Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 *Printed on 28 October 2020 at 14:54:20*

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 50.86m²Site Reference:Hermitage LanePlot Reference:Plot 30

Address:

Client Details:

Name: Address :

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 17.23 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

11.10 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 35.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 31.5 kWh/m²

OK

2 Fabric U-values

ElementAverageHighestExternal wall0.14 (max. 0.30)0.15 (max. 0.70)OK

Floor (no floor) Roof (no roof)

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

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

		Llea	r Details:						
Assessor Name:	Zahid Ashraf	030	Strom	a Nium	bori		STD∪	001082	
Software Name:	Stroma FSAP 2012	2	Softwa					on: 1.0.5.9	
		Proper	ty Address:	Plot 30					
Address :									
Overall dwelling dime	ensions:				A I I .	last (/as)		V - l	
Ground floor		A	srea(m²)	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	 + (1n)		(4)]` ''	127.10	
Dwelling volume	a) · (· a) · (· a) · (· a) · (· a)	()	30.00)+(3c)+(3c	d)+(3e)+	.(3n) =	107.15	7(5)
				(50) (50)	, , (00) , (00	.,	.(0)	127.15	(5)
2. Ventilation rate:		condary	other		total			m³ per hou	r
Number of chimneys	heating he	eating +	0	1 = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	Ј <u>Г</u>	0	x	20 =	0	(6b)
Number of intermittent fa				J	0	x	10 =	0	(7a)
Number of passive vents				L	0	x	10 =	0	(7b)
Number of flueless gas fi				L	0		40 =		(7c)
Number of flueless gas in	1163			L				0	(70)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b	o)+(7c) =		0		÷ (5) =	0	(8)
	peen carried out or is intended	d, proceed to (1)	7), otherwise o	ontinue fr	om (9) to	(16)	,		_
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9)]	-1]x0.1 =	0	(9)
	.25 for steel or timber fr	ame or 0.35	for masonr	v constr	uction	[(0)	1]x0.1 =	0	(11)
	resent, use the value corresp	onding to the gr	reater wall are	a (after					` ′
deducting areas of openia	ngs); if equal user 0.35 floor, enter 0.2 (unseale	od) or 0.1 (se	aled) else	enter ()			i	0	(12)
If no draught lobby, en	•	0.1 (30	aica), cisc	Critici o				0	(13)
• •	s and doors draught str	ipped					-	0	(14)
Window infiltration	-		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubi	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	•							0.15	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has	been done or a	degree air pe	meability	is being u	sed		2	(19)
Shelter factor	,		(20) = 1 -	0.075 x (1	19)] =			3 0.78	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ÷ 4								
	1.23 1.1 1.08	0.95 0.98	5 0.92	1	1.08	1.12	1.18		
			•		•	•	•	•	

Colouiste str	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 exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23
If balanced with									(200)			79.05	(23
a) If balance		-	-	_					2h)m + (23h) x [1 – (23c)		(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	ed mech	anical ve	ntilation	without	heat rec	covery (N	иV) (24b	m = (22)	2b)m + (23b)	<u> </u>	ı	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h	ouse ex	tract ver	itilation c	r positiv	e input v	ventilatio	n from o	outside				1	
if (22b)r	n < 0.5 ×	(23b), t	hen (24d	c) = (23b); other	wise (24	c) = (22k	o) m + 0.	.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural				•	•				0.51				
	n = 1, the	en (24d) 0	m = (220)	o)m othe	erwise (2	$\frac{4d}{0}$ m = 0		2b)m² x	0.5]	0		1	(2
24d)m= 0							0				0		(2
Effective air 25)m= 0.25	cnange 0.25	0.25	nter (24a 0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	1	(2
0.23	0.23	0.23	0.20	0.20	0.22	0.22	0.21	0.22	0.20	0.24	0.24		(_
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		X k J/K
Ooors	aroa	(111)	•••		2	 x	1.4	 =	2.8		10/111		(2
Vindows					8.651	=	/[1/(1.4)+	!	11.47	=			(2
Valls Type1	27.0)1	8.65	\neg	18.36	=	0.15		2.75	╡┌			\ \(2
Valls Type2	23.6		2	=	21.69	=	0.14	_	3.07	륵 ¦		-	(₂
otal area of e					50.7		0.14		0.07				\ (3
for windows and		•	ffective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragraph	n 3.2	(5
										_			
* include the area													
	3s, W/K :	= S (A x	U)				(26)(30)) + (32) =				20.09	(3
abric heat los leat capacity	Cm = S((A x k)	ŕ				(26)(30)		(30) + (32	2) + (32a).	(32e) =	20.09 560.63	= '
abric heat los leat capacity hermal mass	Cm = S(parame	(A x k) eter (TMF	P = Cm ÷	,				((28).	itive Value	: Low	, ,		(3
* include the area Fabric heat los Heat capacity Thermal mass For design assess The used inste	Cm = S(parame sments wh	(A x k) eter (TMF	$P = Cm \div tails of the$,				((28).	itive Value	: Low	, ,	560.63	(3
Fabric heat los Heat capacity Thermal mass For design assess an be used inste	Cm = S(s parame sments whead of a dea	(A x k) eter (TMF ere the de tailed calcu	P = Cm ÷ tails of the ulation.	construct	ion are not	t known pr		((28).	itive Value	: Low	, ,	560.63 100	(3
Fabric heat lost leat capacity Thermal mass For design assess an be used inste	Cm = S(s parame sments wh rad of a dec es : S (L	(A x k) eter (TMF ere the de tailed calcu x Y) cal	P = Cm ÷ tails of the ulation. culated t	construct	ion are not pendix l	t known pr		((28).	itive Value	: Low	, ,	560.63	(3
Fabric heat lost leat capacity Thermal mass For design assess an be used inste Thermal bridge Thermal bridge Thetails of thermal	Cm = S(parame sments wh had of a dea es : S (L al bridging	(A x k) eter (TMF ere the de tailed calcu x Y) cal	P = Cm ÷ tails of the ulation. culated t	construct	ion are not pendix l	t known pr		((28). Indica	itive Value	: Low	, ,	560.63 100	(3)
Fabric heat lost leat capacity Thermal mass for design assess an be used instevential bridged details of thermal fotal fabric he	Cm = S(a parame sments wh had of a dec es : S (L hal bridging that loss	(A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to	constructions co	ion are not pendix l	t known pr		((28) Indica e indicative	ative Value e values of	: Low : TMP in T	able 1f	560.63 100 6.08	(3)
Fabric heat lost leat capacity Thermal mass for design assess an be used instead thermal bridged details of thermal fotal fabric he	Cm = S(a parame sments wh had of a dec es : S (L hal bridging that loss	(A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to	constructions co	ion are not pendix l	t known pr		((28) Indica e indicative	tive Value e values of	: Low : TMP in T	able 1f	560.63 100 6.08	(3
Tabric heat losses leat capacity Thermal masses for design assess an be used instead for thermal bridge details of thermal fotal fabric head fabric head and the search and	Cm = S(parame sments wh had of a dei es : S (L al bridging eat loss at loss ca	(A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to own (36) =	constructions and constructions are constructed using April 20.05 x (3)	ppendix k	t known pr	ecisely the	((28). Indica e indicative (33) + (38)m	e values of	: Low : TMP in To	able 1f	560.63 100 6.08	(3
Fabric heat losseleat capacity Thermal massessan be used instead for details of thermal fotal fabric head of the details of th	Cm = S(parame sments wh had of a der es : S (L hal bridging hat loss at loss ca Feb 10.49	(A x k) eter (TMF ere the de tailed calculated are not kn alculated Mar 10.37	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix ł 1) Jun	t known pr	ecisely the	((28). Indica e indicative (33) + (38)m Sep 9.27	e values of (36) = 0.33 × (225)m x (5 Nov 9.88	able 1f	560.63 100 6.08	(3)
Fabric heat losseleat capacity Thermal massessan be used inste Thermal bridge Thermal bridge Total fabric he Total fabric he Total fabric he Total fabric heat	Cm = S(parame sments wh had of a der es : S (L hal bridging hat loss at loss ca Feb 10.49	(A x k) eter (TMF ere the de tailed calculated are not kn alculated Mar 10.37	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix ł 1) Jun	t known pr	ecisely the	((28). Indica e indicative (33) + (38)m Sep 9.27	(36) = 0.33 × (Oct 9.64	225)m x (5 Nov 9.88	able 1f	560.63 100 6.08	(3)
Fabric heat losseleat capacity Thermal massessan be used inste Thermal bridge Total fabric her Total fabric	Cm = S(parame sments wh had of a det es : S (L hal bridging hat loss at loss ca Feb 10.49 coefficier 36.66	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37 nt, W/K 36.54	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 9.76	constructions Appendix Construction (Construction) construction (Construction) display (Construction	ppendix k Jun 9.03	t known pr	Aug 8.91	((28). Indicative indicative (33) + (38)m Sep 9.27 (39)m 35.44	(36) = = 0.33 × (Oct = 9.64 35.81 Average =	25)m x (5 Nov 9.88 38)m 36.05 Sum(39) ₄	Dec 10.13	560.63 100 6.08	(3)
Fabric heat lost leat capacity Thermal mass for design assess an be used insternal bridge details of thermal fotal fabric here a support of the support of t	Cm = S(parame sments wh had of a det es : S (L hal bridging hat loss at loss ca Feb 10.49 coefficier 36.66	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37 nt, W/K 36.54	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 9.76	constructions Appendix Construction (Construction) construction (Construction) display (Construction	ppendix k Jun 9.03	t known pr	Aug 8.91	((28). Indicative indicative (33) + (38)m Sep 9.27 (39)m 35.44	(36) = 0.33 × (0.00	25)m x (5 Nov 9.88 38)m 36.05 Sum(39) ₄	Dec 10.13	560.63 100 6.08 26.17	(3)

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)
				ı										
4 \\/-	tor boot	ing once	av rogui	romonti								Is\A/b/s	201	
4. ۷۷	ater heat	ing ener	gy requi	nement.								kWh/ye	al.	
Assum	ed occu	pancy, I	N								1.	72		(42)
		-	+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)		1	
	A £ 13.9	•						(O= N)			_		1	
								(25 x N) to achieve	+ 36 a water us	se target o		.89		(43)
		•		• •	/ater use, i	-	•			ar amgara				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Hot wate							Table 1c x		Т Зер	l Oct	INOV	Dec		
		-						· ·	77.04	00.40	00.00	00.70	1	
(44)m=	86.78	83.62	80.46	77.31	74.15	71	71	74.15	77.31	80.46	83.62	86.78		740
Eneray (content of	hot water	used - cal	culated m	onthly = 4	190 x Vd.i	m x nm x F	OTm / 3600) kWh/mor	Total = Su oth (see Ta	. ,		946.64	(44)
				1							ı		1	
(45)m=	128.69	112.55	116.14	101.25	97.16	83.84	77.69	89.15	90.21	105.13	114.76	124.63		1 (45)
If instan	taneous w	ater heatii	na at point	of use (no	o hot wate	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1241.2	(45)
				,					, , , , I	15.77	17.04	10.00	1	(46)
(46)m= Water	19.3 storage	16.88	17.42	15.19	14.57	12.58	11.65	13.37	13.53	15.77	17.21	18.69		(46)
	•		includin	na anv si	olar or W	/WHRS	storage	within s	ame ves	ടല		0	1	(47)
_		,		•) litres in		ATTIC VOS	001		U		(47)
	-	_			_				ers) ente	ar 'O' in <i>(</i>	47)			
	storage		not wate	; (tili5 li	iciuues i	HStaritai	ieous cc	ווטט וטוווע	ers) erite	51 0 111 (47)			
	•		eclared l	oss fact	or is kno	wn (kWl	n/dav):					0		(48)
•	erature fa					(, , .]	(49)
•								(40) × (40	\			0] 1	` '
•	/ lost fro		_	-	ear Ioss fact	or is not		(48) x (49) =		1	10		(50)
				-	le 2 (kW						0	02]	(51)
	munity h	•			- (,				<u> </u>	<u> </u>	I	(= -)
	e factor	_									1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
Energy	/ lost fro	m water	storage	, kWh/y	ear			(47) x (51) x (52) x (53) =	1.	03	<u>.</u>]	(54)
	(50) or (•								-	03		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01]	(56)
									7)m = (56)] liv H	(30)
ii Cyllilde				rage, (37)	•	•	<u> </u>		•			тт дррена	1	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	nual) fro	m Table	e 3							0		(58)
Primar	y circuit	loss cal	culated t	for each	month (59)m =	(58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fi	om Tab	le H5 if t	here is	solar wa	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	اروم دعا	culated	for each	month	(61)m –	(60) ± 31	65 × (41)m	•				•	
(61)m=	0	0	0	0	0 0	00) + 3	0 7 (41	0	0	0	0	0		(61)
(01)111-		U	Ŭ	L	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>			(0.)

