	season)								
	ure during h		`			a from Tal	ole 9, Th	ո1 (°C)				21	(85)
•	factor for g	•			•			` ,					_
	an Feb	Mar	Apr	May	Jun		Aug	Sep	Oct	Nov	Dec		
	84 0.8	0.73	0.6	0.45	0.31	0.23	0.26	0.42	0.63	0.78	0.85		(86)
Mana inte				T4 //-			7 : T	I- O-\	<u> </u>	<u> </u>	<u> </u>	ı	
	ernal temper	20.7		20.97		-i		T	20.88	20.65	20.4	1	(87)
(87)m= 20	.42 20.53	20.7	20.88	20.97	20.99	21	21	20.98	20.88	20.65	20.4	j	(07)
Temperat	ure during h	neating p	eriods ir	rest of	dwellir	ng from Ta	able 9, T	h2 (°C)				1	
(88)m= 20	.39 20.4	20.4	20.41	20.41	20.42	20.42	20.42	20.42	20.41	20.41	20.4		(88)
Utilisation	factor for g	ains for r	est of d	welling,	h2,m (see Table	9a)						
(89)m= 0.8	82 0.79	0.71	0.58	0.43	0.29	0.2	0.22	0.38	0.61	0.76	0.84		(89)
Mean inte	ernal tempe	ature in t	he rest	of dwelli	na T2	(follow ste	ens 3 to	7 in Tabl	le 9c)	•	•	ı	
	.62 19.78	20.02	20.27	20.37	20.42	`	20.42	20.4	20.27	19.96	19.6		(90)
` /		!					<u> </u>	<u> </u>	L fLA = Livir	l g area ÷ (4	4) =	0.43	(91)
						() A = T4	/4 6	. A.) TO					」 ` '
	ernal temper	-				_		_	20.52	00.00	10.05	1	(92)
` ′	.96 20.1	20.32	20.53	20.63	20.67		20.67	20.65	20.53	20.26	19.95		(92)
· · · · · ·	ustment to t	ne mean 20.32	20.53	20.63	20.67		20.67	ere appro	20.53	20.26	19.95	l	(93)
			20.53	20.03	20.67	20.67	20.67	20.65	20.53	20.26	19.95		(90)
	heating req the mean in		oporotiu	ro obtoin	od ot d	stop 11 of	Toble C	lb oo tha	ot Ti m_/	76)m on	d ro colo	nulata	
	tion factor f				eu ai s	мер птог	Table 8	D, 50 IIIa	ıt 11,111=(10)III ali	u re-carc	,uiale	
	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	factor for g	ains, hm	•					· · ·				ı	
(94)m= 0.8	81 0.78	0.71	0.58	0.44	0.3	0.21	0.24	0.4	0.61	0.76	0.83		(94)
Useful ga	ins, hmGm	, W = (94	l)m x (84	4)m		!		!	!	!	!	I	
(95)m= 393	3.83 398.48	386.02	344.03	274.44	186.05	125.34	130.9	200.47	288.82	348.68	385.77		(95)
Monthly a	verage exte	ernal tem	perature	from Ta	able 8	•	•	•	•	•	•		
(96)m= 4	3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss	rate for me	an intern	al tempe	erature,	Lm , W	/ =[(39)m	x [(93)m	n— (96)m]			' -	
(97)m= 507	7.77 490.99	444.55	367.25	280.83	187.07	7 125.53	131.2	203.64	312.34	416.95	502.78		(97)
Space he	ating requir	ement fo	r each n	nonth, k\	Vh/mo	nth = 0.02	24 x [(97	')m – (95)m] x (4	1)m			
(98)m= 84	.77 62.16	43.55	16.72	4.75	0	0	0	0	17.5	49.16	87.06		
							Tot	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	365.66	(98)
Space he	ating requir	ement in	kWh/m²	² /year								7.23	(99)
•	• '			-									

Oh Enorgy requirements Community heating	shomo —			
9b. Energy requirements – Community heating so This part is used for space heating, space cooling		rovided by a community scheme		
Fraction of space heat from secondary/supplement			0	(301)
Fraction of space heat from community system 1	- (301) =		1	(302)
The community scheme may obtain heat from several sources			he latter	
includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community boilers	r power stations. See Ap	репаіх С.	1	(303a)
Fraction of total space heat from Community boile	ers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c)	(3)) for community h	neating system	1	(305)
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)
Space heating			kWh/yea	<u>-</u>
Annual space heating requirement			365.66	╛
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	383.94	(307a)
Efficiency of secondary/supplementary heating sy	rstem in % (from Ta	ble 4a or Appendix E)	0	(308
Space heating requirement from secondary/suppl	ementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating			1000.07	\neg
Annual water heating requirement If DHW from community scheme:			1888.37	
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)] =	23.67	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, i	f not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Tak mechanical ventilation - balanced, extract or posit		de	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) (negat	ive quantity)		-510.48	(333)
Electricity generated by wind turbine (Appendix M	l) (negative quantity	·)	0	(334)
10b. Fuel costs – Community heating scheme				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0.01 =	16.28	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	84.07	(342a)
	(22.1)	Fuel Price		_
Pumps and fans	(331)	13.19 x 0.01 =	23.13	(349)

(332)

Energy for lighting

(350)

31.8

x 0.01 =

13.19

Total energy cost (340)(342e) + (345)(354) = (275.28 (355) (356) (35	Additional standing charges (Table 12)				120	(351)
SAP rating - Community heating scheme SAP rating - Community heating scheme SAP rating - Community heating scheme SAP rating (section12) (355) x (356)] + ((4) + 45.0)] =	Energy saving/generation technologies					_
Energy cost deflator (Table 12) Energy cost factor (ECF) [(355) x (356)] + [(4) + 45.0] =	•,	= (340a)(342e) + (345)(3	354) =		275.28	(355)
SAP rating (section12) 121 (357) (358) (4) + 45.0]	11b. SAP rating - Community heating so	cheme				
SAP rating (section12) 33,12 358 12b. CO2 Emissions – Community heating scheme Energy kWh/year Emission factor kg CO2/kWh	Energy cost deflator (Table 12)				0.42	(356)
Energy Emissions Emission	Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =	=		1.21	(357)
Energy Rimission factor Ri	SAP rating (section12)				83.12	(358)
CO2 from other sources of space and water heating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the second fuel 94 (367a) (367	12b. CO2 Emissions - Community heating	ng scheme				
