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 14:54:31*

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 50.54m²Site Reference:Hermitage LanePlot Reference:Plot 25

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 17.94 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.37 kg/m² **OK**

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 39.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 33.2 kWh/m²

OK

2 Fabric U-values

ElementAverageHighestExternal wall0.14 (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)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	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 lser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
Address :	F	roperty	Address	: Plot 25					
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 10 (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 nas): 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	. ,	-	. (15) -		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 incorpora Infiltration rate modified to	•		(21) = (10) X (20) =				0.12	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	1 -3	1	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 Faster (00s) (2	2)	•	•	•	•	-	-	•	
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	<u> </u>	1.08	1.12	1.18]	
(ΣΣα)ΠΤ 1.21 1.20	1.20 1.1 1.00 0.95	1 0.95	0.32	<u> </u>	1.00	1.12	1.10	J	

201011 -111	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			ı				— ,
If mechanicate of the street o			endix N (2	3h) <i>– (2</i> 3a	a) × Fmv (e	equation (N	NS)) othe	rwise (23h) = (23a)			0.5	(23
If balanced with) = (23a)			0.5	(2:
a) If balance		-	•	_					2h\m + (23P) ^ [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	l				<u> </u>		·
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h	ı ıouse ex	tract ver	tilation o	or positiv	re input v	ventilatio	n from o	utside	<u> </u>	<u> </u>	<u> </u>	J	
,	n < 0.5 ×			•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural					•				-	-		-	
	n = 1, the	<u> </u>	· ·		·		 			1		1	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			<u> </u>	` `	´``	``		`			1	1	10
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24]	(2
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros		Openin		Net Ar		U-val		AXU		k-value		Χk
oors	area	(m²)	m	_	A ,r		W/m2		(W/	K)	kJ/m²-	r K	J/K "
Vindows					2	X	1.4 /[1/(1.4)+	0.041	2.8	=			(2
Valls Type1				_	8.651			— ;	11.47				(2
	19.	/	8.65		11.05	5 X	0.15	=	1.66				
Jolla Tuna?								=		믁 ¦		-	=
	19.		2		17.7	=	0.14	= [2.5				(2
otal area of e	elements	s, m²		ndow II ve	39.4			= [2.5		noragrant		(2
otal area of e	elements Froof wind	s, m² ows, use e	ffective wi		39.4 alue calcul			= [2.5	as given in	paragrapl	h 3.2	(2
otal area of e for windows and include the area	elements I roof wind as on both	s, m² lows, use e sides of in	ffective wi		39.4 alue calcul	ated using		= [/[(1/U-valu	2.5	as given in	paragrapl	h 3.2	(2
otal area of e for windows and include the area abric heat los	elements d roof winde as on both ss, W/K :	s, m² lows, use e sides of in = S (A x	ffective wi		39.4 alue calcul	ated using	formula 1	= [/[(1/U-valu) + (32) =	2.5				(2
otal area of e for windows and include the area abric heat los leat capacity	elements If roof winder as on both ss, W/K = Cm = S(ows, use e sides of in S (A x (A x k)	ffective wi eternal wali	ls and pan	39.4 alue calcul titions	ated using	formula 1	= [/[(1/U-valu) + (32) = ((28)	2.5 ue)+0.04] &	2) + (32a).		18.43	
otal area of endorwindows and include the area abric heat lost leat capacity thermal mass for design assess	elements I roof winder as on both ss, W/K: Cm = S(s parame sments wh	ows, use e sides of in S (A x (A x k) eter (TMF	ffective winternal walk U) P = Cm ÷ tails of the	's and pan	39.4 alue calcul titions	ated using	g formula 1	= ((28) Indica	2.5 (30) + (32) tive Value	2) + (32a). : Low	(32e) =	18.43 402.46	
Valls Type2 Total area of each for windows and a include the area fabric heat loss leat capacity thermal mass for design assessing the used insterior and bridge.	elements If roof winder as on both ss, W/K: Cm = S(s parame sments where and of a december of the second s	ows, use e sides of in S (A x (A x k) eter (TMF here the de tailed calcu	offective winternal walk U) P = Cm ÷ tails of the culation.	s and pan	39.4 alue calcul titions n kJ/m²K tion are not	ated using	g formula 1	= ((28) Indica	2.5 (30) + (32) tive Value	2) + (32a). : Low	(32e) =	18.43 402.46 100	(3)
fotal area of enter for windows and include the area fabric heat loss leat capacity fhermal mass for design assessan be used instemble formal bridge.	elements If roof winder as on both ss, W/K: Cm = S(s parame sments where and of a deceses: S (L	ows, use e sides of in = S (A x (A x k) eter (TMF erer the de tailed calcu	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated to	s and pan - TFA) ir constructi using Ap	39.4 alue calcul titions n kJ/m²K tion are not	ated using	g formula 1	= ((28) Indica	2.5 (30) + (32) tive Value	2) + (32a). : Low	(32e) =	18.43 402.46	
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Number of days in month (Table 1a)

	Jan.		T	i .	N/a	1	1	Λ	0	0-4	Nan	Dan		
(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	iter 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									.65		(43)
		_	hot water person per			_	-	to achieve	a water us	se target o	f		l	
not more							•	T .	0	0.1	NI.	5	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	70.79	10.19	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	m x nm x E	OTm / 3600) kWh/mor				0.10.00	 ` ′
(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		
			Į.				!	!		Total = Su	m(45) ₁₁₂ =	=	1237.53	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	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		includir	na anv sa	olar or M	/WHRS	storana	within s	ame ves	امء		0		(47)
•		` ,	ind no ta	•			_		arric ves	301		0		(47)
	-	-			_			. ,	ers) ente	er '0' in (47)			
	storage			`					,	`	,			
a) If m	nanufact	urer's de	eclared I	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		0 2 (1000)	11/11(10/00	ху /				0.	02		(31)
	-	from Ta									1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
•			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 1	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	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 (ar	nual) fro	m Table	3							0		(58)
	-		culated		,	•	. ,	, ,						
•									cylinde				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)												

Northea	ast _{0.9x}	0.77	x	8.6	65	x	5	0.42	x		0.63	x	0.7	=	133.31	(75)
Northea	ast _{0.9x}	0.77	x	8.6	65	x	2	8.07	x		0.63	x	0.7	=	74.21	(75)
Northea	ast _{0.9x}	0.77	x	8.6	65	x	1	14.2	х		0.63	X	0.7	=	37.53	(75)
Northea	ast _{0.9x}	0.77	x	8.6	65	x	9	9.21	х		0.63	X	0.7	=	24.36	(75)
	_					Ī			_							
Solar g	gains in	watts, ca	alculated	for eacl	h month				(83)m	= Sı	um(74)m .	(82)m				
(83)m=	29.83	60.72	109.4	179.67	241.51	25	7.47	240.86	192.0	02	133.31	74.21	37.53	24.36		(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (8	3)m ,	, watts		•			•	-	•	
(84)m=	357.5	386.59	425.35	479.81	525.99	52	26.58	499.8	456.0	05	405.31	362.19	343.84	344.04		(84)
7. Me	an inter	nal temp	erature ((heating	season)										
			eating p	`			area f	rom Tab	ole 9,	Th′	1 (°C)				21	(85)
•		•	ains for li			_					,					
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Au	ıa	Sep	Oct	Nov	Dec		
(86)m=	0.93	0.9	0.84	0.71	0.55	0	.38	0.28	0.32	Ť	0.53	0.77	0.89	0.93		(86)
Maan	:::::::::::::::::::::::::::::::::::::::	+ = == = = =	l	is done on		سا		2 2 42 7		ا ماماء	. 0 =)		<u> </u>		l	
	20.01	20.18	ature in I	20.76	20.93		w ste	21	20.9	-	20.95	20.73	20.35	19.99	l	(87)
(87)m=	20.01	20.16	20.45	20.76	20.93		0.99	21	20.9	9	20.95	20.73	20.33	19.99		(07)
-			eating p				Ť		ble 9	, Th	n2 (°C)		1		1	
(88)m=	20.37	20.37	20.37	20.38	20.39	2	0.4	20.4	20.4	4	20.39	20.39	20.38	20.38		(88)
Utilisa	ation fac	tor for g	ains for r	est of d	welling,	h2,ı	m (se	e Table	9a)							
(89)m=	0.92	0.89	0.83	0.69	0.52	0	.35	0.24	0.28	3	0.49	0.74	0.88	0.93		(89)
Mean	interna	l temper	ature in t	he rest	of dwelli	na i	T2 (fc	ollow ste	ns 3	to 7	' in Tabl	e 9c)	•		•	
(90)m=	19.04	19.27	19.66	20.09	20.31	Ť	0.38	20.39	20.4		20.35	20.06	19.53	19.01		(90)
		!	!								f	LA = Livin	L ig area ÷ (⁴	4) =	0.43	(91)
14				. 41	-ll	II:	\ £1	Λ Τ4	. /4	£I	۸) T O					_
	19.46	19.66	ature (fo	20.38	20.57) = IL 0.64	20.65	+ (1 - 20.6		A) × 12 20.61	20.35	19.88	19.43]	(92)
(92)m=			ne mean										19.00	19.43		(32)
(93)m=	19.46	19.66	20	20.38	20.57	_	0.64	20.65	20.6	_	20.61	20.35	19.88	19.43		(93)
		ting requ		20.30	20.57		3.04	20.00	20.0)	20.01	20.55	19.00	19.45		(00)
			ernal ten	nneratui	re ohtair	had	at etc	n 11 of	Table	a Gh	so tha	t Ti m-(76)m an	d re-calc	nulate	
			or gains u			ica	at ott	ρ 11 Oi	rabic	, ,,	, 50 tha	(11,111–(r Ojiii aii	a ro oaic	diato	
	Jan	Feb	Mar	Apr	May	Ţ,	Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	•									•			
(94)m=	0.9	0.88	0.82	0.69	0.53	0	.36	0.26	0.3		0.5	0.74	0.87	0.91		(94)
Usefu	ıl gains,	hmGm ,	W = (94))m x (8	4)m								_			
(95)m=	323.52	339.02	346.74	331.09	276.89	19	1.97	129.98	135.	54	202.7	268.7	297.66	314.18		(95)
Month	nly aver	age exte	rnal tem	perature	from T	able	e 8								•	
(96)m=	4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.4	4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93)m-	- (96)m]			•	
(97)m=	511.69	496.59	452.59	377.81	290.95	19	4.49	130.48	136.3	38	211.05	319.75	422.09	506.71		(97)
	e heatin		ement for	r each n	nonth, k	Nh/	mont	h = 0.02	4 x [((97)	m – (95)m] x (4	1)m		Ī	
(98)m=	140	105.89	78.75	33.64	10.46		0	0	0		0	37.98	89.59	143.24		_
									T	Γotal	per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	639.55	(98)
Space	e heatin	g require	ement in	kWh/m²	/year										12.65	(99)

