Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:53:48

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 50.86m² Plot Reference: Plot 42 Site Reference : Hermitage Lane

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 17.38 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.23 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 32.1 kWh/m²

OK

OK

2 Fabric U-values

Element Average Highest External wall 0.14 (max. 0.30) 0.15 (max. 0.70)

Floor (no floor) Roof (no roof)

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

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

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

Air permeablility

Photovoltaic array

Community heating, heat from boilers - mains gas

		l Isar I	Details:						
Assessor Name:	Zahid Ashraf	03011	Stroma	Mum	bor		STDO	001082	
Software Name:	Stroma FSAP 2012		Softwa					on: 1.0.5.9	
		Property	Address:	Plot 42					
Address :									
Overall dwelling dime	ensions:	A	- (··· 2)		A 11 .	last (Cost)		V - l	
Ground floor			ea(m²) 50.86	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1)	a)+(1b)+(1c)+(1d)+(1e)+			(4)]`` ''	127.10	
Dwelling volume	۵,۰(۱۵,۰(۱۵,۰(۱۵,۰	()	30.00)+(3c)+(3c	d)+(3e)+	.(3n) =	127.15	(5)
				(5.5) (5.6)	, (, , , , , , , , , , , , , , , , , ,	., . (,		127.15	
2. Ventilation rate:		ondary	other		total			m³ per hou	r
Number of chimneys	heating hea	$\frac{\mathbf{ating}}{0}$ + Γ	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0]	0	x 2	20 =	0	(6b)
Number of intermittent fa				, <u> </u>	0	x ·	10 =	0	(7a)
Number of passive vents				F	0	x	10 =	0	(7b)
Number of flueless gas fi				F	0	x 4	40 =	0	(7c)
rambor of hadioco gao n	100			L				0	
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+	-(6b)+(7a)+(7b)+	(7c) =	Γ	0		÷ (5) =	0	(8)
	een carried out or is intended,	proceed to (17),	otherwise c	ontinue fr	om (9) to	(16)	ĺ		_
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9).	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber fra	me or 0.35 fo	r masonr	v constr	uction	[(0)]	1]XO.1 =	0	(11)
if both types of wall are p	resent, use the value correspo			•				<u> </u>	` ′
deducting areas of opening	ngs); if equal user 0.35 floor, enter 0.2 (unsealed	I) or 0.1 (soal	ad) also	antar O			ı		7(42)
If no draught lobby, en	•	i) Ui U. i (Seai	eu), eise i	enter o				0	(12)
•	s and doors draught strip	ned						0	(14)
Window infiltration	o and accide arangin comp	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic	metres per h	our per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabil	ity value, then (18) = [(17)	÷ 20]+(8), otherv	vise (18) = (16)				0.15	(18)
	es if a pressurisation test has be	een done or a de	egree air per	meability	is being u	sed	•		_
Number of sides sheltere	ed		(20) – 1 [0 075 v /4	10)1 –			3	(19)
Shelter factor	iina ahaltar faatar		(20) = 1 - [19)] =			0.78	(20)
Infiltration rate incorporat	-		(21) = (18)	X (20) =				0.12	(21)
Infiltration rate modified f Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec	1	
		Juli Jul	Aug	Sep	Oct	I NOV	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7]	
()	1	0.0	1 0.,	-	I +.0	I +.0]	I	
Wind Factor (22a)m = (2	' 		, , , , , , , , , , , , , , , , , , , 		1	1	,	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		