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)						
Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel (367a) (367a) (367a) (367b) (CO2 from other courses of anges and was	stor booting (not CHD)	KWII/yeai	kg CO2/kWii	kg CO2/year	
Electrical energy for heat distribution	•		g two fuels repeat (363) to	(366) for the second fue	94	(367a)
Total CO2 associated with community systems	CO2 associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b) x	0.22	543.84	(367)
CO2 associated with space heating (secondary) CO2 associated with water from immersion heater or instantaneous heater (312) x CO2 associated with water from immersion heater or instantaneous heater (312) x CO2 associated with space and water heating CO2 associated with electricity for pumps and fans within dwelling (331)) x CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO2 associated with electricity for lighting CO32 associated with electricity for lighting CO32 associated with electricity for lighting CO333) to (334) as applicable ltem 1 CO352	Electrical energy for heat distribution	1	[(313) x	0.52	12.28	(372)
CO2 associated with water from immersion heater or instantaneous heater (312) x	Total CO2 associated with community sy	stems	(363)(366) + (368)(372	 ') =	556.13	(373)
Total CO2 associated with space and water heating (373) + (374) + (375) = 556.13 (376) CO2 associated with electricity for pumps and fans within dwelling (331)) x	CO2 associated with space heating (second	ondary)	(309) x	0	0	(374)
CO2 associated with electricity for pumps and fans within dwelling (331)) x	CO2 associated with water from immersion	on heater or instantane	eous heater (312) x	0.22	0	(375)
Energy saving/generation technologies (333) to (334) as applicable Item 1	Total CO2 associated with space and wa	ter heating	(373) + (374) + (375) =		556.13	(376)
Energy saving/generation technologies (333) to (334) as applicable litem 1 Total CO2, kg/year sum of (376)(382) = 507.33 (383) Dwelling CO2 Emission Rate (383) ÷ (4) = 10.04 (384) El rating (section 14) 92.88 (385) 13b. Primary Energy – Community heating scheme Energy kWh/year Primary factor P.Energy kWh/year factor P.Energy kWh/year primary factor primary primary factor primary primary factor primary primary factor primary primary factor primary factor primary primary primary factor primary primary primary factor p	CO2 associated with electricity for pumps	s and fans within dwelli	ng (331)) x	0.52	91.01	(378)
Total CO2, kg/year sum of (376)(382) = (383) (382) = (383) (384) (3	CO2 associated with electricity for lighting	g	(332))) x	0.52	125.12	(379)
Total CO2, kg/year sum of $(376)(382) =$ 507.33 (383) Dwelling CO2 Emission Rate (383) ÷ (4) = 10.04 (384) El rating (section 14) 92.88 (385) 13b. Primary Energy – Community heating scheme Energy kWh/year Primary F.Energy kWh/year Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 94 (367a) Energy associated with heat source 1 [(307b)+(310b)] × 100 ÷ (367b) × 1.22 = 3071.71 (367) Electrical energy for heat distribution [(313) × = 72.66 (372) Total Energy associated with community systems (363)(366) + (368)(372) = 3144.37 (373) if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) Energy associated with space heating (secondary) (309) × 0 = 0 (374) Energy associated with water from immersion heater or instantaneous heater(312) × 1.22 = 0 (375) Total Energy associated with space and water heating (373) + (374) + (375) = 3144.37 (376)		333) to (334) as applica	able	0.52 x 0.01 =	-264.94	(380)
El rating (section 14) 10.04 (384)	Total CO2. kg/year	sum of (376)(382) =				
El rating (section 14) 13b. Primary Energy – Community heating scheme Energy kWh/year Primary factor P.Energy kWh/year Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel 94 (367a) Energy associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 1.22 = 3071.71 (367) Electrical energy for heat distribution [(313) x = 72.66 (372) Total Energy associated with community systems (363)(366) + (368)(372) = 3144.37 (373) if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) = 0 (374) Energy associated with space heating (secondary) (309) x 0 = 0 (374) Energy associated with water from immersion heater or instantaneous heater(312) x 1.22 = 0 (375) Total Energy associated with space and water heating (373) + (374) + (375) = 3144.37 (376)		(383) ÷ (4) =				
Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) Energy associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x [(313)	•				92.88	(385)
Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) Energy associated with heat source 1 [(307b)+(310b)] × 100 ÷ (367b) × Electrical energy for heat distribution [(313) × [(313) × [(313) × [(372) + (368)(372)] Total Energy associated with community systems (363)(366) + (368)(372) Energy associated with space heating (secondary) Energy associated with water from immersion heater or instantaneous heater(312) × Total Energy associated with space and water heating (373) + (374) + (375) = Energy associated with space and water heating (373) + (374) + (375) = Energy associated with space and water heating	13b. Primary Energy – Community heating	ng scheme				
Energy from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) Energy associated with heat source 1 [(307b)+(310b)] × 100 ÷ (367b) × [(313)				•		
Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the second fuel [(367a)] Energy associated with heat source 1 [(307b)+(310b)] \times 100 ÷ (367b) \times 1.22 [(367)] Electrical energy for heat distribution [(313) \times [(314)	Energy from other courses of appearand	water beating (not CUF	·	lactor	KWII/yeai	
Electrical energy for heat distribution $ [(313) \times] = 72.66 (372) $ Total Energy associated with community systems $ (363)(366) + (368)(372) = 3144.37 (373) $ if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) $ (309) \times $				(366) for the second fue	94	(367a)
Total Energy associated with community systems $(363)(366) + (368)(372)$ = 3144.37 (373) if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) = 3144.37 (373) Energy associated with space heating (secondary) $(309) \times $ 0 = 0 (374) Energy associated with water from immersion heater or instantaneous heater(312) \times 1.22 = 0 (375) Total Energy associated with space and water heating $(373) + (374) + (375) =$ 3144.37 (376)	Energy associated with heat source 1	[(307b)+	(310b)] x 100 ÷ (367b) x	1.22	3071.71	(367)
if it is negative set (373) to zero (unless specified otherwise, see C7 in Appendix C) Energy associated with space heating (secondary) Energy associated with water from immersion heater or instantaneous heater(312) x Total Energy associated with space and water heating (373) + (374) + (375) = (373) (373) (373) (374) (374) (375)	Electrical energy for heat distribution	I	[(313) x	=	72.66	(372)
Energy associated with space heating (secondary) (309) x $0 = 0$ (374) Energy associated with water from immersion heater or instantaneous heater(312) x $1.22 = 0$ (375) Total Energy associated with space and water heating (373) + (374) + (375) = 3144.37 (376)	Total Energy associated with community	systems	(363)(366) + (368)(372	=	3144.37	(373)
Energy associated with water from immersion heater or instantaneous heater(312) x $=$ 0 (375) Total Energy associated with space and water heating $(373) + (374) + (375) =$ $=$ 3144.37 (376)	if it is negative set (373) to zero (unles:	s specified otherwise, s	see C7 in Appendix C)	3144.37	(373)
Total Energy associated with space and water heating $(373) + (374) + (375) =$ $3144.37 (376)$	Energy associated with space heating (se	econdary)	(309) x	0 =	= 0	(374)
Energy associated with space cooling $(315) \times 3.07 = 0$ (377)	Energy associated with water from imme	rsion heater or instanta	neous heater(312) x	1.22	= 0	(375)
				1.22		

Energy associated with electricity for pumps and fans within dwelling (331)) x 538.35 (378) 3.07 Energy associated with electricity for lighting (379) (332))) x 740.13 3.07 Energy saving/generation technologies Item 1 x 0.01 = -1567.16 (380) 3.07 Total Primary Energy, kWh/year sum of (376)...(382) = (383) 2855.7

		l lser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			0001082 on: 1.0.5.9	
Address :	F	roperty	Address	: Plot 24					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
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	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+ [0	_ = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			Ī	2	x ′	10 =	20	(7a)
Number of passive vents	;			Ī	0	x ²	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x	40 =	0	(7c)
				<u>L</u>				_	
				_			Air ch	nanges per ho	our —
	ys, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a			oontinuo fi	20		÷ (5) =	0.16	(8)
Number of storeys in the		iu io (17),	ourer wise t	conunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 ([(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are padeducting areas of openia	resent, use the value corresponding t ngs): if equal user 0.35	o the grea	ter wall are	ea (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	250 averaged in a his mate		(8) + (10)					0	(16)
•	q50, expressed in cubic metre (ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	ietre oi e	envelope	area	5	(17)
•	es if a pressurisation test has been do				is being u	sed		0.41	(10)
Number of sides sheltered	ed							3	(19)
Shelter factor			(20) = 1 -		19)] =			0.78	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.32	(21)
Infiltration rate modified f	- 1 	11	Δ	0	0-4	Nan	Data	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
(-2)::-	1.0 7.7 7.0 0.0	L 5.6	1 3.7	<u> </u>	L 7.0	I 7.5	I 7./	I	
Wind Factor $(22a)m = (2a)m =$	2)m ÷ 4						1	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltration rate (allowing for shelter and w	rind speed) = (21a) x	(22a)m				
	0.3 0.3 0.29	0.32 0.34	0.36	0.37		
Calculate effective air change rate for the applicab	le case					
If mechanical ventilation:					0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x	, , , , , ,	, , , ,			0	(23b)
If balanced with heat recovery: efficiency in % allowing for in	-use factor (from Table 4h	n) =			0	(23c)
a) If balanced mechanical ventilation with heat re	ecovery (MVHR) (24	a)m = (22b)m + (2b)m	23b) × [1	- (23c)	÷ 100]	
(24a)m= 0 0 0 0 0	0 0 0	0 0	0	0		(24a)
b) If balanced mechanical ventilation without hea	at recovery (MV) (24	b)m = (22b)m + (2)	23b)		•	
(24b)m= 0 0 0 0 0	0 0 0	0 0	0	0		(24b)
c) If whole house extract ventilation or positive in if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$; or	•)			
(24c)m= 0 0 0 0 0	0 0 0	0 0	0	0		(24c)
d) If natural ventilation or whole house positive if (22b)m = 1, then (24d)m = (22b)m otherwi	•		,		•	
(24d)m= 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 - enter (24a) or (24b) o	r (24c) or (24d) in bo	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)