Total boot roa	uirad far	water be	acting of	alouloto a	l for	aaab manth	(CO) m	0.05	(4E\m .	(46)m ı	/F7\m .	(E0)m + (61)m	
	162.48	171.42	154.75	152.43		7.33 132.97	144.4		160.41	168.26	179.9	(59)m + (61)m 1	(62)
` '											l .	İ	(02)
Solar DHW input (add additiona									ir contribu	ition to wate	er neating)		
(63)m= 0	0	0	0	0	- 	0 0	0		0	0	0		(63)
Output from w										1 -		i	` ,
(64)m= 183.96	162.48	171.42	154.75	152.43	137	7.33 132.97	144.4	13 143.71	160.41	168.26	179.9	1	
(04)111= 100.00	102.40	17 1.42	104.70	102.40	107	102.07		Output from w			l	1892.04	(64)
Heat gains fro	m water	heating	kWh/m	onth 0.2	5 ´ [() 85 × (45)m		•		,](- /
(65)m= 87.01	77.36	82.84	76.46	76.53	70.		73.8		79.18	80.95	85.66	ĺ	(65)
include (57)	ļ								<u> </u>	<u>ļ</u>	!	l Seating	` ,
` ,					ymic		JWEIIII	ig of flot w	alei is i	TOTTI COTTI	inunity i	leating	
5. Internal ga	•).									
Metabolic gair Jan	rs (Table Feb	(5), Wat Mar		May		un Jul	Au	g Sep	Oct	Nov	Dec	1	
(66)m= 85.77	85.77	85.77	Apr 85.77	85.77	85.	_	85.7		85.77	85.77	85.77		(66)
` '	ļ.					I		<u>_</u>	00.77	03.77	03.77	İ	(00)
Lighting gains	` 			L, equat	_	_9 or L9a), a 74	6.66		14.25	13.25	14.10	1	(67)
(67)m= 13.74	12.21	9.93	7.51		l		l	<u> </u>	11.35	13.25	14.12	İ	(07)
Appliances ga				·	_		-		1	1 400	4 40 07	1	(60)
(68)m= 149.47		147.11	138.79	128.29		3.42 111.82	110.2		122.5	133	142.87	İ	(68)
Cooking gains	<u> </u>	· ·					_		1	1	T	1	(00)
(69)m= 31.58	31.58	31.58	31.58	31.58	31	.58 31.58	31.5	8 31.58	31.58	31.58	31.58	İ	(69)
Pumps and fa		r `							1	1		1	(- 0)
(70)m= 0	0	0	0	0	l	0	0	0	0	0	0		(70)
Losses e.g. ev		``			–	<u> </u>			1		i	1	
(71)m= -68.62	-68.62	-68.62	-68.62	-68.62	-68	3.62 -68.62	-68.6	-68.62	-68.62	-68.62	-68.62		(71)
Water heating	Ť	able 5)								1		1	
(72)m= 116.95	115.13	111.34	106.2	102.86	98	.15 94.16	99.2	!	106.42	112.44	115.13	İ	(72)
Total internal						(66)m + (67)m	· ` ′	<u> </u>	<u> </u>	71)m + (72)		1	
(73)m= 328.89	327.08	317.11	301.24	285.49	270	259.83	264.9	272.95	289.01	307.42	320.86		(73)
6. Solar gains													
Solar gains are		•			and a	·	itions to		ne applica		ion.		
Orientation: /	Access F Table 6d		Area m²			Flux Table 6a		g_ Table 6b	7	FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	8.6	· -	хГ	36.79	1 _x [0.63		0.7		97.28	(77)
Southeast 0.9x	0.77	x			^ _ х Г	62.67] ^	0.63		0.7	= -	165.7](77)
Southeast 0.9x	0.77	x	8.6		x Γ	85.75] ^ L] _x [0.63	^ L x [0.7	=	226.72](77)
Southeast 0.9x		×			^ _ х Г]		-		= =](77)
Southeast 0.9x	0.77	^	8.6		х Г х Г	106.25]	0.63	^ L × [0.7	= =	280.91](77)
Southeast 0.9x	0.77	^	8.6		F	119.01]	0.63	≓ ;	0.7	=	314.65	」 ⁽⁷⁷⁾ □ ₍₇₇₎
Southeast 0.9x	0.77		8.6		х <u>Г</u>	118.15	┆	0.63	× [, [0.7	_ = -	312.37	╣`
Southeast 0.9x	0.77	×	8.6		х <u>Г</u>	113.91]	0.63	× [, [0.7	=	301.16	 1 (77)
Journeast (J.9X	0.77	X	8.6	00	x L	104.39	X	0.63	x [0.7	=	275.99	(77)

Southea	ıst _{0.9x}	0.77	X	8.6	55	x	92.85	x	0.63	x	0.7		245.49	(77)
Southea	st _{0.9x}	0.77	x	8.6	65	x	69.27	x	0.63	x	0.7	=	183.13	(77)
Southea	st 0.9x	0.77	x	8.6	65	x	44.07	x	0.63	х	0.7	=	116.52	(77)
Southea	st 0.9x	0.77	x	8.6	65	x	31.49	x	0.63	х	0.7	=	83.25	(77)
	_													_
Solar ga	ains in v	watts, ca	alculated	for eacl	h month			(83)m =	Sum(74)m .	(82)m				
(83)m=	97.28	165.7	226.72	280.91	314.65	312.3	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)	m , watts			!	!	!	1	
(84)m=	426.17	492.78	543.83	582.15	600.14	582.4	12 560.99	540.94	518.44	472.14	423.94	404.11		(84)
7. Mea	an inter	nal temp	erature ((heating	season)	_							
				`			ea from Tal	ole 9. T	h1 (°C)				21	(85)
•		_	• .			•	Table 9a)	,	(- /					`` ′
Г	Jan	Feb	Mar	Apr	May	Ju		Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.9	0.85	0.77	0.66	0.52	0.38	-	0.3	0.46	0.68	0.84	0.91		(86)
` ′ L							!	l .		0.00	0.04	0.01	J	()
Mean							steps 3 to 7	ı —		,	,	,	1	
(87)m=	20.04	20.28	20.54	20.79	20.92	20.9	8 21	20.99	20.96	20.79	20.4	20	J	(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dwell	ing from Ta	able 9, ⁻	Γh2 (°C)					
(88)m=	20.32	20.32	20.32	20.34	20.34	20.3	5 20.35	20.35	20.34	20.34	20.33	20.33		(88)
Utilisat	tion fac	tor for a	ains for r	est of d	welling	n2 m	(see Table	9a)					ı	
(89)m=	0.89	0.83	0.75	0.63	0.49	0.34	<u>` </u>	0.25	0.42	0.65	0.83	0.9]	(89)
L	. ,						. / 6 11		<u> </u>	L		<u> </u>	ı	
Г		19.38	19.74	20.08	20.25		2 (follow ste	20.35	20.31	20.09	19.56	18.99	1	(90)
(90)m=	19.04	19.36	19.74	20.08	20.25	20.3	3 20.34	20.35			19.56 ig area ÷ (4			_ ` ′
									'	ILA = LIVIII	ig alea ÷ (·	+) =	0.45	(91)
Mean	interna	temper	ature (fo	r the wh	ole dwe	ling)	= fLA × T1	+ (1 – f	LA) × T2					
(92)m=	19.5	19.79	20.11	20.4	20.56	20.6	3 20.64	20.64	20.61	20.41	19.95	19.44		(92)
Apply	adjustn	nent to th	he mean	internal	temper	ature	from Table	4e, wh	ere appr	opriate			_	
(93)m=	19.5	19.79	20.11	20.4	20.56	20.6	3 20.64	20.64	20.61	20.41	19.95	19.44		(93)
8. Spa	ice hea	ting requ	uirement											
						ed at	step 11 of	Table 9	9b, so tha	nt Ti,m=(76)m an	d re-cald	culate	
the util			or gains ι				_		_		1	1	1	
L	Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec]	
г			ains, hm					1					1	
(94)m=	0.87	0.82	0.75	0.63	0.5	0.36	0.25	0.27	0.43	0.66	0.82	0.89	J	(94)
			W = (94)	, <u> </u>					_		1	1	1	
L	371.88	403.72	405.27	369.54	301.53	208.		147.8	223.82	310.06	346.1	358.02]	(95)
	ly avera	_	rnal tem	perature	from Ta	able 8	3			,	,		1	
(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 lo	oss rate		an intern	al tempe	erature,	Lm , ۱	N =[(39)m	x [(93)r	n- (96)m]	1	1	1	
(97)m=	559.03	545.92	497.15	413.1	317.1	212.	12 142.2	148.72	230.59	351.28	463.11	553.3		(97)
Space	heatin	g require	ement for	r each n	nonth, k\	/Vh/m	onth = 0.02	24 x [(9	7)m – (95)m] x (4	1)m		1	
(98)m=	139.24	95.56	68.36	31.36	11.58	0	0	0	0	30.67	84.24	145.29		
								To	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	606.3	(98)
Space	heating	g require	ement in	kWh/m²	² /year								11.92	(99)
•		- •			-									

9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community sch	eme	
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0 (30	01)
Fraction of space heat from community system $1 - (301) =$	1 (30	02)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sincludes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.	sources; the latter	
Fraction of heat from Community boilers	1 (30	03a)
Fraction of total space heat from Community boilers (302) x (303a)	a) = 1 (30	04a)
Factor for control and charging method (Table 4c(3)) for community heating system	1 (30	05)
Distribution loss factor (Table 12c) for community heating system	1.05	06)
Space heating	kWh/year	
Annual space heating requirement	606.3	
Space heat from Community boilers (98) x (304a) x (305) x (306) =	636.62	07a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (30	808
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0 (30	09)
Water heating		
Annual water heating requirement	1892.04	
If DHW from community scheme: Water heat from Community boilers (64) x (303a) x (305) x (306) =	1986.64 (31	10a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(307e)	310e)] = 26.23 (31	13)
Cooling System Energy Efficiency Ratio	0 (31	14)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	0 (31	15)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	176.46 (33	30a)
warm air heating system fans	0 (33	30b)
pump for solar water heating	0 (33	30g)
Total electricity for the above, kWh/year =(330a) + (330b) + (330g) =	176.46 (33	31)
Energy for lighting (calculated in Appendix L)	242.69 (33	32)
Electricity generated by PVs (Appendix M) (negative quantity)	-518.71 (33	33)
Electricity generated by wind turbine (Appendix M) (negative quantity)	0 (33	34)
12b. CO2 Emissions – Community heating scheme		
Energy Emission kWh/year kg CO2/k\	factor Emissions Wh kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two fuels repeat (363) to (366) for the se	econd fuel 94 (36	67a)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x 0.22	= 602.79 (36	67)
Electrical energy for heat distribution [(313) x 0.52	= 13.61 (37	72)
Total CO2 associated with community systems (363)(366) + (368)(372)	= 616.41 (37	73)
CO2 associated with space heating (secondary) (309) x 0	= 0 (37	74)

CO2 associated with water from imme	rsion heater or instanta	aneous heater (312)	x 0.22	=	0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =	:		616.41	(376)
CO2 associated with electricity for pur	nps and fans within dw	velling (331)) x	0.52	=	91.58	(378)
CO2 associated with electricity for ligh	ting	(332))) x	0.52	=	125.95	(379)
Energy saving/generation technologie	s (333) to (334) as app	licable _				_
Item 1			0.52 × 0	.01 =	-269.21	(380)
Total CO2, kg/year	sum of (376)(382) =				564.73	(383)
Dwelling CO2 Emission Rate	$(383) \div (4) =$				11.1	(384)
El rating (section 14)					92.11	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 30

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: No Number of storeys: 1

Front of dwelling faces: North West

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

Night ventilation: False

Blinds, curtains, shutters:

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

Overheating Details:

Summer ventilation heat loss coefficient: 167.84 (P1)

Transmission heat loss coefficient: 26.2

Summer heat loss coefficient: 194.01 (P2)

Overhangs:

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

Solar gains:

Orientation FF Area Flux Shading Gains g_{-} 119.92 0.9 370.59 South East (SE) 0.9 x8.65 0.63 0.7 **Total** 370.59 (P3/P4)

Internal gains:

June July **August** Internal gains 368.07 355.18 361.83 757.09 725.77 (P5) Total summer gains 707.54 Summer gain/loss ratio 3.9 3.74 3.65 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Thermal mass temperature increment 1.3 1.3 1.3 (P7) Threshold temperature 21.2 22.94 22.75 Likelihood of high internal temperature Slight Medium Medium

Assessment of likelihood of high internal temperature: Medium

		User_[Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012			a Num are Ve				0001082 on: 1.0.5.9	
		Property	Address	: Plot 30					
Address :									
1. Overall dwelling dime	ensions:	۸۳۵	a(m2)		۸۰، ۵۰	iaht/m)		Valuma/m³	4
Ground floor		_	ea(m²) 50.86	(1a) x		ight(m) 2.5	(2a) =	Volume(m³	(3a)
Total floor area TFA – (1	a)+(1b)+(1c)+(1d)+(1e)+(1		50.86	(4)				127.110	
	a)1(10)1(10)1(10)1(10)1(50.66	J)+(3c)+(3c	4) 1 (30) 1	(2n) -		7
Dwelling volume				(3a)+(3b)+(30)+(30	ı)+(3e)+	(311) =	127.15	(5)
2. Ventilation rate:	main seconda	arv	other		total			m³ per hou	r
Number of alligners	heating heating			F			40 =	-	_
Number of chimneys		_ +	0	<u> </u>	0			0	(6a)
Number of open flues	0 + 0	+	0	_ = [0	x	20 =	0	(6b)
Number of intermittent fa	ins				2	X	10 =	20	(7a)
Number of passive vents	3				0	X	10 =	0	(7b)
Number of flueless gas f	ires				0	X	40 =	0	(7c)
							Air ch	anges per he	NIIP.
lafituation due to altique	fl (Co).(Ch).	(7 0) . (7 b) .	(70)	_				nanges per ho	_
	ys, flues and fans = (6a)+(6b)+ neen carried out or is intended, proce			continue fi	20 rom (9) to 1		÷ (5) =	0.16	(8)
Number of storeys in t		ou to (11),	Oli IOI WIGO	oorianae n	0111 (0) 10 ((10)		0	(9)
Additional infiltration	- , ,					[(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	ea (after					
=	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration				2 x (14) ÷ 1				0	(15)
Infiltration rate					12) + (13)			0	(16)
	q50, expressed in cubic metallity value, then $(18) = [(17) \div 20]$ -	•	•	•	etre of e	envelope	e area	3	(17)
•	es if a pressurisation test has been de				is being u	sed		0.31	(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	3) x (20) =				0.24	(21)
Infiltration rate modified f		-	1	•	•	1	1	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		-	1	•	•	1	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 infilt	ration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.3	0.3	0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28]	
Calculate effe		_	rate for t	he appli	cable ca	ise						•	
If mechanic			andiv N (2	3h) - (23s	a) v Emy (4	aguation (I	N5N othe	rwisa (23h	n) – (23a)			0	(23a)
If balanced wi) = (23a)			0	(23b)
a) If balance		-	-	_					Oh)m ı ((22h) v [1 (220)	0	(23c)
(24a)m= 0			0	0	0	0	0	0	0	0	0]	(24a)
b) If balance		anical ve					MV) (24t			23h)]	,
(24b)m= 0		0	0	0	0	0	0	0	0	0	0]	(24b)
c) If whole	house ex	tract ver	tilation o	r positiv	L /e input :	L ventilatio	on from (L outside	<u>!</u>	<u>!</u>	ļ	J	
•	m < 0.5 >			•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natura	ventilation	on or wh	ole hous	e positiv	e input	ventilati	on from	oft	•	•	•	•	
if (22b)	m = 1, th	en (24d)	· ·	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]			7	
(24d)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(24d)
Effective ai			<u> </u>	<u> </u>	í `	ŕ `		`				7	
(25)m= 0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(25)
3. Heat loss	es and he	eat loss _l	paramete	er:									
ELEMENT	Gros		Openin		Net Ar		U-val		AXU		k-value		λXk
5	area	(m²)	m	l ²	A ,r	m² ────	W/m2	:Κ ──	(W/	K)	kJ/m²•	K k	J/K
Doors					2	X	1.4	=	2.8	_			(26)
Windows					8.651	1 x ¹	/[1/(1.4)+	0.04] =	11.47	ᆜ .			(27)
Walls Type1	27.0	01	8.65		18.36	5 X	0.15	=	2.75			_	(29)
Walls Type2	23.6	69	2		21.69) x	0.14	=	3.07				(29)
Total area of		-			50.7								(31)
* for windows an ** include the are						lated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	h 3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30) + (32) =				20.09	(33)
Heat capacity	' Cm = S	(A x k)						((28).	(30) + (3	2) + (32a).	(32e) =	560.63	(34)
Thermal mas	s parame	eter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design asses				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridg				usina An	pendix I	K						6.08	(36)
if details of thern	,	,			•							0.00	(00)
Total fabric h			, ,	·	,			(33) +	(36) =			26.17	(37)
Ventilation he	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 22.91	22.84	22.77	22.42	22.36	22.05	22.05	22	22.17	22.36	22.49	22.62		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m= 49.08	49.01	48.93	48.59	48.52	48.22	48.22	48.17	48.34	48.52	48.65	48.79]	
Heat loss par	ameter (l		/m²K		-	•	-		Average = = (39)m ÷		12 /12=	48.59	(39)
(40)m= 0.97	0.96	0.96	0.96	0.95	0.95	0.95	0.95	0.95	0.95	0.96	0.96	1	
0.07	1 0.00	1	L 5.00	1 3.00	L 5.00	L 3.50	1 3.50		Average =	<u> </u>	<u> </u>	0.96	(40)
													,