00/01/15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effe If mechanic		-	rate for t	he appli	cable ca	se	!	<u>.</u>	!	!	!		
If exhaust air h			endix N. (2	3b) = (23a	ı) × 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	лV) (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	tilation c	or positiv	e input v	entilatio	n from o	utside	l .	l		1	
if (22b)r	n < 0.5 ×	(23b), t	hen (24d	c) = (23b); other	vise (24	c) = (22k	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				
	n = 1, the	en (24d) 0	m = (220)	o)m othe	rwise (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)	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	28.7	74	8.65	\neg	20.09	=	0.15		3.01	╡┌			\ \(2
Valls Type2	25.2		2	=	23.21	=	0.14	╡┇	3.28	륵 ¦			(2
otal area of e		i			53.95	=	0.14		0.20				(3
for windows and		•	ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2	(5
										_			
* include the area													
	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				20.57	(3
abric heat los leat capacity	Cm = S((A x k)	ŕ				(26)(30)		(30) + (32	2) + (32a).	(32e) =	20.57	==
abric heat los leat capacity hermal mass	Cm = S(parame	(A x k) eter (TMF	P = Cm ÷	,				((28) Indica	tive Value	: Low	, ,		(3
* include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste	Cm = S(s paramessments wh	(A x k) eter (TMF	$P = Cm \div tails of the$,				((28) Indica	tive Value	: Low	, ,	606.2	(3
Fabric heat los Heat capacity Thermal mass For design assess an be used inste	Cm = S(s parame sments wheread of a des	(A x k) eter (TMF ere the de tailed calcu	P = Cm ÷ tails of the ulation.	construct	ion are not	t known pr		((28) Indica	tive Value	: Low	, ,	606.2 100	(3
Fabric heat lost leat capacity Thermal mass For design assess an be used inste	Cm = S(s parame sments whead 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) Indica	tive Value	: Low	, ,	606.2	(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 dec 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	tive Value	: Low	, ,	606.2 100	(3
Fabric heat lost leat capacity Thermal mass for design assess an be used instevential bridged details of thermal fotal fabric he	Cm = S(s parame sments wh ead of a de- es : S (L al bridging	(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 co	ion are not pendix l	t known pr		((28) Indica e indicative	tive Value	: Low TMP in T	able 1f	606.2	(3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (
fabric heat lost leat capacity Thermal mass for design assessan be used instead thermal bridged details of thermal fotal fabric he	Cm = S(s parame sments wh ead of a de- es : S (L al bridging	(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 co	ion are not pendix l	t known pr		((28) Indica e indicative	tive Value e values of (36) =	: Low TMP in T	able 1f	606.2	(3
Fabric heat lost leat capacity Thermal mass for design assess an be used instead for thermal bridge details of thermal fotal fabric head fabric head and the details of the	Cm = S(parame sments wh had of a de- 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	on are not pendix h	t known pr	ecisely the	((28) Indica e indicative (33) + (38)m	tive Value e values of (36) = = 0.33 × (: Low : TMP in To	able 1f	606.2	(3
Fabric heat losseleat capacity Thermal massessan be used inste Thermal bridge Tetalis of thermal Total fabric head	Cm = S(parame sments wh had of a dec es : S (L hal bridging eat 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	constructs using Ap = 0.05 x (3	opendix k	known pr	ecisely the	((28) Indica e indicative (33) + (38)m Sep 9.27	tive Value e values of (36) = = 0.33 × (25)m x (5 Nov 9.88	able 1f	606.2	(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 dec es : S (L hal bridging eat 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	constructs using Ap = 0.05 x (3	opendix k	known pr	ecisely the	((28) Indica e indicative (33) + (38)m Sep 9.27	(36) = = 0.33 × (Oct 9.64	25)m x (5 Nov 9.88	able 1f	606.2	(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 dec es : S (L hal bridging eat loss at loss ca Feb 10.49 coefficier 37.25	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37 nt, W/K 37.12	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 9.76	constructions are constructed using April 20.05 x (3) / May 9.64	pendix k	t known pr	Aug 8.91	((28) Indicative (33) + (38)m Sep 9.27 (39)m 36.03	(36) = = 0.33 × (Oct 9.64 = (37) + (36) = (37) + (25)m x (5 Nov 9.88 38)m 36.64 Sum(39) ₄	Dec 10.13	606.2	(3
Fabric heat losseleat capacity Thermal massessan be used inste Thermal bridge Total fabric he Ventilation hea Jan 38)m= 10.61	Cm = S(parame sments wh had of a dec es : S (L hal bridging eat loss at loss ca Feb 10.49 coefficier 37.25	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37 nt, W/K 37.12	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 9.76	constructions are constructed using April 20.05 x (3) / May 9.64	pendix k	t known pr	Aug 8.91	((28) Indicative (33) + (38)m Sep 9.27 (39)m 36.03	(36) = = 0.33 × (Oct 9.64 = (37) + (36.39)	25)m x (5 Nov 9.88 38)m 36.64 Sum(39) ₄	Dec 10.13	606.2 100 6.19 26.75	(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 roqui	romonti								Is\A/b/s	201	
4. ۷۷	ater heat	ing ener	gy requi	nement.								kWh/ye	Z ai.	
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		AIIIC VCS	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	ľ	(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	ì			L, equat	_	_9 or L9a), a	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	^ _ x	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	
Journeast (J.9X	0.77	X	8.6	00	x L	104.39	X	0.63	x [0.7	=	275.99	(77)