9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab		0	(301)
Fraction of space heat from community system 1 – (301) =		1	(302)
The community scheme may obtain heat from several sources. The procedure allow	us for CHP and up to four other heat sources: the		(302)
includes boilers, heat pumps, geothermal and waste heat from power stations. See			_
Fraction of heat from Community boilers	<u></u>	1	(303a)
Fraction of total space heat from Community boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating	Г	kWh/yea	r
Annual space heating requirement		639.55	╡
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	671.53	(307a)
Efficiency of secondary/supplementary heating system in % (from T	· · · · · · · · · · · · · · · · · · ·	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement	Γ	1888.37	\neg
If DHW from community scheme:	_		_
Water heat from Community boilers	(64) x (303a) x (305) x (306) =	1982.79	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	26.54	(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 out	side	175.36	(330a)
warm air heating system fans	Γ	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	175.36	(331)
Energy for lighting (calculated in Appendix L)	Ī	241.09	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	Ī	-510.48	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ty)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor E kWh/year kg CO2/kWh k	missions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	o fuels repeat (363) to (366) for the second fuel	94	(367a)
CO2 associated with heat source 1 [(307b)+(310	b)] x 100 ÷ (367b) x	609.93	(367)
Electrical energy for heat distribution [(313		13.78	(372)
)(366) + (368)(372) =	623.7	(373)
CO2 associated with space heating (secondary) (309		0	(374)
(509	0		

CO2 associated with water from imme	rsion heater or instanta	aneous heater (312	2) x 0.22	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375)	=		623.7	(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 light	ting	(332))) x	0.52	=	125.12	(379)
Energy saving/generation technologies	s (333) to (334) as app	licable		_		_
Item 1			0.52 ×	0.01 =	-264.94	(380)
Total CO2, kg/year	sum of (376)(382) =				574.9	(383)
Dwelling CO2 Emission Rate	$(383) \div (4) =$				11.37	(384)
El rating (section 14)					91.94	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 25

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: 23.2

Summer heat loss coefficient: 190 (P2)

Overhangs:

Orientation: Ratio: Z_overhangs:

North East (NE) 0 1

Solar shading:

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

Solar gains:

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

Internal gains:

June July **August** 360.45 Internal gains 366.65 353.83 696.41 659.28 610.35 (P5) Total summer gains Summer gain/loss ratio 3.67 3.47 3.21 (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 20.97 22.67 22.31 Likelihood of high internal temperature Slight Medium Medium

Assessment of likelihood of high internal temperature: Medium

		UserJ	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 25					
1. Overall dwelling dime	ensions:								
		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	+	0	= [0	x 2	20 =	0	(6b)
Number of intermittent fa	ins			Ī	2	x ′	10 =	20	(7a)
Number of passive vents	3			Ī	0	x ²	10 =	0	(7b)
Number of flueless gas f	ires				0	X 4	40 =	0	(7c)
				<u>L</u>					
				_			Air ch	anges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)$				20		÷ (5) =	0.16	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ea to (17),	otnerwise	continue ti	om (9) to	(16)		0	(9)
Additional infiltration	([(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	ea (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	3	(17)
•	lity value, then $(18) = [(17) \div 20] + (6)$ es if a pressurisation test has been do.				is haina u	sad		0.31	(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	s) x (20) =				0.24	(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 i	nfiltration ra	te (allowi	ing for sl	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
	0.3	0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28]	
	effective air	_	rate for t	he appli	cable ca	ise						•	
	anical ventila air heat pump		andiv N. (2	12h) - (22a) v Emy (oguation (NEV otho	nuico (22h	n) = (33a)			0	(23a)
	d with heat rec								i) = (23a)			0	(23b)
		-	-	_					Ob.) /	'00k\ f	4 (00.0)	0	(23c)
	anced mech	anicai ve	0	o with ne	0		$\frac{nR}{l}$ (248)	0	2b)m + ((230) × [$\frac{1-(230)}{0}$) - 100]]	(24a)
` '	anced mech											J	(= .0)
			0	0	0	0	0	0	0	0	0	1	(24b)
	ole house ex											J	(= :)
•	2b)m < 0.5			-	•				.5 × (23b	o)			
	0 0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If nat	ural ventilati	ion or wh	ole hous	e positiv	/e input	ventilati	on from	oft	<u>!</u>	!	Į	J	
,	(2b)m = 1, th								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]	(24d)
Effective	e air change	rate - er	nter (24a) or (24k	o) or (24	c) or (24	d) in bo	(25)				_	
(25)m= 0	.55 0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(25)
3 Heat lo	osses and h	eat loss i	naramet	er.									
ELEMEI			Openin		Net Ar	ea	U-val	ie	ΑXU		k-value	e A	λΧk
	• • • •	a (m²)	n		A ,r		W/m2		(W/		kJ/m²-		J/K
Doors					2	X	1.4	=	2.8				(26)
Windows					8.651	1 x1	/[1/(1.4)+	0.04] =	11.47				(27)
Walls Typ	e1 19	.7	8.65	5	11.05	5 X	0.15	=	1.66	<u> </u>			(29)
Walls Typ	e2 19	.7	2		17.7	x	0.14	₹ - i	2.5	₹ i		7 —	(29)
Total area	of elements	s, m²			39.4								(31)
* for window	s and roof wind	dows, use e	effective wi	ndow U-va	alue calcul	lated using	g formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragrapl	h 3.2	
	e areas on botl			ls and par	titions								
	at loss, W/K	,	U)				(26)(30)) + (32) =				18.43	(33)
•	city Cm = S	` ,						((28).	(30) + (3	2) + (32a).	(32e) =	402.46	(34)
	nass param								tive Value			100	(35)
_	ssessments w instead of a de			construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f		
	ridges : S (L			usina Ar	pendix I	K						4.78	(36)
	hermal bridging				-							0	()
	c heat loss							(33) +	(36) =			23.21	(37)
Ventilation	n heat loss o	alculated	d monthly	y				(38)m	= 0.33 × ((25)m x (5))		
J	lan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 22	2.78 22.71	22.64	22.29	22.23	21.92	21.92	21.87	22.04	22.23	22.36	22.49		(38)
Heat trans	sfer coefficie	ent, W/K						(39)m	= (37) + (38)m		_	
	5.99 45.92	45.84	45.5	45.43	45.13	45.13	45.07	45.25	45.43	45.56	45.7]	
	I		!			!			Average =	Sum(39) ₁	12 /12=	45.5	(39)
	parameter (HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0	.91 0.91	0.91	0.9	0.9	0.89	0.89	0.89	0.9	0.9	0.9	0.9		 .
									Average =	: Sum(40)₁	12 /12=	0.9	(40)

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)				ı	
(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 ′	$[0.85 \times (45)]$	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			. ,									•		
	·			<i>/-</i>										
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	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)

Northeast _{0.9x}	0.77	x	8.6	55	x [50.42	x	0.	.63	x	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	х	8.6	55	x	28.07	x	0.	.63	x	0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	14.2	x	0.	.63	x	0.7	=	37.53	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	9.21	x	0.	.63	x	0.7	=	24.36	(75)
				_			_							
Solar gains in v	vatts, 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	240.86	192.0	2 13	33.31	74.21	37.53	24.36		(83)
Total gains – in	iternal a	nd solar	(84)m =	(73)m -	+ (83	3)m, watts		•	•				•	
(84)m= 277.37	307.12	347.23	403.55	450.93	453	3.21 427.87	382.2	8 33	30.88	285.84	265.33	264.56		(84)
7. Mean intern	nal temp	erature ((heating	season)									
Temperature of	during h	eating pe	eriods ir	the livir	ng ai	rea from Tal	ole 9,	Th1 ('	°C)				21	(85)
Utilisation fact	_	•			•			`	,					_
Jan	Feb	Mar	Apr	May	<u> </u>	un Jul	Au	a T	Sep	Oct	Nov	Dec		
(86)m= 0.97	0.96	0.93	0.86	0.73	0.5		0.5	_	0.73	0.9	0.96	0.97		(86)
` '	4	!		- T4 /5-										
Mean internal						i				00.47	10.50	40.00	Ī	(87)
(87)m= 19.08	19.28	19.68	20.21	20.64	20.	20.96	20.94	+ 2	0.73	20.17	19.53	19.03		(67)
Temperature of	during h	eating pe	eriods ir	rest of	dwe	lling from Ta	ble 9,	Th2	(°C)				•	
(88)m= 20.16	20.16	20.16	20.17	20.17	20.	.17 20.17	20.17	7 2	0.17	20.17	20.17	20.16		(88)
Utilisation fact	or for ga	ains for r	est of d	welling, l	h2,m	n (see Table	9a)							
(89)m= 0.97	0.95	0.92	0.84	0.69	0.5	<u> </u>	0.42		0.68	0.88	0.95	0.97		(89)
Mean internal	temper:	ature in t	he rest	of dwelli	na T	2 (follow ste	ne 3 t	 o 7 in	Tabl	a 9c)				
(90)m= 18.38	18.59	18.98	19.49	19.89	20		20.14		9.98	19.46	18.84	18.34		(90)
(11)											g area ÷ (4		0.43	(91)
											`	,	0.10	
Mean internal								\neg	1	40.77	10.11	40.04	1	(02)
(92)m= 18.68	18.89	19.28	19.8	20.21	20.		20.49		20.3	19.77	19.14	18.64		(92)
Apply adjustm	r	r		· ·			r			•	10.11	10.01	1	(02)
(93)m= 18.68	18.89	19.28	19.8	20.21	20.	.43 20.5	20.49	9 2	20.3	19.77	19.14	18.64		(93)
8. Space heat	•						.	01	41	· · /-	70)		1.4	
Set Ti to the method the utilisation for					ed a	at step 11 of	lable	9b, s	so tha	t 11,m=(76)m an	d re-cald	culate	
Jan	Feb	Mar	Apr	May	lı	un Jul	Au	<u> </u>	Sep	Oct	Nov	Dec		
Utilisation fact	!		•	iviay		un Jui	_ Au	9	oep [Oct	1407	Dec		
(94)m= 0.96	0.94	0.91	0.82	0.69	0.5	53 0.4	0.45		0.69	0.87	0.94	0.96		(94)
Useful gains, l													l	
(95)m= 265.49	289.17	314.46	332.89	312.51	239	0.95 169.13	173.5	7 2	228	249.67	249.6	254.54		(95)
Monthly avera	ae exte						<u> </u>	!	ļ					
(96)m= 4.3	4.9	6.5	8.9	11.7	14		16.4	1	14.1	10.6	7.1	4.2		(96)
Heat loss rate							<u> </u>			1				, ,
(97)m= 661.4	642.23	585.82	495.82	386.61	263		184.2		80.65	416.54	548.55	659.73		(97)
Space heating							<u> </u>						1	
(98)m= 294.56	237.26	201.89	117.31	55.13	(0	1	0	124.15	215.24	301.46		
							<u> </u>	otal ne) = Sum(9		1547	(98)
Chase beeting	1 roal:!==	mont:-	7 مدا ما ۱۸ اما	hiose			•	20	, 50. (,	,(0	- ,		╡
Space heating	, require	anent II)	NV//////	year									30.61	(99)

