Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:53:51

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 54.6m² Plot Reference: Plot 41 Site Reference : Hermitage Lane

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))

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

Dwelling Carbon Dioxide Emission Rate (DER) 10.41 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 34.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 29.8 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.14 (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)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	ОК
Summertime temperature		
Overheating risk (Thames valley):	Medium	ок
sed on:		
Overshading:	Average or unknown	
Windows facing: South East	8.65m²	
Ventilation rate:	4.00	

 $3.0 \text{ m}^3/\text{m}^2\text{h}$

Air permeablility

Photovoltaic array

Community heating, heat from boilers - mains gas

		1	lear D	etails:						
	7 1:10 1 6	C						OTDO	.004000	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	2		Stroma Softwa	-				001082 on: 1.0.5.9	
Software Name.	Ottoma i OAI 2012			Address:		SIUII.		VCISIO	71. 1.0.5.5	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4 -)		ight(m)	1 (0-)	Volume(m³	_
					(1a) x	2	2.5	(2a) =	136.49	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e))+(1n)	5	54.6	(4)					_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	136.49	(5)
2. Ventilation rate:	main se	condary		other		total			m³ per hou	r
N. selven of all leaves a	heating he	eating	_		, –			40	-	_
Number of chimneys	0 +	0	+ _	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0		20 =	0	(6b)
Number of intermittent fa						0	X '	10 =	0	(7a)
Number of passive vents	3					0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	ur
Infiltration due to chimne	vs_flues and fans = (6a	ı)+(6b)+(7a)+	+(7b)+(7	7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended				ontinue fr			. (0) =	0	
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber for resent, use the value corresp				•	uction			0	(11)
deducting areas of openi		oriding to the	e greate	er wan are	a (anter					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1	(seale	d), else	enter 0				0	(12)
If no draught lobby, en									0	(13)
· ·	s and doors draught str	ripped							0	(14)
Window infiltration				0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	250			(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubi	-		•	•	etre or e	rivelope	area	3	(17)
	es if a pressurisation test has					is beina u	sed		0.15	(18)
Number of sides sheltere				, ,	,	J			3	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								_	_
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ∸ 4									
<u> </u>	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
<u> </u>									I	

Calaudate	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14]	
Calculate effe		-	rate for t	he appli	cable ca	se						,	
If mechanicate of the street o			endix N (2	3h) <i>– (2</i> 3a	ı) x Fmv (e	equation (N	NS)) othe	rwise (23h) = (23a)			0.5	(23
If balanced with) = (25a)			0.5	(23
a) If balance		-	•	_					2h\m ı (22h) v [1 (220)	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				l .	l	<u> </u>			ļ -		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h	ouse ex	tract ver	tilation o	or positiv	re input v	ventilatio	n from o	utside				1	
,		(23b), t		•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural					•				-	_	-	-	
	r	en (24d)	· ·		· · ·		 			1	1	1	(0
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			<u> </u>	` `	``	´`		`			1	1	(6
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24]	(2
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros	_	Openin		Net Ar		U-val		AXU		k-value		Χk
lo o ro	area	(m²)	m	2	A ,r		W/m2		(W/	K)	kJ/m²•	K K	J/K
)oors					2	×	1.4	=	2.8	=			(2
Vindows				_	8.651	_	/[1/(1.4)+	0.04] =	11.47	ᆗ ,			(2
Valls Type1	18.7	71 I	8.65		10.06								
V-II- T 0				=		=	0.15	=	1.51	_		╡	=
	31.1	4	2		29.14	=	0.15	= =	4.12				(2
otal area of e	31.1 elements	, m²	2		29.14 49.86	1 x	0.14	=	4.12				(2
otal area of e	31.1	, m² ows, use e	2 ffective with	ndow U-va	29.14 49.86 alue calcul	1 x	0.14	=	4.12	as given in	paragrapl	h 3.2	(2
otal area of e	31.1 elements I roof winder as on both	, m ² ows, use e	2 Iffective winternal wall	ndow U-va	29.14 49.86 alue calcul	x	0.14	= /[(1/U-valu	4.12	as given in	ı paragrapl	h 3.2	(3
otal area of e for windows and * include the area abric heat los	31.1 Plements I roof wind as on both ss, W/K :	, m² ows, use e sides of ir = S (A x	2 Iffective winternal wall	ndow U-va	29.14 49.86 alue calcul	x	0.14	= /[(1/U-valu) + (32) =	4.12				(3
otal area of e for windows and * include the area abric heat los leat capacity	31.1 elements I roof wind as on both ss, W/K: Cm = S(, m ² ows, use e sides of ir = S (A x (A x k)	2 ffective winternal walk	ndow U-va	29.14 49.86 alue calcul	4 ×	0.14	= /[(1/U-valu) + (32) = ((28).	4.12 ue)+0.04] &	2) + (32a).		19.9	(2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
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Total area of ending for windows and the include the area fabric heat loss leat capacity. Thermal mass for design assess and be used inste	31.1 elements froof winder as on both as, W/K: Cm = S(a parame and of a de	, m² ows, use e sides of ir = S (A x (A x k)) tter (TMF) ere the de tailed calcular	2 Iffective winternal walk U) P = Cm ÷ tails of the ulation.	ndow U-va s and pan - TFA) ir construct	29.14 49.86 Alue calcul itions kJ/m²K	4 × Salated using	0.14 g formula 1 (26)(30)	= ((28). Indica	4.12 ue)+0.04] a (30) + (32 tive Value	2) + (32a). : Low	(32e) =	19.9 548.87 100	(3)
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fotal area of ending for windows and include the area fabric heat loss leat capacity. Thermal mass for design assessing the used instead thermal bridged details of thermal fotal fabric hear and the state of the st	31.1 elements I roof wind as on both es, W/K: Cm = S(a parame esments wh ad of a de es: S (L al bridging at loss	, m² ows, use e sides of ir = S (A x (A x k) eter (TMF) ere the de tailed calculation (X Y) calculate (A x Y) calculate	griffective winternal walk U) P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vals and pand - TFA) in constructa	29.14 49.86 alue calcul titions kJ/m²K ion are not	4 × Salated using	0.14 g formula 1 (26)(30)	= /[(1/U-valu) + (32) = ((28). Indicative e indicative	4.12 ue)+0.04] a (30) + (32 tive Value e values of	2) + (32a). : Low : TMP in T	(32e) =	19.9 548.87 100	(3)
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fotal area of ending for windows and area include the area fabric heat loss feat capacity. Thermal mass for design assess and be used insternational bridge details of thermal fotal fabric head fabri	31.1 elements I roof winders on both ess, W/K: Cm = S(experience paramets whe ad of a de ess: S (L elements	, m² ows, use esides of ir = S (A x (A x k) oter (TMF) ere the detailed calculated are not known alculated Mar 11.13 nt, W/K 36.72	general fective winternal walk ternal walk ternal walk ternal walk ternal walk ternal soft the culation. culated to cown (36) = 1 monthly Apr 10.48	ndow U-vels and pand - TFA) in construction using April 20.05 x (3) / May 10.35	29.14 49.86 alue calcul titions kJ/m²K fon are not spendix k 1) Jun 9.69	t known pr	0.14 formula 1 (26)(30) recisely the	= (1/U-value) + (32) = ((28) Indicative) (33) + (38)m Sep 9.95 (39)m 35.54	4.12 1e)+0.04] a (30) + (32) tive Value e values of (36) = = 0.33 × (Oct 10.35 = (37) + (35.94	2) + (32a). : Low : TMP in T (25)m x (5) Nov 10.61 38)m 36.2 Sum(39).	(32e) = Sable 1f Dec 10.87	19.9 548.87 100 5.69 25.59	(3)

Number of days in month (Table 1a)

Numbe	er or day	s in mor	nın (Tab	ie ra)		1	1	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)
						•	•	•		•	•		1	
4 \\/\	tor boot	ing oner	rav roqui	romont:								kWh/ye	oor:	
4. ۷۷	ilei neai	ing ener	rgy requi	rement.								KVVII/yt	sai.	
Assum	ed occu	pancy, I	N								1.	83		(42)
			+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)			
	A £ 13.9	-						(O.F. N.I.)	. 00				ı	
			ater usag						+ 36 a water us	se target o	_	.64		(43)
		_	person per			_	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea			l .			Сор	1 000	1101			
(44)m=	89.8	86.54	83.27	80.01	76.74	73.47	73.47	76.74	80.01	83.27	86.54	89.8		
(11)	00.0	00.01	00.21	00.01	70.7 1	70.17	10.17	10				l	979.65	(44)
Energy o	Total = $Sum(44)_{112}$ = Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)												070.00	
(45)m=	133.17	116.47	120.19	104.79	100.54	86.76	80.4	92.26	93.36	108.8	118.76	128.97		
(10)						000		02:20			m(45) ₁₁₂ =	l	1284.48	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rotar – oa	····(10) 112 -		1201110	
(46)m=	19.98	17.47	18.03	15.72	15.08	13.01	12.06	13.84	14	16.32	17.81	19.35		(46)
	storage	loss:					l	l		l				
Storag	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)					•	
Otherw	ise if no	stored	hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:												
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
			eclared o											
			factor fr		e 2 (kW	h/litre/da	ay)				0.	02		(51)
	nunity n e factor i	_	ee section	on 4.3								00	1	(52)
			m Table	2h							-	.6		(52) (53)
•					oor			(47) v (51)	\ v (E2) v (I	E2) _				, ,
	(50) or (storage	, KVVII/ye	aı			(47) X (51)) x (52) x (55) =	-	03		(54) (55)
	` , , ,	, ,	culated f	or oach	month			((56)m - (55) × (41)ı	m	1.	03		(33)
						1						ı	1	(=a)
(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	dedicated	d solar sto	rage, (57)i	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Append	IX H	
(57)m=	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)
	•	•	culated t			59)m = ((58) ÷ 36	65 × (41)	m				•	
(mod	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss cal	culated	for each	month (61)m =	(60) ± 30	65 x (41)m	-	-	-		•	
(61)m=	0	0	0	0	0	00) + 30	0	0	0	0	0	0		(61)
(3.7/11-	Ŭ	Ŭ				<u>`</u>	<u>`</u>	<u>`</u>		<u>`</u>				()

Total heat required for wat	er he	ating ca	alculated	l fo	r each month	(62)	m =	0.85 × (45)m +	· (46)m +	(57)m +	(59)m + (61)m	
(62)m= 188.45 166.4 17	5.47	158.28	155.82	14	10.26 135.67	147	.53	146.85	164.08	172.26	184.25	1	(62)
Solar DHW input calculated using	g Appe	ndix G or	Appendix	H (negative quantity	/) (ent	ter '0'	if no solar	contribu	ition to wate	er heating)	•	
(add additional lines if FGI	HRS a	and/or V	VWHRS	ар	plies, see Ap	pend	dix G	i)					
(63)m= 0 0	0	0	0		0 0	C		0	0	0	0		(63)
Output from water heater					•			•		•			
(64)m= 188.45 166.4 17	5.47	158.28	155.82	14	10.26 135.67	147	'.53	146.85	164.08	172.26	184.25		
					•		Outp	ut from wa	iter heat	er (annual) ₁	12	1935.32	(64)
Heat gains from water hea	ting,	kWh/mo	onth 0.2	5 ′	[0.85 × (45)m	+ (6	31)m] + 0.8 x	[(46)n	n + (57)m	+ (59)m	1]	
(65)m= 88.5 78.67 84	.18	77.64	77.65	7	1.64 70.95	74	.9	73.84	80.4	82.28	87.1		(65)
include (57)m in calcula	tion o	f (65)m	only if c	ylin	der is in the o	dwell	ling o	or hot wa	ater is	from com	munity h	· neating	
5. Internal gains (see Ta	ble 5	and 5a)):								•		
Metabolic gains (Table 5),	Watt	s											
	/lar	Apr	May	Γ,	Jun Jul	Α	ug	Sep	Oct	Nov	Dec	1	
(66)m= 91.28 91.28 91	.28	91.28	91.28	9	1.28 91.28	91.	.28	91.28	91.28	91.28	91.28		(66)
Lighting gains (calculated	in Apı	pendix I	_, equat	ion	L9 or L9a), a	lso s	ee T	able 5				ı	
	.71	8.11	6.06	_	5.12 5.53	7.1	_	9.65	12.25	14.3	15.24	1	(67)
Appliances gains (calculat	ed in	Append	lix L, eq	uat	ion L13 or L1	3a),	also	see Tab	ole 5			ı	
· · · · · · · · · · · · · · · · · · ·	6.63	147.77	136.59	_	26.08 119.06	117		121.57	130.43	141.61	152.12	1	(68)
Cooking gains (calculated	in Ap	pendix	L, equat	ion	L15 or L15a)	. .), als	o se	e Table	5		<u>l</u>	ı	
 	.13	32.13	32.13	_	2.13 32.13	32.		32.13	32.13	32.13	32.13]	(69)
Pumps and fans gains (Ta	ble 5	 a)		_	ļ			<u>l</u>			<u> </u>	ı	
· - · · · · · · · · · · · · · · · · · ·	0	0	0		0 0	C		0	0	0	0	1	(70)
Losses e.g. evaporation (r	egati	ve valu	es) (Tab	le s	5)	I						ı	
	3.02	-73.02	-73.02	_	3.02 -73.02	-73	.02	-73.02	-73.02	-73.02	-73.02	1	(71)
Water heating gains (Table	e 5)			<u> </u>	I .			!		<u> </u>	<u>!</u>	ı	
(72)m= 118.95 117.07 113	<u> </u>	107.83	104.37	9	95.37	100	0.67	102.55	108.06	114.28	117.08]	(72)
Total internal gains =	!				(66)m + (67)m	<u> </u>						ı	
	0.88	314.09	297.41	28	31.09 270.34	275	5.65	284.15	301.12	320.58	334.82]	(73)
6. Solar gains:													
Solar gains are calculated using	g solar	flux from	Table 6a	and	associated equa	tions	to co	nvert to the	e applica	ıble orientat	ion.		
Orientation: Access Fact	or	Area			Flux			g_		FF		Gains	
Table 6d		m²			Table 6a		Ta	able 6b	-	Table 6c		(W)	
Southeast 0.9x 0.77	X	8.6	5	x	36.79	x		0.63	x [0.7	=	97.28	(77)
Southeast 0.9x 0.77	x	8.6	5	x	62.67	x		0.63	x	0.7	_	165.7	(77)
Southeast 0.9x 0.77	X	8.6	5	x	85.75	x		0.63	_ x [0.7	-	226.72	(77)
Southeast 0.9x 0.77	x	8.6	5	x [106.25	x		0.63	x_[0.7	=	280.91	(77)
Southeast 0.9x 0.77	X	8.6	5	x	119.01	x		0.63	_ x [0.7	=	314.65	(77)
Southeast 0.9x 0.77	X	8.6	5	x	118.15	x		0.63		0.7		312.37	(77)
Southeast 0.9x 0.77	x	8.6	5	x	113.91	x		0.63	= x [0.7		301.16	(77)
Southeast 0.9x 0.77	X	8.6	5	x	104.39	x		0.63		0.7	=	275.99	(77)