Southeast 0.9x	0.77	X	8.6	65	x	92.85	X	0.63	x	0.7	=	245.49	(77)
Southeast 0.9x	0.77	X	8.6	6 5	X	69.27	X	0.63	x	0.7	=	183.13	(77)
Southeast 0.9x	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	55	x	31.49	X	0.63	х	0.7	=	83.25	(77)
													_
Solar gains in	watts, ca	alculated	for eac	h month			(83)m = 5	Sum(74)m .	(82)m				
(83)m= 97.28	165.7	226.72	280.91	314.65	312.37	301.16	275.99	245.49	183.13	116.52	83.25]	(83)
Total gains –	internal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts	•	•		•		•	
(84)m= 426.17	492.78	543.83	582.15	600.14	582.42	560.99	540.94	518.44	472.14	423.94	404.11		(84)
7. Mean inte	rnal temp	perature	(heating	season)								
Temperature	•		`		,	from Tal	ble 9, Th	n1 (°C)				21	(85)
Utilisation fa	•	•			_		,	` ,					_ `
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(86)m= 0.9	0.85	0.78	0.66	0.53	0.39	0.28	0.3	0.46	0.69	0.85	0.91	1	(86)
	-1 +		l	T4 //-	. !! 4 .		7 : Tabl	اء ٥-١	ļ.			J	
Mean interna	20.25	20.52		20.92	20.98	i 			20.78	20.38	19.96	1	(87)
(87)m= 20.01	20.25	20.52	20.77	20.92	20.96	21	20.99	20.96	20.78	20.36	19.96]	(01)
Temperature	e during h	neating p	eriods ir	rest of	dwelling	g from Ta	able 9, T	h2 (°C)	,	,	,	1	
(88)m= 20.31	20.31	20.31	20.33	20.33	20.34	20.34	20.34	20.33	20.33	20.32	20.32		(88)
Utilisation fa	ctor for g	ains for ı	est of d	welling,	h2,m (s	ee Table	9a)						
(89)m= 0.89	0.83	0.76	0.64	0.5	0.35	0.24	0.26	0.42	0.66	0.83	0.9		(89)
Mean interna	al temper	ature in t	the rest	of dwelli	na T2 (follow ste	ens 3 to	7 in Tabl	le 9c)	•	•	•	
(90)m= 18.99	19.33	19.7	20.05	20.23	20.32	20.33	20.34	20.3	20.07	19.52	18.93]	(90)
							!	!	L fLA = Livir	l g area ÷ (4	4) =	0.45	(91)
						() A T4	/4 6	A) TO					┛` ′
Mean interna		· ` ·				1	- `	T .	1	10.04	104	1	(92)
(92)m= 19.45	19.75	20.07	20.38	20.54	20.62	20.63	20.63	20.6	20.39	19.91	19.4		(92)
Apply adjust	19.75	ne mean 20.07	20.38	20.54	20.62	20.63	20.63	20.6	20.39	19.91	19.4	1	(93)
8. Space he			20.30	20.54	20.02	20.03	20.03	20.0	20.59	19.91	19.4		(30)
Set Ti to the	·		mporatiu	ro obtair	od at st	ton 11 of	Table 0	h so tha	t Ti m-(76)m an	d ro-cald	culato	
the utilisation					icu at s	tep 11 oi	Table 3	D, 30 tile	ı. 11,111—(r Ojiii aii	u re-care	Julate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Utilisation fa	ctor for g	ains, hm	:			•	· -	•		•	•		
(94)m= 0.87	0.82	0.75	0.64	0.51	0.36	0.26	0.28	0.44	0.66	0.82	0.89		(94)
Useful gains	, hmGm	, W = (94	1)m x (84	4)m								_	
(95)m= 372.58	404.99	407.31	372.52	304.89	211.68	143.57	149.93	226.63	312.38	347.25	358.61		(95)
Monthly ave	rage exte	rnal tem	perature	from Ta	able 8	_	-	_				_	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2]	(96)
Heat loss ra	te for me	an intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)m	– (96)m]	-	-	•	
(97)m= 566.27	553.13	503.91	419.03	321.81	215.37	144.35	150.98	234.06	356.28	469.33	560.56		(97)
Space heati	ng require	ement fo	r each n	nonth, k	/Vh/mor	1 + 0.02	24 x [(97	')m – (95	<u>i)m] x (4</u>	1)m		•	
(98)m= 144.11	99.55	71.87	33.49	12.59	0	0	0	0	32.66	87.9	150.25		_
							Tota	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	632.41	(98)
Space heati	ng require	ement in	kWh/m²	/year								12.43	(99)
	-												_