8c. Sp	pace co	oling rec	quiremen	t										
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	ELm (ca	lculated	using 2	5°C inter	nal temp	oerature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	424.22	333.96	342.57	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.86	0.91	0.88	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = (100)m x	(101)m								i	
(102)m=	0	0	0	0	0	366.54	303.04	301.55	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)				ı	
(103)m=	0	0	0	0	0	594.22	563.42	511.11	0	0	0	0		(103)
•			ement fo 104)m <			lwelling,	continuo	ous (kW	h' = 0.0	24 x [(10	03)m – (102)m] x	x (41)m	
(104)m=	0	0	0	0	0	163.94	193.72	155.91	0	0	0	0		
•									Total	= Sum(104)	=	513.56	(104)
	I fraction	-							f C =	cooled	area ÷ (4	4) =	1	(105)
		actor (Ta	able 10b)		1	1						1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
_									Total	I = Sum((104)	=	0	(106)
			ment for								ı	<u> </u>		
(107)m=	0	0	0	0	0	40.98	48.43	38.98	0	0	0	0		_
									Total	= Sum(107)	=	128.39	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	/ear				(107)	\div (4) =			2.54	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	lculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Energy	y Efficier	псу						(99)	+ (108) =	=		33.15	(109)

SAP Input

Property Details: Plot 25

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

Floor area:

Detachment:

Year Completed: 2020

Floor Location:

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 19.699 2 17.7 0.15 0.4 False N/A

Internal Elements

Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1212

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) 31.391 0.064 E7 Party wall between dwellings 8.175 0.053 E18

SAP Input

Staggered party wall between dwellings 2.725 0.12 E25

Intermediate floor between dwellings (in blocks of flats) 25.494 Р3 0

Yes (As designed) Pressure test:

Balanced with heat recovery Ventilation:

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: Number of passive stacks: 0 3 Number of sides sheltered: 3

Pressure test:

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

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

thermostats

Control code: 2312

Secondary heating system: None

From main heating system Water heating:

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

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

Low energy lights:

Low rise urban / suburban Terrain type:

English EPC language: 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 I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			001082 on: 1.0.5.9	
Address :	F	roperty	Address	: Plot 25					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		Ę	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 1	10 =	20	(7a)
Number of passive vents	;			Ī	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				_					
				_			Air ch	anges 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)+(6b)+(6a)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a			oontinuo fi	20		÷ (5) =	0.16	(8)
Number of storeys in the		ia 10 (17),	ourerwise (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 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate	50		(8) + (10)					0	(16)
•	q50, expressed in cubic metre (ity value, then $(18) = [(17) \div 20] + (18)$			•	etre of e	envelope	area	5	(17)
•	es if a pressurisation test has been do				is being u	sed		0.41	(18)
Number of sides sheltere				•	-			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 				l .	l	_	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		T 20	1 27	Ι 4	T 42	4.5	4.7	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (2a)m =$	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltra	ation rat	e (allowi	ng 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 effec		•	rate for t	he appli	cable ca	se	1	!	!	!	1	J	
If mechanica			l' N. (0	al.) (aa	\ - (\\	. (22)	\ (00.)			0	(23a
If exhaust air he) = (23a)			0	(23b
If balanced with		-	•	_								0	(230
a) If balance					·	- 	, 	ŕ	 	` 	' ') ÷ 100] 1	(0.4
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24 a
b) If balance			ntilation		1	covery (N	MV) (24b	m = (22)	· ·	1	T	1	
(24b)m = 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole he if (22b)m				•	•				.5 × (23b	o)		_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural vif (22b)m									0.5]				
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(240
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3. Heat losses	s and he	at loss r	naramete	or.									
ELEMENT	Gros		Openin		Net Ar	ea	U-valı	IE.	AXU		k-value	<u> </u>	ΑΧk
LLLIVILIAI	area		m		A ,r		W/m2		(W/		kJ/m²·		kJ/K
Doors					2	X	1	=	2				(26)
Windows					8.651	x1	/[1/(1.4)+	0.04] =	11.47				(27)
Walls Type1	19.7	7	8.65		11.05	5 X	0.18	i	1.99				(29)
Walls Type2	19.7	7	2		17.7	X	0.18	= i	3.19	=		7 F	(29)
Total area of el	lements	 , m²			39.4	=							(31)
* for windows and ** include the area					alue calcul		g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	n 3.2	, ,
Fabric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				18.64	(33)
Heat capacity (Cm = S(Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	402.4	6 (34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used instead				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix I	<						3.75	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric hea	at loss							(33) +	(36) =			22.39	(37)
Ventilation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5)	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 24.24	24.11	23.98	23.38	23.26	22.73	22.73	22.64	22.94	23.26	23.49	23.73		(38)
Heat transfer c	oefficier	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 46.64						_			•			-	
(33)111- 40.04	46.51	46.38	45.77	45.66	45.13	45.13	45.03	45.33	45.66	45.89	46.13		
Heat loss para				45.66	45.13	45.13	45.03		45.66 Average = = (39)m ÷	L : Sum(39)₁		45.77	(39)
` '				45.66 0.9	0.89	0.89	45.03		L Average =	L : Sum(39)₁		45.77	(39)

Number of days in month (Table 1a)

INUITIDE	ei oi day	5 111 11101	illii (Tabi	ге та)	ı	ı	ī	ī	ı	I	1	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	rement:								kWh/ye	ear:	
\ ccum	and accu	inanov l	NI									74	I	(42)
	ned occu A > 13.9		м + 1.76 х	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)1 + 0.0	0013 x (ΓFA -13.		71		(42)
	A £ 13.9				(•		, ,1 -			-,			
			ater usag							a taraat a		.72		(43)
		_	hot water person per			-	-	to acnieve	a water us	se target o)T			
	Jan	Feb	Mar			Jun	Jul	Δυα	Sep	Oct	Nov	Dec		
Hot wat			day for ea	Apr ach month	May Vd,m = fa		ļ	Aug (43)	J Sep	Oct	1400	Dec		
(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		
(44)111=	02.10	75.2	70.22	73.23	70.24	07.20	07.20	70.24		l	m(44) ₁₁₂ =		896.65	(44)
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,ı	m x nm x E	OTm / 3600			. ,		000.00	
(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>				ļ	ļ		I Total = Su	m(45) ₁₁₂ =	! =	1175.66	(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=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		•				•	•	•			•		
Storag	je volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	_	ınd no ta		-			` '						
			hot wate	r (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
	storage		eclared l	nee facti	nr ie kna	wn (k\//	J/day).					0	1	(40)
					טו וא פו וט	WII (KVVI	i/uay).					0		(48)
•			m Table					(40) (40)				0		(49)
٠.			storage eclared c	-		or is not		(48) x (49)) =			0		(50)
			factor fr									0		(51)
			ee secti											
	e factor											0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
٠.			storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	(50) or (. , .	•									0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	ım Tahlı	3		•	•	•		i e	0		(58)
	•	`	culated f			59)m =	(58) ÷ 36	65 × (41)	m					, ,
	-		rom Tabl			•	. ,	, ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	culated	for each	month	(61)m –	(60) ÷ 30	65 v (41)m	•	•	•		1	
(61)m=	0	0	0	0	0 0	00) + 3	05 x (41)	0	0	0	0	0		(61)
(51)111-					<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>	I	(= 1)