2 Hartlands and hartland named and	1 1					
3. Heat losses and heat loss parameter:	ot Area III.vol	A V I I		مريامير ما	Λ.	/ l.
ELEMENT Gross Openings N area (m²) m²	et Area U-val A ,m² W/m²		()	k-value kJ/m²-l		
Doors	2 x 1	= 2				(26)
Windows	8.651 x1/[1/(1.4)+	+ 0.04] = 11.47	=			(27)
Walls Type1 19.7 8.65	11.05 × 0.18	= 1.99				(29)
Walls Type2 13.04 2	11.04 × 0.18	= 1.99	- -			(29)
Total area of elements, m ²	32.74					(31)
* for windows and roof windows, use effective window U-value		1/[(1/U-value)+0.04] as	s aiven in r	paragraph	3.2	(01)
** include the areas on both sides of internal walls and partition	=		- g ,-			
Fabric heat loss, $W/K = S (A \times U)$	(26)(30	0) + (32) =			17.44	(33)
Heat capacity Cm = S(A x k)		((28)(30) + (32) + (32a)	.(32e) =	309.2	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ	/m²K	Indicative Value:	Medium		250	(35)
For design assessments where the details of the construction a	are not known precisely the	e indicative values of	TMP in Tal	ble 1f		
can be used instead of a detailed calculation.	adia IZ			1		7,
Thermal bridges: $S(L \times Y)$ calculated using Appen if details of thermal bridging are not known (36) = 0.05 x (31)	idix K				4.02	(36)
Total fabric heat loss		(33) + (36) =			21.46	(37)
Ventilation heat loss calculated monthly		(38) m = $0.33 \times (2)$	25)m x (5)		21.40	(0.7
	Jun Jul Aug	Sep Oct	Nov	Dec		
	2.73 22.73 22.64	22.94 23.26	23.49	23.73		(38)
Heat transfer coefficient, W/K	- 1	 				
	4.2 44.2 44.1	(39)m = (37) + (34.4 44.72	44.95	45.19		
(00)111	7.2 77.2 44.1	Average = 5			44.84	(39)
Heat loss parameter (HLP), W/m²K		(40)m = (39) m ÷			1 77.07	
(40)m= 0.9 0.9 0.89 0.88 0	.87 0.87 0.87	0.88 0.88	0.89	0.89		
		Average =	Sum(40) ₁₁	12 /12=	0.89	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		71		(42)
Reduce	the annua	ıl average	ater usag hot water person per	usage by	5% if the a	lwelling is	designed t		+ 36 a water us	se target o		.72		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
г			day for ea	ach month									l	
(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 c	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C)Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		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		_
If instant	aneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1175.66	(45)
(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)
	storage		الماريطانم		olor or M	WALLDO	otoro ao	within o	.m.o. 1/00/	- o l			1	(47)
•		,					_		ame ves	sei		150		(47)
Otherw	ise if no	stored	nd no ta hot wate		-			' '	ers) ente	er '0' in (47)			
	storage anufact		eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Tempe	rature fa	actor fro	m Table	2b							0.	54		(49)
• • • • • • • • • • • • • • • • • • • •			storage	-				(48) x (49)) =		0.	75		(50)
			eclared of factor fr	-								_		(54)
		•	ee secti		e z (KVV	ii/iitie/ua	iy)					0		(51)
	-	from Tal										0		(52)
Tempe	rature fa	actor fro	m Table	2b								0		(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter ((50) or (54) in (5	55)								0.	75		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)r	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 cylinde	er contains	dedicated	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	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)