9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab			(301)
		0	_՝ ՝
Fraction of space heat from community system 1 – (301) =	is far CHP and up to four other heat sources: the	1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See		e iallei	
Fraction of heat from Community boilers		1	(303a)
Fraction of total space heat from Community boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating	_	kWh/yea	r_
Annual space heating requirement	Ĺ	632.41	╛
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	664.03	(307a)
Efficiency of secondary/supplementary heating system in % (from T	Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating	_		_
Annual water heating requirement		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	0.01 × [(307a)(307e) + (310a)(310e)] =	26.51	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out	side	176.46	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	176.46	(331)
Energy for lighting (calculated in Appendix L)	<u> </u>	242.69	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-518.71	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ty)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor E kWh/year kg CO2/kWh k	missions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	o fuels repeat (363) to (366) for the second fuel	94	(367a)
CO2 associated with heat source 1 [(307b)+(310	b)] x 100 ÷ (367b) x 0.22 =	609.09	(367)
Electrical energy for heat distribution [(313	3) x 0.52 =	13.76	(372)
Total CO2 associated with community systems (363)(366) + (368)(372)	622.85	(373)
CO2 associated with space heating (secondary) (309		0	(374)
(000	, <u> </u>		(=)

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) =	:		622.85	(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) =				571.17	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				11.23	(384)
El rating (section 14)					92.02	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 42

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

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: 26.8

Summer heat loss coefficient: 194.59 (P2)

Overhangs:

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 3.89 3.73 3.64 (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 21.19 22.93 22.74 Likelihood of high internal temperature Slight Medium Medium

Assessment of likelihood of high internal temperature: Medium

		He	er Details:						
Access at Name.	Zabid Ashrof	Use		. Mirros	hau.		CTDO	001000	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012)	Stroma Softwa	-				001082 on: 1.0.5.9	
Continuito Humo.	Guerra Terra		rty Address:				7 0 10 10	1101010	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		<i>,</i>	Area(m²) 50.86	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1	a) . (1b) . (1a) . (1d) . (1a)					2.5	(2a) -	127.15	
	a)+(1b)+(1c)+(1d)+(1e)	±(111)	50.86	(4)) . (2a) . (2a	1) . (20) .	(2n) -		٦
Dwelling volume				(3a)+(3b))+(30)+(30	l)+(3e)+	.(311) =	127.15	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
Number of chimneys	heating he	eating		1 = [x 4	40 =		(6a)
Number of open flues		-] <u>L</u>] = [0		20 =	0	=
Number of intermittent fa		0 +	0	J L	0		10 =	0	(6b)
				L	2		10 =	20	(7a)
Number of passive vents				Ļ	0		40 =	0	(7b)
Number of flueless gas fi	ires				0	x '	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7	'b)+(7c) =	Γ	20		÷ (5) =	0.16	(8)
	peen carried out or is intended	d, proceed to (1	17), otherwise o	ontinue fr	om (9) to	(16)			<u> </u>
Number of storeys in the Additional infiltration	he dwelling (ns)					[(0)	-1]x0.1 =	0	(9)
	.25 for steel or timber fr	ame or 0.35	5 for masonr	v constr	uction	[(9)	-1]XU.1 =	0	(10)
if both types of wall are p	resent, use the value corresp			•				<u> </u>	` ′
deducting areas of openii	ngs); if equal user 0.35 floor, enter 0.2 (unseale	ed) or 0.1 (se	ealed), else	enter 0			1	0	(12)
If no draught lobby, en	•	(3)	oa.oa), o.oo	011101 0				0	(13)
Percentage of window	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2	, ,	_			0	(15)
Infiltration rate	.50		(8) + (10)	, , ,	, , ,	, ,		0	(16)
Air permeability value, If based on air permeabil	q50, expressed in cubic then $(18) = [(17)]$	•	•	•	etre of e	envelope	area	3	(17)
	es if a pressurisation test has				is being u	sed		0.31	(18)
Number of sides sheltered	ed							3	(19)
Shelter factor	in a chaltanta atau		(20) = 1 - [[9)] =			0.78	(20)
Infiltration rate incorporate Infiltration rate modified f	•		(21) = (18)	X (20) =				0.24	(21)
Jan Feb	Mar Apr May	Jun Ju	ul Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp			<u> /.eg</u>					I	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	8 3.7	4	4.3	4.5	4.7		
Wind Factor (20-) (2	2)	•	-		-		-	-	
Wind Factor $(22a)m = (2(22a)m = 1.27)$ 1.25	2)m ÷ 4 1.23	0.95 0.9	95 0.92	1	1.08	1.12	1.18]	
1.27	1.1 1.00	0.00 0.8	0.92	i	1.00	L ''.'2	1.10	I	