Southea	ast _{0.9x}	0.77	Х	8.6	65	x	9	2.85	X		0.63	x	0.7	=	245.49	(77)
Southea	ast _{0.9x}	0.77	х	8.6	65	x	6	9.27	X		0.63	x	0.7	=	183.13	(77)
Southea	ast _{0.9x}	0.77	Х	8.6	65	x	4	4.07	х		0.63	x	0.7		116.52	(77)
Southea	ast _{0.9x}	0.77	x	8.6	65	x	3	31.49	x		0.63	x	0.7	=	83.25	(77)
	_															
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m=	97.28	165.7	226.72	280.91	314.65	3	12.37	301.16	275	.99	245.49	183.13	116.52	83.25		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts					•	•	•	
(84)m=	440.59	507.12	557.6	595.01	612.05	5	93.46	571.5	551.	.64	529.64	484.26	437.09	418.07		(84)
7. Me	an inter	nal temp	erature	(heating	season)			•							
		•	eating p	`		<u> </u>	area f	from Tal	ole 9.	. Th	1 (°C)				21	(85)
•		•	ains for l			_			,	,	()					` ′
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	1	
(86)m=	0.9	0.85	0.77	0.66	0.52	╁	0.37	0.27	0.2	 	0.45	0.68	0.84	0.91		(86)
` ′ [<u> </u>								
Ī			ature in			_		i				00.00	00.47		1	(07)
(87)m=	20.13	20.36	20.6	20.82	20.94		20.99	21	2'	1	20.97	20.82	20.47	20.09		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	able 9	9, Tr	n2 (°C)				,	
(88)m=	20.36	20.36	20.37	20.38	20.38	2	20.39	20.39	20.	39	20.38	20.38	20.37	20.37		(88)
Utilisa	ition fac	tor for g	ains for	rest of d	welling,	h2	,m (se	e Table	9a)							
(89)m=	0.89	0.83	0.75	0.63	0.49		0.34	0.23	0.2	25	0.41	0.65	0.83	0.9		(89)
Mean	interna	l temner	ature in	the rest	of dwell	ina	T2 (f	ollow ste	ns 3	to 7	7 in Tahl	e 9c)	•		•	
(90)m=	19.2	19.52	19.85	20.15	20.31	Ť	20.38	20.39	20.		20.36	20.17	19.69	19.15]	(90)
` ′ [<u> </u>				!	f	LA = Livir	ng area ÷ (<u>1</u> 4) =	0.48	(91)
							` .		/4		A) TO					_ `
	19.64	19.92	ature (fo	r tne wn 20.47	ole dwe	$\overline{}$						20.48	20.06	19.6	1	(92)
(92)m=			20.21			<u> </u>	20.67	20.68	20.0		20.65		20.06	19.0		(32)
(93)m=	19.64	19.92	he mean 20.21	20.47	20.61	_	20.67	20.68	20.0		20.65	20.48	20.06	19.6	1	(93)
` ′			uirement		20.01		.0.07	20.00	20.	00	20.00	20.40	20.00	19.0		(00)
•		·			re ohtair	ned	l at eta	an 11 of	Tahl	ے Oh	so tha	t Ti m-/	76)m an	d re-cald	rulate	
			or gains			100	at ott	ор 11 OI	Tubi	0 01), 50 tila		7 Ojiii aii	a ro oak	diato	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	:										•	_	
(94)m=	0.88	0.82	0.75	0.63	0.5		0.36	0.25	0.2	27	0.43	0.66	0.82	0.89		(94)
Usefu	l gains,	hmGm ,	, W = (9 ²	1)m x (8	4)m											
(95)m=	385.74	416.95	416.77	377.78	306.61	2	11.38	143.34	149	.65	227.17	317.68	357.72	371.57		(95)
Month	ly aver	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 I	oss rate	for mea	an intern	al tempe	erature,	Lm	ı , W =	=[(39)m	x [(93	3)m-	– (96)m]			,	
(97)m=	567.46	553.4	503.32	417.31	320.1	2	14.05	143.86	150	.36	232.81	355.1	469.14	561.3		(97)
Space		g require	ement fo	r each n	nonth, k	Wh	/mont	th = 0.02	24 x [(97)	m – (95)m] x (4	1)m		1	
(98)m=	135.2	91.69	64.4	28.46	10.03		0	0	0		0	27.84	80.22	141.15		_
										Total	per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	579	(98)
Space	e heatin	g require	ement in	kWh/m²	/year										10.61	(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			(301)
		0	_՝ ՝
Fraction of space heat from community system 1 – (301) =	is far CHP and up to four other heat sources: the	1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See a		e latter	
Fraction of heat from Community boilers		1	(303a)
Fraction of total space heat from Community boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating	_	kWh/yea	r_
Annual space heating requirement	Ĺ	579	_
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	607.95	(307a)
Efficiency of secondary/supplementary heating system in % (from T	able 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating	_		_
Annual water heating requirement If DHW from community scheme:	L	1935.32	
Water heat from Community boilers	(64) x (303a) x (305) x (306) =	2032.09	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	26.4	(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	189.41	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Γ	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	189.41	(331)
Energy for lighting (calculated in Appendix L)	Ī	261.91	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	Ī	-551.64	(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	606.65	(367)
Electrical energy for heat distribution [(313	3) x 0.52 =	13.7	(372)
Total CO2 associated with community systems (363)(366) + (368)(372)	620.35	(373)
CO2 associated with space heating (secondary) (309		0	(374)
1 3 ()	, <u> </u>		(- · ·)

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)	=			620.35	(376)
CO2 associated with electricity for pun	nps and fans within dw	elling (331)) x	0	.52	=	98.31	(378)
CO2 associated with electricity for ligh	ting	(332))) x	0	.52	=	135.93	(379)
Energy saving/generation technologies	s (333) to (334) as app	licable	_	-	_		,
Item 1			0.52	x 0.01	=	-286.3	(380)
Total CO2, kg/year	sum of (376)(382) =					568.28	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =					10.41	(384)
El rating (section 14)						92.35	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 41

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: No Number of storeys: 1

Front of dwelling faces: North East

Overshading: Average or unknown

None

Thermal mass parameter: Indicative Value Low

False

Blinds, curtains, shutters:

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

Overheating Details:

Summer ventilation heat loss coefficient: 180.17 (P1)

Transmission heat loss coefficient: 25.6

Summer heat loss coefficient: 205.76 (P2)

Overhangs:

Overhangs:

Night ventilation:

Orientation: Ratio: Z_overhangs:

South East (SE) 0 1

Solar shading:

Orientation:Z blinds:Solar access:Overhangs:Z summer:South East (SE)10.910.9

Color going

Orientation FF Area Flux Shading Gains g_{-} 119.92 0.9 370.59 South East (SE) 0.9 x0.63 8.65 0.7 **Total** 370.59 (P3/P4)

Internal gains:

June July **August** 378.16 Internal gains 384.77 371.18 773.79 741.77 (P5) Total summer gains 723.87 Summer gain/loss ratio 3.76 3.52 (P6) 3.61 Mean summer external temperature (Thames valley) 16 17.9 17.8 Thermal mass temperature increment 1.3 1.3 1.3 (P7) Threshold temperature 21.06 22.81 22.62 Likelihood of high internal temperature Slight Medium Medium

Assessment of likelihood of high internal temperature: Medium

		5							
		User D	etails:						
Assessor Name:	Zahid Ashraf		Strom					0001082	
Software Name:	Stroma FSAP 2012	roperty /	Softwa		rsion:		versic	on: 1.0.5.9	
Address :	·	Toperty /	Address	. 1101 41					
1. Overall dwelling dime	nsions:								
		Area	a(m²)		Av. He	ight(m)	_	Volume(m³)	<u>) </u>
Ground floor		Ę	54.6	(1a) x	2	2.5	(2a) =	136.49	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	54.6	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	136.49	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	٢
Number of chimneys	0 + 0	+	0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	Ī = Ē	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			_ 	2	x ·	10 =	20	(7a)
Number of passive vents				F	0	x ·	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X 4	40 =	0	
C				L					` ′
							Air ch	nanges per ho	ur
•	ys, flues and fans = $(6a)+(6b)+(6b)$				20		÷ (5) =	0.15	(8)
If a pressurisation test has b Number of storeys in the	een carried out or is intended, procee	ed to (17), o	otherwise (continue fr	rom (9) to	(16)			٦,0)
Additional infiltration	ie dweiling (ris)					[(9)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 for	r masoni	y constr	uction	1(0)		0	(11)
• • • • • • • • • • • • • • • • • • • •	resent, use the value corresponding to	o the great	er wall are	a (after					_
deducting areas of openir If suspended wooden f	ngs);	.1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(,,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	, , ,	, , ,	, ,		0	(16)
•	q50, expressed in cubic metre	•	•	•	etre of e	envelope	area	3	(17)
•	ity value, then $(18) = [(17) \div 20] + (18)$ is if a pressurisation test has been do.				is beina u	sed		0.3	(18)
Number of sides sheltere			y					3	(19)
Shelter factor			(20) = 1 -	[0.075 x (1	19)] =			0.78	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.23	(21)
Infiltration rate modified for	- 1 	T				·		1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		1 00	l 0.7		l 40	1 45	T 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	J	
Wind Factor (22a)m = $(22a)$ 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 infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.29	0.29	0.28	0.25	0.25	0.22	0.22	0.21	0.23	0.25	0.26	0.27		
Calculate effe		•	rate for t	he appli	cable ca	se	ı				•	Г	
If mechanica			andiv N. (2	2h) _ (22a) v Emy (c	auation (N	JE)) otho	ruino (22h) - (22a)			0	(23a)
If exhaust air h) = (23a)			0	(23b)
If balanced with		•	•	Ū		`			21.)	001) [4 (00.)	0	(23c)
a) If balance							- ´ ` -	,	 		1 ` ´	÷ 100] I	(240)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance							- ´ ` -		<u> </u>			1	(0.41)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)r	nouse ex n < 0.5 ×			•	•				.5 × (23b)		_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)r	ventilation = 1, the			•					0.5]			•	
(24d)m= 0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54		(24d
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.54		(25)
3. Heat losse	s and he	eat loss r	naramete	or.									
ELEMENT	Gros	·	Openin		Net Ar	A 2	U-valı	IA	AXU		k-value	۵	A X k
LLLIVILIAI	area		m		A ,r		W/m2		(W/I	<)	kJ/m²·l		kJ/K
Doors					2	х	1.4	=	2.8				(26)
Windows					8.651	x1,	/[1/(1.4)+	0.04] =	11.47				(27)
Walls Type1	18.7	' 1	8.65		10.06	x	0.15		1.51	<u> </u>			(29)
Walls Type2	31.1	4	2		29.14	x	0.14	=	4.12	=			(29)
Total area of e	elements	 , m²			49.86								(31)
* for windows and			ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	n 3.2	()
** include the area						_							
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				19.9	(33)
Heat capacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a)	(32e) =	548.87	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	ı kJ/m²K			Indica	tive Value:	Low		100	(35)
For design assess				constructi	ion are not	known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
can be used inste					البناءمم	,							
The arrow of the states		V/\ aal										5.69	(36)
Thermal bridge					-	`						0.00	` ′
if details of therma	al bridging				-	`		(33) +	(36) =				
if details of therma	al bridging eat loss	are not kn	own (36) =	= 0.05 x (3	-	`			(36) = = 0.33 × (25)m x (5)	25.59	(37)
if details of thermal Total fabric he Ventilation hea	al bridging eat loss at loss ca	are not kn	own (36) =	= 0.05 x (3	1)		Aug	(38)m	= 0.33 × (
if details of therma Total fabric he Ventilation hea	al bridging eat loss at loss ca Feb	are not kn alculated Mar	own (36) = monthly Apr	= 0.05 x (3 / May	Jun	Jul	Aug 23.54	(38)m Sep	= 0.33 × (Nov	Dec		
Total fabric he Ventilation hea Jan (38)m= 24.45	eat loss cat	are not kn alculated Mar 24.31	own (36) =	= 0.05 x (3	1)		Aug 23.54	(38)m Sep 23.71	= 0.33 × (Oct 23.9	Nov 24.03			(37)
Total fabric heventilation head (38)m= 24.45 Heat transfer of	eat loss cat loss coefficier	are not kn alculated Mar 24.31 nt, W/K	own (36) = monthly	= 0.05 x (3 / May 23.9	Jun 23.59	Jul 23.59	23.54	(38)m Sep 23.71 (39)m	$= 0.33 \times ($ Oct 23.9 $= (37) + ($	Nov 24.03 38)m	Dec 24.16		(37)
Total fabric he Ventilation hea Jan (38)m= 24.45	eat loss cat	are not kn alculated Mar 24.31	own (36) = monthly Apr	= 0.05 x (3 / May	Jun	Jul	⊢ <u> </u>	(38)m Sep 23.71 (39)m 49.3	= 0.33 × (Oct 23.9 = (37) + (34)	Nov 24.03 38)m 49.61	Dec 24.16 49.75	25.59	(37)
Total fabric heventilation head (38)m= 24.45 Heat transfer of	eat loss cat los cat loss cat loss cat los cat loss cat loss cat loss cat loss cat loss cat loss cat l	Mar 24.31 nt, W/K 49.89	own (36) = I monthly Apr 23.96	= 0.05 x (3 / May 23.9	Jun 23.59	Jul 23.59	23.54	(38)m Sep 23.71 (39)m 49.3	$= 0.33 \times ($ Oct 23.9 $= (37) + ($	Nov 24.03 38)m 49.61 Sum(39)	Dec 24.16 49.75		(37)
Total fabric he Ventilation hea (38)m= 24.45 Heat transfer (39)m= 50.04	eat loss cat los cat loss cat loss cat los cat loss cat loss cat loss cat loss cat loss cat loss cat l	Mar 24.31 nt, W/K 49.89	own (36) = I monthly Apr 23.96	= 0.05 x (3 / May 23.9	Jun 23.59	Jul 23.59	23.54	(38)m Sep 23.71 (39)m 49.3	= 0.33 × (Oct 23.9 = (37) + (349.48) Average =	Nov 24.03 38)m 49.61 Sum(39)	Dec 24.16 49.75	25.59	(37)