•		`	nual) fro									0		(58)
-			culated t		,		,	, ,		. 41	-4-4\			
(mod (59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	cylinde 22.51	23.26	22.51	23.26		(59)
Comhi	loss cal	culated	for each	month ((61)m =	(60) ± 36	65 × (41))m			•		•	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for wate	r heat	ting cal	lculated	l foi	each month	(62)	m =	0.85 × (4	45)m +	· (46)m +	(57)m +	(59)m + (61)m	
(62)m= 168.49 148.69 156		141	138.62		24.5 120.18	131		130.54	146.18	ì	164.64		(62)
Solar DHW input calculated using	Append	dix G or	Appendix	H (ı	negative quantity	/) (ent	ter '0'	if no solar	contribu	ition to wate	er heating)		
(add additional lines if FGH	RS an	nd/or W	/WHRS	ар	plies, see Ap	pend	dix G	i)					
(63)m= 0 0 0		0	0		0 0	0)	0	0	0	0		(63)
Output from water heater	•	•					•			•			
(64)m= 168.49 148.69 156	.6	141	138.62	12	24.5 120.18	131	.04	130.54	146.18	153.79	164.64		
		<u> </u>					Outp	ut from wa	ter heat	er (annual)₁	12	1724.27	(64)
Heat gains from water heati	ng, kV	Nh/mo	nth 0.2	5 ′	0.85 × (45)m	+ (6	31)m] + 0.8 x	[(46)m	n + (57)m	+ (59)m]	
(65)m= 77.8 69.12 73.8	35 6	67.96	67.87	62	2.48 61.74	65.	35	64.49	70.39	72.22	76.53		(65)
include (57)m in calculation	on of ((65)m (only if c	ylin	der is in the	dwell	ling o	or hot wa	ater is	from com	munity h	eating	
5. Internal gains (see Tab	le 5 ar	nd 5a):										-	
Metabolic gains (Table 5), V		<i>'</i>											
Jan Feb Ma		Apr	May	Τ,	Jun Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m= 85.31 85.31 85.3	31 8	35.31	85.31	8	5.31 85.31	85.	31	85.31	85.31	85.31	85.31		(66)
Lighting gains (calculated in	Appe	endix L	eguati	ion	L9 or L9a). a	lso s	ee T	able 5				l	
(67)m= 13.65 12.12 9.8		7.47	5.58		.71 5.09	6.6	_	8.88	11.28	13.16	14.03		(67)
Appliances gains (calculate	d in Aı	ppend	ix L. ea	uati	on L13 or L1	3a). :	also	see Tab	le 5	1		l	
(68)m= 148.65 150.19 146		38.03	127.58		7.77 111.21	109		113.55	121.83	132.27	142.09		(68)
Cooking gains (calculated in	L n Anne	endix I	equat	ion	I I 15 or I 15a`	L \ als	L	e Table	5				
(69)m= 31.53 31.53 31.5	- i -	31.53	31.53		1.53 31.53	31.		31.53	31.53	31.53	31.53		(69)
Pumps and fans gains (Tab			000		100			000		000	000		,
(70)m= 3 3 3		3	3		3 3	3	<u>. T</u>	3	3	3	3		(70)
Losses e.g. evaporation (ne	antivo			<u>ا</u> م						1 -			(- /
(71)m= -68.25 -68.25 -68.35		68.25	-68.25		8.25 -68.25	-68	25	-68.25	-68.25	-68.25	-68.25		(71)
Water heating gains (Table	!		00.20		0.20 00.20		0	00.20	00.20	00.20	00.20		()
(72)m= 104.58 102.85 99.2		04 30 T	91.23	80	6.77 82.99	87.	g/ T	89.56	94.61	100.3	102.86		(72)
	., 3	94.59	91.25		(66)m + (67)m								(12)
Total internal gains = (73)m= 318.47 316.76 307.	02 20	91.48	275.99	26	0.84 250.88	255		263.59	279.3	297.33	310.57		(73)
6. Solar gains:	02 23	91.40	213.99	20	0.04 230.00	233	., ,	203.39	219.5	297.33	310.37		(10)
Solar gains are calculated using	solar flu	ux from T	Γable 6a a	and	associated equa	itions	to cor	nvert to the	applica	able orientat	ion.		