Adjusted ir	nfiltration rat	te (allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.		0.29	0.26	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28]	
	<i>effective air</i> Inical ventila	_	rate for t	he appli	cable ca	se	•	•	•	•	•	<u>.</u>	(00-)
	air heat pump		endix N. (2	3b) = (23a	a) × Fmv (e	eguation (N5)) . othe	rwise (23b) = (23a)			0	(23a) (23b)
	d with heat rec								, (===,			0	(23c)
	nced mech		-	_					2b)m + (23b) x [1 – (23c)		(200)
(24a)m=		0	0	0	0	0	0	0	0	0	0]	(24a)
b) If bala	nced mech	anical ve	entilation	without	heat red	covery (ľ	л ИV) (24b	m = (22)	2b)m + (23b)		1	
(24b)m=		0	0	0	0	0	0	0	0	0	0]	(24b)
•	le house ex 2b)m < 0.5 >			•					.5 × (23b	D)	•	•	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0]	(24c)
,	ural ventilati 2b)m = 1, th			•					0.5]	•	•	•	
(24d)m= 0.5	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	air change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	ld) in box	x (25)				_	
(25)m= 0.9	55 0.54	0.54	0.53	0.53	0.53	0.53	0.52	0.53	0.53	0.54	0.54		(25)
3. Heat lo	sses and he	eat loss i	paramete	er:									
ELEMEN			Openin		Net Ar	ea	U-val	ue	AXU		k-value		Xk
		(m²)	m	l ²	A ,r	m²	W/m2	!K	(W/	K)	kJ/m²•	K k	J/K
Doors					2	X	1.4	=	2.8				(26)
Windows					8.651	x1	/[1/(1.4)+	0.04] =	11.47	╛.			(27)
Walls Type	28.7	74	8.65		20.09) x	0.15	=	3.01				(29)
Walls Type	25.2	21	2		23.21	X	0.14	=	3.28				(29)
	of elements	•			53.95								(31)
** include the	and roof wind areas on both	sides of ir	nternal wal			ated using			ie)+0.04] á	as given in	paragrapl	h 3.2	
	t loss, W/K	`	U)				(26)(30)					20.57	(33)
•	city Cm = S	` ,						***	(30) + (32	, , ,	(32e) =	606.2	(34)
	ass parame								tive Value		-1.1. 46	100	(35)
_	ssessments wh instead of a de			construct	ion are no	t known pi	recisely the	e inaicative	values of	TIMP IN T	аріе 11		
Thermal bi	idges : S (L	. x Y) cal	culated (using Ap	pendix I	<						6.19	(36)
if details of th	ermal bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric									(36) =			26.75	(37)
	heat loss c	1							= 0.33 × (1	<u> </u>	1	
-	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(20)
(38)m= 22	I	22.77	22.42	22.36	22.05	22.05	22	22.17	22.36	22.49	22.62	J	(38)
	fer coefficie	r	ı		1		1		= (37) + (1	
(39)m= 49	67 49.59	49.52	49.17	49.11	48.81	48.81	48.75	48.92	49.11	49.24	49.38	40.47	(20)
Heat loss p	oarameter (I	HLP), W	/m²K						Average = = (39)m ÷		12 / 12=	49.17	(39)
(40)m= 0.9	98 0.98	0.97	0.97	0.97	0.96	0.96	0.96	0.96	0.97	0.97	0.97		
									Average =	Sum(40) ₁	12 /12=	0.97	(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										J	,	
(63)m= 0 0	0	0	0	(0	0	C	0	0]	(63)
Output from water heater	r					!	!	<u>'</u>			_	
· — — —	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	C	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	Sh	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	」(77) □ ₍₇₇₎
0 11 1	_ 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	」(77) □ ₍₇₇₎
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)