Numbe	er of day	s in mor	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
						•		•	•	•	•		·	
4. Wa	ater heat	ing ener	rgy requi	irement:								kWh/ye	ear:	
Λeeum	ned occu	nancy I	NI									70	1	(42)
	A > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		72		(42)
	A £ 13.9	•						(O.E. N.I.)	00				I	
	I average the annua									se target o		.89		(43)
not mor	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 wat	er usage ir	litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	86.78	83.62	80.46	77.31	74.15	71	71	74.15	77.31	80.46	83.62	86.78		
France (content of	hat water	used sel	aulatad m	anthly 1	100 v Vd r	m v nm v F	Tm / 2600			m(44) ₁₁₂ =		946.64	(44)
-			1	ı		1	ı		1	,		,	1	
(45)m=	128.69	112.55	116.14	101.25	97.16	83.84	77.69	89.15	90.21	105.13	114.76	124.63	4044.0	(45)
If instan	taneous w	ater heatii	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		i otai = Su	m(45) ₁₁₂ =		1241.2	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:			ļ		ļ	<u> </u>						
Storag	je volum	e (litres)	includin	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	munity h	-			_			` '		(01 ! /	47)			
	vise if no storage		not wate	er (tnis ir	iciuaes i	nstantar	ieous co	ilod Idmo	ers) ente	er o in (47)			
	nanufacti		eclared l	oss fact	or is kno	wn (kWh	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b		•	• ,					0		(49)
Energy	y lost fro	m water	storage	, kWh/y	ear			(48) x (49)) =			0		(50)
•	nanufact			-										
	ater stora	•			le 2 (kW	h/litre/da	ay)					0		(51)
	munity h e factor	-		011 4.3								0		(52)
	erature fa			2b								0		(53)
Energy	y lost fro	m water	storage	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or (54) in (5	55)									0		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylind	er contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	ry circuit	loss (an	nual) fro	m Table	e 3							0		(58)
Primar	y circuit	loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
,	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		ı	
(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					1	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for wa	ater he	ating ca	lculated	for	each month	(62)r	n = 0.85 :	× (45)n	n + (46)m	+ (57)m +	- (59)m + (61)m	
	98.72	86.07	82.58	71.		75.7		ì	``	- ` ´ -]	(62)
Solar DHW input calculated usi	ing Appe	endix G or	Appendix	H (ne	egative guantity	() (ente	er '0' if no so	olar cont	ribution to w	ater heating) L	
(add additional lines if FC										0	,	
(63)m= 0 0	0	0	0	(0	0	C	0	0]	(63)
Output from water heater	r					!	!	!			_	
· — — —	98.72	86.07	82.58	71.	26 66.04	75.7	76.68	89.	36 97.5	5 105.93	7	
	Į.					(Output from	water h	eater (annu	al) ₁₁₂	1055.02	(64)
Heat gains from water he	eating,	kWh/mo	onth 0.2	5 ′ [0).85 × (45)m	+ (6	1)m] + 0.8	3 x [(46	s)m + (57)	m + (59)n	 n]	_
(65)m= 27.35 23.92 2	24.68	21.52	20.65	17.	82 16.51	18.9	94 19.17	7 22.	34 24.3	9 26.48		(65)
include (57)m in calcul	ation o	of (65)m	only if c	ylind	ler is in the o	dwelli	ng or hot	water	is from co	mmunity	heating	
5. Internal gains (see T	able 5	and 5a)):									
Metabolic gains (Table 5), Watt	S										
Jan Feb	Mar	Apr	May	Jı	ın Jul	Αι	ıg Sej	0	ct No	v Dec		
(66)m= 85.77 85.77 8	85.77	85.77	85.77	85.	77 85.77	85.7	7 85.77	7 85.	77 85.7	7 85.77		(66)
Lighting gains (calculated	d in Ap	pendix l	_, equat	ion L	.9 or L9a), a	lso se	ee Table	5			_	
(67)m= 13.74 12.21	9.93	7.51	5.62	4.7	74 5.12	6.6	6 8.94	11.	35 13.2	5 14.12		(67)
Appliances gains (calcula	ated in	Append	lix L, eq	uatic	n L13 or L1	3a), a	also see 7	Table 5		-	_	
(68)m= 149.47 151.02 1	47.11	138.79	128.29	118	.42 111.82	110.	27 114.1	8 122	2.5 133	142.87		(68)
Cooking gains (calculate	d in Ap	pendix	L, equat	ion l	_15 or L15a)	, also	see Tab	le 5	-	-		
(69)m= 31.58 31.58 3	31.58	31.58	31.58	31.	58 31.58	31.5	31.58	31.	58 31.5	31.58		(69)
Pumps and fans gains (T	able 5	a)									_	
(70)m= 0 0	0	0	0	C	0	0	0	С	0	0		(70)
Losses e.g. evaporation	(negati	ive valu	es) (Tab	le 5)							_	
(71)m= -68.62 -68.62 -	68.62	-68.62	-68.62	-68	.62 -68.62	-68.6	62 -68.6	2 -68	62 -68.6	2 -68.62		(71)
Water heating gains (Tab	ole 5)											
(72)m= 36.75 35.59 3	33.17	29.88	27.75	24.	74 22.19	25.4	6 26.63	30.	03 33.8	7 35.6		(72)
Total internal gains =					(66)m + (67)m	+ (68)m + (69)m	+ (70)m	+ (71)m + (72)m		
(73)m= 248.7 247.55 2	238.94	224.92	210.39	196	.63 187.87	191.	13 198.4	8 212	.61 228.8	6 241.33		(73)
6. Solar gains:												
Solar gains are calculated usi	•		Table 6a	and a	•	tions t	o convert to	the app				
Orientation: Access Fac Table 6d	ctor	Area m²			Flux Table 6a		g_ Table 6	ih.	FF Table 6		Gains (W)	
	-					l Г						7(77)
Courthogotha	X	8.6		× _	36.79	X [0.63	,			97.28	」 (77)
0 11 1	X	8.6		× _	62.67	X	0.63	,		==	165.7	<u></u> (77)
	X	8.6		х <u>Г</u>	85.75	X	0.63				226.72	」 (77)
On with a next	X	8.6		х <u>Г</u>	106.25		0.63				280.91	<u></u>
	_ X	8.6		х <u>Г</u>	119.01]	0.63				314.65	<u></u>
0 11 1	_ X	8.6		× L	118.15		0.63				312.37	<u></u>
0 11 1	_ X	8.6		х <u>Г</u>	113.91		0.63				301.16	<u></u>
Southeast 0.9x 0.77	X	8.6	5	X	104.39	X	0.63)	0.7	7 =	275.99	(77)

Southeast 0.9	9x 0.77	x	8.6	S5	X	92.85	X	0.63	х	0.7	=	245.49	(77)
Southeast 0.9	0.77	x	8.6	35	X	69.27	X	0.63	x [0.7	=	183.13	(77)
Southeast 0.9	9x 0.77	x	8.6	65	x	44.07	X	0.63	x	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 = 5	Sum(74)m	(82)m				
(83)m= 97.2	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= 345.	98 413.25	465.66	505.84	525.03	509.01	489.03	467.12	443.96	395.75	345.37	324.58		(84)
7. Mean ir	ternal temp	perature	(heating	season)								
	ıre during l		`		,	from Tal	ble 9, Th	11 (°C)				21	(85)
•	factor for g	•			•		,	` ,					」 ` `
Ja	$\overline{}$	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m= 0.9		0.88	0.8	0.69	0.54	0.41	0.45	0.63	0.83	0.93	0.96	1	(86)
` ′		· ·	ı	T. //	" ,		·		<u> </u>	<u> </u>	<u> </u>	ı	
	rnal temper	1		r — `	r	-i	T		I 00 00	1 40.00	1000	1	(07)
(87)m= 19. ⁻	19.47	19.87	20.31	20.66	20.88	20.96	20.95	20.8	20.33	19.66	19.09	J	(87)
Temperati	ire during h	neating p	eriods ir	rest of	dwellin	g from Ta	able 9, T	h2 (°C)				1	
(88)m= 20.°	20.11	20.12	20.12	20.12	20.13	20.13	20.13	20.12	20.12	20.12	20.12		(88)
Utilisation	factor for g	ains for i	rest of d	welling,	h2,m (s	ee Table	9a)						
(89)m= 0.9		0.86	0.77	0.65	0.48	0.34	0.37	0.58	0.8	0.92	0.95	1	(89)
Mean inte	rnal tempei	rature in	the rest	of dwelli	na T2 (follow sta	one 3 to	7 in Tah	le 9c)			ı	
(90)m= 18.4		19.12	19.54	19.86	20.05	20.11	20.1	19.99	19.57	18.93	18.36]	(90)
(33)								<u> </u>	ļ	l ng area ÷ (ļ	0.45	(91)
							,, .			,	,	00	`` ′
	rnal temper	- `				1	- `	'	1	1 40 00	1 40 00	1	(02)
(92)m= 18.7		19.46	19.89	20.22	20.43	20.49	20.49	20.36	19.92	19.26	18.69	J	(92)
· · · · · - · ·	stment to t	ne mean 19.46	19.89	20.22	20.43	20.49	20.49	ere appro	r	10.06	18.69	1	(93)
(93)m= 18.7				20.22	20.43	20.49	20.49	20.36	19.92	19.26	18.69		(93)
·	neating requee near in the mean in the mea			ro obtoir	od at a	top 11 of	Toble 0	h so tha	ot Ti m_/	76)m on	d ro cold	nulata	
	ion factor f				ieu ai s	teb i i oi	Table 9	D, SO IIIa	at 11,111=(70)III ali	u re-caic	Julate	
Ja		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilisation	factor for g	ains, hm	•		ļ.			· · ·				ı	
(94)m= 0.9	3 0.9	0.85	0.77	0.65	0.5	0.37	0.4	0.59	0.79	0.9	0.94	1	(94)
Useful gai	ns, hmGm	, W = (94	1)m x (8	4)m		-!						1	
(95)m= 322.	82 370.97	394.26	387.42	342.18	256.88	180.79	187.67	262.64	314.09	311.71	305.76		(95)
Monthly a	erage exte	ernal tem	perature	from Ta	able 8	•			•			ı	
(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= 709.	71 694.15	634.03	533.93	413.59	280.93	187.8	196.82	302.5	452.21	591.54	707		(97)
Space hea	ating requir	ement fo	r each n	nonth, k	/Vh/mor	nth = 0.02	24 x [(97)m – (95	5)m] x (4	1)m			
(98)m= 287.	85 217.17	178.39	105.49	53.13	0	0	0	0	102.76	201.48	298.52		
							Tota	al per year	(kWh/yea	r) = Sum(9	08)15,912 =	1444.78	(98)
Space hea	ating requir	ement in	kWh/m²	² /year								28.41	(99)
	٠,			•									

8c. Sp	pace co	oling rec	quiremen	t										
Calcu	lated fo	r June, c	July and	August.	See Tal	ole 10b							i	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	loss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	453.29	356.85	366.07	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm										•	
(101)m=	0	0	0	0	0	0.87	0.91	0.9	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = (100)m x	(101)m								•	
(102)m=	0	0	0	0	0	392.74	325.12	328.83	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	659.77	635.22	610.6	0	0	0	0		(103)
•		•	ement fo 104)m <			lwelling,	continud	ous (kW	h' = 0.0	24 x [(1(03)m – (102)m];	x (41)m	
(104)m=	0	0	0	0	0	192.26	230.72	209.64	0	0	0	0		
									Total	= Sum(104)	=	632.62	(104)
	I fraction	-							f C =	cooled	area ÷ (4	4) =	1	(105)
		actor (Ta	able 10b)									1	<u> </u>
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
_									Total	I = Sum(104)	=	0	(106)
		_ ·	ment for				<u> </u>							
(107)m=	0	0	0	0	0	48.07	57.68	52.41	0	0	0	0		_
									Total	= Sum(107)	=	158.15	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	/ear				(107)	\div (4) =			3.11	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	lculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Energ	y Efficier	псу						(99)	+ (108) =	=		31.52	(109)

SAP Input

Property Details: Plot 30

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:

Troperty description.