Number of days in month (Table 1a)

INUITIDE	ei oi day		illi (Tabi	e ia)		1	1	T	T .	ı	, ,		I	
	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	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear.	
1. ***	itor riout	ing ono	igy roqui	romone.								Tevvii, y	Jul.	
		ipancy, l				/						83		(42)
	A > 13.9 A £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	.9)			
		•	ater usag	ne in litre	s per da	av Vd av	erage =	(25 x N)	+ 36		81	.64		(43)
	_		hot water	•	•	•	_	` ,		se target o		.04		(40)
not more	e that 125	litres per p	person per	day (all w	ater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ch month	Vd,m = fa	ctor from	Table 1c x	(43)	•		•		l	
(44)m=	89.8	86.54	83.27	80.01	76.74	73.47	73.47	76.74	80.01	83.27	86.54	89.8		
									-	rotal = Su	m(44) ₁₁₂ =		979.65	(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	nth (see Ta	ables 1b, 1	c, 1d)		_
(45)m=	133.17	116.47	120.19	104.79	100.54	86.76	80.4	92.26	93.36	108.8	118.76	128.97		
						I	I			rotal = Su	m(45) ₁₁₂ =	-	1284.48	(45)
If instant	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)
Water	storage	loss:									<u> </u>			
Storag	e volum	e (litres)	includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel	(0		(47)
If comr	munity h	eating a	ınd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherw	vise if no	stored	hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage													
a) If m	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):				(0		(48)
Tempe	erature f	actor fro	m Table	2b							(0		(49)
• • • • • • • • • • • • • • • • • • • •			storage	-				(48) x (49)) =		(0		(50)
			eclared o										ı	
			factor free section		e∠(KVV	n/litre/da	iy)					0		(51)
	-	from Ta		311 4.3								0		(52)
			m Table	2b								0		(52)
-			storage		aar			(47) v (51)) x (52) x (53) -				
• • • • • • • • • • • • • • • • • • • •		(54) in (5	_	, KVVII/y	Jai			(47) X (31)) X (32) X (55) =	—	0		(54) (55)
	` '	. , .	culated f	or each	month			((56)m - ((55) × (41)	m		0		(55)
ı													I	(=0)
(56)m=	0	0	0	0	0 (50)	0	0	0	0 (50)	0	0	0	5.11	(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)i	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Append	IX H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	m Table	9 3							0		(58)
	•	•	culated f			59)m = ((58) ÷ 36	65 × (41)	m				l	
	-		rom Tabl		,	•	. ,	, ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Cambi	loss ac	lanlatad	for each	month /	'61\m -	(60) · 3(35 v (41)	\m	!				1	
(61)m=	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	o each	0	0	0 - 30	0	0	0	0	0	0		(61)
(01)111=	U	U	I ^o	U	U	I ^U	I ^U	I ^U	I ^U	l ⁰	L	U		(01)

Total heat required for wa	ter he	eating ca	lculated	l for	each month	(62)r	n = 0.85 x	(45)m	+ (46)m +	(57)m +	(59)m + (61)m	
 	02.16	89.07	85.46		.75 68.34	78.4		``	- 	109.63]	(62)
Solar DHW input calculated usin	ng Appe	endix G or	Appendix	H (n) (ente	er '0' if no so	lar contrib	I ution to wate	r heating)		
(add additional lines if FG										0,		
(63)m= 0 0	0	0	0		0 0	0		0	0	0		(63)
Output from water heater											l	
· — — —	02.16	89.07	85.46	73	.75 68.34	78.4	12 79.36	92.48	100.95	109.63		
						(Output from	water hea	ter (annual) ₁	12	1091.81	(64)
Heat gains from water hea	ating,	kWh/mo	onth 0.2	5 ´[0.85 × (45)m	+ (6	1)m] + 0.8	3 x [(46)ı	n + (57)m	+ (59)m]	_
(65)m= 28.3 24.75 25	5.54	22.27	21.37	18	.44 17.08	19.	6 19.84	23.12	25.24	27.41		(65)
include (57)m in calcula	ation o	of (65)m	only if c	ylin	der is in the o	dwelli	ng or hot	water is	from com	munity h	neating	
5. Internal gains (see Ta	able 5	and 5a)):									
Metabolic gains (Table 5)	. Watt	S										
	Mar	Apr	May	J	un Jul	Αι	ıg Sep	Oct	Nov	Dec		
(66)m= 91.28 91.28 9	1.28	91.28	91.28	91	.28 91.28	91.2	28 91.28	91.28	91.28	91.28		(66)
Lighting gains (calculated	in Ap	pendix l	_, equat	ion l	L9 or L9a), a	lso se	ee Table 5	5	•		•	
(67)m= 14.83 13.17 1	0.71	8.11	6.06	5.	12 5.53	7.1	9 9.65	12.25	14.3	15.24		(67)
Appliances gains (calcula	ted in	Append	lix L, eq	uatio	on L13 or L1:	3a), a	also see T	able 5			•	
(68)m= 159.14 160.8 15	6.63	147.77	136.59	120	6.08 119.06	117.	41 121.57	7 130.4	3 141.61	152.12		(68)
Cooking gains (calculated	l in Ap	pendix	L, equat	ion	L15 or L15a)	, also	see Tab	le 5	-	-		
(69)m= 32.13 32.13 3:	2.13	32.13	32.13	32	.13 32.13	32.1	13 32.13	32.13	32.13	32.13		(69)
Pumps and fans gains (Ta	able 5	a)					-	-	•		•	
(70)m= 0 0	0	0	0		0 0	0	0	0	0	0		(70)
Losses e.g. evaporation (negati	ive valu	es) (Tab	le 5)							
(71)m= -73.02 -73.02 -7	3.02	-73.02	-73.02	-73	3.02 -73.02	-73.0	02 -73.02	-73.02	2 -73.02	-73.02		(71)
Water heating gains (Tab	le 5)										-	
(72)m= 38.04 36.83 3	4.33	30.93	28.72	25	.61 22.96	26.3	35 27.55	31.08	35.05	36.84		(72)
Total internal gains =					(66)m + (67)m	+ (68)m + (69)m	+ (70)m +	(71)m + (72))m	-	
(73)m= 262.39 261.18 25	52.06	237.19	221.75	20	7.19 197.93	201.	33 209.15	224.1	1 241.34	254.58		(73)
6. Solar gains:												
Solar gains are calculated usin	•		Table 6a	and a	•	tions t	o convert to	the applic		tion.		
Orientation: Access Fact Table 6d	tor	Area m²			Flux Table 6a		g_ Table 6	b	FF Table 6c		Gains (W)	
Southeast 0.9x 0.77	x	8.6	5	х	36.79	x	0.63	х	0.7	=	97.28	(77)
Southeast 0.9x 0.77	x	8.6	5	x	62.67	х	0.63	x	0.7	=	165.7	(77)
Southeast 0.9x 0.77	×	8.6	5	x F	85.75	х	0.63	x	0.7	-	226.72	(77)
Southeast 0.9x 0.77	x	8.6	5	x [106.25	х	0.63	x	0.7		280.91	(77)
Southeast 0.9x 0.77	X	8.6	5	x [119.01	х	0.63	X	0.7		314.65	(77)
Southeast 0.9x 0.77	x	8.6	5	x [118.15	х	0.63	x	0.7		312.37	(77)
Southeast 0.9x 0.77	X	8.6	5	x [113.91	x	0.63	x	0.7	=	301.16	(77)
Southeast 0.9x 0.77	X	8.6	5	x [104.39	x	0.63	X	0.7	=	275.99	(77)

Southea	ast _{0.9x}	0.77	x	8.6	35	x	92.85	x	0.63	x [0.7	=	245.49	(77)
Southea	ast _{0.9x}	0.77	x	8.6	S5	x	69.27	x	0.63	x	0.7	=	183.13	(77)
Southea	ast _{0.9x}	0.77	x	8.6	35	x	44.07	x	0.63	х	0.7	=	116.52	(77)
Southea	ast _{0.9x}	0.77	x	8.6	S5	x	31.49	x	0.63	x	0.7	=	83.25	(77)
	_							_						
Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = 3	Sum(74)m .	(82)m				
(83)m=	97.28	165.7	226.72	280.91	314.65	312.3	7 301.16	275.99	245.49	183.13	116.52	83.25]	(83)
Total ga	ains – ir	nternal a	nd solar	(84)m =	= (73)m ·	+ (83)r	n , watts	•	•	•	•	•	•	
(84)m=	359.67	426.88	478.78	518.11	536.4	519.5	6 499.09	477.32	454.64	407.27	357.86	337.83		(84)
7. Mea	an inter	nal temp	erature	(heating	season)								
				`		,	a from Ta	ble 9, Tl	n1 (°C)				21	(85)
•		_	•			•	Table 9a)	,	()					`
[Jan	Feb	Mar	Apr	May	Jur	– – –	Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.95	0.93	0.88	0.8	0.69	0.55	+	0.45	0.64	0.83	0.93	0.96		(86)
\				l: ::		. !!		1 Tab	I- 0-)	!	!	!	1	
Г		19.54	19.92		20.68	20.89	teps 3 to 20.96	20.95	 	20.37	19.73	19.18	1	(87)
(87)m=	19.25	19.54	19.92	20.35	20.00	20.68	20.96	20.95	20.82	20.37	19.73	19.16	J	(07)
Tempe	erature	during h	eating p	eriods ir	rest of		ng from Ta	able 9, 7	h2 (°C)				1	
(88)m=	20.15	20.15	20.16	20.16	20.16	20.17	20.17	20.17	20.16	20.16	20.16	20.16		(88)
Utilisa	tion fac	tor for g	ains for ı	rest of d	welling,	h2,m (see Table	9a)						
(89)m=	0.95	0.92	0.87	0.78	0.65	0.49	0.34	0.37	0.58	0.81	0.92	0.96		(89)
Mean	internal	temper	ature in	the rest	of dwelli	na T2	(follow ste	ens 3 to	7 in Tab	le 9c)	•	•	•	
(90)m=	18.54	18.83	19.2	19.61	19.92	20.1	20.15	20.14	20.04	19.64	19.02	18.48]	(90)
` ′ L										L fLA = Livir	l ng area ÷ (4	4) =	0.48	(91)
						\		,, ,	. A) TO					」 `
Г			<u> </u>				: fLA × T1	'	- 	1	1 40.00	1 40.04	1	(92)
(92)m= [18.88	19.17	19.55	19.96	20.28	20.47		20.53	20.41	19.99	19.36	18.81	J	(92)
(93)m=	18.88	19.17	ne mean 19.55	19.96	20.28	20.47	rom Table	20.53	ere appro	19.99	19.36	18.81	1	(93)
					20.28	20.47	20.54	20.53	20.41	19.99	19.36	10.01	J	(93)
•		·	uirement		ro obtoir	od at	step 11 of	: Tabla (h so tha	ot Ti m_/	76)m an	d ro cal	culato	
			or gains			ieu ai	ыер п о	i able s	D, 50 III	u 11,111=(70)III ali	u re-cai	Julate	
Γ	Jan	Feb	Mar	Apr	May	Jur	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilisa	tion fac	tor for g	ains, hm	•				<u> </u>	·				1	
(94)m=	0.94	0.9	0.85	0.77	0.66	0.51	0.37	0.41	0.6	0.8	0.91	0.95]	(94)
Useful	l gains,	hmGm ,	, W = (94	1)m x (8	4)m		•		•	•	•	•	•	
(95)m=	336.8	385.28	408.36	400.63	353.57	265.3	9 186.98	194.13	271.77	325.78	324.52	319.28]	(95)
Month	ly avera	age exte	rnal tem	perature	from Ta	able 8	•	•	•	•	•	•	•	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat l	oss rate	for mea	an intern	al tempe	erature,	Lm , V	/ =[(39)m	x [(93)n	n– (96)m]			_	
(97)m=	729.52	713.03	650.97	548.1	424.69	288.9	2 193.7	202.94	311.1	464.73	608.1	726.89		(97)
Space	heatin	g require	ement fo	r each n	nonth, k	/Vh/mc	onth = 0.02	24 x [(97	7)m – (95)m] x (4	1)m		-	
(98)m=	292.18	220.25	180.51	106.18	52.92	0	0	0	0	103.38	204.17	303.26		
								Tot	al per year	(kWh/yea	r) = Sum(9	18) _{15,912} =	1462.85	(98)
Space	heating	g require	ement in	kWh/m²	²/year								26.79	(99)

8c. Sp	oace co	oling rec	quiremer	nt										
Calcu	lated fo	r June, c	July and	August.	See Tal	ole 10b							•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	Lm (ca	lculated	using 2	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)	•	
(100)m=	0	0	0	0	0	462.32	363.95	373.36	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm										•	
(101)m=	0	0	0	0	0	0.87	0.92	0.91	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	Vatts) = ((100)m x	(101)m	_					_		•	
(102)m=	0	0	0	0	0	404.07	333.94	338.05	0	0	0	0		(102)
Gains	(solar (gains ca	lculated	for appli	cable we	eather re	gion, se	e Table	10)				•	
(103)m=	0	0	0	0	0	675.98	650.78	626.43	0	0	0	0		(103)
•		•	<i>ement fo</i> (104)m <			lwelling,	continuo	ous (kW	h') = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
(104)m=	0	0	0	0	0	195.77	235.73	214.56	0	0	0	0		
<u>'</u>									Total	= Sum(104)	=	646.06	(104)
Cooled	I fraction	า							f C =	cooled	area ÷ (4	1) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)		•					•	•		_
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	l = Sum((104)	=	0	(106)
		requirer	ment for	month =	(104)m								I	
(107)m=	0	0	0	0	0	48.94	58.93	53.64	0	0	0	0		_
									Total	= Sum(107)	=	161.52	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	/ear				(107)	÷ (4) =			2.96	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Energy	y Efficier	псу						(99)	+ (108) =	=		29.75	(109)

SAP Input

Property Details: Plot 41

Address:

Located in: England Region: Thames valley

UPRN:

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

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

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

PCDF Version: 466

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Living area: 26.035 m² (fraction 0.477)

Front of dwelling faces: North East

Opening types:

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

NE Manufacturer Solid

SE Manufacturer Windows double-glazed Yes

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

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

NECorridor WallNorth East00SEExternal WallSouth East00

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>ts</u>						
External Wall	18.714	8.65	10.06	0.15	0	False	N/A
Corridor Wall	31.142	2	29.14	0.15	0.4	False	N/A

Internal Elements
Party Elements

Thermal bridges:	User-defined (individual PSI-values) Y-Value =	0.114

Thermal bridges	:	User-define	d (individual P	SI-values)	Y-Value = 0.114
· ·		Length	Psi-value	.	
		4.795	0.289	E2	Other lintels (including other steel lintels)
		13.2	0.047	E4	Jamb
		34.382	0.062	E7	Party floor between dwellings (in blocks of flats)
	[Approved]	2.9	0.06	E18	Party wall between dwellings

SAP Input

	8.7	0.106	E25	Staggered party wall between dwellings
[Approved]	5.8	0.09	E16	Corner (normal)
[Approved]	2.9	-0.09	E17	Corner (inverted internal area greater than external area)
	2.384	0.08	E24	Eaves (insulation at ceiling level - inverted)
	20.44	0	P3	Intermediate floor between dwellings (in blocks of flats)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

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

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

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

Central heating pump: 2013 or later

Design flow temperature: Unknown

Boiler interlock: Yes

Main heating Control:

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

thermostats

Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

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

Others:

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

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.67

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		User_[Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		roperty	Address	: Plot 41					
Address :									
1. Overall dwelling dime	ensions:	Λ να	a(m2)		Av. He	iaht/m	`	Valuma/m³	81
Ground floor		Are	ea(m²) 54.6	(1a) x		2.5) (2a) =	Volume(m ³	(3a)
Total floor area TFA – (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	54.6	(4)				100.10	(227)
	a)1(10)1(10)1(10)1(10)1(1	''/	54.0	J)	4) 1 (30) 1	(2n) -		7
Dwelling volume				(3a)+(3b)+(3c)+(3c	a)+(3e)+	(311) =	136.49	(5)
2. Ventilation rate:	main seconda	ırv	other		total			m³ per hou	ır
Number of alligners	heating heating			- 		<u> </u>	(40 =	-	_
Number of chimneys	0 + 0	_ +	0	_	0			0	(6a)
Number of open flues	0 + 0	+	0	_ = [0		(20 =	0	(6b)
Number of intermittent fa	ins				2	,	(10 =	20	(7a)
Number of passive vents	3				0)	(10 =	0	(7b)
Number of flueless gas f	ires				0)	40 =	0	(7c)
							Air ch	anges per he	SUP.
Lefthand and a familiar as	(Oz) (Ob)	(7 -) . (7 5) .	(7-)	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+ neen carried out or is intended, proce			continue fi	20 rom (9) to 1	(16)	÷ (5) =	0.15	(8)
Number of storeys in t		ou to (11),	ourier wide (oonanao n	0111 (0) 10 ((10)		0	(9)
Additional infiltration						[(9	9)-1]x0.1 =	0	(10)
	.25 for steel or timber frame of			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding	to the grea	iter wall are	a (after					
=	floor, enter 0.2 (unsealed) or ().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					0	(15)
Infiltration rate					12) + (13)			0	(16)
	q50, expressed in cubic metrility value, then $(18) = [(17) \div 20] +$	•	•	•	etre of e	envelop	e area	5	(17)
•	es if a pressurisation test has been do				is being u	sed		0.4	(18)
Number of sides sheltered			,	,	Ü			3	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.78	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18	s) x (20) =				0.31	(21)
Infiltration rate modified f		1	1	•	•			1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	 	1	_					1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.35	0.36		
Calculate effe		_	rate for t	he appli	cable ca	se	!	!					
If mechanic			or d'or NL (O	OL) (OO-)IE\\ - (b -		\ (00-\			0	(23a
If exhaust air h		0		, ,	,	. `	,, .	,) = (23a)			0	(23b
If balanced wit		•	•	J		`		,				0	(23c
a) If balance	1					- ` ` - 	HR) (24a	ŕ	, 		1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a
b) If balance	ed mecha	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b	p)m = (22)	2b)m + (2	23b)	1	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h if (22b)r	nouse ex m < 0.5 ×				•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)r	ventilation = 1, the			•					0.5]			•	
(24d)m = 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	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	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57		(25)
3. Heat losse	s and he	eat loss r	naramete	ōt.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	IE.	AXU		k-value	<u> </u>	ΑΧk
LLLIVILIVI	area		m		A ,r		W/m2		(W/I	<)	kJ/m²·l		kJ/K
Doors					2	х	1	=	2				(26)
Windows					8.651	x1.	/[1/(1.4)+	0.04] =	11.47				(27)
Walls Type1	18.7	' 1	8.65		10.06	x	0.18	=	1.81	= [(29)
Walls Type2	31.1	4	2		29.14	×	0.18	-	5.25	=		7 F	(29)
Total area of e	elements	 , m²			49.86								 (31)
* for windows and	d roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	 ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	3.2	,
** include the are	as on both	sides of in	ternal wal	ls and par	titions								
Fabric heat lo	ss, W/K =	= S (A x	U)				(26)(30)) + (32) =				20.53	(33)
Heat capacity	Cm = S($(A \times k)$						((28).	(30) + (32	2) + (32a)	(32e) =	548.87	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
For design asses		ere the de	tails of the	construct	ion are not	known nr		IIIulca					
can be used inste	ad of a de	(- 'II I			ion are not	Kilowii pi	ecisely the		e values of	TMP in T	able 1f		
			ulation.				ecisely the		e values of	TMP in T	able 1f	101	(26)
Thermal bridg	es : S (L	x Y) cal	ulation. culated (using Ap	pendix ł		ecisely the		e values of	TMP in T	able 1f	4.84	(36)
	es : S (L al bridging	x Y) cal	ulation. culated (using Ap	pendix ł		ecisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridg if details of therm Total fabric he	es : S (L al bridging eat loss	x Y) cal	ulation. culated (own (36) =	using Ap = 0.05 x (3	pendix ł		ecisely the	e indicative	(36) =			4.84 25.36	
Thermal bridg if details of therm Total fabric he Ventilation he	es : S (L al bridging eat loss at loss ca	x Y) calc	ulation. culated to	using Ap = 0.05 x (3	ppendix ł	((33) + (38)m	(36) = = 0.33 × (25)m x (5)		
Thermal bridg if details of therm	es : S (L al bridging eat loss	x Y) cal	ulation. culated (own (36) =	using Ap = 0.05 x (3	pendix ł		Aug 24.34	e indicative	(36) =				(37)
Thermal bridg if details of therm Total fabric he Ventilation he Jan (38)m= 25.98	es : S (L al bridging eat loss at loss ca Feb 25.84	x Y) calc are not kn alculated Mar 25.71	ulation. culated to own (36) = I monthly	using Ap = 0.05 x (3 y May	ppendix k 1) Jun	Jul	Aug	(33) + (38)m Sep 24.65	(36) = = 0.33 × (Oct 24.98	25)m x (5 Nov 25.21	Dec		(37)
Thermal bridg if details of therm Total fabric he Ventilation he Jan (38)m= 25.98 Heat transfer	es : S (L al bridging eat loss at loss ca Feb 25.84 coefficier	x Y) calc are not kn alculated Mar 25.71	ulation. culated to own (36) = I monthly Apr 25.09	using Ap = 0.05 x (3 / May 24.98	Jun 24.44	Jul 24.44	Aug 24.34	(33) + (38)m Sep 24.65 (39)m	(36) = = 0.33 × (Oct 24.98 = (37) + (3	25)m x (5 Nov 25.21 38)m	Dec 25.46		(37)
Thermal bridg if details of therm Total fabric he Ventilation he Jan (38)m= 25.98	es : S (L al bridging eat loss at loss ca Feb 25.84	x Y) calc are not kn alculated Mar 25.71	ulation. culated to own (36) = I monthly	using Ap = 0.05 x (3 y May	ppendix k 1) Jun	Jul	Aug	(33) + (38)m Sep 24.65 (39)m 50.01	$(36) =$ $= 0.33 \times ($ Oct $= 0.33 \times ($ $= 0.34 \times ($ Oct $= 0.33 \times ($ Oct	25)m x (5 Nov 25.21 38)m 50.57	Dec 25.46	25.36	(37)
Thermal bridg if details of therm Total fabric he Ventilation he Jan (38)m= 25.98 Heat transfer	es : S (L al bridging eat loss at loss ca Feb 25.84 coefficier 51.21	x Y) calc are not kn alculated Mar 25.71 nt, W/K	ulation. culated cown (36) = monthly Apr 25.09	using Ap = 0.05 x (3 / May 24.98	Jun 24.44	Jul 24.44	Aug 24.34	(33) + (38)m Sep 24.65 (39)m 50.01	(36) = = 0.33 × (Oct 24.98 = (37) + (3	25)m x (5 Nov 25.21 38)m 50.57 Sum(39),	Dec 25.46		(36)
Thermal bridg if details of therm Total fabric her Ventilation her Jan (38)m= 25.98 Heat transfer (39)m= 51.34	es : S (L al bridging eat loss at loss ca Feb 25.84 coefficier 51.21	x Y) calc are not kn alculated Mar 25.71 nt, W/K	ulation. culated cown (36) = monthly Apr 25.09	using Ap = 0.05 x (3 / May 24.98	Jun 24.44	Jul 24.44	Aug 24.34	(33) + (38)m Sep 24.65 (39)m 50.01	$(36) =$ $= 0.33 \times ($ Oct $= 0.33 \times ($	25)m x (5 Nov 25.21 38)m 50.57 Sum(39),	Dec 25.46	25.36	(37)

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	gy requi	rement:								kWh/ye	ear:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		83		(42)
Reduce t	the annua	ıl average	ater usag hot water person per	usage by	5% if the a	lwelling is	designed t			se target o		.56		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			day for ea	ach month			able 1c x							
(44)m=	85.31	82.21	79.11	76	72.9	69.8	69.8	72.9	76	79.11	82.21	85.31		7(44)
Energy c	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		930.67	(44)
(45)m=	126.51	110.65	114.18	99.55	95.52	82.42	76.38	87.64	88.69	103.36	112.83	122.52		
If instanta	aneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) ₁₁₂ =		1220.26	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
` '	storage													` '
Storage	e volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
Otherw Water s	vise if no storage	stored loss:	nd no ta hot wate	er (this in	icludes i	nstantar	eous co	' '	ers) ente	er '0' in (47)			
•			eclared I		or is kno	wn (kWh	n/day):					0		(48)
•			m Table									0		(49)
			storage eclared o	-		or is not		(48) x (49)) =			0		(50)
Hot wa	ter stora	age loss	factor fr	om Tabl								0		(51)
	-	eating s from Tal	ee secti	on 4.3								2		(50)
			m Table	2b								0		(52) (53)
•			storage		ear			(47) x (51)	x (52) x (53) =		0		(54)
		54) in (5	_	,								0		(55)
Waters	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	r 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=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary	y circuit	loss (an	inual) fro	m Table	3							0		(58)
-			culated from Tab		,	•	,	, ,		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) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for wa	ater he	eating ca	alculated	l for	each month	(62)	m =	0.85 × (45)m +	· (46)m +	(57)m +	(59)m + (61)m	
	97.05	84.61	81.19		0.06 64.92	74.		75.39	87.86	95.9	104.14		(62)
Solar DHW input calculated usi	ing Appe	endix G or	Appendix	H (ı	negative quantity	/) (ent	er '0'	if no sola	r contribu	ition to wate	r heating)	l	
(add additional lines if FC											σ,		
(63)m= 0 0	0	0	0		0 0	0		0	0	0	0		(63)
Output from water heater	<u>'</u>										!	•	
·	97.05	84.61	81.19	70	0.06 64.92	74.	.5	75.39	87.86	95.9	104.14		
					<u> </u>		Outp	ut from wa	ater heat	er (annual)₁	12	1037.22	(64)
Heat gains from water he	eating,	kWh/mo	onth 0.2	5 ´[0.85 × (45)m	+ (6	51)m] + 0.8 x	[(46)m	n + (57)m	+ (59)m]	_
(65)m= 26.88 23.51 2	24.26	21.15	20.3	17	7.52 16.23	18.	62	18.85	21.96	23.98	26.04		(65)
include (57)m in calcul	ation c	of (65)m	only if c	ylin	der is in the o	dwell	ing (or hot w	ater is	from com	munity h	neating	
5. Internal gains (see T	able 5	and 5a)):										
Metabolic gains (Table 5). Watt	S											
Jan Feb	Mar	Apr	May	,	Jun Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 91.28 91.28 9	91.28	91.28	91.28	91	1.28 91.28	91.	28	91.28	91.28	91.28	91.28		(66)
Lighting gains (calculated	in Ap	pendix l	_, equat	ion	L9 or L9a), a	lso s	ee T	Table 5		•			
(67)m= 14.83 13.17	10.71	8.11	6.06	5	.12 5.53	7.1	19	9.65	12.25	14.3	15.24		(67)
Appliances gains (calcula	ated in	Append	lix L, eq	uati	on L13 or L1	3a), a	also	see Tal	ole 5				
(68)m= 159.14 160.8 1	56.63	147.77	136.59	12	6.08 119.06	117	.41	121.57	130.43	141.61	152.12		(68)
Cooking gains (calculate	d in Ap	pendix	L, equat	ion	L15 or L15a)	, als	o se	e Table	5	-!	ļ.	•	
(69)m= 32.13 32.13 3	32.13	32.13	32.13	32	2.13 32.13	32.	13	32.13	32.13	32.13	32.13		(69)
Pumps and fans gains (T	able 5	a)			!		•						
(70)m= 0 0	0	0	0		0 0	0		0	0	0	0		(70)
Losses e.g. evaporation	(negat	ive valu	es) (Tab	le 5	5)		•					•	
(71)m= -73.02 -73.02 -	73.02	-73.02	-73.02	-7	3.02 -73.02	-73.	.02	-73.02	-73.02	-73.02	-73.02		(71)
Water heating gains (Tak	ole 5)				•		•	-		•		•	
(72)m= 36.13 34.99 3	32.61	29.38	27.28	24	1.33 21.81	25.	03	26.18	29.52	33.3	34.99		(72)
Total internal gains =					(66)m + (67)m	+ (68	3)m +	(69)m + (70)m + (71)m + (72)	m	_	
(73)m= 260.49 259.34 2	50.34	235.65	220.32	20	5.91 196.79	200	.01	207.78	222.58	239.59	252.74		(73)
6. Solar gains:													
Solar gains are calculated usi	ng solar	flux from	Table 6a	and	associated equa	tions	to co	nvert to th	e applica	ıble orientat	ion.		
Orientation: Access Fac	ctor	Area			Flux		_	g	_	FF		Gains	
Table 6d		m²		_	Table 6a		16	able 6b		Table 6c		(W)	_
Southeast 0.9x 0.77	X	8.6	5	x	36.79	X		0.63	x [0.7	=	97.28	(77)
Southeast 0.9x 0.77	X	8.6	5	x	62.67	X		0.63	x [0.7	=	165.7	(77)
Southeast 0.9x 0.77	X	8.6	5	x	85.75	X		0.63	x [0.7	=	226.72	(77)
Southeast 0.9x 0.77	X	8.6	5	x	106.25	x		0.63	x [0.7	=	280.91	(77)
Southeast 0.9x 0.77	X	8.6	5	x [119.01	x		0.63	x [0.7	=	314.65	(77)
Southeast 0.9x 0.77	X	8.6	5	x	118.15	x		0.63	x [0.7	=	312.37	(77)
Southeast 0.9x 0.77	X	8.6	5	x	113.91	x		0.63	x	0.7	=	301.16	(77)
Southeast 0.9x 0.77	X	8.6	5	x	104.39	X		0.63	x [0.7	=	275.99	(77)