Southeas	t 0.9x	0.77	X	8.6	S5	x	92.85	х	0.63	Х	0.7	=	245.49	(77)
Southeas	t _{0.9x}	0.77	X	8.6	35	x	69.27	X	0.63	Х	0.7	=	183.13	(77)
Southeas	t _{0.9x}	0.77	X	8.6	65	x	44.07	x	0.63	x	0.7	=	116.52	(77)
Southeas	t _{0.9x}	0.77	X	8.6	35	x	31.49	x	0.63	х	0.7	=	83.25	(77)
						_								_
Solar gai	ins in w	vatts, ca	lculated	for eacl	h month			(83)m =	Sum(74)m	(82)m				
(83)m=	97.28	165.7	226.72	280.91	314.65	312.	37 301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gai	ns – in	ternal a	nd solar	(84)m =	= (73)m ·	+ (83)m , watts	•	•	•	•	•	•	
(84)m= 3	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. Mear	n intern	al temp	erature	(heating	season)								
				`			ea from Tal	ole 9, T	h1 (°C)				21	(85)
•		•	•			•	Table 9a)	,	,					」 ` `
Γ	Jan	Feb	Mar	Apr	May	Ju		Aug	Sep	Oct	Nov	Dec	1	
(86)m=	0.95	0.92	0.88	0.8	0.69	0.5	-	0.45	0.64	0.83	0.93	0.96	1	(86)
		<u> </u>			T. //				1 0)	<u> </u>		l	ı	
							steps 3 to 7			I 00 00	10.00	10.00	1	(07)
(87)m=	19.13	19.44	19.84	20.29	20.65	20.8	37 20.96	20.95	20.79	20.32	19.63	19.06	J	(87)
Temper	rature c	during h	eating p	eriods ir	rest of	dwel	ling from Ta	ble 9,	Γh2 (°C)			•	1	
(88)m=	20.1	20.1	20.11	20.11	20.11	20.1	12 20.12	20.12	20.12	20.11	20.11	20.11		(88)
Utilisatio	on facto	or for ga	ains for	rest of d	welling,	h2,m	(see Table	9a)						
_	0.95	0.91	0.86	0.78	0.65	0.4		0.37	0.58	0.8	0.92	0.95]	(89)
∟ Mean ir	nternal	temner:	ature in	the rest	of dwelli	na T	2 (follow ste	ns 3 to	7 in Tah	le 9c)	!			
	18.39	18.69	19.09	19.52	19.84	20.0	<u> </u>	20.09	19.98	19.55	18.89	18.33	1	(90)
(3.3)								<u> </u>		ļ	g area ÷ (4		0.45	(91)
												,	0.10	
			•				= fLA × T1	<u> </u>	- 	1	1 40 00	1,000	1	(02)
` ′	18.73	19.03	19.43	19.87	20.21	20.4		20.48	20.35	19.9	19.23	18.66	J	(92)
· · · · —		T			· ·	ature 20.4	from Table	r	 	r	1 40 00	40.00	1	(93)
` ' _	18.73	19.03	19.43	19.87	20.21	20.4	12 20.49	20.48	20.35	19.9	19.23	18.66		(93)
8. Spac		·				م ما م	4 atam 11 af	Table (4 T: /	76)	ما سم مماد	lata	
				กрегаเนเ using Ta		eu a	t step 11 of	rable s	90, SO 1118	at 11,111=(76)III an	d re-caid	Julate	
	Jan	Feb	Mar	Apr	May	Ju	ın Jul	Aug	Sep	Oct	Nov	Dec	1	
Utilisatio				•					1				ı	
	0.93	0.9	0.85	0.77	0.65	0.5	1 0.37	0.4	0.59	0.8	0.9	0.94]	(94)
ـــ Useful و	gains, h	nmGm ,	W = (94	1)m x (84	4)m			<u>!</u>	-1				ı	
_		371.23	394.8	388.43	343.72	258.	63 182.31	189.18	264.06	314.77	311.91	305.82	1	(95)
Monthly	/ avera	ge exte	rnal tem	perature	from Ta	able 8	 B		_ !				ı	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.	6 16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat los	ss rate	for mea	an intern	al tempe	erature,	Lm ,	W =[(39)m	x [(93)r	n– (96)m]			1	
(97)m= 7	716.57	700.88	640.21	539.23	417.79	283.	86 189.74	198.85	305.58	456.64	597.29	713.88		(97)
Space h	heating	require	ement fo	r each n	nonth, k	Nh/m	nonth = 0.02	24 x [(9	7)m – (95	5)m] x (4	1)m	•	•	
(98)m= 2	292.88	221.52	182.59	108.58	55.11	0	0	0	0	105.56	205.48	303.6		
		•						To	al per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1475.32	(98)
Space h	heating	reauire	ement in	kWh/m²	² /vear								29.01	(99)
1	9			,	,									」 ` ′