Flat

Floor area:

Dwelling type: Detachment:

Year Completed: 2020

Floor Location:

Storey height:

Floor 0 50.861 m^2 2.5 m

Living area: 23.069 m² (fraction 0.454)

Front of dwelling faces: North West

Opening types:

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

NW Manufacturer Solid

SE Manufacturer Windows double-glazed Yes

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

Name: Type-Name: Location: Orient: Width: Height: NW Corridor Wall North West 0 0

SE External Wall South East 0 0

Overshading: Average or unknown

Opaque Elements:

Type: Gross area: Openings: Net area: U-value: Ru value: Curtain wall: Kappa: **External Elements** External Wall 27.01 8.65 18.36 0.15 0 False N/A Corridor Wall 23.686 21.69 0.15 0.4 False N/A

Internal Elements
Party Elements

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1199

Length Psi-value Other lintels (including other steel lintels) 4.795 0.289 E2 E4 Jamb 13.2 0.047 37.208 0.064 E7 Party floor between dwellings (in blocks of flats) Staggered party wall between dwellings E25 10.9 0.109

SAP Input

13.625 0.08 E16 Corner (normal)

8.175 -0.072 E17 Corner (inverted internal area greater than external area)
22.574 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:

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

Pressure test:

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

3

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: 0.63 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		l lser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	<u> </u>	Strom Softwa					001082 on: 1.0.5.9	
	F	roperty	Address	: Plot 30					
Address :									
1. Overall dwelling dime	ensions:	Δro	a(m²)		Δν Ηο	ight(m)		Volume(m	3)
Ground floor				(1a) x		2.5	(2a) =	127.15	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	50.86	(4)					
Dwelling volume		′	00.00	J)+(3c)+(3c	d)+(3e)+	.(3n) =	127.15	(5)
				(00)	,,,(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			127.15	(3)
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır
Number of chimneys	heating heating beauting heating	- + F	0	7 = [0	x 4	10 =	0	(6a)
Number of open flues		╣ + 片	0	」	0	x 2	20 =	0	(6b)
Number of intermittent fa		_ L		_	2	x 1	10 =		(7a)
Number of passive vents				L			10 =	20	= ' '
·				L	0		10 =	0	(7b)
Number of flueless gas fi	ires			L	0	^	+0 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(6b)$	7a)+(7b)+	(7c) =		20	-	÷ (5) =	0.16	(8)
	peen carried out or is intended, proceed	ed to (17),	otherwise o	continue fr	rom (9) to	(16)			_
Number of storeys in the Additional infiltration	he dwelling (ns)					[(0)	410.4	0	(9)
	.25 for steel or timber frame o	r 0 35 fo	ır masonı	ry consti	ruction	[(9)-	·1]x0.1 =	0	(10)
	resent, use the value corresponding t			•	action.			0	(\.,
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unsealed) or 0	1 (222	مط/ مامم	antar O				_	— (40)
If no draught lobby, en	,	. i (Seai	eu), eise	enter 0				0	(12)
	s and doors draught stripped							0	(14)
Window infiltration	3 11		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	es per h	our per s	quare m	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] + (18) = [(17$							0.41	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has been do. ad	ne or a de	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	,u		(20) = 1 -	[0.075 x (19)] =			0.78	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	s) x (20) =				0.32	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
			-	<u> </u>		1		I	

Adjusted infilt	ration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.4	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37	1	
Calculate effe		•	rate for t	he appli	cable ca	se		<u> </u>	<u>!</u>	ļ	<u>I</u>	<u> </u>	
If mechanic												0	(23a
If exhaust air h) = (23a)			0	(23b
If balanced wit		•	•	_								0	(230
a) If balance	1	·			·	- 	, 	ŕ	- 	` 	' ' ') ÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a
b) If balance	1	i	ntilation		i	covery (N	MV) (24b	p)m = (22)	<u> </u>	· ·	1	7	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24t
c) If whole h if (22b)ı	nouse ex m < 0.5 >			•	•				.5 × (23k	o)		_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
d) If natural if (22b)	ventilation m = 1, th								0.5]			_	
(24d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(240
Effective air	r change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
3. Heat losse	es and he	eat loss r	paramete	er.									
ELEMENT	Gros	_	Openin		Net Ar	ea	U-val	ue	ΑXU		k-value	e	ΑΧk
	area		m		A ,r		W/m2		(W/		kJ/m²-		kJ/K
Doors					2	X	1	=	2				(26)
Windows					8.651	x1	/[1/(1.4)+	0.04] =	11.47				(27)
Walls Type1	27.0)1	8.65		18.36	3 X	0.18		3.3	$\overline{}$ [(29)
Walls Type2	23.6	69	2		21.69) x	0.18	-	3.9			= =	(29)
Total area of	elements	, m²			50.7								(31)
* for windows and ** include the are						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	h 3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30) + (32) =				20.68	(33)
Heat capacity	Cm = S	(A x k)						((28).	(30) + (3	2) + (32a).	(32e) =	560.63	(34)
Thermal mass	s parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design asses				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f		
can be used inste				.a.'.a. A.	ابناممم	,							
Thermal bridg	•	,		• .	•	1						4.65	(36)
Total fabric he		are not kn	OWII (30) =	= 0.03 X (3	1)			(33) +	(36) =			25.33	(37)
Ventilation he		alculated	l monthly	/						(25)m x (5))	20.00	(5.7)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(38)m= 24.38	24.25	24.12	23.51	23.4	22.87	22.87	22.77	23.07	23.4	23.63	23.87	1	(38)
` ′								<u> </u>		ļ		1	` '
Heat transfer		r	10 04	10 70	10 10	10 10	40.00		(37) + (1	40.40	1	
(39)m= 49.7	49.57	49.44	48.84	48.72	48.19	48.19	48.09	48.4	48.72	48.95	49.19	48.84	(39)
Heat loss para	- `				T	T	1	(40)m	= (39)m ÷	1		48.84	(39)
(40)m= 0.98	0.97	0.97	0.96	0.96	0.95	0.95	0.95	0.95	0.96	0.96	0.97		
									Average =	: Sum(40) ₁	12 /12=	0.96	(40)

Number	of days	s in mor	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
_	•				•	•	•	•	•	•	•		!	
4. Wate	er heati	ng enei	rgy requi	irement:								kWh/ye	ear:	
Assume	d occur	anov I	NI.									70		(40)
			+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		72		(42)
	£ 13.9	•												
Annual a Reduce the										se target o		.94		(43)
not more th		_				_	-			Ü				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water i	usage in	litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					!	
(44)m=	82.44	79.44	76.44	73.44	70.45	67.45	67.45	70.45	73.44	76.44	79.44	82.44		
						400 \/-/	· · · · · · · · · · · · · · · · · ·	T / 200			m(44) ₁₁₂ =		899.31	(44)
Energy cor			1	1		1			ı	,		,	1	
(45)m= 1	122.25	106.92	110.33	96.19	92.3	79.65	73.8	84.69	85.7	99.88	109.02	118.39		7(45)
If instantar	neous wa	ater heatii	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		lotal = Su	m(45) ₁₁₂ =		1179.14	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water st	orage I	oss:			ļ		ļ	ļ						
Storage	volume	e (litres)	includin	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If commu	•	-			_			` '	` .	(01: /	47)			
Otherwis Water st			not wate	er (this ir	icludes i	nstantar	neous co	ilod idmo	ers) ente	er 'O' in (47)			
a) If mai	_		eclared l	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Tempera						`	,					0		(49)
Energy lo					ear			(48) x (49)) =			0		(50)
b) If mai	nufactu	ırer's de	eclared o	cylinder	loss fact							-		` '
Hot wate		-			le 2 (kW	h/litre/da	ay)					0		(51)
If commu	-	-		on 4.3								0		(52)
Tempera		-		2b								0		(53)
Energy lo	ost fror	n water	storage	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (5	0) or (5	54) in (5	55)									0		(55)
Water st	orage I	oss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder of	contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary	circuit I	loss (an	nual) fro	m Table	e 3							0		(58)
Primary					,	•		, ,						
` —	<u> </u>		rom Tab		r		r				<u> </u>		I	<i>(</i>)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi lo	ss cal	culated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m					ı	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for wat	er hea	ating ca	lculated	l foi	each month	(62)	m =	0.85 × (4	45)m -	- (46)m +	(57)m +	(59)m + (61)m	
(62)m= 103.91 90.88 93	.78	81.76	78.45	6	7.7 62.73	71.	99	72.85	84.9	92.67	100.63		(62)
Solar DHW input calculated using	g Appei	ndix G or	Appendix	H (negative quantity	/) (ent	ter '0'	if no solar	contrib	ution to wate	er heating)	ı	
(add additional lines if FGI	HRS a	and/or V	/WHRS	ар	plies, see Ap	pend	dix G	i)					
(63)m= 0 0	0	0	0		0 0	0)	0	0	0	0		(63)
Output from water heater		•					•			-		•	
(64)m= 103.91 90.88 93	.78	81.76	78.45	6	7.7 62.73	71.	99	72.85	84.9	92.67	100.63		
		•			•		Outpu	ut from wa	iter heat	er (annual)₁	12	1002.27	(64)
Heat gains from water hea	ting, k	kWh/mc	onth 0.2	5	[0.85 × (45)m	+ (6	31)m]] + 0.8 x	[(46)n	n + (57)m	+ (59)m	1	
(65)m= 25.98 22.72 23	.45	20.44	19.61	16	6.92 15.68	18	8	18.21	21.22	23.17	25.16		(65)
include (57)m in calculat	ion of	f (65)m	only if c	ylin	der is in the o	dwell	ling o	or hot wa	ater is	from com	munity h	' leating	
5. Internal gains (see Tal	ble 5 a	and 5a)	:								·		
Metabolic gains (Table 5),	Watts	3											
	/lar	Apr	May	,	Jun Jul	Α	ug	Sep	Oct	Nov	Dec		
(66)m= 85.77 85.77 85	.77	85.77	85.77	8	5.77 85.77	85.	77	85.77	85.77	85.77	85.77		(66)
Lighting gains (calculated	in App	pendix L	., equat	ion	L9 or L9a), a	lso s	ee T	able 5		•	<u>.</u>	ı	
	93	7.51	5.62		.74 5.12	6.6		8.94	11.35	13.25	14.12		(67)
Appliances gains (calculate	ed in <i>i</i>	Append	ix L, eq	uati	on L13 or L13	3a), :	also	see Tab	ole 5			I	
· · · · · · · · · · · · · · · · · · ·		138.79	128.29		8.42 111.82	110		114.18	122.5	133	142.87		(68)
Cooking gains (calculated	in Apı	pendix	L, equat	ion	L15 or L15a)	, als	o se	e Table	5		Į.	I	
	.58	31.58	31.58		1.58 31.58	31.	— т	31.58	31.58	31.58	31.58		(69)
Pumps and fans gains (Ta	ble 5a	——— a)			<u> </u>							1	
· - · · · · · · · · · · · · · · · · · ·	0	0	0		0 0	0		0	0	0	0		(70)
Losses e.g. evaporation (n	egativ	ve value	es) (Tab	le 5	5)			•				I	
	3.62	-68.62	-68.62		8.62 -68.62	-68	.62	-68.62	-68.62	-68.62	-68.62		(71)
Water heating gains (Table	<u>-</u> e 5)	!			I			!			<u>!</u>	1	
(72)m= 34.92 33.81 31	<u> </u>	28.39	26.36	23	3.51 21.08	24.	19	25.29	28.53	32.18	33.82		(72)
Total internal gains =					(66)m + (67)m			(69)m + (7	70)m +	 (71)m + (72)	m	1	
	7.28	223.43	209	19	95.4 186.76	189	.85	197.15	211.11	227.16	239.55		(73)
6. Solar gains:													
Solar gains are calculated using	g solar t	flux from	Table 6a	and	associated equa	tions	to cor	nvert to the	e applica	able orientat	ion.		
Orientation: Access Facto	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	×	0.7	-	226.72	(77)
Southeast 0.9x 0.77] x [8.6	5	x [106.25	x		0.63	×	0.7	_	280.91	(77)
Southeast 0.9x 0.77	x	8.6	5	x	119.01	x		0.63	×	0.7	=	314.65	(77)
Southeast 0.9x 0.77	j ×	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	×	0.7		301.16	(77)
Southeast 0.9x 0.77	x	8.6	5	×	104.39	x		0.63	×	0.7	=	275.99	(77)