Southeast 0.	9x 0.77	x	8.6	S5	X	92.85	Х	0.63	х	0.7	=	245.49	(77)
Southeast 0.	9x 0.77	x	8.6	35	X	69.27	x	0.63	x [0.7	=	183.13	(77)
Southeast 0.	9x 0.77	x	8.6	65	х .	44.07	x	0.63	х	0.7	=	116.52	(77)
Southeast 0.	9x 0.77	x	8.6	35	X :	31.49	х	0.63	х	0.7	=	83.25	(77)
Solar gains	in watts, c	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m= 97.	28 165.7	226.72	280.91	314.65	312.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains	– internal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts		•		•		•	
(84)m= 357	.77 425.04	477.06	516.56	534.96	518.28	497.95	476	453.26	405.72	356.11	335.99		(84)
7. Mean ir	nternal tem	perature	(heating	season)								
Temperat	ure during h	neating p	eriods ir	n the livii	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
•	factor for g	•			•			, ,					
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(86)m= 1	_	0.97	0.92	0.79	0.6	0.44	0.48	0.72	0.94	0.99	1		(86)
` '					.	2 4 5 7	7 : Talal	- 0-)	!			l	
	rnal tempei	20.5		20.92	20.99	i 	1		20.75	20.37	20.07	1	(87)
(87)m= 20	20.28	20.5	20.76	20.92	20.99	21	21	20.97	20.75	20.37	20.07		(07)
Temperat	ure during h	neating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)				1	
(88)m= 20.	13 20.14	20.14	20.15	20.15	20.16	20.16	20.16	20.15	20.15	20.15	20.14		(88)
Utilisation	factor for g	ains for ı	rest of d	welling,	h2,m (s	ee Table	9a)						
(89)m= 1	0.99	0.96	0.89	0.74	0.53	0.36	0.39	0.65	0.92	0.99	1		(89)
Mean inte	rnal tempe	rature in	the rest	of dwelli	na T2 (1	follow ste	ens 3 to	7 in Tabl	le 9c)	•	•	•	
(90)m= 19.		19.71	19.96	20.1	20.15	20.16	20.16	20.14	19.96	19.59	19.29]	(90)
` '							!	1	L fLA = Livir	l g area ÷ (4	4) =	0.48	(91)
	1.4				\		/4 (1	A) TO					」 ` ′
	rnal tempe	· `				1	- `	,	1	10.00	10.00	1	(92)
(92)m= 19.		20.09	20.34	20.49	20.55	20.56	20.56	20.53	20.33	19.96	19.66		(92)
(93)m= 19.	ustment to t	ne mean 20.09	20.34	20.49	20.55	20.56	20.56	20.53	20.33	19.96	19.66	l	(93)
` '	neating req			20.49	20.55	20.56	20.56	20.55	20.33	19.96	19.66		(33)
·	he mean in			ro obtair	od at et	on 11 of	Table 0	h so tha	at Ti m_/	76)m an	d ro-cald	culato	
	ion factor f				icu ai si	ep i i oi	Table 3	b, 30 tria	at 11,111—(r Ojiii aii	u re-care	Julate	
Ja	ın Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	factor for g	ains, hm	:			•				•	•	•	
(94)m= 0.9	9 0.99	0.96	0.9	0.77	0.56	0.4	0.43	0.68	0.92	0.99	1		(94)
Useful gai	ns, hmGm	, W = (9 ²	4)m x (8	4)m								•	
(95)m= 355	.97 419.22	459.76	465.03	409.42	292.02	196.7	205.95	308.84	375.2	351.7	334.79		(95)
Monthly a	verage exte	ernal tem	perature	from T	able 8		-		-			_	
(96)m= 4.3	3 4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss	rate for me	an intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)m	– (96)m]	-	-	•	
(97)m= 790	.24 766.35	694.16	577.13	442.6	296.36	197.12	206.68	321.7	489.94	650.63	785.78		(97)
	ating requir	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95	j)m] x (4	1)m	1	1	
(98)m= 323	3.1 233.27	174.4	80.71	24.69	0	0	0	0	85.37	215.23	335.54		_
							Tota	ıl per year	(kWh/yea	r) = Sum(9	8)15,912 =	1472.3	(98)
Space hea	ating requir	ement in	kWh/m²	² /year								26.97	(99)
	-												_

8c. Sp	pace co	oling req	uiremen	nt										
Calcu	lated fo	r June, J	luly and	August.	See Tal	ole 10b							•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	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	468.14	368.54	377.74	0	0	0	0		(100)
Utilisa	ition fac	tor for lo	ss hm										•	
(101)m=	0	0	0	0	0	0.96	0.99	0.98	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	451.31	363.35	370.57	0	0	0	0		(102)
Gains	(solar (gains cal	culated	for appli	cable we	eather re	gion, se	e Table	10)					
(103)m=	0	0	0	0	0	674.7	649.63	625.12	0	0	0	0		(103)
•	•	g require zero if (lwelling,	continuo	ous (kW	h = 0.02	24 x [(10	03)m – (102)m] :	x (41)m	
(104)m=	0	0	0	0	0	160.84	213	189.39	0	0	0	0		
									Total	= Sum(104)	=	563.22	(104)
	fraction								f C =	cooled	area ÷ (4	4) =	1	(105)
1		actor (Ta		<u> </u>				ı					I	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
		_				()	(()		Total	' = Sum(104)	=	0	(106)
		requirer								_	_	Ι -	1	
(107)m=	0	0	0	0	0	40.21	53.25	47.35	0	0	0	0		_
									Total	= Sum(107)	=	140.81	(107)
Space	cooling	requiren	nent in k	:Wh/m²/y	/ear				(107)	\div (4) =			2.58	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Energy	/ Efficier	псу						(99) -	+ (108) =	=		29.55	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								33.98	(109)

		1	lear D	etails:						
	7 1:10 1 6	C						OTDO	.004000	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	2		Stroma Softwa	-				001082 on: 1.0.5.9	
Software Name.	Ottoma i OAI 2012			Address:		31011.		VCISIO	71. 1.0.5.5	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4 -)		ight(m)	1 (0-)	Volume(m³	_
					(1a) x	2	2.5	(2a) =	136.49	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e))+(1n)	5	54.6	(4)					_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	136.49	(5)
2. Ventilation rate:	main se	condary		other		total			m³ per hou	r
N. selven of all leaves a	heating he	eating	_		, –			40	-	_
Number of chimneys	0 +	0	+ _	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0		20 =	0	(6b)
Number of intermittent fa						0	X '	10 =	0	(7a)
Number of passive vents	3					0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	ur
Infiltration due to chimne	vs_flues and fans = (6a	ı)+(6b)+(7a)+	+(7b)+(7	7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended				ontinue fr			. (0) =	0	
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber for resent, use the value corresp				•	uction			0	(11)
deducting areas of openi		oriding to the	e greate	er wan are	a (anter					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1	(seale	d), else	enter 0				0	(12)
If no draught lobby, en									0	(13)
· ·	s and doors draught str	ripped							0	(14)
Window infiltration				0.25 - [0.2		_	. (45)		0	(15)
Infiltration rate	250			(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeabil	q50, expressed in cubi	-		•	•	etre or e	rivelope	area	3	(17)
	es if a pressurisation test has					is beina u	sed		0.15	(18)
Number of sides sheltere				, ,	,	J			3	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								_	_
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ∸ 4									
<u> </u>	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
<u> </u>									I	