8c. Sp	pace co	oling rec	quiremer	nt										
Calcu	lated fo	r June, c	July and	August.	See Tal	ole 10b	_						•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	458.78	361.17	370.51	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm										i	
(101)m=	0	0	0	0	0	0.86	0.91	0.89	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	Vatts) = ((100)m x	(101)m								•	
(102)m=	0	0	0	0	0	395.37	327.74	331.34	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)				•	
(103)m=	0	0	0	0	0	659.77	635.22	610.6	0	0	0	0		(103)
•		•	<i>ement fo</i> (104)m <			lwelling,	continue	ous (kW	h') = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
(104)m=	0	0	0	0	0	190.37	228.77	207.77	0	0	0	0		
		-	_		_	-	_		Total	= Sum(104)	=	626.91	(104)
Cooled	I fraction	า							f C =	cooled	area ÷ (4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)		1		1					1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
_									Total	I = Sum(104)	=	0	(106)
•		 	ment for		` 							<u> </u>	1	
(107)m=	0	0	0	0	0	47.59	57.19	51.94	0	0	0	0		_
									Total	= Sum(107)	=	156.73	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	year				(107)	÷ (4) =			3.08	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Energy	y Efficier	псу						(99)	+ (108) =	=		32.09	(109)

SAP Input

Property Details: Plot 42

Address:

Located in: England Region: Thames valley

UPRN:

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

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

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

PCDF Version: 466

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 50.861 m² 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

NWCorridor WallNorth West00SEExternal WallSouth East00

Overshading: Average or unknown

Opaque Elements:

Type: Gross area: Openings: Net area: U-value: Ru value: Curtain wall: Kappa: **External Elements** External Wall 28.744 8.65 20.09 0.15 0 False N/A Corridor Wall 25.207 2 23.21 0.15 0.4 False N/A

Internal Elements
Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1146

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 11.6 0.109

SAP Input

14.5 0.08 E16 Corner (normal)

8.7 -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: 0 Number of open flues: 0

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

Main heating system:

Main heating system: Community heating schemes

Heat source: Community boilers

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

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

Boiler interlock: Yes

Main heating Control:

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

thermostats

Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

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

Others:

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

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.63 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		UserI	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			0001082 on: 1.0.5.9	
Address :	F	Property	Address	: Plot 42					
Overall dwelling dime	ensions:								
		Are	a(m²)	-	Av. He	ight(m)	-	Volume(m	<u>")</u>
Ground floor			50.86	(1a) x	2	2.5	(2a) =	127.15	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) :	50.86	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	127.15	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	_ + [0	_ = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				2	x 1	10 =	20	(7a)
Number of passive vents				Ī	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res			Ī	0	x 4	40 =	0	(7c)
				L				_	
				_			Air ch	anges per ho	our —
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a)+(6a$				20		÷ (5) =	0.16	(8)
Number of storeys in the	een carried out or is intended, proceence	ea 10 (17),	otrierwise (conunue ii	om (9) to	(10)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are po deducting areas of opening	resent, use the value corresponding t	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-			0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	etre of e	envelope	area	5	(17)
•	es if a pressurisation test has been do				is being u	sed		0.41	(18)
Number of sides sheltere			,	Í	J			3	(19)
Shelter factor			(20) = 1 -	[0.075 x (′	19)] =			0.78	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.32	(21)
Infiltration rate modified f	- 1 	1	T .	T _	Π_	1	_	1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp		1 00	1 0.7		T 40	1.5	4.7	1	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = $(22a)$ m =	2)m ÷ 4							_	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted 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				21) (22				. (00)	\			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	entilation		i	covery (N	ИV) (24b	p)m = (22)	<u> </u>	1	1	7	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24k
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	nter (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 i	paramete	er.									
ELEMENT	Gros	_	Openin		Net Ar	ea	U-val	ue	ΑXU		k-value	e	AXk
	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	28.7	74	8.65		20.09) x	0.18		3.62				(29)
Walls Type2	25.2	21	2		23.21	ı x	0.18	-	4.18			= =	(29)
Total area of	elements	, m²			53.95	5							(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) =				21.26	(33)
Heat capacity	Cm = S	(A x k)						((28).	(30) + (3	2) + (32a)	(32e) =	606.2	(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	ecisely the	e indicative	e values of	f TMP in T	able 1f		
can be used inste				.a.'.a. A.	ابناممم	,							
Thermal bridg	,	•		• .	•	1						4.72	(36)
Total fabric he		are not kn	OWII (30) =	= 0.03 X (3	1)			(33) +	(36) =			25.99	(37)
Ventilation he		alculated	l monthly	/						(25)m x (5)	20.00	(51)
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	†	(38)
` ′		L	I		<u> </u>	I	<u> </u>	<u> </u>	<u> </u>	<u>I</u>	ļ.	J	
Heat transfer 50.36	50.23	50.1	49.49	49.38	48.85	48.85	48.75	49.06	49.38	49.61	49.85	1	
30.36	30.23	30.1	49.49	49.30	40.00	40.00	40./5		<u> </u>	+9.61 Sum(39) ₁		49.49	(39)
Heat loss para	1 `						l	(40)m	= (39)m ÷	÷ (4)] +3.45	(09)
(40)m= 0.99	0.99	0.99	0.97	0.97	0.96	0.96	0.96	0.96	0.97	0.98	0.98		
									Average =	Sum(40)	12 /12=	0.97	(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	anay 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 L1:	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)