Southeas	st _{0.9x}	0.77	X	8.6	5	x	92	2.85	X		0.63	x	0.7	=	245.49	(77)
Southeas	st _{0.9x}	0.77	X	8.6	5	x	69	9.27	x		0.63	x	0.7	=	183.13	(77)
Southeas	st _{0.9x}	0.77	X	8.6	5	x	4	4.07	X		0.63	x	0.7	=	116.52	(77)
Southeas	st _{0.9x}	0.77	X	8.6	5	x	3	1.49	X		0.63	x	0.7	=	83.25	(77)
Solar ga	ains in v	vatts, ca	lculated	for eacl	n month				(83)m	ı = Sı	um(74)m .	(82)m				
(83)m=	97.28	165.7	226.72	280.91	314.65	312	2.37	301.16	275	.99	245.49	183.13	116.52	83.25		(83)
Total ga	ains – ir	iternal a	nd solar	(84)m =	(73)m ·	+ (8	3)m ,	watts		•					•	
(84)m=	344.14	411.47	464	504.34	523.65	507	7.77	487.92	465	.85	442.63	394.24	343.68	322.8		(84)
7. Mea	ın interr	nal temp	erature	(heating	season)										
			eating p				rea f	rom Tab	ole 9.	, Th	1 (°C)				21	(85)
•		Ū	ains for I			•			,		` ,					
Γ	Jan	Feb	Mar	Apr	May	r `	lun	Jul	A	ug	Sep	Oct	Nov	Dec	1	
(86)m=	1	0.99	0.97	0.91	0.79	_	.59	0.43	0.4	-	0.71	0.94	0.99	1		(86)
` ' _	<u>_</u>				T4 //	<u> </u>		0	<u> </u>	!	0)		<u> </u>		I	
			ature in I		<u>`</u>		i					00.74	1 00 05	00.04	1	(07)
(87)m=	20.07	20.25	20.49	20.75	20.92	20).99	21	2	1	20.96	20.74	20.35	20.04		(87)
Tempe	erature	during h	eating p	eriods ir	rest of	dwe	elling	from Ta	ble 9	9, Tł	n2 (°C)				,	
(88)m=	20.1	20.1	20.11	20.12	20.12	20).13	20.13	20.	13	20.12	20.12	20.11	20.11		(88)
Utilisat	tion fact	or for ga	ains for r	est of d	welling,	h2,n	n (se	e Table	9a)							
(89)m=	1	0.99	0.96	0.89	0.73	r -	.52	0.35	0.3	88	0.64	0.91	0.99	1		(89)
∟ Mean i	internal	temper:	ature in t	the rest	of dwelli	na T	T2 (fc	ollow ste	ne 3	to 7	7 in Tahl	<u> </u>			•	
	19.26	19.44	19.67	19.92	20.07	Ť).12	20.13	20.		20.11	19.92	19.55	19.23]	(90)
(00)													ng area ÷ (4		0.45	(91)
													`	,	0.40	
			ature (fo			_			-				T		1	(00)
` ′	19.63	19.81	20.04	20.3	20.45).51	20.52	20.		20.5	20.29	19.91	19.6		(92)
· · · · · -		r	ne mean			_						·	T 40.04	40.0	1	(02)
(93)m=	19.63	19.81	20.04	20.3	20.45	20).51	20.52	20.	52	20.5	20.29	19.91	19.6		(93)
			iirement				-1 -1-	. 44 . (.	- 01		. T' /	70)			
			ernai ter or gains i	•		iea a	at ste	ep 11 of	rabi	e 9t	o, so tna	t 11,m=(76)m an	a re-caio	culate	
Γ	Jan	Feb	Mar	Apr	May	Г.,	lun	Jul	A	ug	Sep	Oct	Nov	Dec	1	
∟ Utilisat		!	ains, hm	•				.		<u></u>	004		1		J	
(94)m=	0.99	0.98	0.96	0.89	0.75	0.	.55	0.39	0.4	12	0.67	0.92	0.99	1]	(94)
Useful	gains,	ـــــــــــــــــ , hmGm	W = (94	I)m x (84	4)m	!	!		!	!			!		l	
	342.15	405.06	445.22	449.88	394.82	280	0.77	188.58	197	.52	297.04	362.17	338.88	321.46		(95)
Monthl	ly avera	ige exte	rnal tem	perature	from Ta	able	8		<u> </u>						l	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	4.6	16.6	16.	.4	14.1	10.6	7.1	4.2		(96)
Heat lo	oss rate	for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m :	x [(9	3)m-	– (96)m]				
(97)m=	761.8	739.1	669.65	556.64	426.54	28	5.03	189.02	198	.26	309.53	472.16	627.09	757.35]	(97)
Space	heating	require	ment fo	r each m	nonth, k	//h/i	mont	h = 0.02	24 x [(97)	m – (95)m] x (4	1)m		•	
(98)m=	312.22	224.47	166.97	76.87	23.6		0	0	0		0	81.83	207.51	324.31		
_										Total	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1417.78	(98)
Space	heating	require	ement in	kWh/m²	/vear										27.88	(99)
3,500		,			. ,											

8c. Sp	pace co	oling req	uiremer	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	453.01	356.63	365.52	0	0	0	0		(100)
Utilisa	ition fac	tor for lo	ss hm										•	
(101)m=	0	0	0	0	0	0.96	0.98	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	436.09	351.25	358.11	0	0	0	0		(102)
Gains	(solar g	gains cal	lculated	for appli	cable we	eather re	gion, se	e Table	10)					
(103)m=	0	0	0	0	0	658.53	634.11	609.33	0	0	0	0		(103)
•	•			r month, : 3 × (98		lwelling,	continuo	ous (kW	h') = 0.0	24 x [(10	03)m – (102)m]:	x (41)m	
(104)m=	0 +)111 10	0	0	0	0	160.16	210.45	186.91	0	0	0	0		
(101)		Ū		, ,	, ,		2.00		<u> </u>	= Sum(=	557.51	(104)
Cooled	fraction	า								cooled	,		1	(105)
Intermi	ttency fa	actor (Ta	able 10b)							(,	<u> </u>	 `
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
•		-							Total	= Sum(104)	=	0	(106)
Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	40.04	52.61	46.73	0	0	0	0		
							-	-	Total	= Sum(107)	=	139.38	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	/ear				(107)	÷ (4) =			2.74	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectic	on 11)				
Fabrio	Energy	/ Efficier	псу						(99)	+ (108) =	=		30.62	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								35.21	(109)

		Llea	r Details:						
Assessor Name:	Zahid Ashraf	030	Strom	a Nium	bori		STD∪	001082	
Software Name:	Stroma FSAP 2012	2	Softwa					on: 1.0.5.9	
		Proper	ty Address:	Plot 30					
Address :									
Overall dwelling dime	ensions:				A I I .	last (/as)		V - l	
Ground floor		A	srea(m²)	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	 + (1n)		(4)]` ''	127.10	
Dwelling volume	a) · (· a) · (· a) · (· a) · (· a)	()	30.00)+(3c)+(3c	d)+(3e)+	.(3n) =	107.15	7(5)
				(50) (50)	, , (00) , (00	.,	.(0)	127.15	(5)
2. Ventilation rate:		condary	other		total			m³ per hou	r
Number of chimneys	heating he	eating +	0	1 = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	Ј <u>Г</u>	0	x	20 =	0	(6b)
Number of intermittent fa				J <u>L</u>	0	x	10 =	0	(7a)
Number of passive vents				L	0	x	10 =	0	(7b)
Number of flueless gas fi				L	0		40 =		(7c)
Number of flueless gas in	1163			L				0	(70)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b	o)+(7c) =		0		÷ (5) =	0	(8)
	peen carried out or is intended	d, proceed to (1)	7), otherwise o	ontinue fr	om (9) to	(16)	,		_
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9)]	-1]x0.1 =	0	(9)
	.25 for steel or timber fr	ame or 0.35	for masonr	v constr	uction	[(0)	1]x0.1 =	0	(11)
	resent, use the value corresp	onding to the gr	reater wall are	a (after					` ′
deducting areas of openia	ngs); if equal user 0.35 floor, enter 0.2 (unseale	od) or 0.1 (se	aled) else	enter ()			i	0	(12)
If no draught lobby, en	•	0.1 (30	aica), cisc	Critici o				0	(13)
• •	s and doors draught str	ipped					-	0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubi	•	•	•	etre of e	envelope	area	3	(17)
If based on air permeabil	•							0.15	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has	been done or a	degree air pe	meability	is being u	sed		2	(19)
Shelter factor	,		(20) = 1 -	0.075 x (1	19)] =			3 0.78	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ÷ 4								
	1.23 1.1 1.08	0.95 0.98	5 0.92	1	1.08	1.12	1.18		
			•		•	•	•	•	

Colouiste str	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 exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	eguation (N	N5)) . othe	rwise (23b) = (23a)			0.5	(23
If balanced with									(200)			79.05	(23
a) If balance		-	-	_					2h)m + (23h) x [1 – (23c)		(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	ed mech	anical ve	ntilation	without	heat rec	covery (N	иV) (24b	m = (22)	2b)m + (23b)	<u> </u>	ı	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h	ouse ex	tract ver	itilation c	r positiv	e input v	ventilatio	n from o	outside				1	
if (22b)r	n < 0.5 ×	(23b), t	hen (24d	c) = (23b); other	wise (24	c) = (22k	o) m + 0.	.5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural				•	•				0.51				
	n = 1, the	en (24d) 0	m = (220)	o)m othe	erwise (2	$\frac{4d}{0}$ m = 0		2b)m² x	0.5]	0		1	(2
24d)m= 0							0				0		(2
Effective air 25)m= 0.25	cnange 0.25	0.25	nter (24a 0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	1	(2
0.23	0.23	0.23	0.20	0.20	0.22	0.22	0.21	0.22	0.20	0.24	0.24		(_
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²-l		X k J/K
Ooors	aroa	(111)	•••		2	 x	1.4	 =	2.8		10/111		(2
Vindows					8.651	= ,	/[1/(1.4)+	!	11.47	=			(2
Valls Type1	27.0)1	8.65	\neg	18.36	=	0.15		2.75	╡┌			\ \(2
Valls Type2	23.6		2	=	21.69	=	0.14	_	3.07	륵 ¦		-	(₂
otal area of e					50.7		0.14		0.07				\ (3
for windows and		•	ffective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valu	ue)+0.04] a	as given in	paragraph	n 3.2	(5
										_			
* include the area													
	3s, W/K :	= S (A x	U)				(26)(30)) + (32) =				20.09	(3
abric heat los leat capacity	Cm = S((A x k)	ŕ				(26)(30)		(30) + (32	2) + (32a).	(32e) =	20.09 560.63	= '
abric heat los leat capacity hermal mass	Cm = S(parame	(A x k) eter (TMF	P = Cm ÷	,				((28).	itive Value	: Low	, ,		(3
* include the area Fabric heat los Heat capacity Thermal mass For design assess The used inste	Cm = S(parame sments wh	(A x k) eter (TMF	$P = Cm \div tails of the$,				((28).	itive Value	: Low	, ,	560.63	(3
Fabric heat los Heat capacity Thermal mass For design assess an be used inste	Cm = S(s parame sments whead of a dea	(A x k) eter (TMF ere the de tailed calcu	P = Cm ÷ tails of the ulation.	construct	ion are not	t known pr		((28).	itive Value	: Low	, ,	560.63 100	(3
Fabric heat lost leat capacity Thermal mass For design assess an be used inste	Cm = S(s parame sments wh rad of a dec es : S (L	(A x k) eter (TMF ere the de tailed calcu x Y) cal	P = Cm ÷ tails of the ulation. culated t	construct	ion are not pendix l	t known pr		((28).	itive Value	: Low	, ,	560.63	(3
Fabric heat lost leat capacity Thermal mass For design assess an be used inste Thermal bridge Thermal bridge Thetails of thermal	Cm = S(parame sments wh had of a dea es : S (L al bridging	(A x k) eter (TMF ere the de tailed calcu x Y) cal	P = Cm ÷ tails of the ulation. culated t	construct	ion are not pendix l	t known pr		((28). Indica	itive Value	: Low	, ,	560.63 100	(3)
Fabric heat lost leat capacity Thermal mass for design assess an be used instevential bridged details of thermal fotal fabric he	Cm = S(a parame sments wh had of a dec es : S (L hal bridging that loss	(A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to	constructions co	ion are not pendix l	t known pr		((28) Indica e indicative	ative Value e values of	: Low : TMP in T	able 1f	560.63 100 6.08	(3)
Fabric heat lost leat capacity Thermal mass for design assess an be used instead thermal bridged details of thermal fotal fabric he	Cm = S(a parame sments wh had of a dec es : S (L hal bridging that loss	(A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to	constructions co	ion are not pendix l	t known pr		((28) Indica e indicative	tive Value e values of	: Low : TMP in T	able 1f	560.63 100 6.08	(3
Tabric heat losses leat capacity Thermal masses for design assess an be used instead for thermal bridge details of thermal fotal fabric head fabric head and the search and	Cm = S(parame sments wh had of a dei es : S (L al bridging eat loss at loss ca	(A x k) eter (TMF ere the de tailed calcu x Y) calcu are not kn	P = Cm ÷ tails of the ulation. culated to own (36) =	constructions and constructions are constructed using April 20.05 x (3)	ppendix k	t known pr	ecisely the	((28). Indica e indicative (33) + (38)m	e values of	: Low : TMP in To	able 1f	560.63 100 6.08	(3
Fabric heat losseleat capacity Thermal massessan be used instead for details of thermal fotal fabric head of the details of th	Cm = S(parame sments wh had of a der es : S (L hal bridging hat loss at loss ca Feb 10.49	(A x k) eter (TMF ere the de tailed calculated are not kn alculated Mar 10.37	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix ł 1) Jun	t known pr	ecisely the	((28). Indica e indicative (33) + (38)m Sep 9.27	e values of (36) = 0.33 × (225)m x (5 Nov 9.88	able 1f	560.63 100 6.08	(3)
Fabric heat losseleat capacity Thermal massessan be used inste Thermal bridge Thermal bridge Total fabric he Total fabric he Total fabric he Total fabric heat Total fabric heat Total fabric heat Total fabric heat Total fabric heat Total fabric heat Total fabric heat Total fabric heat Total fabric heat Total fabric heat Total fabric heat Total fabric heat	Cm = S(parame sments wh had of a der es : S (L hal bridging hat loss at loss ca Feb 10.49	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly	constructions are constructed using Ap = 0.05 x (3)	ppendix ł 1) Jun	t known pr	ecisely the	((28). Indica e indicative (33) + (38)m Sep 9.27	(36) = 0.33 × (Oct 9.64	225)m x (5 Nov 9.88	able 1f	560.63 100 6.08	(3)
Fabric heat losseleat capacity Thermal massessan be used inste Thermal bridge Total fabric her Total fabric	Cm = S(parame sments wh had of a det es : S (L hal bridging hat loss at loss ca Feb 10.49 coefficier 36.66	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37 nt, W/K 36.54	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 9.76	constructions and constructions with the construction of the const	ppendix k Jun 9.03	t known pr	Aug 8.91	((28). Indicative indicative (33) + (38)m Sep 9.27 (39)m 35.44	(36) = = 0.33 × (Oct = 9.64 35.81 Average =	25)m x (5 Nov 9.88 38)m 36.05 Sum(39) ₄	Dec 10.13	560.63 100 6.08	(3)
Fabric heat lost leat capacity Thermal mass for design assess an be used insternal bridge details of thermal fotal fabric here a support of the support of t	Cm = S(parame sments wh had of a det es : S (L hal bridging hat loss at loss ca Feb 10.49 coefficier 36.66	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37 nt, W/K 36.54	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 9.76	constructions and constructions with the construction of the const	ppendix k Jun 9.03	t known pr	Aug 8.91	((28). Indicative indicative (33) + (38)m Sep 9.27 (39)m 35.44	(36) = 0.33 × (0.00	25)m x (5 Nov 9.88 38)m 36.05 Sum(39) ₄	Dec 10.13	560.63 100 6.08 26.17	(3)