Total heat required for water	er heating	calculate	d for	each month	(62)m	= 0.85 × ((45)m +	- (46)m +	(57)m +	(59)m + (61)m	
(62)m= 103.61 90.62 93.	51 81.5	2 78.22	67	.5 62.55	71.77	72.63	84.65	92.4	100.34		(62)
Solar DHW input calculated using	Appendix (or Appendi	x H (ne	gative quantit	y) (enter	'0' if no sola	r contribu	ution to wate	er heating)	•	
(add additional lines if FGH	RS and/o	r WWHR	app	lies, see Ap	pendix	(G)					
(63)m= 0 0	0	0	0	0	0	0	0	0	0		(63)
Output from water heater	-							-	•	•	
(64)m= 103.61 90.62 93.8	51 81.5	2 78.22	67	.5 62.55	71.77	72.63	84.65	92.4	100.34		
	•	•	•	•	0	utput from wa	ater heat	er (annual) ₁	112	999.31	(64)
Heat gains from water heat	ing, kWh	month 0.2	.5 ´ [C	.85 × (45)m	n + (61	m] + 0.8 x	c [(46)n	n + (57)m	+ (59)m]	
(65)m= 25.9 22.65 23.	38 20.3	3 19.56	16.	87 15.64	17.94	18.16	21.16	23.1	25.08		(65)
include (57)m in calculati	on of (65	m only if	cylind	er is in the	dwellin	g or hot w	ater is	from com	munity h	neating	
5. Internal gains (see Tab	le 5 and	5a):							·		
Metabolic gains (Table 5), \		,									
	ar Ap	r May	Jı	ın Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 85.31 85.31 85.3			85.	31 85.31	85.31		85.31	85.31	85.31		(66)
Lighting gains (calculated in	Append	ix L. equa	tion L	9 or L9a). a	ılso se	e Table 5	<u> </u>	-1	!	ı	
(67)m= 13.65 12.12 9.8			4.7		6.62	8.88	11.28	13.16	14.03		(67)
Appliances gains (calculate	d in Appe	endix L. ed	uatio	n L13 or L1	3a), al	so see Tal	ble 5		1	l	
(68)m= 148.65 150.19 146			117		109.6		121.83	132.27	142.09]	(68)
Cooking gains (calculated i	!	_ !	tion I	 15 or l 15a	l also	see Table	5		<u> </u>	l	
(69)m= 31.53 31.53 31.5	- i -		31.		31.53		31.53	31.53	31.53		(69)
Pumps and fans gains (Tab		1 000	1	1 000	0	000	000	1 000	1 000	l	, ,
(70)m =		0		0	0	0	0	0	0		(70)
Losses e.g. evaporation (ne	l		<u> </u>					1 -		I	, ,
(71)m= -68.25 -68.25 -68.		 	-68		-68.2	-68.25	-68.25	-68.25	-68.25	1	(71)
Water heating gains (Table		9 1 00:20	1 00			7 00.20	00.20	1 00.20	1 00.20	l	, ,
(72)m= 34.81 33.71 31.	<u> </u>	1 26.28	23.	44 21.02	24.12	25.22	28.44	32.08	33.72	1	(72)
	72 20.0	20.20	20.	(66)m + (67)n			<u> </u>	<u> </u>	<u> </u>		()
Total internal gains = (73)m= 245.71 244.62 236	.18 222.3	9 208.04	194		188.9		210.14		238.43	1	(73)
6. Solar gains:	.10 222.0	208.04	194	.51 165.91	100.9	190.24	210.14	220.11	230.43		(10)
Solar gains are calculated using	solar flux fr	om Table 6a	and a	ssociated equa	ations to	convert to th	e applica	able orientat	tion.		
Orientation: Access Facto				Flux		g_		FF		Gains	
Table 6d		1 ²		Table 6a		Table 6b	-	Table 6c		(W)	
Northeast 0.9x 0.77	х	8.65	хГ	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]	0.63	x [0.7	= =	179.67	(75)
Northeast 0.9x 0.77	x	8.65	x [91.35] ^ <u>L</u>] _x [0.63	^ L	0.7	= =	241.51](75)
Northeast 0.9x 0.77	x	8.65	× [97.38	」^∟ 1 _× Γ	0.63	^ L x [0.7		257.47](75)
Northeast 0.9x 0.77		0.00	· L	07.00	ı ^ L	5.00	^	0.7		I -01.71	
	x	8.65	хГ	91 1	i _x F	0.63	Ħ x i	0.7		240.86	(75)
0.77	x	8.65	х	91.1	x	0.63	X	0.7		240.86	(75)

Northea	ast _{0.9x}	0.77	x	8.6	65	x	5	0.42	x		0.63	x	0.7	=	133.31	(75)
Northea	ast _{0.9x}	0.77	x	8.6	65	x	2	8.07	х		0.63	_ x _	0.7	_ =	74.21	(75)
Northea	ast _{0.9x}	0.77	x	8.6	S5	x		14.2	х		0.63	x	0.7	=	37.53	(75)
Northea	ast _{0.9x}	0.77	x	8.6	S5	x		9.21	x		0.63	_ x _	0.7		24.36	(75)
	_															_
Solar	ains in	watts. ca	alculated	for eac	h month				(83)m	ı = Sı	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 g	ains – iı	nternal a	and solar	(84)m =	= (73)m	+ (83)m	, watts							J	
(84)m=	275.54	305.34	345.58	402.06	449.55	4	51.98	426.77	381	.01	329.55	284.34	263.64	262.79]	(84)
7 Me	an inter	nal temr	perature	(heating	season)							,		1	
			neating p	`		<u> </u>	area i	from Tal	ole 9	Th	1 (°C)				21	(85)
•		•	ains for I			_			0.00	,	. ()					
Otilise	Jan	Feb	Mar	Apr	May	T (3	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec	1	
(86)m=	1	1	0.99	0.96	0.83		0.62	0.46	0.5	- 	0.84	0.98	1	1	1	(86)
` '			l .					<u> </u>				0.00	<u> </u>	<u> </u>	J	()
			ature in			_		i					T		1	(07)
(87)m=	20.02	20.14	20.36	20.67	20.9		20.99	21	2	1	20.93	20.62	20.27	20		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling/	from Ta	able 9	9, Tł	n2 (°C)				-	
(88)m=	20.15	20.15	20.15	20.16	20.16	2	20.17	20.17	20.	18	20.17	20.16	20.16	20.16		(88)
Utilisa	ation fac	tor for g	ains for i	rest of d	welling,	h2	,m (se	e Table	9a)							
(89)m=	1	1	0.99	0.94	0.79	$\overline{}$	0.55	0.38	0.4	14	0.77	0.97	1	1]	(89)
Mean	intorna	l tompor	ature in	the rest	of dwall	ina	T2 (f	ollow etc	nc 3	to 7	7 in Tahl	0.00)			J	
(90)m=	19.25	19.37	19.59	19.9	20.1	T	20.17	20.17	20.		20.13	19.85	19.51	19.24	1	(90)
(00)	.0.20	.0.0.	10.00										g area ÷ (4		0.43	(91)
														,	0.40	
			ature (fo			$\overline{}$			1				l		1	(00)
(92)m=	19.58	19.7	19.92	20.23	20.45	_	20.52	20.53	20.		20.47	20.18	19.84	19.57		(92)
	adjustn 19.58		he mean			_		1	<u> </u>			·	1 40 04	40.57	1	(93)
(93)m=		19.7	19.92	20.23	20.45		20.52	20.53	20.	53	20.47	20.18	19.84	19.57		(93)
			uirement		ro obtoir	200	l ot ot	on 11 of	Tobl	o Oh	oo tha	+ Ti m_/	76)m on	d ro ook	nulata	
			ernal ter or gains			iec	i ai sii	з р п ог	ıabı	e ar), 50 ma	. 11,111=(rojili ali	u re-cai	Julate	
	Jan	Feb	Mar	Apr	May	Γ	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec]	
Utilisa	ation fac	tor for g	ains, hm		,	<u> </u>				<u> </u>					J	
(94)m=	1	1	0.99	0.94	0.8		0.58	0.41	0.4	19	0.8	0.97	1	1]	(94)
Usefu	l gains,	hmGm ,	, W = (9 ²	1)m x (8	4)m										ı	
(95)m=	274.98	304.07	341.12	379.27	361.49	2	62.89	176.88	184	1.8	263.01	276.9	262.51	262.39]	(95)
Month	nly avera	age exte	rnal tem	perature	from T	abl	e 8		•				•	•	•	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16	.4	14.1	10.6	7.1	4.2]	(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm	າ , W =	=[(39)m	x [(9	3)m-	- (96)m]	•		_	
(97)m=	712.79	688.25	622.41	518.63	399.39	2	67.23	177.33	185	.93	288.98	437.6	584.45	708.91		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	24 x [(97)	m – (95)m] x (4	1)m		-	
(98)m=	325.73	258.17	209.28	100.34	28.2		0	0	0)	0	119.56	231.79	332.21		
·										Total	per year	(kWh/yea	r) = Sum(9	8)15,912 =	1605.28	(98)
Space	e heatin	g require	ement in	kWh/m²	?/year										31.76	(99)
•		•			-											

8c. Sp	ace co	oling req	uiremen	it										
Calcu	lated fo	r June, J	luly and	August.	See Tab	ole 10b							•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	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	424.21	333.95	342.23	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	ss hm										-	
(101)m=	0	0	0	0	0	0.96	0.98	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	407.49	328.42	332.14	0	0	0	0		(102)
Gains	(solar g	gains cal	culated	for appli	cable we	eather re	gion, se	e Table	10)				-	
(103)m=	0	0	0	0	0	592.99	562.31	509.84	0	0	0	0		(103)
		g require zero if (lwelling,	continue	ous (kW	h') = 0.0	24 x [(10	03)m – (102)m].	x (41)m	
(104)m=	0 +)111 10	0	0	0	0	133.56	174.02	132.21	0	0	0	0]	
(101)		Ū	<u> </u>		<u> </u>	.00.00		.02.2		= Sum(=	439.78	(104)
Cooled	fraction	า								cooled	,		1	(105)
		actor (Ta	able 10b)							(,		`
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	= Sum(104)	=	0	(106)
Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	33.39	43.5	33.05	0	0	0	0		
-					-				Total	= Sum(107)	=	109.95	(107)
Space	cooling	requirer	nent in k	:Wh/m²/y	/ear				(107)	÷ (4) =			2.18	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric	Energy	/ Efficier	псу						(99) -	+ (108) =	=		33.93	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								39.02	(109)