Orientation: Access Factor		Area			Flux			g_		FF		Gains	
Table 6d		m²			Table 6a		Ta	able 6b	-	Γable 6c		(W)	
Northeast 0.9x 0.77	х	8.65	5	x	11.28	x		0.63	7 x [0.7	=	29.83	(75)
Northeast _{0.9x} 0.77	x –	8.65	5	x	22.97	X		0.63] x [0.7	=	60.72	(75)
Northeast 0.9x 0.77	x –	8.65	5	x [41.38	X		0.63	i x [0.7		109.4	(75)
Northeast 0.9x 0.77	x	8.65		×	67.96	X		0.63	_ x [0.7	=	179.67	(75)
Northeast 0.9x 0.77	x	8.65		x [91.35	X		0.63] x [0.7	=	241.51	(75)
Northeast 0.9x 0.77	×	8.65	_	x [97.38) x		0.63] _x [0.7	=	257.47] (75)
Northeast 0.9x 0.77	×	8.65		x [91.1]]		0.63		0.7	= -	240.86](75)
****												270.00	

Northeast 0.9s														
Northeast 0.5%	Northeast 0.9x	0.77	X	8.6	55	x	50.42	X	0.63	×	0.7		133.31	(75)
Northeast 0.9x	Northeast 0.9x	0.77	х	8.6	65	х	28.07	X	0.63	х	0.7	=	74.21	(75)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	Northeast 0.9x	0.77	х	8.6	65	x	14.2	X	0.63	х	0.7	=	37.53	(75)
(63)me 29.83 60.72 109.4 179.67 241.51 267.4 240.86 192.02 133.31 74.21 37.53 24.36 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)me 348.3 377.48 416.42 471.15 6167.49 518.31 491.74 47.73 398.89 353.51 334.88 334.93 (84) 7. Mean internal temperature (treating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)	Northeast 0.9x	0.77	х	8.6	65	x	9.21	X	0.63	х	0.7	=	24.36	(75)
(63)me 29.83 60.72 109.4 179.67 241.51 267.4 240.86 192.02 133.31 74.21 37.53 24.36 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)me 348.3 377.48 416.42 471.15 6167.49 518.31 491.74 47.73 398.89 353.51 334.88 334.93 (84) 7. Mean internal temperature (treating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)														_
Total gains – Internal and solar (84)m = (73)m + (83)m, watts (84)m	Solar gains in	n watts, ca	alculated	for eacl	h month			(83)m = 8	Sum(74)m .	(82)m				
(84) (84)	(83)m= 29.83	60.72	109.4	179.67	241.51	257.4	7 240.86	192.02	133.31	74.21	37.53	24.36		(83)
Temperature during heating periods in the living area from Table 9, Th1 (°C)	Total gains -	internal a	and solar	(84)m =	= (73)m -	+ (83)r	n , watts	•		•	•	•		
Temperature during heating periods in the living area from Table 9, Th1 (°C)	(84)m= 348.3	377.48	416.42	471.15	517.49	518.3	1 491.74	447.73	396.89	353.51	334.86	334.93		(84)
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb	7. Mean inte	ernal temp	perature ((heating	season)								
Separation Sep	Temperatur	e during h	neating p	eriods ir	the livii	ng are	a from Tal	ole 9, Th	1 (°C)				21	(85)
(86)me 1 0.99 0.98 0.91 0.75 0.54 0.39 0.45 0.73 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)me 20.19 20.3 20.51 20.78 20.95 20.99 21 21 20 20.97 20.75 20.43 20.17 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)me 20.16 20.17 20.17 20.17 20.18 20.18 20.19 20.19 20.19 20.19 20.18 20.18 20.18 20.17 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (88)me 0.99 0.99 0.97 0.89 0.7 0.47 0.32 0.37 0.66 0.93 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)me 19.08 19.25 19.55 19.93 20.13 20.19 20.19 20.19 20.19 20.16 19.89 19.44 19.06 (90) ILA = Living area + (4) = 0.43 (91) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)me 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.54 20.51 20.26 19.87 19.54 (93) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.54 20.51 20.26 19.87 19.54 (93) 3. Space heating requirement Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)me 0.99 0.99 0.97 0.89 0.72 0.5 0.35 0.41 0.69 0.93 0.99 0.99 0.99 Useful gains, hmGm , W = (94)m x (84)m Set T1 of the mean internal temperature from Table 8 (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (86) Heat loss rate for mean internal temperature, Irm, W = ((39)m x ((93)m-(96)m) (97)m= (897.56 674.6 611.86 511.1 392.94 282.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 261.71 202.88 155.32 64.74 14.65 0 0 0 0 0 7 76.4 175.76 288.12	Utilisation fa	actor for g	ains for li	ving are	ea, h1,m	(see	Table 9a)							
(86)me 1 0.99 0.98 0.91 0.75 0.54 0.39 0.45 0.73 0.95 0.99 1 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)me 20.19 20.3 20.51 20.78 20.95 20.99 21 21 20 20.97 20.75 20.43 20.17 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)me 20.16 20.17 20.17 20.17 20.18 20.18 20.19 20.19 20.19 20.19 20.18 20.18 20.18 20.17 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (88)me 0.99 0.99 0.97 0.89 0.7 0.47 0.32 0.37 0.66 0.93 0.99 1 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)me 19.08 19.25 19.55 19.93 20.13 20.19 20.19 20.19 20.19 20.16 19.89 19.44 19.06 (90) ILA = Living area + (4) = 0.43 (91) Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92)me 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.54 20.51 20.26 19.87 19.54 (93) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)me 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.54 20.51 20.26 19.87 19.54 (93) 3. Space heating requirement Set T1 to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)me 0.99 0.99 0.97 0.89 0.72 0.5 0.35 0.41 0.69 0.93 0.99 0.99 0.99 Useful gains, hmGm , W = (94)m x (84)m Set T1 of the mean internal temperature from Table 8 (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (86) Heat loss rate for mean internal temperature, Irm, W = ((39)m x ((93)m-(96)m) (97)m= (897.56 674.6 611.86 511.1 392.94 282.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)me 261.71 202.88 155.32 64.74 14.65 0 0 0 0 0 7 76.4 175.76 288.12	Jan	Feb	Mar	Apr	May	Jur	Jul	Aug	Sep	Oct	Nov	Dec		