Number of day	/s in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu	inancy	N								1	.72		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13		.12		(42)
if TFA £ 13.9	,	otor ucoc	ao in litro	no nor de	w Vd ov	orogo –	(25 v NI)	. 26				1	(40)
Annual average Reduce the annual									se target o		3.89		(43)
not more that 125	litres per	person per	day (all w	ater use, i	hot and co	ld)						_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					•	
(44)m= 86.78	83.62	80.46	77.31	74.15	71	71	74.15	77.31	80.46	83.62	86.78		_
Energy content of	hot water	used - cal	culated mo	anthly = 4	190 x Vd r	п х пт х Г)Tm / 3600			m(44) ₁₁₂ =		946.64	(44)
	112.55	116.14	101.25	97.16	83.84	77.69	89.15	90.21	105.13	114.76	124.63		
(45)m= 128.69	112.55	110.14	101.25	97.16	03.04	77.09	69.15	<u> </u>		m(45) ₁₁₂ =	L	1241.2	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		rotal – ou	111(40)112		12-11.2	()
(46)m= 19.3	16.88	17.42	15.19	14.57	12.58	11.65	13.37	13.53	15.77	17.21	18.69		(46)
Water storage											!		
Storage volum	, ,		•			_		ame ves	sel		0		(47)
If community hotherwise if no	_			-			` '	are) anto	or 'O' in <i>(</i>	47 \			
Water storage		not wate	i (uno n	iciuues i	Hotaritai	ieous cc	ווטט וטווות	cis) cill	51 0 111 (41)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If manufact			-									1	
Hot water stor	•			ie Z (KVV	n/litre/da	ly)				0.	.02		(51)
Volume factor	•		011 1.0							1.	.03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	.03		(54)
Enter (50) or	(54) in (5	55)								1.	.03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m 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 (ar	nnual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	` '	, ,						
(modified by										<u> </u>	1 -	1	(50)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss ca	lculated	for each	month ((61)m =	(60) ÷ 30	65 × (41))m					•	
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for wa	ter he	ating ca	alculated	l for	each month	(62)r	m = (0.85 × (45)m +	(46)m +	(57)m +	(59)m + (61)m	
 	1.42	154.75	152.43		7.33 132.97	144.		143.71	160.41	168.26	179.9		(62)
Solar DHW input calculated usin	g Appe	endix G or	Appendix	H (n	egative quantity	/) (ent	 L er '0' i	if no solar	· contribu	tion to wate	r heating)	l	
(add additional lines if FGI											σ,		
(63)m= 0 0	0	0	0		0 0	0		0	0	0	0		(63)
Output from water heater												•	
· — — — —	1.42	154.75	152.43	13	7.33 132.97	144.	.43	143.71	160.41	168.26	179.9		
1 1							Outpu	ıt from wa	ater heate	er (annual)₁	12	1892.04	(64)
Heat gains from water hea	ating,	kWh/mo	onth 0.2	5 ′ [0.85 × (45)m	+ (6	1)m]	+ 0.8 x	[(46)m	+ (57)m	+ (59)m]	_
(65)m= 87.01 77.36 82	2.84	76.46	76.53	70	.67 70.05	73.8	86	72.79	79.18	80.95	85.66		(65)
include (57)m in calcula	tion o	of (65)m	only if c	ylin	der is in the o	dwelli	ing o	r hot wa	ater is f	rom com	munity h	eating	
5. Internal gains (see Ta	ıble 5	and 5a)):									-	
Metabolic gains (Table 5),	Watt	S											
	Mar	Apr	May	J	un Jul	Αι	ug	Sep	Oct	Nov	Dec		
(66)m= 102.93 102.93 10	2.93	102.93	102.93	102	2.93 102.93	102.	.93	102.93	102.93	102.93	102.93		(66)
Lighting gains (calculated	in Ap	pendix l	_, equat	ion l	L9 or L9a), a	lso s	ee Ta	able 5		•	•	•	
(67)m= 34.35 30.51 2 ²	4.82	18.79	14.04	11	.86 12.81	16.6	65	22.35	28.38	33.12	35.31		(67)
Appliances gains (calculat	ted in	Append	lix L, eq	uati	on L13 or L1	3a), a	also :	see Tal	ole 5			•	
(68)m= 223.09 225.4 21	9.57	207.15	191.47	170	6.74 166.9	164.	.58	170.42	182.84	198.51	213.25		(68)
Cooking gains (calculated	in Ap	pendix	L, equat	ion	L15 or L15a)	, also	o see	e Table	5	•	•	•	
(69)m= 47.01 47.01 47	7.01	47.01	47.01	47	7.01 47.01	47.0	01	47.01	47.01	47.01	47.01		(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 (r	negati	ive valu	es) (Tab	le 5)							•	
(71)m= -68.62 -68.62 -6	8.62	-68.62	-68.62	-68	3.62 -68.62	-68.	62	-68.62	-68.62	-68.62	-68.62		(71)
Water heating gains (Tabl	e 5)										-	•	
(72)m= 116.95 115.13 11	1.34	106.2	102.86	98	.15 94.16	99.2	28	101.1	106.42	112.44	115.13		(72)
Total internal gains =					(66)m + (67)m	+ (68	3)m + ((69)m + (70)m + (71)m + (72)	m	•	
(73)m= 455.71 452.36 43	7.05	413.45	389.69	368	355.18	361.	.83	375.18	398.95	425.39	445.01		(73)
6. Solar gains:													
Solar gains are calculated using	-	flux from	Table 6a	and a	associated equa	tions t	to con	vert to the	e applica		ion.		
Orientation: Access Fact	or	Area			Flux			g_ black	-	FF		Gains	
Table 6d	_	m²		_	Table 6a		ı a	ble 6b	_ '	able 6c		(W)	-
Southeast 0.9x 0.77	×	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 L	62.67	X		0.63	X	0.7	=	165.7	(77)
Southeast 0.9x 0.77	X	8.6	5	x L	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	х		0.63	x	0.7	=	312.37	(77)
Southeast 0.9x 0.77	X	8.6	5	x [113.91	х		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	55	x	9	2.85	x		0.63	x	0.7	=	245.49	(77)
Southeast (0.9x	.77	x	8.6	55	x	6	9.27	х		0.63	_ x _	0.7		183.13	(77)
Southeast (0.9x	.77	x	8.6	55	x	4	4.07	х		0.63	x	0.7	=	116.52	(77)
Southeast (0.9x	.77	x	8.6	55	x	3	31.49	x		0.63	_ x _	0.7	=	83.25	(77)
			•						•							_
Solar gain	s in watts	, calcul	ated	for eacl	n month				(83)m	ı = Sı	um(74)m .	(82)m				
ĭ—	7.28 165.			280.91	314.65	$\overline{}$	12.37	301.16	275	.99	245.49	183.13	116.52	83.25		(83)
Total gain	s – interna	al and s	olar	(84)m =	(73)m	+ (83)m	, watts	•					!	•	
(84)m= 55	2.99 618.0	06 663	.76	694.37	704.34	6	80.44	656.34	637	.82	620.67	582.09	541.9	528.26		(84)
7. Mean	internal te	mperat	ure ((heating	season)										
	ture durin			`			area f	from Tal	ole 9.	. Th	1 (°C)				21	(85)
•	n factor fo	•	٠.			·			0.00	,	. ()				21	(,
	lan Fe	Ť	lar	Apr	May	Ť	Jun	Jul	Δ	ug	Sep	Oct	Nov	Dec]	
	.82 0.76	+	_	0.58	0.46	╁	0.33	0.24	0.2	- 	0.39	0.59	0.75	0.83		(86)
` ′								<u> </u>		!		0.00	0.70	0.00		()
	ernal tem					_			T						1	
(87)m= 20).34 20.5	1 20.	69	20.86	20.95	2	20.99	21	2	1	20.98	20.87	20.61	20.3		(87)
Tempera	ture durin	g heatii	ng p	eriods ir	rest of	dw	elling/	from Ta	able 9	9, Tł	n2 (°C)					
(88)m= 20).32 20.3	2 20.	32	20.34	20.34	2	20.35	20.35	20.	35	20.34	20.34	20.33	20.33		(88)
Utilisation	n factor fo	r gains	for r	est of d	wellina.	h2	.m (se	e Table	9a)		,		-	-		
	0.75	-		0.55	0.43	$\overline{}$	0.29	0.2	0.2	22	0.35	0.56	0.73	0.82]	(89)
Moon int	ornal tam			ho root	of durall	in a	TO /f	ollow oto		+o 7	7 in Tabl	o 0o)		!	l	
	ernal temp 9.45 19.6			20.17	20.28	Ť	20.34	20.35	20.		20.32	20.19	19.84	19.41	1	(90)
(30)111= 13	7.43	5 15.		20.17	20.20	<u></u>	-0.04	20.00	20.	55			g area ÷ (4		0.45	(91)
												L/ (— L/VIII)	g aroa . (., –	0.45	(31)
	ernal tem	-				llin	g) = fl	LA × T1	+ (1	– fL			1	1	1	
` ′	9.85 20.0			20.48	20.59	_	20.63	20.64	20.		20.62	20.5	20.19	19.81		(92)
· · · · -	justment t		T			_		1	T			priate	ı	,	1	
(93)m= 19	9.85 20.0	6 20.	28	20.48	20.59	2	20.63	20.64	20.	64	20.62	20.5	20.19	19.81		(93)
	heating r	•														
	the mean			•		nec	l at ste	ep 11 of	Tabl	e 9b	o, so tha	t Ti,m=(76)m an	d re-cald	culate	
	ation facto					_					0	0.1	NI.		1	
<u> </u>	lan Fe	!	lar	Apr	May	L	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	J	
	n factor fo .79 0.74				0.44	1	0.24	0.22		,,]	0.27	0.57	0.72	0.04	1	(94)
` '				0.56			0.31	0.22	0.2	23	0.37	0.57	0.73	0.81		(94)
	ains, hmG 8.94 456.		Ť	387.32		٦,	10.22	141.85	148	26	227.46	329.06	202.40	407.05	1	(95)
` '					308.18		10.33	141.65	140	.20	227.16	329.00	393.49	427.35		(93)
	average e	-1				_		40.0	10	4	444	40.0	7.4	1 40	1	(06)
` '	1.3 4.9			8.9	11.7	1	14.6	16.6	16		14.1	10.6	7.1	4.2	J	(96)
	rate for r					_			- ` `	_	· <i>′</i>		474.00		1	(07)
` '	2.05 555.8			416.13	318.17	_	12.36	142.26	148		231.11	354.53	471.92	566.69	J	(97)
	eating req					vvh T			_	Ť	<u> </u>	<u> </u>		465 ==	1	
(98)m= 99	9.03 67.0	2 46.	91	20.75	7.44		0	0	0		0	18.95	56.47	103.67		7,55
										Total	per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	420.23	(98)
Space he	eating req	uiremer	nt in	kWh/m²	/year										8.26	(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			420.23	
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	441.25	(307a)
Efficiency of secondary/supplementary heating sy	stem in % (from Tab	ole 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			1892.04	
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	1986.64	(310a)
Electricity used for heat distribution	0.0	01 × [(307a)(307e) + (310a)(310e)] =	24.28	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, i	f not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Tak mechanical ventilation - balanced, extract or posit		e	176.46	(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) =	176.46	(331)
Energy for lighting (calculated in Appendix L)			242.69	(332)
Electricity generated by PVs (Appendix M) (negat	ive quantity)		-518.71	(333)
Electricity generated by wind turbine (Appendix M	l) (negative quantity)		0	(334)
10b. Fuel costs – Community heating scheme				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0.01 =	18.71	(340a)
Water heating from CHP	(310a) x	4.24 x 0.01 =	84.23	(342a)
		Fuel Price		_
Pumps and fans	(331)	13.19 x 0.01 =	23.27	(349)

(332)

Energy for lighting

(350)

32.01

x 0.01 =

13.19

Additional standing charges (Table 12)				120	(351)
Energy saving/generation technologies					_
	40a)(342e) + (345)((354) =		278.23	(355)
11b. SAP rating - Community heating scher	me				
Energy cost deflator (Table 12)				0.42	(356)
,	5) x (356)] ÷ [(4) + 45.0]	=		1.22	(357)
SAP rating (section12)				82.99	(358)
12b. CO2 Emissions – Community heating s	cheme				
		Energy	Emission factor		
000 (haadaa (aa) OHD)	kWh/year	kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and water Efficiency of heat source 1 (%)		g two fuels repeat (363) to	(366) for the second fu	el 94	(367a)
CO2 associated with heat source 1	[(307b)+	+(310b)] x 100 ÷ (367b) x	0.22	557.9	(367)
Electrical energy for heat distribution		[(313) x	0.52	12.6	(372)
Total CO2 associated with community system	ms	(363)(366) + (368)(372	2)	570.5	(373)
CO2 associated with space heating (second	ary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion h	neater or instantan	eous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water	heating	(373) + (374) + (375) =		570.5	(376)
CO2 associated with electricity for pumps an	nd fans within dwell	ing (331)) x	0.52	91.58	(378)
CO2 associated with electricity for lighting		(332))) x	0.52	125.95	(379)
Energy saving/generation technologies (333) Item 1) to (334) as applic	able	0.52 x 0.01 =	-269.21	(380)
Total CO2, kg/year sum	of (376)(382) =			518.82	(383)
) ÷ (4) =			10.2	(384)
El rating (section 14)				92.75	(385)
13b. Primary Energy – Community heating s	cheme				
		Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and wat					_
Efficiency of heat source 1 (%)	If there is CHP usin	ig two fuels repeat (363) to	(366) for the second fu	94 	(367a)
Energy associated with heat source 1	[(307b)+	-(310b)] x 100 ÷ (367b) x	1.22	3151.08	(367)
Electrical energy for heat distribution		[(313) x		74.54	(372)
Total Energy associated with community sys	tems	(363)(366) + (368)(372	2)	3225.62	(373)
if it is negative set (373) to zero (unless sp	pecified otherwise,	see C7 in Appendix C	S) 	3225.62	(373)
Energy associated with space heating (second	ndary)	(309) x	0	0	(374)
Energy associated with water from immersion	n heater or instanta	aneous heater(312) x	1.22	0	(375)
Total Energy associated with space and water	er heating	(373) + (374) + (375) =		3225.62	(376)
Energy associated with space cooling		(315) x	3.07	0	(377)