		عوا ا	r Details:						
Assessor Name:	Zahid Ashraf	030	Strom	o Nium	bor		STDO	001082	
Software Name:	Stroma FSAP 2012	2	Softwa					on: 1.0.5.9	
		Proper	ty Address	Plot 25					
Address :									
Overall dwelling dime	ensions:				A I I .	last (/as)) / - l /	
Ground floor		A	rea(m²)	(1a) x		ight(m) 2.5	(2a) =	Volume(m³	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	 + (1n) ☐		(4)]` ''	120.00	
Dwelling volume	a) · (· a) · (· a) · (· a)		30.34)+(3c)+(3c	d)+(3e)+	.(3n) =	126.26	7(5)
				(54) (55)	, , (00) , (00	.,	.(0)	126.36	(5)
2. Ventilation rate:		condary	other		total			m³ per hou	r
Number of chimneys	heating he	eating +	0	7 - F	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	Ј <u>Г</u>	0	x	20 =	0	(6b)
Number of intermittent fa				J -	0	x	10 =	0	(7a)
Number of passive vents				L	0		10 =	0	(7b)
Number of flueless gas fi				Ļ			40 =	<u> </u>	(7c)
Number of flueless gas in	1163			L	0			0	(70)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a))+(6b)+(7a)+(7b)+(7c) =		0		÷ (5) =	0	(8)
	peen carried out or is intended	l, proceed to (17	7), otherwise o	ontinue fr	rom (9) to	(16)	•		
Number of storeys in the Additional infiltration	ne dwelling (ns)					[(9)]	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber fr	ame or 0.35	for masoni	v constr	uction	[(0)	1]x0.1 =	0	(11)
	resent, use the value corresp	onding to the gr	eater wall are	a (after					` ′
deducting areas of openia	ngs); if equal user 0.35 floor, enter 0.2 (unseale	d) or 0.1 (se	aled) else	enter ()				0	(12)
If no draught lobby, en	•	u) 01 0.1 (30	aica), cisc	Critci o				0	(13)
• •	s and doors draught stri	pped					-	0	(14)
Window infiltration	-		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	•							0.15	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has i	been done or a	degree air pe	meability	is being u	sed		2	(19)
Shelter factor	,		(20) = 1 -	0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ÷ 4								
<u> </u>	1.23 1.1 1.08	0.95 0.95	5 0.92	1	1.08	1.12	1.18		
			-		•	•	•	•	

201011 -111	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			ı				— ,
If mechanicate of the street o			endix N (2	3h) <i>– (2</i> 3a	a) × Fmv (e	equation (N	NS)) othe	rwise (23h) = (23a)			0.5	(23
If balanced with) = (23a)			0.5	(2:
a) If balance		-	•	_					2h\m + (23P) ^ [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	l				<u> </u>	l	l				<u> </u>		·
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h	ı ıouse ex	tract ver	tilation o	or positiv	re input v	ventilatio	n from o	utside	<u> </u>		<u> </u>	J	
,	n < 0.5 ×			•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural					•				-	-		-	
	n = 1, the	<u> </u>	· ·		·		 			1		1	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			<u> </u>	` `	´``	``		`			1	1	10
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24]	(2
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros		Openin		Net Ar		U-val		AXU		k-value		Χk
oors	area	(m²)	m	_	A ,r		W/m2		(W/	K)	kJ/m²-	r K	J/K "
Vindows					2	X	1.4 /[1/(1.4)+	0.041	2.8	=			(2
Valls Type1				_	8.651			— ;	11.47				(2
	19.	/	8.65		11.05	5 X	0.15	=	1.66				
Jolla Tuna?								=		믁 ¦		-	=
	19.		2		17.7	=	0.14	= [2.5				(2
otal area of e	elements	s, m²		ndow II ve	39.4			= [2.5		noragrant		(2
otal area of e	elements Froof wind	s, m² ows, use e	ffective wi		39.4 alue calcul			= [2.5	as given in	paragrapl	h 3.2	(2
otal area of e for windows and include the area	elements I roof wind as on both	s, m² lows, use e sides of in	ffective wi		39.4 alue calcul	ated using		= [/[(1/U-valu	2.5	as given in	paragrapl	h 3.2	(2
otal area of e for windows and include the area abric heat los	elements d roof winde as on both ss, W/K :	s, m² lows, use e sides of in = S (A x	ffective wi		39.4 alue calcul	ated using	formula 1	= [/[(1/U-valu) + (32) =	2.5				(2
otal area of e for windows and include the area abric heat los leat capacity	elements If roof winder as on both ss, W/K = Cm = S(ows, use e sides of in S (A x (A x k)	ffective wi eternal wali	ls and pan	39.4 alue calcul titions	ated using	formula 1	= [/[(1/U-valu) + (32) = ((28)	2.5 ue)+0.04] &	2) + (32a).		18.43	
otal area of endorwindows and include the area abric heat lost leat capacity thermal mass for design assess	elements I roof winder as on both ss, W/K: Cm = S(s parame sments wh	ows, use e sides of in S (A x (A x k) eter (TMF	ffective winternal walk U) P = Cm ÷ tails of the	's and pan	39.4 alue calcul titions	ated using	g formula 1	= ((28) Indica	2.5 (30) + (32) tive Value	2) + (32a). : Low	(32e) =	18.43 402.46	
Valls Type2 Total area of each for windows and a include the area fabric heat loss leat capacity thermal mass for design assessing the used insterior and bridge.	elements If roof winder as on both ss, W/K: Cm = S(s parame sments where and of a december of the second s	ows, use e sides of in S (A x (A x k) eter (TMF here the de tailed calcu	offective winternal walk U) P = Cm ÷ tails of the culation.	s and pan	39.4 alue calcul titions n kJ/m²K tion are not	ated using	g formula 1	= ((28) Indica	2.5 (30) + (32) tive Value	2) + (32a). : Low	(32e) =	18.43 402.46 100	(3)
fotal area of enter for windows and include the area fabric heat loss leat capacity fhermal mass for design assessan be used instemble formal bridge.	elements If roof winder as on both ss, W/K: Cm = S(s parame sments where and of a deceses: S (L	ows, use e sides of in = S (A x (A x k) eter (TMF erer the de tailed calcu	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated to	s and pan - TFA) ir constructi using Ap	39.4 alue calcul titions n kJ/m²K tion are not	ated using	g formula 1	= ((28) Indica	2.5 (30) + (32) tive Value	2) + (32a). : Low	(32e) =	18.43 402.46	
otal area of e for windows and include the area abric heat los leat capacity thermal mass for design assess an be used inste	elements If roof winder as on both as, W/K: Cm = S(a parame asments where ead of a decease: S (L al bridging	ows, use e sides of in = S (A x (A x k) eter (TMF erer the de tailed calcu	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated to	s and pan - TFA) ir constructi using Ap	39.4 alue calcul titions n kJ/m²K tion are not	ated using	g formula 1	= ((28) Indicative	2.5 (30) + (32) tive Value	2) + (32a). : Low	(32e) =	18.43 402.46 100 4.78	
otal area of enterior windows and a include the area abric heat loss leat capacity hermal mass or design assessan be used insternal bridged details of thermal otal fabric hermal cotal fabric hermal otal fabric hermal bridged the state of t	elements If roof winder as on both as, W/K: Cm = S(as parame and of a decese: S (L al bridging eat loss	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	ffective winternal walk U) P = Cm ÷ tails of the culation. culated to cown (36) =	- TFA) ir constructi using Ap	39.4 alue calcul titions n kJ/m²K tion are not	ated using	g formula 1	= ((1/U-value) + (32) = ((28) Indicate indicative) (33) +	2.5 (a)+0.04] a (30) + (30) (a) tive Values of	2) + (32a). : Low : TMP in T	(32e) =	18.43 402.46 100	
fotal area of entering for windows and a include the area fabric heat loss leat capacity thermal mass for design assess and be used insterior details of thermal fotal fabric hermal fab	elements If roof winder as on both as, W/K: Cm = S(as parame and of a decese: S (L al bridging eat loss	ows, use e sides of in S (A x (A x k) eter (TMF ere the de tailed calcu x Y) calculated are not kn	ffective winternal walk U) P = Cm ÷ tails of the culation. culated to the culat	- TFA) ir construct using Ap	39.4 alue calcul titions n kJ/m²K ion are not opendix l	ated using	recisely the	= ((1/U-value) + (32) = ((28) Indicative) (33) + (38)m	2.5 (30) + (32) tive Value e values of (36) =	2) + (32a). : Low : TMP in T	(32e) =	18.43 402.46 100 4.78	
otal area of entire for windows and include the area abric heat loss leat capacity hermal mass or design assess and be used instelled the details of thermal otal fabric hermal bridge details of the det	elements If roof winder as on both ss, W/K: Cm = S(s parame sments where ead of a decease : S (L al bridging eat loss at loss ca	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	ffective winternal walk U) P = Cm ÷ tails of the culation. culated to cown (36) =	- TFA) ir constructi using Ap	39.4 alue calcul titions n kJ/m²K tion are not	ated using	g formula 1	= ((1/U-value) + (32) = ((28) Indicate indicative) (33) +	2.5 (30) + (3: tive Value e values of (36) = = 0.33 × (2) + (32a). : Low : TMP in T	(32e) = able 1f	18.43 402.46 100 4.78	
fotal area of ending of the mal mass or design assess and be used insterioral fabric hermal bridge details of thermal fotal fabric hermal fotal fabric hermal fabric her	elements If roof winder as on both ss, W/K: Cm = S(s parame sments where es : S (L al bridging eat loss at loss ca Feb 10.43	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calculated are not kn alculated Mar 10.31	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	- TFA) ir constructi using Ap = 0.05 x (3	39.4 alue calcul titions n kJ/m²K ion are noi ppendix l	ated using t known pr	formula 1 (26)(30)	= ((28) Indicative (33) + (38)m Sep 9.22	2.5 (30) + (32) tive Value e values of (36) = = 0.33 × (Oct 9.58	2) + (32a). : Low : TMP in T	(32e) = able 1f Dec	18.43 402.46 100 4.78	
fotal area of ending for windows and include the area fabric heat loss leat capacity. Thermal mass for design assess and be used instead thermal bridge details of thermal fotal fabric heat fabric heat Jan	elements If roof winder as on both ss, W/K: Cm = S(s parame sments where es : S (L al bridging eat loss at loss ca Feb 10.43	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calculated are not kn alculated Mar 10.31	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	- TFA) ir constructi using Ap = 0.05 x (3	39.4 alue calcul titions n kJ/m²K ion are noi ppendix l	ated using t known pr	formula 1 (26)(30)	= ((28) Indicative (33) + (38)m Sep 9.22	2.5 (30) + (32) (30) + (32) (30) + (32) (36) = (36) = (36) = Oct	2) + (32a). : Low : TMP in T	(32e) = able 1f Dec	18.43 402.46 100 4.78	
fotal area of end for windows and a include the area fabric heat loss leat capacity thermal mass for design assess and be used insterioral bridge details of thermal fotal fabric heat fabric heat lation heat sets and the sets fabric heat fabric heat lation heat sets fabric heat fabric heat fabric heat lation heat sets fabric heat	elements I roof winder as on both ss, W/K: Cm = S(s parame sments wheread of a der es : S (L al bridging eat loss at loss ca Feb 10.43 coefficier	ows, use e sides of in = S (A x (A x k) eter (TMF ere the de tailed calculated are not kn alculated Mar 10.31	ffective winternal walk U) P = Cm ÷ tails of the culation. culated to cown (36) = I monthly Apr 9.7	- TFA) ir constructi using Ap - 0.05 x (3	39.4 alue calcul titions n kJ/m²K tion are not opendix h 1) Jun 8.97	ated using t known pr	Aug 8.85	= ((28) Indica indicative (33) + (38)m Sep 9.22 (39)m 32.42	2.5 (30) + (32) tive Value e values of (36) = = 0.33 × (Oct 9.58 = (37) + (2) + (32a). : Low : TMP in T (25)m x (5 Nov 9.82 38)m 33.03	(32e) = able 1f Dec 10.06	18.43 402.46 100 4.78	
fotal area of end for windows and a include the area fabric heat loss leat capacity thermal mass for design assess and be used insterioral bridge details of thermal fotal fabric heat fabric heat lation heat sets and the sets fabric heat fabric heat lation heat sets fabric heat fabric heat fabric heat lation heat sets fabric heat	elements of roof winder as on both ss, W/K: Cm = S(s parame sments where es : S (L al bridging eat loss at loss at loss ca Feb 10.43 coefficier 33.63	ows, use e sides of in = S (A x (A x k) eter (TMF erre the de tailed calculated are not kn alculated Mar 10.31 nt, W/K	own (36) = I monthly Apr 9.7	- TFA) ir constructi using Ap - 0.05 x (3	39.4 alue calcul titions n kJ/m²K tion are not opendix h 1) Jun 8.97	ated using t known pr	Aug 8.85	= ((28) Indicative (33) + (38)m Sep 9.22 (39)m 32.42	2.5 (30) + (32) (31) + (32) (32) + (33) (32) + (33) (33) + (33) (34) + (32) (35) + (32) (36) + (32) (37) + (32)	2) + (32a). : Low : TMP in T (25)m x (5) Nov 9.82 38)m 33.03 Sum(39).	(32e) = able 1f Dec 10.06	18.43 402.46 100 4.78	