Calaudate	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14]	
Calculate effe		-	rate for t	he appli	cable ca	se						,	
If mechanicate of the street o			endix N (2	3h) <i>– (2</i> 3a	ı) x Fmv (e	equation (N	NS)) othe	rwise (23h) = (23a)			0.5	(23
If balanced with) = (25a)			0.5	(23
a) If balance		-	•	_					2h\m ı (22h) v [1 (220)	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				l .	l	<u> </u>			ļ -		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h	ouse ex	tract ver	tilation o	or positiv	re input v	ventilatio	n from o	utside				1	
,		(23b), t		•	•				.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural					•				-	_	-	-	
	r	en (24d)	· ·		· · ·		 			1	1	1	(0
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air			<u> </u>	` `	``	´`		`			1	1	(6
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24]	(2
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros	_	Openin		Net Ar		U-val		AXU		k-value		Χk
lo oro	area	(m²)	m	2	A ,r		W/m2		(W/	K)	kJ/m²•	K K	J/K
)oors					2	×	1.4	=	2.8	=			(2
Vindows				_	8.651	_	/[1/(1.4)+	0.04] =	11.47	ᆗ ,			(2
Valls Type1	18.7	71 I	8.65		10.06								
V-II- T 0				=		=	0.15	-	1.51	_		╡	=
	31.1	4	2		29.14	=	0.15	= =	4.12				(2
otal area of e	31.1 elements	, m²	2		29.14 49.86	1 x	0.14	=	4.12				(2
otal area of e	31.1	, m² ows, use e	2 ffective with	ndow U-va	29.14 49.86 alue calcul	1 x	0.14	=	4.12	as given in	paragrapl	h 3.2	(2
otal area of e	31.1 elements I roof winder as on both	, m ² ows, use e	2 Iffective winternal wall	ndow U-va	29.14 49.86 alue calcul	x	0.14	= /[(1/U-valu	4.12	as given in	ı paragrapl	h 3.2	(3
otal area of e for windows and * include the area abric heat los	31.1 Plements I roof wind as on both ss, W/K :	, m² ows, use e sides of ir = S (A x	2 Iffective winternal wall	ndow U-va	29.14 49.86 alue calcul	x	0.14	= /[(1/U-valu) + (32) =	4.12				(3
otal area of e for windows and * include the area abric heat los leat capacity	31.1 elements I roof wind as on both ss, W/K: Cm = S(, m ² ows, use e sides of ir = S (A x (A x k)	2 ffective winternal walk	ndow U-va	29.14 49.86 alue calcul	4 ×	0.14	= /[(1/U-valu) + (32) = ((28).	4.12 ue)+0.04] &	2) + (32a).		19.9	(2 (2 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3
Total area of ending for windows and the include the area fabric heat loss deat capacity. Thermal mass for design assess	31.1 elements I roof wind as on both ss, W/K: Cm = S(parame	, m² ows, use e sides of ir = S (A x k) ter (TMF)	2 Iffective winternal walk U) P = Cm ÷	ndow U-va s and pan	29.14 49.86 alue calcul titions	4 x	0.14 g formula 1 (26)(30)	= ((28). Indica	4.12 ue)+0.04] a (30) + (32 tive Value	2) + (32a). : Low	(32e) =	19.9 548.87	(3)
Total area of ending for windows and the include the area fabric heat loss leat capacity. Thermal mass for design assess and be used inste	31.1 elements froof winder as on both as, W/K: Cm = S(a parame and of a de	, m² ows, use e sides of ir = S (A x (A x k)) tter (TMF) ere the de tailed calcular	2 Iffective winternal walk U) P = Cm ÷ tails of the ulation.	ndow U-va s and pan - TFA) ir construct	29.14 49.86 Alue calcul itions kJ/m²K	4 × Salated using	0.14 g formula 1 (26)(30)	= ((28). Indica	4.12 ue)+0.04] a (30) + (32 tive Value	2) + (32a). : Low	(32e) =	19.9 548.87 100	(3)
Valls Type2 Total area of each for windows and the include the area fabric heat loss deat capacity. Thermal mass for design assess an be used instemal bridge factories of thermal bridge factories of the include the include of the include factories.	31.1 Elements I roof winders on both SS, W/K: Cm = S(Deparaments who ad of a decession is seen to seen the comparation of the	, m² cows, use esides of ir = S (A x k) eter (TMF) ere the detailed calco x Y) cal	griffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and pand - TFA) ir construct	29.14 49.86 alue calcul titions kJ/m²K ion are not	4 × Salated using	0.14 g formula 1 (26)(30)	= ((28). Indica	4.12 ue)+0.04] a (30) + (32 tive Value	2) + (32a). : Low	(32e) =	19.9 548.87	(3)
otal area of e for windows and include the area fabric heat los fleat capacity thermal mass for design assess an be used inste thermal bridge details of thermal	31.1 elements I roof windens on both ess, W/K: Cm = S(exparaments whe ad of a de ess : S (L el bridging	, m² cows, use esides of ir = S (A x k) eter (TMF) ere the detailed calco x Y) cal	griffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-vals and pand - TFA) ir construct	29.14 49.86 alue calcul titions kJ/m²K ion are not	4 × Salated using	0.14 g formula 1 (26)(30)	= /[(1/U-valu) + (32) = ((28). Indica	4.12 (a) +0.04] a (30) + (3) (30) + (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4)	2) + (32a). : Low	(32e) =	19.9 548.87 100 5.69	(3)
fotal area of ending for windows and include the area fabric heat loss leat capacity. Thermal mass for design assessing the used instead thermal bridged details of thermal fotal fabric hear and the state of the st	31.1 elements I roof wind as on both es, W/K: Cm = S(a parame esments wh ad of a de es: S (L al bridging at loss	, m² ows, use e sides of ir = S (A x (A x k) eter (TMF) ere the de tailed calculation (X Y) calculate (A x Y) calculate	griffective winternal walk U) P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vals and pand - TFA) in constructa	29.14 49.86 alue calcul titions kJ/m²K ion are not	4 × Salated using	0.14 g formula 1 (26)(30)	= /[(1/U-valu) + (32) = ((28). Indicative e indicative	4.12 ue)+0.04] a (30) + (32 tive Value e values of	2) + (32a). : Low : TMP in T	(32e) =	19.9 548.87 100	(3)
fotal area of entering for windows and a include the area fabric heat loss feat capacity fhermal mass for design assess and be used insterior details of thermal fotal fabric hermal fab	31.1 elements I roof winder as on both as, W/K: Cm = S(parame and of a de es: S (L al bridging at loss at loss ca	, m² ows, use e sides of ir = S (A x (A x k) eter (TMF) ere the de tailed calculated are not kn	ffective winternal walk U) P = Cm ÷ tails of the culation. culated to cown (36) =	ndow U-vels and pand - TFA) ir construction using Ap	29.14 49.86 alue calcul titions h kJ/m²K fon are not	x dated using	0.14 g formula 1 (26)(30)	= /[(1/U-valu) + (32) = ((28). Indica e indicative (33) + (38)m	4.12 (30) + (3: tive Value e values of (36) = = 0.33 × (2) + (32a). : Low : TMP in T	(32e) =	19.9 548.87 100 5.69	(3)
fotal area of ending for windows and include the area abric heat loss leat capacity thermal mass for design assess and be used instead details of thermal bridge details of thermal fotal fabric head and include a label fabr	31.1 elements I roof wind as on both es, W/K: Cm = S(a parame esments wh ad of a de es: S (L al bridging at loss	, m² ows, use e sides of ir = S (A x (A x k) eter (TMF) ere the de tailed calculation (X Y) calculate (A x Y) calculate	griffective winternal walk U) P = Cm ÷ tails of the ulation. culated to own (36) =	ndow U-vals and pand - TFA) in constructa	29.14 49.86 alue calcul titions kJ/m²K ion are not	4 × Salated using	0.14 g formula 1 (26)(30)	= /[(1/U-valu) + (32) = ((28). Indicative e indicative	4.12 ue)+0.04] a (30) + (32 tive Value e values of	2) + (32a). : Low : TMP in T	(32e) =	19.9 548.87 100 5.69	(3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
fotal area of ending for windows and include the area fabric heat loss leat capacity. Thermal mass for design assess and be used insterioral bridge details of thermal bridge details of thermal fotal fabric head fabric head and sales are sales and sales are	31.1 elements I roof wind as on both ss, W/K: Cm = S(parame sments wh ad of a de es : S (L al bridging at loss at loss ca Feb	, m² ows, use e sides of ir = S (A x k) eter (TMF) ere the de tailed calculated are not known alculated Mar 11.13	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated u own (36) =	ndow U-vals and pand - TFA) ir construction using Ap = 0.05 x (3	29.14 49.86 alue calcul titions kJ/m²K fon are not spendix I	t known pr	0.14 formula 1 (26)(30) recisely the	= /[(1/U-valu) + (32) = ((28). Indica e indicative (33) + (38)m Sep 9.95	4.12 (a) +0.04] a (30) + (30) (30) + (30) (30) = (30) = (30)	2) + (32a). : Low : TMP in T	(32e) = Fable 1f	19.9 548.87 100 5.69	(3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
fotal area of end for windows and include the area fabric heat loss leat capacity thermal mass for design assess and be used insterioral bridge details of thermal fotal fabric heat fabri	31.1 elements I roof wind as on both ss, W/K: Cm = S(parame sments wh ad of a de es : S (L al bridging at loss at loss ca Feb	, m² ows, use e sides of ir = S (A x k) eter (TMF) ere the de tailed calculated are not known alculated Mar 11.13	ffective winternal walk U) P = Cm ÷ tails of the ulation. culated u own (36) =	ndow U-vals and pand - TFA) ir construction using Ap = 0.05 x (3	29.14 49.86 alue calcul titions kJ/m²K fon are not spendix I	t known pr	0.14 formula 1 (26)(30) recisely the	= /[(1/U-valu) + (32) = ((28). Indica e indicative (33) + (38)m Sep 9.95	4.12 (a) +0.04] a (30) + (32) (30) + (32) (30) = (36)	2) + (32a). : Low : TMP in T	(32e) = Fable 1f	19.9 548.87 100 5.69	(3 (3 (3 (3 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
fotal area of ending for windows and include the area fabric heat loss leat capacity. Thermal mass for design assess and be used instemental bridge details of thermal fotal fabric head f	31.1 elements I roof wind as on both es, W/K: Cm = S(exparame esments whe ad of a de es: S (L al bridging at loss at loss ca Feb 11.26	, m² ows, use e sides of ir = S (A x (A x k)) eter (TMF) ere the de tailed calculated are not known alculated Mar 11.13 nt, W/K	ffective winternal walk U) P = Cm ÷ tails of the culation. culated to cown (36) = I monthly Apr 10.48	ndow U-vels and pand - TFA) in construction using April 20.05 x (3) / May 10.35	29.14 49.86 alue calcul titions kJ/m²K fon are not spendix k 1) Jun 9.69	t known pr	0.14 formula 1 (26)(30) recisely the	= (1/U-value) + (32) = ((28) Indicative indicative (33) + (38)m Sep 9.95 (39)m 35.54	4.12 1(30) + (32) 1(30)	2) + (32a). : Low : TMP in T (25)m x (5 Nov 10.61 38)m 36.2	(32e) = Sable 1f Dec 10.87	19.9 548.87 100 5.69	(3)
fotal area of ending for windows and area include the area fabric heat loss feat capacity. Thermal mass for design assess and be used insternational bridge details of thermal fotal fabric head fabri	31.1 elements I roof winders on both ess, W/K: Cm = S(experience paramets whe ad of a de ess: S (L elements	, m² ows, use esides of ir = S (A x (A x k) oter (TMF) ere the detailed calculated are not known alculated Mar 11.13 nt, W/K 36.72	general fective winternal walk ternal walk ternal walk ternal walk ternal walk ternal soft the culation. culated to cown (36) = 1 monthly Apr 10.48	ndow U-vels and pand - TFA) in construction using April 20.05 x (3) / May 10.35	29.14 49.86 alue calcul titions kJ/m²K fon are not spendix k 1) Jun 9.69	t known pr	0.14 formula 1 (26)(30) recisely the	= (1/U-value) + (32) = ((28) Indicative) (33) + (38)m Sep 9.95 (39)m 35.54	4.12 1e)+0.04] a (30) + (32) tive Value e values of (36) = = 0.33 × (Oct 10.35 = (37) + (35.94	2) + (32a). : Low : TMP in T (25)m x (5) Nov 10.61 38)m 36.2 Sum(39).	(32e) = Sable 1f Dec 10.87	19.9 548.87 100 5.69 25.59	(3)

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. Wate	er heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assume	ed occu	nancy I	N								1	83]	(42)
if TFA	A > 13.9	N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		.03		(42)
if TFA Annual a	13.9 2verag	•	otor usac	no in litro	se par da	w Vd av	orago –	(25 v N)	± 36		0.4	0.4	1	(42)
Reduce th										se target o		.64		(43)
not more t	that 125	litres per p	person per	day (all w	ater use, l	not and co	ld)		•				•	
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	usage ir	-	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43) 1					1	
(44)m=	89.8	86.54	83.27	80.01	76.74	73.47	73.47	76.74	80.01	83.27	86.54	89.8		7
Energy co	ontent of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		979.65	(44)
(45)m=	133.17	116.47	120.19	104.79	100.54	86.76	80.4	92.26	93.36	108.8	118.76	128.97		
_	!		ļ				!	!		Γotal = Su	l m(45) ₁₁₂ =	!	1284.48	(45)
If instanta	neous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					_
	19.98	17.47	18.03	15.72	15.08	13.01	12.06	13.84	14	16.32	17.81	19.35		(46)
Water states Storage	_		includin	va 201/ 6/	olar or M	/\/\LDC	ctorogo	within co	amo voc	col		•	1	(47)
If comm		, ,					_		anie ves	SEI		0		(47)
Otherwi	•	_			_			. ,	ers) ente	er '0' in (47)			
Water st				•					,	`	,			
a) If ma	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempera	ature fa	actor fro	m Table	2b								0		(49)
Energy			_	-				(48) x (49)) =		1	10		(50)
b) If ma			eclared of	•								.02		(51)
If comm		•			0 2 (100)	11/11(10/00	ху /				0.	.02		(31)
Volume	•	_									1.	.03		(52)
Tempera	ature fa	actor fro	m Table	2b							0	.6		(53)
Energy			•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
,	, ,	54) in (5	,								1.	.03		(55)
Water st	torage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m			<u>-</u>	
` '	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder	contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – ([H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary	circuit	loss (an	nual) fro	m Table	3							0		(58)
Primary					,	•	. ,	, ,						
` _			rom Tab									22.00	1	(50)
` ' _	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 lo						` ´ 	· ` `		1		ı	ı	1	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for w	ater he	eating ca	alculated	for e	each month	(62)n	n = 0.85 ×	(45)m +	· (46)m +	(57)m +	(59)m + (61)m	
	175.47	158.28	155.82	140.		147.		164.08	` 	184.25]	(62)
Solar DHW input calculated us	ing Appe	endix G or	Appendix	H (ne	gative quantity	v) (ente	er '0' if no sola	ar contribu	tion to wate	r heating)		
(add additional lines if Fo					-					0,		
(63)m= 0 0	0	0	0	0	<u> </u>	0	0	0	0	0		(63)
Output from water heate	•r				!	•		•			•	
·	175.47	158.28	155.82	140.	26 135.67	147.	53 146.85	164.08	172.26	184.25		
							Output from w	vater heat	er (annual) ₁	12	1935.32	(64)
Heat gains from water he	eating,	kWh/mo	onth 0.2	5 ′ [0	.85 × (45)m	ı + (6′	1)m] + 0.8	x [(46)m	ı + (57)m	+ (59)m]	_
(65)m= 88.5 78.67	84.18	77.64	77.65	71.6	70.95	74.9	73.84	80.4	82.28	87.1		(65)
include (57)m in calcu	lation c	of (65)m	only if c	ylind	er is in the	dwelli	ng or hot v	vater is	rom com	munity h	neating	
5. Internal gains (see 7	Table 5	and 5a)):									
Metabolic gains (Table 5	5), Watt	s										
Jan Feb	Mar	Apr	May	Ju	ın Jul	Au	ıg Sep	Oct	Nov	Dec		
(66)m= 109.53 109.53	109.53	109.53	109.53	109.	53 109.53	109.	53 109.53	109.53	109.53	109.53		(66)
Lighting gains (calculate	d in Ap	pendix l	_, equat	on L	9 or L9a), a	lso se	ee Table 5	-	-	-		
(67)m= 37.08 32.93	26.78	20.27	15.16	12.	8 13.83	17.9	7 24.12	30.63	35.75	38.11		(67)
Appliances gains (calcul	ated in	Append	lix L, eq	uatio	n L13 or L1	3a), a	ilso see Ta	able 5			-	
(68)m= 237.53 239.99	233.78	220.56	203.87	188.	18 177.7	175.2	23 181.45	194.67	211.36	227.05		(68)
Cooking gains (calculate	ed in Ap	pendix	L, equat	ion L	15 or L15a), also	see Table	e 5	-	-		
(69)m= 47.78 47.78	47.78	47.78	47.78	47.7	78 47.78	47.7	8 47.78	47.78	47.78	47.78		(69)
Pumps and fans gains (Table 5	ia)			-	-	-	-	-	-		
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evaporation	(negat	ive valu	es) (Tab	le 5)								
(71)m= -73.02 -73.02	-73.02	-73.02	-73.02	-73.	02 -73.02	-73.0	2 -73.02	-73.02	-73.02	-73.02		(71)
Water heating gains (Ta	ble 5)										_	
(72)m= 118.95 117.07	113.15	107.83	104.37	99.	5 95.37	100.0	67 102.55	108.06	114.28	117.08		(72)
Total internal gains =					(66)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	_	
(73)m= 477.85 474.28	458	432.95	407.68	384.	77 371.18	378.	16 392.41	417.65	445.68	466.52		(73)
6. Solar gains:												
Solar gains are calculated us	•		Table 6a		•	tions to	convert to t	he applica		tion.		
Orientation: Access Fa Table 6d	ctor	Area m²			Flux Table 6a		g_ Table 6b	, 7	FF Table 6c		Gains (W)	
Southeast 0.9x 0.77	X	8.6	5	х	36.79	x [0.63	x	0.7	=	97.28	(77)
Southeast 0.9x 0.77	X	8.6	5	x	62.67	x	0.63	x	0.7	=	165.7	(77)
Southeast 0.9x 0.77	X	8.6	5	x \square	85.75	x	0.63	x	0.7		226.72	(77)
Southeast 0.9x 0.77	X	8.6	5	x	106.25	x	0.63	х	0.7	=	280.91	(77)
Southeast 0.9x 0.77	x	8.6	5	x	119.01	x	0.63	x	0.7	=	314.65	(77)
Southeast 0.9x 0.77	х	8.6	5	x	118.15	x	0.63	x	0.7	=	312.37	(77)
Southeast 0.9x 0.77	x	8.6	5	x	113.91	x	0.63	x	0.7	=	301.16	(77)
Southeast 0.9x 0.77	X	8.6	5	х	104.39] _x [0.63	x	0.7		275.99	(77)