(87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (88) (88) (88) (88) (88) (89) (20.16 20.17 20.17 20.18 20.18 20.18 20.19 20.19 20.19 20.19 20.18 20.18 20.18 20.17 (88) (88) (89) ((86)m= 1	0.99	0.98	0.91	0.75	0.54	0.39	0.45		0.95	0.99	1		(86)
(87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (87) (88) (88) (88) (88) (88) (89) (20.16 20.17 20.17 20.18 20.18 20.18 20.19 20.19 20.19 20.19 20.18 20.18 20.18 20.17 (88) (88) (89) (Mean intern	al temper	atura in l	ivina ar	22 T1 (fc	llow s	tens 3 to 3	7 in Tah	e 9c)					
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)me							_i			20.75	20.43	20.17		(87)
(88)me	, ,							<u> </u>		20.70	20.40	20.17		(01)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)me	· -		 				-	1	T `	1		T	Ī	(00)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) Geome	(88)m= 20.16	20.17	20.17	20.18	20.18	20.19	20.19	20.19	20.19	20.18	20.18	20.17		(88)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (90)m= 19.08 19.25 19.55 19.93 20.19 20.19 20.16 19.89 19.44 19.06 (90) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 − fLA) x T2 (92)m= 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.51 20.26 19.87 19.54 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.51 20.26 19.87 19.54 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, sim: Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: 90.99 0.99	Utilisation fa	actor for g	ains for r	est of d	welling,	ո2,m (see Table	9a)						
(90)me	(89)m= 0.99	0.99	0.97	0.89	0.7	0.47	0.32	0.37	0.66	0.93	0.99	1		(89)
(90)me	Mean intern	al temper	ature in t	he rest	of dwelli	ng T2	(follow ste	eps 3 to	7 in Tab	le 9c)				
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m= 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.54 20.51 20.26 19.87 19.54 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.54 20.51 20.26 19.87 19.54 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.99 0.99 0.97 0.89 0.72 0.5 0.35 0.41 0.69 0.93 0.98 0.99 0.99 Useful gains, hmGm , W = (94)m x (84)m (95)m= 345.79 372.68 403.09 421.18 373.24 260.51 173.93 182.16 273.63 329.5 329.83 332.99 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m)] (97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 0 76.4 175.76 268.12			r r				<u>` </u>	i	ı	- 	19.44	19.06		(90)
(92)m=			!!				_ !		1	fLA = Livir	ng area ÷ (4	4) =	0.43	(91)
(92)m=	Moon intorn	al tampar	aturo (foi	r tha wh	ala dwa	lina) -	. fl ∧ ∨ T1	ı (1 f	۸) ی T2					
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93)m= 19.56 19.7 19.96 20.3 20.49 20.54 20.54 20.54 20.51 20.26 19.87 19.54 (93) 8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.97 0.89 0.72 0.5 0.35 0.41 0.69 0.93 0.98 0.99 0.99 Useful gains, hmGm , W = (94)m x (84)m (95)m= 345.79 372.68 403.09 421.18 373.24 260.51 173.93 182.16 273.63 329.5 329.83 332.99 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m)] (97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 0 76.4 175.76 268.12		_i					\neg		1	20.26	19.87	19 54		(92)
(93)m=	` ′							ļ		ļ	10.07	10.04		(/
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.97 0.89 0.72 0.5 0.35 0.41 0.69 0.93 0.98 0.99 Useful gains, hmGm, W = (94)m x (84)m (95)m= 345.79 372.68 403.09 421.18 373.24 260.51 173.93 182.16 273.63 329.5 329.83 332.99 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) (97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98)		1	r r		· ·			1	T	·	19.87	19.54		(93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.97 0.89 0.72 0.5 0.35 0.41 0.69 0.93 0.98 0.99 Useful gains, hmGm, W = (94)m x (84)m (95)m= 345.79 372.68 403.09 421.18 373.24 260.51 173.93 182.16 273.63 329.5 329.83 332.99 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = ((39)m x ((93)m - (96)m) I (97)m = 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 0 76.4 175.76 268.12											1000			
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 0.99 0.99 0.97 0.89 0.72 0.5 0.35 0.41 0.69 0.93 0.98 0.99 Useful gains, hmGm , W = (94)m x (84)m (95)m= 345.79 372.68 403.09 421.18 373.24 260.51 173.93 182.16 273.63 329.5 329.83 332.99 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W = ((39)m x [(93)m - (96)m] (97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98)se12 1219.59 (98)				nperatui	re obtain	ed at	step 11 of	Table 9	b. so tha	nt Ti.m=(76)m an	d re-calc	culate	
Utilisation factor for gains, hm: (94)m= 0.99														