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											00.55		(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	X	8.6	5	x	22.97	х		0.63	X	0.7	=	60.72	(75)
Northeast _{0.9x} 0.77	X	8.6	55	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	x	8.6	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	65	x	5	0.42	X		0.63	X	0.7	=	133.31	(75)
Northeast 0.9x	0.77	x	8.6	65	x	2	8.07	x		0.63	_ x _	0.7		74.21	(75)
Northeast 0.9x	0.77	x	8.6	S5	x		14.2	x		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	x	8.6	S5	x	Ç	9.21	x		0.63	_ x _	0.7	=	24.36	(75)
															_
Solar gains in	n watts, ca	alculated	for eacl	h month				(83)m	= Sı	um(74)m .	(82)m				
(83)m= 29.83	1	109.4	179.67	241.51		57.47	240.86	192.	.02	133.31	74.21	37.53	24.36		(83)
Total gains -	internal a	nd solar	(84)m =	= (73)m ·	+ (8	33)m	, watts						!		
(84)m= 483.67	7 511.23	544.67	591.47	629.68	62	24.12	594.69	552.	.46	507.03	471.58	461.21	467.55		(84)
7. Mean inte	ernal temp	perature	(heating	season)										
Temperatur						area f	from Tab	ole 9.	Th	1 (°C)				21	(85)
Utilisation fa	•				-).O O,	• • • •	. (0)				21	(,
Jan	Feb	Mar	Apr	May	È	Jun	Jul	Δι	ug	Sep	Oct	Nov	Dec		
(86)m= 0.85	0.81	0.74	0.62	0.47	┢).33	0.24	0.2	Ť	0.43	0.65	0.79	0.86		(86)
		<u> </u>									0.00	0.70	0.00		(==)
Mean intern								r				1		Ī	(07)
(87)m= 20.34	20.47	20.66	20.86	20.96	2	0.99	21	21	1	20.98	20.85	20.6	20.32		(87)
Temperatur	e during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9), Th	n2 (°C)			_	ī	
(88)m= 20.37	20.37	20.37	20.38	20.39	2	20.4	20.4	20.	4	20.39	20.39	20.38	20.38		(88)
Utilisation fa	actor for g	ains for r	est of d	welling,	h2,	m (se	e Table	9a)							
(89)m= 0.83	0.8	0.72	0.59	0.44	Т	0.3	0.21	0.2	:3	0.4	0.62	0.77	0.84		(89)
Mean intern	al temper	ature in t	the rest	of dwalli	ina	T2 (f	allow etc	ne 3	+0.7	in Tahl	0.00				
(90)m= 19.5	19.67	19.94	20.21	20.34	Ť	0.39	20.4	20.		20.37	20.21	19.87	19.48		(90)
(00)111= 10.0	10.07	10.01	20.21	20.01		0.00	20.1					g area ÷ (4		0.43	(91)
												3 (,	0.40	(0.)
Mean intern	_	1												İ	(00)
(92)m= 19.87		20.25	20.49	20.61		0.65	20.66	20.6		20.63	20.49	20.18	19.85		(92)
Apply adjus		r i		· ·	1			ī					T	Ī	(00)
(93)m= 19.87		20.25	20.49	20.61	2	0.65	20.66	20.6	66	20.63	20.49	20.18	19.85		(93)
8. Space he				1.4.1			44 6		01	41		70)		1.4	
Set Ti to the the utilisation			•		ned	at ste	ep 11 of	labi	e 9b	o, so tha	t II,m=(/6)m an	d re-cald	culate	
Jan	Feb	Mar	Apr	May	Γ.	Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
Utilisation fa				iviay	<u> </u>	Jan	- Gui		<u> </u>	ООР	000	1101	1 200		
(94)m= 0.82	0.79	0.72	0.6	0.45).31	0.22	0.2	5	0.41	0.63	0.77	0.83		(94)
Useful gains	 s, hmGm	. W = (94	I)m x (84	4)m				<u> </u>	!				<u> </u>		
(95)m= 397.53	1	392.5	352.94	283.71	19	3.27	130.25	136.	.03	207.59	295.73	353.53	389.23		(95)
Monthly ave	erage exte	rnal tem	perature	from Ta	able	= 8									
(96)m= 4.3	4.9	6.5	8.9	11.7	1	4.6	16.6	16.	4	14.1	10.6	7.1	4.2		(96)
Heat loss ra	te for me	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(93	3)m-	 - (96)m]	ı			
(97)m= 525.45	1	460.72	381.42	292	1	94.69	130.52	136.	_	211.8	324.27	432.11	520.54		(97)
Space heati	ng require	ement fo	r each n	nonth, k	Wh,	/mont	h = 0.02	24 x [(97)	m – (95)m] x (4	1)m			
(98)m= 95.17		50.75	20.5	6.17		0	0	0	Ì	0	21.24	56.58	97.69		
	•								Total	per year	(kWh/yeaı	:) = Sum(9	8)15,912 =	418.77	(98)
Space heati	na requir	ement in	kWh/m²	?/vear										8.29	(99)
opado noati	g roquiit	5711OFTC 111		, y Jui										0.23	

Oh Enorgy requirements Community heating	homo			
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	 r
Annual space heating requirement			418.77	╛
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	439.71	(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				7
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)] =	24.22	(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 =	18.64	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	84.07	(342a)
		Fuel Price		_
Pumps and fans	(331)	13.19 x 0.01 =	23.13	(349)

(332)

Energy for lighting

(350)