Southeast 0.9x 0.	77 X	8.65	x g	2.85	x	0.63	x	0.7	=	245.49	(77)
Southeast 0.9x 0.	77 x	8.65	x 6	9.27	x	0.63	x	0.7	=	183.13	(77)
Southeast 0.9x 0.	77 X	8.65	x 4	4.07	x	0.63	х	0.7	=	116.52	(77)
Southeast 0.9x 0.	77 X	8.65	x 3	31.49	x	0.63	х	0.7	=	83.25	(77)
											_
Solar gains in watts,	calculated for	or each month			(83)m = S	um(74)m .	(82)m				
(83)m= 97.28 165.		280.91 314.65	312.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains – interna	l and solar (8	84)m = (73)m -	+ (83)m	, watts							
(84)m= 575.12 639.9	8 684.72 7	713.86 722.33	697.14	672.34	654.16	637.89	600.78	562.19	549.77		(84)
7. Mean internal te	nperature (h	neating season)								
Temperature during	•			from Tal	ole 9. Th	1 (°C)				21	(85)
Utilisation factor for			•		,	(-)					」`′
Jan Fe	Ť		` .	Jul	Aug	Sep	Oct	Nov	Dec		
	+	·	Jun	-	Ť	0.38			0.83		(86)
(86)m= 0.82 0.76	0.08	0.57 0.45	0.32	0.23	0.25	0.36	0.58	0.75	0.83		(00)
Mean internal temp	erature in liv	ring area T1 (fo	llow ste	ps 3 to 7	in Table	e 9c)			_		
(87)m= 20.42 20.56	3 20.74	20.89 20.96	20.99	21	21	20.98	20.9	20.67	20.39		(87)
Temperature during	n heating per	riods in rest of	dwellina	from Ta	able 9. Ti	n2 (°C)					
(88)m= 20.36 20.3		20.38 20.38	20.39	20.39	20.39	20.38	20.38	20.37	20.37		(88)
	going for ro	at of dwalling	h2 m /oc	L Toblo	00)						
Utilisation factor for (89) m= 0.8 0.74		0.55 0.42	0.29	0.2	9a) 0.21	0.35	0.55	0.73	0.82		(89)
(89)111= 0.8 0.74	0.00	0.55 0.42	0.29	0.2	0.21	0.35	0.55	0.73	0.82		(09)
Mean internal temp	erature in the	e rest of dwelli	<u>`</u>	ollow ste	eps 3 to	7 in Tabl	e 9c)		•	•	
(90)m= 19.6 19.83	2 20.04	20.24 20.34	20.38	20.39	20.39	20.37	20.26	19.95	19.56		(90)
						f	LA = Livin	g area ÷ (4	4) =	0.48	(91)
Mean internal temp	erature (for t	the whole dwe	llina) = fl	LA × T1	+ (1 – fL	A) × T2					_
(92)m= 19.99 20.18		20.55 20.63	20.67	20.68	20.68	20.66	20.56	20.3	19.96		(92)
Apply adjustment to	the mean ir	nternal temper	ture fro	ı m Table	4e. whe	re appro	poriate				
(93)m= 19.99 20.18		20.55 20.63	20.67	20.68	20.68	20.66	20.56	20.3	19.96		(93)
8. Space heating re	auirement				l						
Set Ti to the mean	•	perature obtain	ed at ste	en 11 of	Table 9	so tha	t Ti m=(76)m an	d re-calc	culate	
the utilisation facto			ou at ou	op o.	1 4515 61	, 00 ma	, (. o) a	a ro care	alato	
Jan Fe	Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for	gains, hm:									ı	
(94)m= 0.79 0.74	0.66	0.55 0.43	0.31	0.21	0.23	0.36	0.56	0.72	0.81		(94)
Useful gains, hmG	n , W = (94)r	m x (84)m		!						l	
(95)m= 455.63 471	452.49 3	395.13 312.78	212.69	143.61	150.03	230.14	336.16	406.23	443.93		(95)
Monthly average ex	ternal tempe	erature from Ta	able 8							l	
(96)m= 4.3 4.9	6.5	8.9 11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for n	ean internal	temperature.	Lm . W =	=[(39)m	x [(93)m	– (96)m	1			l	
(97)m= 580.24 563.0		420.1 321.05	214.25	143.9	150.42	233.26	358.08	477.62	574.45		(97)
Space heating requ				<u> </u>					<u> </u>		
(98)m= 92.71 61.8		17.98 6.15	0	0	0	0	16.31	51.4	97.11		
. ,			<u> </u>	L		l per year			l	385.87	(98)
Chana haatina aa aa	iromontin H	\\/\b\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			. 5.0	, y con	,,	, ==(0	,		╡
Space heating requ	mement in K	vvii/iii * /year								7.07	(99)

9b. Energy requirements – Community heating so	cheme			
This part is used for space heating, space cooling Fraction of space heat from secondary/supplement	or water heating pro	•	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	n power stations. See App	pendix C.	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 he	eating system	1	(305)
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)
Space heating		'	kWh/yea	<u></u>
Annual space heating requirement			385.87	
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	405.16	(307a)
Efficiency of secondary/supplementary heating sy	stem in % (from Tab	le 4a or Appendix E)	0	(308
Space heating requirement from secondary/suppl	ementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1935.32	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	2032.09	(310a)
Electricity used for heat distribution	0.	01 × [(307a)(307e) + (310a)(310e)] =	24.37	(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 (Talmechanical ventilation - balanced, extract or posit		e	189.41	(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) =	189.41	(331)
Energy for lighting (calculated in Appendix L)			261.91	(332)
Electricity generated by PVs (Appendix M) (negat	ive quantity)		-551.64	(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 =	17.18	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	86.16	(342a)
Pumps and fans	(331)	Fuel Price 13.19 × 0.01 =	24.98	(349)
r		10.10	27.00	

(332)

Energy for lighting

(350)

34.55

x 0.01 =

13.19

Additional standing charges (Table 12)				120	(351)
radiional standing sharges (rable 12)				120	_(001)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (345)	(354) =		282.87	(355)
11b. SAP rating - Community heating s				202.07	_(333)
					_
Energy cost deflator (Table 12)	[(255) (250)] - [(4) 45 (21		0.42	(356)
Energy cost factor (ECF)	$[(355) \times (356)] \div [(4) + 45.0]$	J] =		1.19	(357)
SAP rating (section12)	ng sahama			83.36	(358)
12b. CO2 Emissions – Community heati	ng scheme	Energy	Emission factor	Emissions	
		kWh/year	kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and was Efficiency of heat source 1 (%)	• ,) ing two fuels repeat (363) to	(366) for the second fue	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	560.05	(367)
Electrical energy for heat distribution		[(313) x	0.52	12.65	(372)
Total CO2 associated with community sy	ystems	(363)(366) + (368)(372	2) =	572.7	(373)
CO2 associated with space heating (sec	condary)	(309) x	0 =	= 0	(374)
CO2 associated with water from immers	ion heater or instantar	neous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =		572.7	(376)
CO2 associated with electricity for pump	s and fans within dwe	elling (331)) x	0.52	98.31	(378)
CO2 associated with electricity for lighting	ng	(332))) x	0.52	135.93	(379)
Energy saving/generation technologies ((333) to (334) as appli	cable			_
Item 1			0.52 x 0.01 =	-286.3	(380)
Total CO2, kg/year	sum of (376)(382) =			520.63	(383)
Dwelling CO2 Emission Rate	$(383) \div (4) =$			9.54	(384)
El rating (section 14)				93	(385)
13b. Primary Energy – Community heati	ng scheme	Enorgy	Drimory	D Energy	
		Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and	water heating (not Cl	HP)			
Efficiency of heat source 1 (%)	If there is CHP us	ing 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	3163.24	(367)
Electrical energy for heat distribution		[(313) x	=	74.82	(372)
Total Energy associated with community	v systems	(363)(366) + (368)(37	2) =	3238.06	(373)
if it is negative set (373) to zero (unles	ss specified otherwise	, see C7 in Appendix C	;)	3238.06	(373)
Energy associated with space heating (s	secondary)	(309) x	0	0	(374)
Energy associated with water from imme	ersion heater or instan	taneous heater(312) x	1.22	0	(375)
Total Energy associated with space and	water heating	(373) + (374) + (375) =		3238.06	(376)
Energy associated with space cooling		(315) x	3.07	0	(377)

Energy associated with electricity for pumps and fans within dwelling (331)) x 581.5 (378) 3.07 Energy associated with electricity for lighting (379) (332))) x 804.06 3.07 Energy saving/generation technologies Item 1 x 0.01 = (380) 3.07 -1693.55 Total Primary Energy, kWh/year sum of (376)...(382) = (383) 2930.07

		l Iser I	Details:										
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	<u> </u>	Strom Softwa					0001082 on: 1.0.5.9					
Software Name.		Property	Address		31011.		VCISIC	71. 1.0.0.0					
Address: 1 Overall dwelling dimensions:													
1. Overall dwelling dime	nsions:												
Ground floor			a(m²)	(4 -)		ight(m)	1,0-1	Volume(m ³	<u> </u>				
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		54.6	(1a) x	2	2.5	(2a) =	136.49	(3a)				
•	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	54.6	(4)									
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	136.49	(5)				
2. Ventilation rate:	main ann an	 .	04h 0 #		40401								
	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				2	X '	10 =	20	(7a)				
Number of passive vents				Γ	0	x '	10 =	0	(7b)				
Number of flueless gas fi	res			Ī	0	X	40 =	0	(7c)				
								_					
							Air ch	nanges per ho	our —				
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.15	(8)				
Number of storeys in the	een carried out or is intended, procee ne dwelling (ns)	ea 10 (17),	otrierwise (onunue ir	om (9) to	(10)		0	(9)				
Additional infiltration	or an emily (ne)					[(9)	-1]x0.1 =	0	(10)				
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)				
if both types of wall are prededucting areas of openir	resent, use the value corresponding t	o the grea	ter wall are	a (after									
,	loor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)				
If no draught lobby, en	ter 0.05, else enter 0							0	(13)				
Percentage of windows	s and doors draught stripped							0	(14)				
Window infiltration			0.25 - [0.2	. ,	-			0	(15)				
Infiltration rate			(8) + (10)					0	(16)				
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	etre of e	envelope	area	5	(17)				
•	s if a pressurisation test has been do				is being u	sed		0.4	(18)				
Number of sides sheltere				·	J			3	(19)				
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			0.78	(20)				
Infiltration rate incorporat	_		(21) = (18) x (20) =				0.31	(21)				
Infiltration rate modified for		T	 		 	T	_	1					
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Monthly average wind sp	 	1 20	1 27		T 42	1 4 5	4.7	1					
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7						
Wind Factor (22a)m = $(22a)$ 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	peed) =	(21a) x	(22a)m					
0.39	0.38	0.38	0.34	0.33	0.29	0.29	0.28	0.31	0.33	0.35	0.36		
Calculate effect If mechanica		-	rate for t	he appli	cable ca	se						0	(23:
If exhaust air he			endix N. (2	3b) = (23a	a) × Fmv (e	eguation (I	N5)) . othe	rwise (23b) = (23a)			0	(23
If balanced with		0 11	, ,	, (, ,		,, ,	`	, (===,			0	(23
a) If balance		•	•	J		,		,	2h\m + (23h) ~ [1 _ (23c)		(23
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance								<u> </u>					•
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
c) If whole h	<u> </u>				ļ		<u> </u>	<u> </u>				l	,
,	n < 0.5 ×				•				.5 × (23b)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilation	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	!		1	J	
,	n = 1, the				•				0.5]			_	
(24d)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.57		(25
3. Heat losse	s and he	eat loss i	naramet	⊃r.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	IE.	AXU		k-value	<u>.</u>	ΑΧk
	area		m		A ,r		W/m2		(W/I	<)	kJ/m²-l		kJ/K
Doors					2	х	1	_ = [2				(26
Windows					8.651	x1,	/[1/(1.4)+	0.04] =	11.47	=			(27
Walls Type1	18.7	' 1	8.65		10.06	x	0.18	i	1.81	=		$\neg \vdash$	(29
Walls Type2	31.1	4	2	=	29.14	x	0.18	╡┇	5.25	F i		=	(29
Total area of e					49.86	_							` (31
* for windows and			ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	ıs given in	paragraph	n 3.2	(-
** include the area						_			, -				
abric heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				20.53	(33
Heat capacity	Cm = S($(A \times k)$						((28)	(30) + (32	2) + (32a).	(32e) =	548.87	(34
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35
For design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
can be used inste				icina An	nondiy l	,					ı		
Thermal bridge if details of therma	,	,			•	`						4.84	(36
Total fabric he		are not kir	OWII (30) -	- 0.00 X (3	')			(33) +	(36) =			25.36	(37
Ventilation hea	at loss ca	alculated	l monthly	/					= 0.33 × (25)m x (5))		
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		25.71	25.09	24.98	24.44	24.44	24.34	24.65	24.98	25.21	25.46		(38
Jan	25.84				<u> </u>	<u> </u>	L	L			<u>I</u>	I	•
Jan 38)m= 25.98		 >t \Λ//∠						(30)~	_ (27) + "	38)m			
Jan 25.98 Heat transfer of	coefficier		50.46	50.24	40 B	40 ₽	⊿ 0.7		= (37) + (3		50.82	1	
Jan (38)m= 25.98 Heat transfer of		nt, W/K 51.07	50.46	50.34	49.8	49.8	49.7	50.01	50.34	50.57	50.82	50.46	(39
Jan (38)m= 25.98 Heat transfer of (39)m= 51.34	coefficier 51.21	51.07		50.34	49.8	49.8	49.7	50.01		50.57 Sum(39) ₁	L	50.46	(39
Jan (38)m= 25.98 Heat transfer of	coefficier 51.21	51.07		50.34	49.8	49.8	49.7	50.01	50.34 Average =	50.57 Sum(39) ₁	L	50.46	(39

Number of days in month (Table 1a)