(94)m= 0.99 0.99 0.97 0.89 0.72 0.5 0.35 0.41 0.69 0.93 0.98 0.99 (94) Useful gains, hmGm , W = (94)m x (84)m (95)m= 345.79 372.68 403.09 421.18 373.24 260.51 173.93 182.16 273.63 329.5 329.83 332.99 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m = 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m = 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 (98)	Jan	Feb	Mar	Apr	May	Jur	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm , W = (94)m x (84)m (95)m= 345.79 372.68 403.09 421.18 373.24 260.51 173.93 182.16 273.63 329.5 329.83 332.99 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = (39) m x (93) m - (96) m (97) m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x (97) m - (95) m] x (41) m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 1219.59 (98)	Utilisation fa	actor for g	ains, hm:							_			•	
(95)m= 345.79 372.68 403.09 421.18 373.24 260.51 173.93 182.16 273.63 329.5 329.83 332.99 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m] (97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98) _{159.12} = 1219.59 (98)	(94)m= 0.99	0.99	0.97	0.89	0.72	0.5	0.35	0.41	0.69	0.93	0.98	0.99		(94)
Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W = [(39)m x [(93)m - (96)m] (97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1219.59 (98)	Useful gains	s, hmGm	, W = (94)m x (8	4)m			,					•	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ 1219.59 (98)	(95)m= 345.79	372.68	403.09	421.18	373.24	260.5	1 173.93	182.16	273.63	329.5	329.83	332.99		(95)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m] (97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1219.59 (98)	Monthly ave	rage exte	rnal tem	perature	from Ta	able 8							•	
(97)m= 697.56 674.6 611.86 511.1 392.94 262.31 174.09 182.54 284.62 432.18 573.94 693.36 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1219.59 (98)	(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1219.59 (98)		te for me	an interna	al tempe	erature,	_m , V		x [(93)m	– (96)m			,	Ī	
(98)m= 261.71 202.88 155.32 64.74 14.65 0 0 0 0 76.4 175.76 268.12 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1219.59 (98)	(97)m= 697.56	6 674.6	611.86	511.1	392.94	262.3	1 174.09	182.54	284.62	432.18	573.94	693.36		(97)
Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ = 1219.59 (98)									i `	í - `			Ī	
	(98)m= 261.7°	202.88	155.32	64.74	14.65	0	0		<u> </u>	<u> </u>	L			¬ .
Space heating requirement in kWh/m²/year 24.13 (99)								Tota	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	1219.59	(98)
	Space heati	ng require	ement in	kWh/m²	?/year								24.13	(99)

9a. Energy requiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	ı micro-C	CHP)					
Space heating:							,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					7,
Fraction of space hea				mentary	•		(204)				0	(201)
Fraction of space hea		-	, ,			(202) = 1 -		(000)1			1	(202)
Fraction of total heating	•	•				(204) = (204)	02) x [1 –	(203)] =			1	(204)
Efficiency of main spa		0 ,									93.5	(206)
Efficiency of seconda					1			Ī	-	-	0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating require 261.71 202.88	155.32	64.74	14.65	0	0	0	0	76.4	175.76	268.12	1	
$(211)m = \{[(98)m \times (20)]\}$							Ů	70.4	170.70	200.12		(211)
$(211)111 = \{[(98)111 \times (2011) + (20$	166.12	69.24	15.67	0	0	0	0	81.71	187.98	286.76		(211)
							l (kWh/yea			<u> </u>	1304.37	(211)
Space heating fuel (s	econdar	y), kWh/	month									
= {[(98)m x (201)] } x 1	00 ÷ (20	8)									<u>.</u>	
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		_
						Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u>_</u>	0	(215
Water heating	tor (oolo	ulotod o	hovo)									
Output from water hea	156.6	141	138.62	124.5	120.18	131.04	130.54	146.18	153.79	164.64		
Efficiency of water hea	ıter				l						79.8	(216
(217)m= 85.98 85.64	84.79	82.88	80.71	79.8	79.8	79.8	79.8	83.18	85.17	86.11		(217
Fuel for water heating,						!			!	!	•	
$(219)m = (64)m \times 100$ (219)m = 195.95 173.62) ÷ (217) 184.69	m 170.12	171.75	156.02	150.6	164.21	163.59	175.75	180.57	191.2]	
210/m= 100.00 170.02	104.03	170.12	171.75	100.02	130.0		I = Sum(2:	<u> </u>	100.57	101.2	2078.05	(219
Annual totals									Wh/year	•	kWh/yea	┛`
Space heating fuel use	ed, main	system	1						•		1304.37	
Water heating fuel use	d										2078.05	Ī
Electricity for pumps, fa	ans and	electric	keep-ho	t								_
central heating pump	•		-							30		(230
boiler with a fan-assis										45]	(230
		11h/100				eum	of (230a).	(230a) -		43	7-	_
Total electricity for the	above, r	kwn/yea	ır			Suili	UI (230a).	(230g) =			75	(231)
Electricity for lighting											241.09	(232)
12a. CO2 emissions -	– Individi	ual heat	ing syste	ems inclu	uding mi	cro-CHP						
					ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main s	ystem 1))		(21	1) x			0.2	16	=	281.74	(261
Space heating (second	dary)			(21	5) x			0.5		=	0	(263)
Water heating	,				9) x			0.2		=		(264)
_	na					+ (263) + (264) -	0.2	10		448.86	_՝ ՝
Space and water heati	ııy			(20	·/ · (∠U∠)	· (200) + (<u> </u>				730.6	(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 (268) Total CO2, kg/year sum of (265)...(271) = 894.65 (272)

 $TER = 17.7 \tag{273}$