31.8

x 0.01 =

13.19

Additional standing charges (Table 12)				120	(351)
Energy saving/generation technologies					_
	l0a)(342e) + (345)((354) =		277.64	(355)
11b. SAP rating - Community heating scher	me				
Energy cost deflator (Table 12)				0.42	(356)
,	5) x (356)] ÷ [(4) + 45.0]	=		1.22	(357)
SAP rating (section12)				82.97	(358)
12b. CO2 Emissions – Community heating s	cheme				
		Energy	Emission factor		
		kWh/year	kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and water Efficiency of heat source 1 (%)		g two fuels repeat (363) to	(366) for the second fue	el 94	(367a)
CO2 associated with heat source 1	[(307b)+	-(310b)] x 100 ÷ (367b) x	0.22	556.66	(367)
Electrical energy for heat distribution		[(313) x	0.52	12.57	(372)
Total CO2 associated with community system	ns	(363)(366) + (368)(372	2)	569.23	(373)
CO2 associated with space heating (secondary	ary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion h	neater or instantane	eous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water	heating	(373) + (374) + (375) =		569.23	(376)
CO2 associated with electricity for pumps an	d fans within dwell	ing (331)) x	0.52	91.01	(378)
CO2 associated with electricity for lighting		(332))) x	0.52	125.12	(379)
Energy saving/generation technologies (333) Item 1	to (334) as applica	able	0.52 x 0.01 =	-264.94	(380)
Total CO2, kg/year sum	of (376)(382) =			520.43	(383)
) ÷ (4) =			10.3	(384)
El rating (section 14)				92.7	(385)
13b. Primary Energy – Community heating s	cheme				
		Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and wat	er heating (not CHI	P)			
Efficiency of heat source 1 (%)		g two fuels repeat (363) to	(366) for the second fue	94	(367a)
Energy associated with heat source 1	[(307b)+	-(310b)] x 100 ÷ (367b) x	1.22	3144.09	(367)
Electrical energy for heat distribution		[(313) x		74.37	(372)
Total Energy associated with community sys	tems	(363)(366) + (368)(372	2)	3218.46	(373)
if it is negative set (373) to zero (unless sp	ecified otherwise,	see C7 in Appendix C	;)	3218.46	(373)
Energy associated with space heating (second	ndary)	(309) x	0	= 0	(374)
Energy associated with water from immersio	n heater or instanta	aneous heater(312) x	1.22	= 0	(375)
Total Energy associated with space and water	er heating	(373) + (374) + (375) =		3218.46	(376)
Energy associated with space cooling		(315) x	3.07	0	(377)

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) 2929.79

		UserJ	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 25					
1. Overall dwelling dime	ensions:								
		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	+	0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				2	x ′	10 =	20	(7a)
Number of passive vents	3			Ī	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			Ī	0	X 4	40 =	0	(7c)
				_				_	
				_			Air ch	nanges per ho	our —
	ys, flues and fans = (6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b			oontinuo fi	20		÷ (5) =	0.16	(8)
Number of storeys in t		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 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	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)
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					12) + (13)			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 heina u	sed		0.41	(18)
Number of sides sheltere		io or a ac	groo all po	modelinty	io boilig a	50 u		3	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.78	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	s) x (20) =				0.32	(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							1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
	•			_	_			-	

Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.4	7
Calculate effective air change rate for the applicable case	
If mechanical ventilation:	0 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0 (23c)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 – (<u> </u>
(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24a)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)	(24b)
(24b)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$; otherwise $(24c) = (22b)m + 0.5 \times (23b)$	
$ (24c)_{m} = $	(24c)
d) If natural ventilation or whole house positive input ventilation from loft	
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	
(24d)m= 0.58	(24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (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 parameter:	A V Is
ELEMENTGrossOpeningsNet AreaU-valueA X Uk-valarea (m²)m²A ,m²W/m2K(W/K)kJ/m²	
Doors 2 x 1 = 2	(26)
Windows $8.651 x^{1/[1/(1.4) + 0.04]} = 11.47$	(27)
Walls Type1 19.7 8.65 11.05 x 0.18 = 1.99	(29)
Walls Type2 19.7 2 17.7 x 0.18 = 3.19	(29)
Total area of elements, m ² 39.4	(31)
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragra	•
** include the areas on both sides of internal walls and partitions	pii 0.2
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$	18.64 (33)
Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e)	402.46 (34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium	250 (35)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f	
can be used instead of a detailed calculation.	
Thermal bridges: S (L x Y) calculated using Appendix K	3.75 (36)
if details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) =	22.39 (37)
Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$	22.00
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	ภ
(38)m= 24.24 24.11 23.98 23.38 23.26 22.73 22.73 22.64 22.94 23.26 23.49 23.73	(00)
	_
Heat transfer coefficient, W/K $(39)m = (37) + (38)m$ $(39)m = 46.64$ 46.51 46.38 45.77 45.66 45.13 45.13 45.03 45.33 45.66 45.89 46.13	
(59)III= 46.04 46.51 46.36 45.77 45.06 45.13 45.13 45.03 45.03 45.05 45.09 46.13 Average = Sum(39) ₁₁₂ /12=	45.77 (39)
Heat loss parameter (HLP), W/m ² K $ (40)m = (39)m \div (4) $	40.77
(40)m= 0.92 0.92 0.92 0.91 0.9 0.89 0.89 0.9 0.9 0.9 0.91 0.91	7
Average = $Sum(40)_{112}/12=$	0.91 (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	r 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/	- al			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	water he	eating ca	alculated	l for e	each month	(62)	m = (0.85 × (4	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 168.49 148.69	156.6	141	138.62	124		131		130.54	146.18	153.79	164.64		(62)
Solar DHW input calculated	using App	endix G or	Appendix	H (ne	gative quantity	y) (ent	er '0'	if no solar	contribu	tion to wate	er heating)		
(add additional lines if	FGHRS	and/or V	VWHRS	appl	ies, see Ap	pend	lix G)					
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0		(63)
Output from water hea	ter				•		•	•		•		•	
(64)m= 168.49 148.69	156.6	141	138.62	124	.5 120.18	131	.04	130.54	146.18	153.79	164.64		
<u> </u>						•	Outpu	ut from wa	iter heate	er (annual)₁	12	1724.27	(64)
Heat gains from water	heating,	kWh/mo	onth 0.2	5 ′ [0	.85 × (45)m	ı + (6	1)m]) + 0.8 x	[(46)m	+ (57)m	+ (59)m	1	
(65)m= 77.8 69.12	73.85	67.96	67.87	62.4	18 61.74	65.	35	64.49	70.39	72.22	76.53		(65)
include (57)m in calc	culation o	of (65)m	only if c	ylind	er is in the o	dwell	ing c	or hot wa	ater is f	rom com	munity h	neating	
5. Internal gains (see	e Table 5	and 5a):	-							·		
Metabolic gains (Table													
Jan Feb	Mar	Apr	May	Ju	ın Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 85.31 85.31	85.31	85.31	85.31	85.3	31 85.31	85.	31	85.31	85.31	85.31	85.31		(66)
Lighting gains (calcula	ted in Ap	pendix	L. equat	ion L	—————9 or L9a). a	lso s	ee T	able 5		<u> </u>	ļ.	ı	
(67)m= 13.65 12.12	9.86	7.47	5.58	4.7		6.6	_	8.88	11.28	13.16	14.03		(67)
Appliances gains (calc	ulated in	Append	dix L. ea	uatio	 n L13 or L1	3a). a	also	see Tab	ole 5	1	<u> </u>	I	
(68)m= 148.65 150.19	146.3	138.03	127.58	117.		109		113.55	121.83	132.27	142.09		(68)
Cooking gains (calcula	ted in Ar	nendix	l equat	ion I	 15 or I 15a`	L) als		e Table	5	<u> </u>			
(69)m= 31.53 31.53	31.53	31.53	31.53	31.5		31.		31.53	31.53	31.53	31.53		(69)
Pumps and fans gains		ia)									ļ		
(70) m= $\frac{3}{3}$ $\frac{3}{3}$	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses e.g. evaporation	n (negat	ive valu	es) (Tab	le 5)	I					<u> </u>		<u> </u>	
(71)m= -68.25 -68.25	-68.25	-68.25	-68.25	-68.	25 -68.25	-68.	.25	-68.25	-68.25	-68.25	-68.25]	(71)
Water heating gains (1	ıı Table 5)				I	!	!			<u> </u>		<u> </u>	
(72)m= 104.58 102.85		94.39	91.23	86.7	77 82.99	87.	84	89.56	94.61	100.3	102.86]	(72)
Total internal gains =					(66)m + (67)m								
(73)m= 318.47 316.76	307.02	291.48	275.99	260.	`	255		263.59	279.3	297.33	310.57]	(73)
6. Solar gains:	<u> </u>												
Solar gains are calculated	using solaı	flux from	Table 6a	and as	sociated equa	tions	to con	overt to the	e applica	ble orientat	ion.		
Orientation: Access F	actor	Area			Flux			g_		FF		Gains	
Table 6d		m²			Table 6a			able 6b	7	able 6c		(W)	
Northeast 0.9x 0.77	х	8.6	55	x	11.28	x		0.63	x	0.7	=	29.83	(75)
Northeast 0.9x 0.77	x	8.6	55	x	22.97	x		0.63	x	0.7	_	60.72	(75)
Northeast 0.9x 0.77	x	8.6	55	x $\overline{}$	41.38	x		0.63	_ x [0.7	<u> </u>	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	х	8.6	55	x 🗏	91.35	x		0.63	×	0.7	=	241.51	(75)
Northeast 0.9x 0.77	х	8.6	55	x $$	97.38	x		0.63	x	0.7		257.47	(75)
Northeast _{0.9x} 0.77	х	8.6	55	x $\overline{\ }$	91.1	x		0.63	_ x [0.7		240.86	(75)
Northeast _{0.9x} 0.77	х	8.6	55	x 🗏	72.63	x		0.63	×	0.7	=	192.02	(75)