Energy associated with electricity for pumps and fans within dwelling (331)) x 541.72 (378) 3.07 Energy associated with electricity for lighting (379) (332))) x 745.05 3.07 Energy saving/generation technologies Item 1 x 0.01 = (380) 3.07 -1592.44 Total Primary Energy, kWh/year sum of (376)...(382) = (383) 2919.95

		l lser I	Details: _						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	<u> </u>	Strom						
	F	roperty	Address	: Plot 30					
Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.9									
Sasessor Name: Zahid Ashraf Stroma Number: STRO001082 Software Version: Version: 1.0.5.9		3)							
Ground floor				(1a) x			(2a) =		<u> </u>
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n)] •					
		′ <u> </u>	00.00	J)+(3c)+(3c	d)+(3e)+	.(3n) =	107.15	— (5)
				(00)	,,,(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			127.15	(3)
2. Ventilation rate:		ry	other		total			m³ per hou	ır
Number of chimnevs		- + F	0	7 = [0	x 4	10 =	0	(6a)
•		╣ + ┝		」		x 2	20 =		= ' '
·		_ L				x 1	10 =		╡`′
				L					= ' '
·				L					= ' '
number of flueless gas if	ires			L	0		+0 =	0	(/c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+(6b)$	7a)+(7b)+	(7c) =		20	-	÷ (5) =	0.16	(8)
		ed to (17),	otherwise o	continue fr	rom (9) to	(16)			_
•	he dwelling (ns)					[(0)	410.4		_
	25 for steel or timber frame o	r 0 35 fo	ır masonı	ry consti	ruction	[(9)-	·1]XU.1 =		=
				•	action.			0	(\.,
•	3 /·	1 (222	مط/ مامم	antar O				_	— (40)
•	,	. i (Seai	eu), eise	enter 0					=
	•								=
-	3 11		0.25 - [0.2	2 x (14) ÷ 1	100] =				= ' '
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic metre	es per h	our per s	quare m	etre of e	envelope	area	5	(17)
•								0.41	(18)
		ne or a de	egree air pe	rmeability	is being u	sed			(10)
	,u		(20) = 1 -	[0.075 x (19)] =				─
Infiltration rate incorporate	ting shelter factor		(21) = (18	s) x (20) =					=
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ∸ 4								
	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
			-	<u> </u>		<u> </u>		I	

Calculate effe	0.39	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37]	
		_	rate for t	he appli	cable ca	se	!		!		•	<u>. </u>	
If mechanical If exhaust air h			endix N (2	3h) = (23:	ı) x Fmv (e	equation (N	NS)) othe	rwise (23h) = (23a)			0	(23
If balanced with) = (20a)			0	(23
a) If balance		-	-	_					2h)m + (23h) x [1 – (23c)		(2,
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
b) If balance	ed mech	anical ve	entilation	without	heat red	covery (N	л ЛV) (24t)m = (22	2b)m + (23b)	Į	J	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(2
c) If whole h	nouse ex	tract ver	ntilation c	or positiv	e input v	ventilatio	n from o	utside	!	!	· ·		
if (22b)r	n < 0.5 >	< (23b), t	then (24d	;) = (23b); other	wise (24	c) = (22h	o) m + 0.	.5 × (23b)		_	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural				•					0.51				
If (22b)r 24d)m= 0.58	n = 1, th	en (24a) 0.57	m = (22k) 0.56	0.56	0.54	0.54	0.5 + [(2)]	2D)M ² X	0.5]	0.56	0.57	1	(2
,									0.56	0.56	0.57]	(2
Effective air 25)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	1	(2
0.50	1 0.50	0.57	0.50	0.50	0.04	0.54	0.54	0.00	0.50	0.50	0.57]	(-
Heat losse	s and he	eat loss r	paramete	er:									
LEMENT	Gros	ss (m²)	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/	K)	k-value kJ/m²-		A X k kJ/K
Doors	urou	(2	 x	1		2		NO/III		(2
Vindows					8.651	=	/[1/(1.4)+	!	11.47	=			(2
Valls Type1	27.0	11	8.65		18.36		0.18		3.3	╡╷			(2
Valls Type2	23.6		2	=	21.69	_	0.18	╡┇	3.9	=			(2
otal area of e					50.7	=	0.10		0.0				(_
		•			30.7								(3
for windows and	i i ooi wiiia	'ows, use e	effective wil	ndow U-va	alue calcul	ated using	j formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	h 3.2	(3
						ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] á	as given in	paragrapl	h 3.2	(3
* include the area	as on both	sides of in	nternal wali				formula 1		ue)+0.04] á	as given in	paragrapl	20.68	
for windows and * include the area Fabric heat los Heat capacity	as on both ss, W/K :	sides of in	nternal wali					+ (32) =	(30) + (32)				(3
* include the area fabric heat los	as on both ss, W/K : Cm = S(sides of in = S (A x (A x k)	nternal wall U)	ls and part	titions			((28)		2) + (32a)		20.68	(3
* include the area Fabric heat los Heat capacity Thermal mass For design assess	as on both ss, W/K: Cm = S(s parame sments wh	sides of in = S (A x (A x k) eter (TMF) here the de	nternal wall U) P = Cm ÷ etails of the	ls and part	titions n kJ/m²K		(26)(30)	((28) Indica	(30) + (3 tive Value	2) + (32a) : Medium	(32e) =	20.68	(3
* include the area Fabric heat lost Heat capacity Thermal mass For design assess an be used inste	as on both ss, W/K: Cm = S(s parame sments whe ead of a de	e sides of in = S (A x (A x k) eter (TMF here the de tailed calcu	nternal wall U) P = Cm ÷ etails of the ulation.	s and part	itions n kJ/m²K ion are not	t known pr	(26)(30)	((28) Indica	(30) + (3 tive Value	2) + (32a) : Medium	(32e) =	20.68 560.63 250	(3
* include the area Fabric heat lost Heat capacity Thermal mass For design assess an be used inste Thermal bridg	as on both ss, W/K: Cm = S(s parame sments wh ead of a de es: S (L	sides of in = S (A x (A x k) eter (TMF here the de tailed calco	P = Cm ÷ etails of the ulation.	s and part - TFA) ir constructi	itions n kJ/m²K ion are noi	t known pr	(26)(30)	((28) Indica	(30) + (3 tive Value	2) + (32a) : Medium	(32e) =	20.68	(3
* include the area fabric heat los feat capacity fhermal mass for design assess an be used inste fhermal bridg fetails of therma	as on both ss, W/K: Cm = S(s parame sments wh ead of a de es: S(L al bridging	sides of in = S (A x (A x k) eter (TMF here the de tailed calco	P = Cm ÷ etails of the ulation.	s and part - TFA) ir constructi	itions n kJ/m²K ion are noi	t known pr	(26)(30)	((28) Indica	(30) + (3 tive Value	2) + (32a) : Medium	(32e) =	20.68 560.63 250	(3
* include the area fabric heat los feat capacity fhermal mass for design assess an be used inste fhermal bridg details of therma fotal fabric he	as on both ss, W/K: Cm = S(s parame sments wh ead of a de es: S (L al bridging eat loss	e sides of in = S (A x (A x k) eter (TMF here the de stailed calco x Y) calco are not kn	P = Cm ÷ etails of the ulation. lculated to	- TFA) ir constructi using Ap	itions n kJ/m²K ion are noi	t known pr	(26)(30)	(28) Indica indicative	(30) + (3: tive Value e values of	2) + (32a) : Medium : TMP in T	(32e) =	20.68 560.63 250 4.65	(3
* include the area fabric heat los feat capacity fhermal mass for design assess an be used inste fhermal bridg details of therma fotal fabric he	as on both ss, W/K: Cm = S(s parame sments wh ead of a de es: S (L al bridging eat loss	e sides of in = S (A x (A x k) eter (TMF here the de stailed calco x Y) calco are not kn	P = Cm ÷ etails of the ulation. lculated to	- TFA) ir constructi using Ap	itions n kJ/m²K ion are noi	t known pr	(26)(30)	(28) Indica indicative	(30) + (32) tive Value e values of	2) + (32a) : Medium : TMP in T	(32e) =	20.68 560.63 250 4.65	(3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (
* include the area fabric heat los leat capacity Thermal mass for design assess an be used inste Thermal bridg details of therma fotal fabric he yentilation hea	as on both ss, W/K: Cm = S(s parame sments wh ead of a de es: S (L al bridging eat loss at loss ca	esides of in S (A x k) eter (TMF) eter the de etailed calcular ax Y) calculated alculated	P = Cm ÷ etails of the ulation. culated u nown (36) =	- TFA) ir constructi using Ap	kJ/m²K ion are not pendix k	t known pr	recisely the	(28) Indica indicative (33) + (38)m	(30) + (32) tive Value e values of (36) = = 0.33 × (2) + (32a) : Medium : TMP in T	(32e) =	20.68 560.63 250 4.65	(3)
* include the area fabric heat los leat capacity Thermal mass for design assess an be used inste Thermal bridg details of therma fotal fabric he dentilation hea Jan 38)m= 24.38	as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss at loss ca Feb 24.25	a sides of in a	nternal wall U) P = Cm ÷ etails of the ulation. culated u nown (36) =	- TFA) ir constructi using Ap = 0.05 x (3	kJ/m²K ion are not pendix k 1)	t known pr	recisely the	(33) + (38)m Sep 23.07	(30) + (32) tive Values of evalues of (36) = = 0.33 × (2) + (32a) : Medium : TMP in T 25)m x (5 Nov 23.63	(32e) = Fable 1f	20.68 560.63 250 4.65	(3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (
* include the area fabric heat los leat capacity Thermal mass for design assess an be used inste Thermal bridg details of therma fotal fabric he fentilation hea Jan 38)m= 24.38 leat transfer of	as on both ss, W/K: Cm = S(s parame sments whead of a de es: S (L al bridging eat loss at loss ca Feb 24.25	a sides of in a	nternal wall U) P = Cm ÷ etails of the ulation. culated u nown (36) =	- TFA) ir constructi using Ap = 0.05 x (3	kJ/m²K ion are not pendix k 1)	t known pr	recisely the	(33) + (38)m Sep 23.07	(30) + (3.2) tive Values of evalues of (36) = = 0.33 × (2) + (32a) : Medium : TMP in T 25)m x (5 Nov 23.63	(32e) = Fable 1f	20.68 560.63 250 4.65	(3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (
* include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste Thermal bridg I details of therma Total fabric he Ventilation hea 38)m= 24.38 Heat transfer (39)m= 49.7	as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss at loss ca Feb 24.25 coefficier 49.57	a sides of in a	nternal wall U) P = Cm ÷ etails of the ulation. culated u nown (36) = d monthly Apr 23.51	- TFA) ir constructi using Ap - 0.05 x (3	kJ/m²K ion are no pendix k 1) Jun 22.87	Jul	Aug 22.77	(33) + (38)m Sep 23.07 (39)m 48.4	(30) + (3.2) tive Values of evalues of the (36) = 0.33 × (10) Oct 23.4 = (37) + (10) 48.72 Average =	2) + (32a) : Medium : TMP in T 25)m x (5 Nov 23.63 38)m 48.95 Sum(39)	(32e) = Sable 1f Dec 23.87	20.68 560.63 250 4.65	(3
* include the area Fabric heat loss Heat capacity Thermal mass For design assess an be used inste Thermal bridg I details of thermal Total fabric hea Ventilation hea 38)m= 24.38 Heat transfer of	as on both ss, W/K: Cm = S(s parame sments wh ead of a de es : S (L al bridging eat loss at loss ca Feb 24.25 coefficier 49.57	a sides of in a	nternal wall U) P = Cm ÷ etails of the ulation. culated u nown (36) = d monthly Apr 23.51	- TFA) ir constructi using Ap - 0.05 x (3	kJ/m²K ion are no pendix k 1) Jun 22.87	Jul	Aug 22.77	(33) + (38)m Sep 23.07 (39)m 48.4	(30) + (3.2) tive Values of evalues of (36) = = 0.33 × (2) + (32a) : Medium : TMP in T 25)m x (5 Nov 23.63 38)m 48.95 Sum(39)	(32e) = Sable 1f Dec 23.87	20.68 560.63 250 4.65 25.33	(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. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
if TF	ed occu A > 13.9 A £ 13.9	, N = 1	N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		72		(42)
Reduce	the annua	l average	ater usag hot water person per	usage by	5% if the a	lwelling is	designed			se target o		.94		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in	litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					ı	
(44)m=	82.44	79.44	76.44	73.44	70.45	67.45	67.45	70.45	73.44	76.44	79.44	82.44		_
Energy o	content 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		899.31	(44)
(45)m=	122.25	106.92	110.33	96.19	92.3	79.65	73.8	84.69	85.7	99.88	109.02	118.39		_
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1179.14	(45)
(46)m=	18.34	16.04	16.55	14.43	13.84	11.95	11.07	12.7	12.86	14.98	16.35	17.76		(46)
	storage		includin	a any sa	olar or M	/\//LDQ	etorago	within co	mo voc	col		150		(47)
If comr	nunity h	eating a	nd no ta	nk in dw	velling, e	nter 110	litres in	(47)				130		(,
a) If m	anufacti	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	39		(48)
Tempe	rature fa	actor fro	m Table	2b							0.	54		(49)
•			storage	-				(48) x (49)) =		0.	75		(50)
Hot wa	iter stora	ige loss	eclared of factor fr see section	om Tabl								0		(51)
	e factor t	•										0		(52)
Tempe	rature fa	actor fro	m Table	2b								0		(53)
• • • • • • • • • • • • • • • • • • • •			storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
	(50) or (, ,	,								0.	75		(55)
			culated f					((56)m = (55) × (41)r				l	
(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	iv I I	(56)
-					· · ·							m Append	IX П	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
	•	`	nual) fro									0		(58)
	•		culated t rom Tab		,		,	, ,		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) ÷ 36	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for water	er heating	calculated	for	each month	(62)	$m = 0.85 \times$	(45)m -	- (46)m +	(57)m +	(59)m + (61)m	
(62)m= 168.85 149.01 156.	.93 141.28	138.89	124	.74 120.4	131	29 130.79	146.47	154.12	164.99		(62)
Solar DHW input calculated using	Appendix G	or Appendix	H (ne	gative quantit	y) (ent	er '0' if no sola	ar contrib	ution to wate	er heating)	•	
(add additional lines if FGH	RS and/o	WWHRS	арр	lies, see Ap	pend	lix G)					
(63)m= 0 0	0	0	(0	0	0	0	0	0		(63)
Output from water heater	•	-						-		•	
(64)m= 168.85 149.01 156	.93 141.2	138.89	124	.74 120.4	131	29 130.79	146.47	154.12	164.99]	
	•	•		•	•	Output from w	ater heat	er (annual) ₁	I12	1727.75	(64)
Heat gains from water heat	ing, kWh/ı	nonth 0.2	5 ′ [0	.85 × (45)m	า + (6	1)m] + 0.8	x [(46)n	n + (57)m	+ (59)m]	
(65)m= 77.92 69.22 73.9	96 68.06	67.97	62.	56 61.82	65.	44 64.57	70.49	72.32	76.64		(65)
include (57)m in calculati	on of (65)	m only if c	ylind	er is in the	dwell	ing or hot w	vater is	from com	munity h	neating	
5. Internal gains (see Tab	le 5 and 5	a):							·		
Metabolic gains (Table 5), \	Natts	,									
Jan Feb M		May	Ji	ın Jul	A	ug Sep	Oct	Nov	Dec]	
(66)m= 85.77 85.77 85.	77 85.77	85.77	85.	77 85.77	85.	77 85.77	85.77	85.77	85.77		(66)
Lighting gains (calculated in	n Appendi	L, equat	ion L	9 or L9a), a	ılso s	ee Table 5		- !		•	
(67)m= 13.74 12.21 9.9		5.62	4.7		6.6	1	11.35	13.25	14.12]	(67)
Appliances gains (calculate	d in Appe	ndix L, ea	uatio	n L13 or L1	3a), a	also see Ta	able 5			1	
(68)m= 149.47 151.02 147.			118		110		122.5	133	142.87	1	(68)
Cooking gains (calculated i	n Appendi	x Legua:	ion I	15 or l 15a) als	n see Table	- - 5		<u> </u>	J	
(69)m= 31.58 31.58 31.58	- i -	31.58	31.		31.5		31.58	31.58	31.58]	(69)
Pumps and fans gains (Tab		_	<u> </u>			!	!			ı	
(70)m= 3 3 3		3	3	3	3	3	3	3	3]	(70)
Losses e.g. evaporation (ne	I enative va	ues) (Tah	le 5)	l	<u> </u>			_ _		J	
(71)m= -68.62 -68.62 -68.		- 	-68		-68.	62 -68.62	-68.62	-68.62	-68.62]	(71)
Water heating gains (Table	!	_l	<u> </u>				1			J	
(72)m= 104.74 103.01 99.4		91.35	86.	88 83.09	87.	95 89.68	94.74	100.45	103.01]	(72)
Total internal gains =				(66)m + (67)n		!		<u> </u>	ļ	I	` '
(73)m= 319.68 317.96 308.	.18 292.50	276.99	261		256	· · · ·	280.32	<u> </u>	311.74	1	(73)
6. Solar gains:											
Solar gains are calculated using	solar flux fro	m Table 6a	and a	ssociated equa	ations	to convert to the	he applica	able orientat	tion.		
Orientation: Access Facto	r Are	а		Flux		g_		FF		Gains	
Table 6d	m	2		Table 6a		Table 6b	•	Table 6c		(W)	
Southeast 0.9x 0.77	x	3.65	x	36.79	x	0.63	х	0.7	=	97.28	(77)
Southeast 0.9x 0.77	х	3.65	x \Box	62.67	х	0.63	х	0.7	=	165.7	(77)
Southeast 0.9x 0.77	x	3.65	x	85.75	x	0.63	x	0.7	=	226.72	(77)
Southeast 0.9x 0.77	х	3.65	x	106.25	x	0.63	×	0.7	-	280.91	(77)
Southeast 0.9x 0.77		3.65	x	119.01	X	0.63	x	0.7	-	314.65	(77)
Southeast 0.9x 0.77		3.65	x [118.15) x	0.63	x	0.7	_ =	312.37	(77)
Southeast 0.9x 0.77		3.65	x	113.91	X	0.63	x	0.7	_ =	301.16	(77)
Southeast 0.9x 0.77	x	3.65	x	104.39	X	0.63	x	0.7		275.99	(77)