Numbe	er of day	s in moi	ntn (Tab	ie 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)
													l	
4 \\/\	tor boot	ing once	ray roqui	iromont:								kWh/ye	oor:	
4. 000	ilei neai	ing ener	rgy requi	nement.								KVVII/yt	ear.	
Assum	ed occu	pancy, I	N								1.	83		(42)
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TI	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.	9)		ı	
	A £ 13.9	•						(O.F. N.I.)	. 00				ı	
								(25 x N) to achieve		se target o		.56		(43)
		_	person pei			-	-			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			l	<u> </u>		l	Table 1c x		ООР	00.	1101	200		
(44)m=	85.31	82.21	79.11	76	72.9	69.8	69.8	72.9	76	79.11	82.21	85.31		
(11)=	00.01	OL.L!	70		12.0	00.0	00.0	1 .2.0			m(44) ₁₁₂ =		930.67	(44)
Energy o	content of	hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,ı	m x nm x E	OTm / 3600					300.07	
(45)m=	126.51	110.65	114.18	99.55	95.52	82.42	76.38	87.64	88.69	103.36	112.83	122.52		
(10)111=	120.01	110.00	11110	00.00	00.02	02.12	7 0.00	07.01			m(45) ₁₁₂ =		1220.26	(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		rotar – oa	111(40)112 -	ļ	1220.20	
(46)m=	18.98	16.6	17.13	14.93	14.33	12.36	11.46	13.15	13.3	15.5	16.92	18.38		(46)
	storage							1						, ,
Storag	e volum	e (litres)	includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If comr	munity h	eating a	nd no ta	ınk in dw	velling, e	nter 110) litres in	(47)					•	
Otherw	vise if no	stored	hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:												
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWl	n/day):				1.	39		(48)
Tempe	erature fa	actor fro	m Table	2b							0.	54		(49)
Energy	lost fro	m water	storage	, kWh/y	ear			(48) x (49)	=		0.	75		(50)
•			eclared o	-										
		-	factor fr		le 2 (kW	h/litre/da	ay)					0		(51)
	munity h e factor	•	ee secti	on 4.3									I	(50)
			bie ∠a m Table	2h								0		(52)
								(43) (54)	(50)	- 0)		0		(53)
•	/ 10st 1ro (50) or (storage	, KVVN/ye	ear			(47) x (51)) X (52) X (53) =	-	0		(54)
	` , ` `	, ,	,					((50) (EE) (44)		0.	75		(55)
vvater	storage	ioss cai	culated 1	or each	month			((56)m = (55) × (41)I	n	•		•	
(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	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=	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)
Primar	v circuit	loss (an	nual) fro	m Table	3			•				0		(58)
	•	,				59)m =	(58) ÷ 36	65 × (41)	m				l	
	-					•	. ,	ng and a		r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
		oulot'	for ac-	month.	(C1)	(CO) : 0:	SE /44	\					I	
			i		ì	ì ´	65 × (41	<u></u>	_	_		_	1	(64)
(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 fo	r each month	(62)	m = 0).85 × (4	45)m +	· (46)m +	(57)m +	(59)m + (61)m	
(62)m= 173.11 152.74	160.78	144.64	142.11	12	27.52 122.97	134	.24	133.78	149.96	157.92	169.12		(62)
Solar DHW input calculated	using App	endix G oı	Appendix	H (negative quantity	/) (ent	er '0' if	f no solar	contribu	ition to wate	er heating)	•	
(add additional lines if	FGHRS	and/or \	WWHRS	ар	plies, see Ap	pend	dix G)						
(63)m= 0 0	0	0	0		0 0	C)	0	0	0	0		(63)
Output from water hea	iter				•					•		•	
(64)m= 173.11 152.74	160.78	144.64	142.11	12	27.52 122.97	134	.24	133.78	149.96	157.92	169.12		
				•	•		Output	t from wa	ter heat	er (annual) ₁	12	1768.87	(64)
Heat gains from water	heating,	kWh/m	onth 0.2	5 ´	[0.85 × (45)m	+ (6	1)m]	+ 0.8 x	[(46)m	n + (57)m	+ (59)m]	
(65)m= 79.34 70.46	75.24	69.17	69.04	6	3.48 62.67	66.	42	65.56	71.64	73.59	78.01		(65)
include (57)m in cal	culation of	of (65)m	only if c	ylir	der is in the	dwell	ing o	r hot wa	ater is	from com	munity h	neating	
5. Internal gains (see	e Table 5	and 5a):										
Metabolic gains (Table	e 5). Wat	ts											
Jan Feb	Mar	Apr	May		Jun Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m= 91.28 91.28	91.28	91.28	91.28	9	1.28 91.28	91.	28	91.28	91.28	91.28	91.28		(66)
Lighting gains (calcula	ited in Ap	pendix	L, equat	ion	L9 or L9a), a	lso s	ee Ta	able 5				•	
(67)m= 14.83 13.17	10.71	8.11	6.06	_	5.12 5.53	7.1	_	9.65	12.25	14.3	15.24		(67)
Appliances gains (calc	culated in	Append	dix L, eq	uat	ion L13 or L1	 3а),	also s	see Tab	le 5	-		ı	
(68)m= 159.14 160.8	156.63	147.77	136.59	_	26.08 119.06	117		121.57	130.43	141.61	152.12		(68)
Cooking gains (calcula	ated in A	ppendix	L, equat	tion	L15 or L15a)	, als	o see	Table	5				
(69)m= 32.13 32.13	32.13	32.13	32.13	_	2.13 32.13	32.		32.13	32.13	32.13	32.13		(69)
Pumps and fans gains	Table 5	 5a)		_	I	<u> </u>	!	!			ļ.	ı	
(70)m= 3 3	3	3	3		3 3	3	3	3	3	3	3		(70)
Losses e.g. evaporation	on (negat	tive valu	es) (Tab	le s		<u> </u>		,				ı	
(71)m= -73.02 -73.02	-73.02	-73.02	-73.02		3.02 -73.02	-73	.02	-73.02	-73.02	-73.02	-73.02		(71)
Water heating gains (rable 5)	<u> </u>	ļ.	<u> </u>	I	<u> </u>	!_	!		<u> </u>	<u>!</u>	ı	
(72)m= 106.64 104.85	·	96.07	92.79	8	8.17 84.24	89.	27	91.06	96.3	102.21	104.86		(72)
Total internal gains :					(66)m + (67)m					<u>.</u>	<u> </u>]	
(73)m= 334 332.2	321.86	305.34	288.83	27	2.75 262.21	267	.25	275.66	292.36	311.5	325.61		(73)
6. Solar gains:													
Solar gains are calculated	using sola	r flux from	Table 6a	and	associated equa	itions	to conv	vert to the	e applica	ıble orientat	ion.		
Orientation: Access I	actor	Area			Flux			g_		FF		Gains	
Table 6d	I	m²			Table 6a		Tal	ble 6b	-	Table 6c		(W)	
Southeast 0.9x 0.77	X	8.6	35	x	36.79	x	(0.63	_ x [0.7	=	97.28	(77)
Southeast 0.9x 0.77	x	8.6	35	x	62.67	x		0.63	x	0.7	=	165.7	(77)
Southeast 0.9x 0.77	x	8.6	35	x	85.75	x	(0.63	x	0.7	=	226.72	(77)
Southeast 0.9x 0.77	X	8.6	65	x	106.25	x		0.63] × [0.7		280.91	(77)
Southeast 0.9x 0.77	х	8.6	55	x	119.01	x		0.63	_ x [0.7	=	314.65	(77)
Southeast 0.9x 0.77	x	8.6	55	x	118.15	x	(0.63		0.7		312.37	(77)
Southeast 0.9x 0.77	x	8.6	35	x	113.91	x	(0.63	_ x [0.7	=	301.16	(77)
Southeast 0.9x 0.77	x	8.6	35	x	104.39	x		0.63	x	0.7		275.99	(77)

Southeas	st _{0.9x}	0.77	X	8.6	65	x	9	2.85	x		0.63	x	0.7	=	245.49	(77)
Southeas	st _{0.9x}	0.77	x	8.6	65	X	6	9.27	x		0.63	_ x _	0.7		183.13	(77)
Southeas	st _{0.9x}	0.77	X	8.6	65	x	4	4.07	x		0.63	= x =	0.7	=	116.52	(77)
Southeas	st _{0.9x}	0.77	X	8.6	65	x	3	1.49	x		0.63	= x =	0.7	=	83.25	(77)
	_								•							_
Solar ga	ins in v	watts, ca	alculated	for eacl	h month				(83)m	ı = Sı	um(74)m .	(82)m				
Ť	97.28	165.7	226.72	280.91	314.65		12.37	301.16	275	.99	245.49	183.13	116.52	83.25		(83)
Total gai	ins – ir	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts							•	
(84)m= 4	431.28	497.9	548.58	586.25	603.47	5	85.12	563.37	543	.24	521.15	475.49	428.01	408.86		(84)
7. Mear	n interi	nal temp	erature	(heating	season)										
			eating p				area f	from Tab	ole 9.	. Th	1 (°C)				21	(85)
•		_	ains for I			_				,	()					` ′
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec]	
(86)m=	0.99	0.98	0.95	0.87	0.73	⊢	0.54	0.39	0.4	- 	0.64	0.9	0.98	0.99		(86)
` ′			ļ.			_				!						` '
			ature in			_						22.22	00.40	00.0	1	(07)
(87)m=	20.23	20.4	20.61	20.82	20.95	<u> </u>	20.99	21	2	1	20.98	20.82	20.49	20.2		(87)
Tempe	rature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Tł	n2 (°C)				,	
(88)m=	20.13	20.14	20.14	20.15	20.15	2	20.16	20.16	20.	16	20.15	20.15	20.15	20.14		(88)
Utilisati	ion fac	tor for g	ains for r	est of d	welling,	h2	,m (se	e Table	9a)							
	0.99	0.97	0.94	0.84	0.68		0.47	0.31	0.3	34	0.57	0.86	0.97	0.99		(89)
— Mean ir	nternal	temner	ature in t	the rest	of dwelli	ina	T2 (fr	allow ste	ne 3	to 7	7 in Tahl	e 9c)			•	
	19.12	19.36	19.66	19.95	20.1	Ť	20.15	20.16	20.		20.14	19.96	19.51	19.08]	(90)
(00)		10100											g area ÷ (4	<u> </u>	0.48	(91)
													`	,	0.40	(,
	1		ature (fo				-		r `						1	(00)
` ′	19.65	19.86	20.11	20.37	20.51		20.55	20.56	20.		20.54	20.37	19.98	19.61		(92)
· · · · -			ne mean		· ·	т —			1			•	40.00	40.04	1	(93)
` '	19.65	19.86	20.11	20.37	20.51		20.55	20.56	20.	56	20.54	20.37	19.98	19.61		(93)
			uirement		بامداد د.			11 of	Tabl	- Ob		4 T: /*	7C\m ===	d == == == ==	v doto	
			ernal ter or gains u	•		ied	at Ste	ерттог	rabi	e 9L), so tha	t 11,ff1=(ro)m an	a re-caic	culate	
Γ	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec]	
∟ Utilisati			ains, hm		,					<u>-9 </u>					J	
	0.99	0.97	0.94	0.85	0.7		0.5	0.35	0.3	38	0.6	0.87	0.97	0.99		(94)
Useful (gains,	hmGm ,	W = (94	I)m x (84	4)m	_			<u> </u>					<u> </u>	J	
(95)m=	425.7	483.66	513.55	499.32	422.64	2	94.14	196.93	206	.36	315.24	414.53	415.51	404.79]	(95)
Monthly	y 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 los	ss rate	for mea	an intern	al tempe	erature,	Lm	ı , W =	=[(39)m :	x [(9:	3)m-	- (96)m]		•	•	
(97)m=	788.1	765.81	695.17	578.69	443.41	2	96.51	197.14	206	.71	322.16	492.01	651.17	783.26]	(97)
Space I	heating	g 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= 2	269.62	189.6	135.13	57.15	15.46		0	0	0)	0	57.65	169.68	281.59		
										Total	per year	(kWh/year) = Sum(9	8) _{15,912} =	1175.87	(98)
Space I	heating	g require	ement in	kWh/m²	2/year										21.54	(99)
- p- 2.00 i		۰ - ۱۳۰۰			, 											」 ` ′

9a. Energy requirements – Individual heating	systems including	g micro-CHP)					
Space heating:	Ž	,					٦
Fraction of space heat from secondary/supplementary system						0	(201)
Fraction of space heat from main system(s) (202) = 1 - (201) =						1	(202)
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =						1	(204)
Efficiency of main space heating system 1						93.5	(206)
Efficiency of secondary/supplementary heating system, %						0	(208)
Jan Feb Mar Apr Ma	' 	Aug Se	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above	i 		57.05	400.00	204.50	1	
269.62 189.6 135.13 57.15 15.46	0 0	0 0	57.65	169.68	281.59		
$ (211)m = \{ [(98)m \times (204)] \} \times 100 \div (206) $ $ 288.37 202.78 144.52 61.12 16.53 $	0 0	0 0	61.66	181.47	201 16		(211)
288.37 202.78 144.52 61.12 16.53		Total (kWh/	61.66 (ear) =Sum(301.16	1257.62	(211)
Space heating fuel (secondary), kWh/month		rotal (KVVIII)	(our) =ourn	- · · / 15,101	2	1257.62	(211)
$= \{[(98) \text{m x } (201)] \} \text{ x } 100 \div (208)$							
(215)m= 0 0 0 0 0	0 0	0 0	0	0	0		
		Total (kWh/	/ear) =Sum(215) _{15,101}	2=	0	(215)
Water heating							_
Output from water heater (calculated above)	4 407 50 400 07	140404 4007	2 1 40 00	457.00	100.40	1	
173.11 152.74 160.78 144.64 142.1 Efficiency of water heater	1 127.52 122.97	134.24 133.7	149.96	157.92	169.12	70.0	(216
217)m= 85.99 85.39 84.35 82.56 80.74	79.8 79.8	79.8 79.8	82.51	85.01	86.16	79.8	(217 (217
Fuel for water heating, kWh/month	70.0 70.0	70.0	02.01	00.01	00.10		(—
(219) m = (64) m × $100 \div (217)$ m			_	_		•	
(219)m= 201.31 178.87 190.6 175.18 176.03	2 159.79 154.1	168.22 167.6		185.77	196.27		_
Total = Sum(219a) ₁₁₂ = Annual totals Space heating fuel used, main system 1						2135.53	(219)
					r	kWh/yea	r
Water heating fuel used							╣
						2135.53	
Electricity for pumps, fans and electric keep-h	ot					<u>.</u>	
central heating pump:					30		(230
boiler with a fan-assisted flue					45		(230
Total electricity for the above, kWh/year		sum of (230	a)(230g) =	=		75	(231)
Electricity for lighting						261.91	(232)
12a. CO2 emissions – Individual heating sys	stems including m	icro-CHP					
	Energy kWh/year			sion fac 2/kWh	tor	Emissions	
Space heating (main system 1)	(211) x		0.2		=	271.65	(261
Space heating (secondary)	(215) x		0.5		=	0	(263
Water heating	(219) x		0.2		=	461.27	(264)
Space and water heating		+ (263) + (264) =				732.92	(265)
opaco and mater neating	(-) - (-3-)	, , (== -,				132.92	(203)

Electricity for pumps, fans and electric keep-hot $(231) \times 0.519 = 38.93 (267)$ Electricity for lighting $(232) \times 0.519 = 135.93 (268)$ Total CO2, kg/year sum of (265)...(271) = 907.77 (272)

TER = 16.63 (273)