Northea	st _{0.9x}	0.77	x	8.6	65	x	5	0.42	x		0.63	х	0.7	=	133.31	(75)
Northea	ıst _{0.9x}	0.77	x	8.6	65	x	2	8.07	x		0.63	_ x _	0.7		74.21	(75)
Northea	ıst _{0.9x}	0.77	X	8.6	65	X		14.2	x		0.63	_ x _	0.7	=	37.53	(75)
Northea	st _{0.9x}	0.77	X	8.6	65	X	9	9.21	x		0.63	_ x _	0.7	=	24.36	(75)
	_								•							_
Solar o	ains in	watts. ca	alculated	for eac	h month				(83)m	า = Sเ	um(74)m .	(82)m				
(83)m=	29.83	60.72	109.4	179.67	241.51		57.47	240.86	192		133.31	74.21	37.53	24.36]	(83)
Total g	ains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (83)m	, watts	<u> </u>					<u>I</u>	ı	
(84)m=	348.3	377.48	416.42	471.15	517.49	5	18.31	491.74	447	.73	396.89	353.51	334.86	334.93]	(84)
7. Me	an inter	nal temp	erature	(heating	season)										
			eating p				area f	from Tab	ole 9	. Th	1 (°C)				21	(85)
•		Ū	ains for I			·				,	. (•)					(==/
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec	1	
(86)m=	1	0.99	0.98	0.92	0.76	-	0.55	0.4	0.4	Ť	0.74	0.95	0.99	1	1	(86)
` ′ [l	ļ.			_		<u> </u>		!		0.90	0.99		l	(00)
Mean		l temper	ature in l	iving are	ea T1 (fo	ollo	w ste	ps 3 to 7	in T	able	e 9c)			1	1	
(87)m=	20.16	20.27	20.49	20.76	20.94	2	20.99	21	2	1	20.96	20.73	20.4	20.14		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	able 9	9, Tł	n2 (°C)					
(88)m=	20.15	20.15	20.15	20.16	20.16	2	20.17	20.17	20.	18	20.17	20.16	20.16	20.16]	(88)
Utilisa	ition fac	tor for a	ains for r	est of d	welling	h2	m (se	e Table	9a)						1	
(89)m=	0.99	0.99	0.97	0.89	0.71		0.48	0.33	0.3	38	0.67	0.93	0.99	1]	(89)
Moon	intorno	Ltompor	ature in t	the rest	of dwall	ina	T2 (f	ollow etc	nc 3	to 7	7 in Tahl	0.00		<u> </u>	J	
(90)m=	19.03	19.2	19.5	19.9	20.11	Ť	20.17	20.17	20.		20.14	19.86	19.4	19.01	1	(90)
(30)111=	10.00	15.2	13.5	13.3	20.11	L_	.0.17	20.17	20.	''			g area ÷ (4		0.43	(91)
												L/ (— L/////	g aroa . (., –	0.43	(31)
Mean		l temper	ature (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1	– fL	A) × T2		1	1	1	
(92)m=	19.52	19.66	19.93	20.27	20.47	2	20.53	20.53	20.	53	20.5	20.24	19.83	19.5		(92)
		nent to th	ne mean		temper	т —		m Table	4e,	whe	re appro	priate	1	1	1	
(93)m=	19.52	19.66	19.93	20.27	20.47	2	20.53	20.53	20.	53	20.5	20.24	19.83	19.5		(93)
8. Spa	ace hea	ting requ	uirement													
			ernal ter	•		nec	at ste	ep 11 of	Tab	le 9b	o, so tha	t Ti,m=(76)m an	d re-cald	culate	
tne uti	_		or gains u			_				. 1	0	0.1	l N.		1	
1 14:11:	Jan	Feb	Mar	Apr	May		Jun	Jul	<u> </u>	ug	Sep	Oct	Nov	Dec	J	
	0.99	0.99	ains, hm 0.97		0.73		0.54	0.36	0.4	14	0.7	0.93	0.00	0.99	1	(94)
(94)m=				0.9			0.51	0.36	0.2	*'	0.7	0.93	0.99	0.99	J	(34)
r		nmGm ,	W = (94)	423.26		<u> </u>	CE 22	177.15	105	<i>E</i> 2	277 20	330.48	220.07	222.02	1	(95)
(95)m=	345.84				377.98	_	65.22	177.15	185	.52	277.38	330.48	329.97	333.02	J	(93)
r		_	rnal tem					40.0	10	4 1	444	40.0	7.4	1.0	1	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	<u> </u>	14.6	16.6	16		14.1	10.6	7.1	4.2		(96)
Г			an intern			_				_			T	Γ	1	(07)
(97)m=	709.87	686.53	622.72	520.45	400.41	_	67.39	177.35	185		290.01	439.96	584.21	705.75		(97)
· .			ement fo			Wh				Í	<u> </u>	<u>`</u>	ŕ		1	
(98)m=	270.84	210.82	163.06	69.97	16.69	L	0	0	(0	81.46	183.05	277.31		٦.
										Total	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1273.2	(98)
Space	e heatin	g require	ement in	kWh/m²	² /year										25.19	(99)

Space heating: Fraction of space heat from secondary/supplementary system 0 (20)
Fraction of space heat from main system(s) Fraction of total heating from main system 1 Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) 270.84 210.82 163.06 69.97 16.69 0 0 0 0 81.46 183.05 277.31 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 289.67 225.48 174.39 74.84 17.85 0 0 0 0 87.12 195.77 296.59 Total (kWh/year) = Sum(211), xm1; 1361.71 (21 xm1; 1361.71) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Fraction of total heating from main system 1 (204) = (202) × [1 - (203)] = 1 (205) = 1
Efficiency of main space heating system 1 Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above) 270.84 210.82 163.06 69.97 16.69 0 0 0 0 81.46 183.05 277.31 (211)m = {{[(98)m x (204)]}} x 100 ÷ (206) 289.67 225.48 174.39 74.84 17.85 0 0 0 0 87.12 195.77 296.59 Total (kWh/year) = Sum(211), 1.5, 10.5, 15.5 Space heating fuel (secondary), kWh/month = {{[(98)m x (204)]}} x 100 ÷ (208) (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) = Sum(215), 1.5, 1.5, 1.5, 1.5 Water heating Output from water heater (calculated above) 168.49 148.69 156.6 141 138.62 124.5 120.18 131.04 130.54 146.18 153.79 164.64 Efficiency of water heater (217)m = 86.07 85.74 84.92 83.06 80.83 79.8 79.8 79.8 79.8 83.33 85.28 86.19 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = 195.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) 270.84 210.82 163.06 69.97 16.69 0 0 0 0 81.46 183.05 277.31 (211)m = {[(98)m x (204)] } x 100 ÷ (206) 289.67 225.48 174.39 74.84 17.85 0 0 0 0 87.12 195.77 296.59 Total (kWh/year) = Sum(211) _{1x1012} 1361.71 (21 12 13 13 13 13 13 13
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Space heating requirement (calculated above) 270.84 210.82 163.06 69.97 16.69 0 0 0 0 81.46 183.05 277.31 (211)m = {[(98)m x (204)]} x 100 ÷ (206)
270.84 210.82 163.06 69.97 16.69 0 0 0 0 81.46 183.05 277.31
(211)m = {[(98)m x (204)] } x 100 ÷ (206) 289.67 225.48 174.39 74.84 17.85 0 0 0 0 87.12 195.77 296.59 Total (kWh/year) = Sum(211) ₁₅₁₀₁₂ = 1361.71 (21) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m = 0 0 0 0 0 0 0 0 0 Total (kWh/year) = Sum(215) ₁₅₁₀₁₂ = 0 (21) Water heating Output from water heater (calculated above) [168.49 148.69 156.6 141 138.62 124.5 120.18 131.04 130.54 146.18 153.79 164.64 Efficiency of water heater (217)m = 86.07 85.74 84.92 83.06 80.83 79.8 79.8 79.8 79.8 83.33 85.28 86.19 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = 195.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01
289.67 225.48 174.39 74.84 17.85 0 0 0 0 87.12 195.77 296.59 Total (kWh/year) = Sum(211) ₁₅₁₀₁₂ 1361.71 (21) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) = Sum(215) ₁₅₁₀₁₂ 0 (21) Water heating Output from water heater (calculated above) 168.49 148.69 156.6 141 138.62 124.5 120.18 131.04 130.54 146.18 153.79 164.64 Efficiency of water heater (217)m= 86.07 85.74 84.92 83.06 80.83 79.8 79.8 79.8 79.8 83.33 85.28 86.19 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 195.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01
Total (kWh/year) =Sum(211),s,10,12= 1361.71 (21) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
= {[(98)m x (201)]} x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Water heating Output from water heater (calculated above) 168.49 148.69 156.6 141 138.62 124.5 120.18 131.04 130.54 146.18 153.79 164.64 Efficiency of water heater (217)m= 86.07 85.74 84.92 83.06 80.83 79.8 79.8 79.8 79.8 83.33 85.28 86.19 Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 195.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01
Output from water heater (calculated above) 168.49
168.49 148.69 156.6 141 138.62 124.5 120.18 131.04 130.54 146.18 153.79 164.64 Efficiency of water heater (217)m= 86.07 85.74 84.92 83.06 80.83 79.8 79.8 79.8 83.33 85.28 86.19 Fuel for water heating, kWh/month (219)m= (64)m x 100 ÷ (217)m (219)m= 195.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01
Efficiency of water heater 79.8 (217)m= 86.07 85.74 84.92 83.06 80.83 79.8 79.8 79.8 79.8 83.33 85.28 86.19 (2187)m= (64)m x 100 ÷ (217)m (219)m= (95.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01
(217)m= 86.07 85.74 84.92 83.06 80.83 79.8 79.8 79.8 79.8 83.33 85.28 86.19 Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 195.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m= 195.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01
$ (219)m = (64)m \times 100 \div (217)m $ $ (219)m = 195.75 173.41 184.41 169.76 171.5 156.02 150.6 164.21 163.59 175.43 180.34 191.01 $
$10iai = 5uin(219a)_{112} = 2076.02 $ (21)
Annual totals kWh/vear kWh/vear
Annual totals kWh/year kWh/year Space heating fuel used, main system 1 1361.71
Water heating fuel used 2076.02
Electricity for pumps, fans and electric keep-hot
central heating pump:
boiler with a fan-assisted flue
Total electricity for the above, kWh/year sum of (230a)(230g) = 75 (23
Electricity for lighting 241.09 (23
12a. CO2 emissions – Individual heating systems including micro-CHP
Energy Emission factor Emissions kWh/year kg CO2/kWh kg CO2/year
Space heating (main system 1) $(211) \times 0.216 = 294.13$ (26)
204.10 (25)
Space and water heating $(261) + (262) + (263) + (264) =$ 742.55

Electricity for pumps, fans and electric keep-hot $(231) \times (232) \times (2$

 $TER = 17.94 \tag{273}$