Southeast	t _{0.9x}	0.77	x	8.6	55	x [92.85	x		0.63	x	0.7	=	245.49	(77)
Southeast	t _{0.9x}	0.77	x	8.6	65	x	69.27	x		0.63	x	0.7	=	183.13	(77)
Southeast	t _{0.9x}	0.77	x	8.6	65	x F	44.07	×		0.63	x	0.7		116.52	(77)
Southeast	t _{0.9x}	0.77	×	8.6	65	x \lceil	31.49	×		0.63	_ x _	0.7	_ =	83.25	(77)
	_					_									_
Solar gai	ns in w	atts. ca	alculated	for eac	h month			(83)	m = S	um(74)m .	(82)m				
—	97.28	165.7	226.72	280.91	314.65	312	2.37 301.1	6 27	5.99	245.49	183.13	116.52	83.25]	(83)
Total gair	ns – in	ternal a	nd solar	(84)m =	= (73)m -	+ (8:	3)m , watts	 }					I.	1	
(84)m= 4	16.96	483.66	534.9	573.48	591.64	574	4.15 552.9	2 53	2.61	510.02	463.46	414.95	394.99]	(84)
7. Mean	n intern	al temp	erature	(heating	season)	•								
		·		`			rea from T	able 9	9. Th	1 (°C)				21	(85)
•		•	• .			•	e Table 9a		-,	(- /					 ` ′
	Jan	Feb	Mar	Apr	May	Ò.	un Jul		Aug	Sep	Oct	Nov	Dec	1	
_	0.99	0.98	0.95	0.87	0.72	_	53 0.38	_	.41	0.63	0.89	0.98	0.99	1	(86)
(00)111=	0.99	0.90	0.93	0.07	0.72	0.	0.30	0	.41	0.03	0.89	0.98	0.99	J	(00)
Mean in	ternal	temper	ature in I	iving are	ea T1 (fo	llow	v steps 3 to	o 7 in	Table	e 9c)				1	
(87)m=	20.2	20.38	20.6	20.82	20.95	20	.99 21		21	20.98	20.82	20.47	20.17		(87)
Tempera	ature c	during h	eating p	eriods ir	rest of	dwe	elling from	Table	9, TI	h2 (°C)					
	20.1	20.1	20.11	20.12	20.12		.13 20.13	$\overline{}$).13	20.12	20.12	20.11	20.11]	(88)
Litilicatio	on fact	or for a	nine for r	oct of d	wolling	h2 n	n (see Tab	ام ۵۵۱				<u> </u>	<u>I</u>	J	
	0.99	0.97	0.93	0.83	0.67		46 0.31		.34	0.56	0.85	0.97	0.99	1	(89)
			ļ				<u> </u>					0.07	0.00	J	()
						Ť	Γ2 (follow s	-i-				1	Γ	1	(00)
(90)m= 1	19.06	19.31	19.62	19.92	20.07	20	.12 20.13	3 20).13	20.11	19.93	19.46	19.02		(90) —
										f	LA = Livin	g area ÷ (4	4) =	0.45	(91)
Mean in	nternal	tempera	ature (fo	r the wh	ole dwe	lling) = fLA × T	⁻ 1 + (1	– fL	.A) × T2					
(92)m= 1	19.58	19.8	20.06	20.33	20.47	20	.52 20.52	2 20).52	20.51	20.33	19.92	19.54		(92)
Apply a	djustm	ent to th	ne mean	internal	temper	atur	e from Tab	ole 4e,	, whe	re appro	priate				
(93)m= 1	19.58	19.8	20.06	20.33	20.47	20	.52 20.52	2 20).52	20.51	20.33	19.92	19.54		(93)
8. Space	e heati	ng requ	uirement												
Set Ti to	the m	ean int	ernal ten	nperatui	re obtain	ed a	at step 11	of Tab	ole 9k	o, so tha	t Ti,m=(76)m an	d re-cal	culate	
the utilis	sation f	actor fo	r gains ເ	using Ta	ble 9a										
	Jan	Feb	Mar	Apr	May	J	un Jul	ļ ļ	∖ug	Sep	Oct	Nov	Dec		
Utilisatio	on facto	or for g	ains, hm	:								_	_	_	
(94)m=	0.99	0.97	0.93	0.84	0.69	0.	49 0.34	0.	.37	0.59	0.86	0.97	0.99		(94)
Useful g	gains, h	nmGm ,	W = (94)	l)m x (84	4)m									_	
(95)m= 4	10.82	468.12	497.33	482.62	407.36	282	2.83 188.8	1 19	7.93	303.21	400.06	401.43	390.49		(95)
Monthly	avera	ge exte	rnal tem	perature	from Ta	able	8							_	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	16.6	10	6.4	14.1	10.6	7.1	4.2		(96)
Heat los	ss rate	for mea	an intern	al tempe	erature,	Lm ,	, W =[(39)r	n x [(9	93)m	– (96)m]			-	
(97)m= 7	59.41	738.38	670.54	558.11	427.31	285	5.18 189.0	4 19	98.3	309.98	474.16	627.49	754.58		(97)
Space h	neating	require	ement for	r each n	nonth, k\	/Vh/r	month = 0.	024 x	[(97))m – (95)m] x (4	1)m	-	•	
(98)m= 2	59.35	181.62	128.87	54.35	14.84		0 0		0	0	55.13	162.77	270.88		
			!				•		Tota	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1127.8	(98)
Space h	neatina	require	ement in	kWh/m²	/year									22.17	(99)
-	9	1	2 .		<i>y</i>										」 ` ′

9a. Energy requireme	nts – Indi	vidual h	eating sv	vstems i	ncluding	micro-C	CHP)					
Space heating:					J		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					¬ ,
Fraction of space hea				mentary	-		(224)				0	(201)
Fraction of space hea		•	. ,			(202) = 1 -		(222)			1	(202)
Fraction of total heat	•	-				(204) = (204)	02) × [1 –	(203)] =			1	(204)
Efficiency of main sp		0 ,									93.5	(206)
Efficiency of seconda	ary/supple	ementar	y heating	g system	າ, %			ī	1	1	0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating requir 259.35 181.62	ement (c	54.35	14.84	0	0	0	0	55.13	162.77	270.88	1	
				0	0		U	33.13	102.77	270.00	J	(044)
$(211)m = \{[(98)m \times (20)] \\ 277.38 194.24 $	137.83	58.13	15.87	0	0	0	0	58.96	174.08	289.71	1	(211)
277.00	107.00	001.10	.0.0.						211) _{15.1012}		1206.2	(211)
Space heating fuel (s	econdar	y), kWh/	month									` ′
$= \{[(98) \text{m x } (201)]\} \text{ x } 1$	•	, , .									_	
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		
						Tota	I (kWh/yea	ar) =Sum(215) _{15,1012}	2=	0	(215
Water heating												
Output from water hea	156.93	ulated al 141.28	138.89	124.74	120.4	131.29	130.79	146.47	154.12	164.99	1	
Efficiency of water hea			100100								79.8	(216
(217)m= 85.96 85.34	84.29	82.51	80.72	79.8	79.8	79.8	79.8	82.47	84.96	86.13		(217
Fuel for water heating	, kWh/mc	onth						<u> </u>			J	
$(219)m = (64)m \times 10^{\circ}$ (219)m = 196.43 174.6			172.06	156.24	150.00	164.50	163.9	177.62	I 404 4	191.56	1	
(219)111= 190.43 174.0	186.17	171.23	172.00	156.31	150.88	164.52 Tota	I = Sum(2)	<u> </u>	181.4	191.56	2086.69	(219)
Annual totals									Wh/year	•	kWh/yea	— '
Space heating fuel us	ed, main	system	1						, J Gu.		1206.2	<u> </u>
Water heating fuel use	ed										2086.69	=
Electricity for pumps, f	ans and	electric	keep-ho	t								
central heating pump										30	1	(230
] 1	
boiler with a fan-assi							-1 (000-)	(000-)		45		(230
Total electricity for the	above, k	(Wh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting											242.69	(232)
12a. CO2 emissions	– Individu	ual heati	ng syste	ems inclu	uding mi	cro-CHP						
					ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main s	system 1))		(21	1) x			0.2	16	=	260.54	(261)
Space heating (secon	dary)			(215	5) x			0.5		=	0	(263)
Water heating	• ,			(219	9) x			0.2		=	450.72	(264)
_	ina					+ (263) + (264) -		10			=
Space and water heat	ıııy			(20	., . (202)	. (200) + (- / -				711.26	(265)

Electricity for pumps, fans and electric keep-hot (231) × 0.519 = 38.93 (267) Electricity for lighting (232) × 0.519 = 125.95 (268) Total CO2, kg/year sum of (265)...(271) = 876.14 (272)

TER = 17.23 (273)