Souther	ast _{0.9x}	0.77	X	8.6	6 5	X	9	2.85	X		0.63	x	0.7	=	245.49	(77)
Souther	ast _{0.9x}	0.77	X	8.6	65	x	6	9.27	x		0.63	x	0.7	=	183.13	(77)
Southe	ast _{0.9x}	0.77	X	8.6	65	x	4	4.07	x		0.63	x	0.7	=	116.52	(77)
Southe	ast _{0.9x}	0.77	Х	8.6	55	x	3	1.49	х		0.63	x	0.7	=	83.25	(77)
	_															_
Solar g	ains in	watts, ca	alculated	for eacl	h month				(83)m	n = Si	um(74)m .	(82)m				
(83)m=	97.28	165.7	226.72	280.91	314.65	3′	12.37	301.16	275	.99	245.49	183.13	116.52	83.25		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	= (73)m	+ (8	33)m	, watts					•			
(84)m=	344.14	411.47	464	504.34	523.65	50	07.77	487.92	465	.85	442.63	394.24	343.68	322.8		(84)
7. Me	an inter	nal temp	erature	(heating	season)										
		during h					area f	from Tab	ole 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	iving are	ea, h1,m	ı (se	ee Ta	ble 9a)			, ,					_
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.97	0.91	0.79	┢	0.6	0.44	0.4		0.72	0.94	0.99	1		(86)
` '				l: .:	T4 /5:	. !! -	4-	0 4			- 0-\		!			
	20.05	temper			<u> </u>							20.73	20.33	20.02	1	(87)
(87)m=	20.05	20.24	20.47	20.74	20.91		0.99	21	2	<u>' </u>	20.96	20.73	20.33	20.02		(07)
		during h	eating p	eriods ir	rest of	_		from Ta	ble 9	9, Th	n2 (°C)				Ī	
(88)m=	20.09	20.09	20.1	20.11	20.11	2	0.12	20.12	20.	12	20.11	20.11	20.1	20.1		(88)
Utilisa	ation fac	tor for ga	ains for i	rest of d	welling,	h2,	m (se	e Table	9a)							
(89)m=	1	0.99	0.96	0.89	0.74	().52	0.35	0.3	39	0.64	0.92	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ina	T2 (f	ollow ste	ns 3	to 7	7 in Tahl	e 9c)	•	•	•	
(90)m=	19.23	19.41	19.65	19.9	20.05	Ť	0.11	20.12	20.		20.09	19.9	19.52	19.2		(90)
` '									<u> </u>		f	LA = Livir	l ng area ÷ (4	<u>1</u> 4) =	0.45	(91)
							` .	A T 4			A) To					」 ` `
		tempera 19.79				_			 	$\overline{}$		00.00	1 40 00	40.57		(92)
(92)m=	19.6		20.02	20.28	20.44		0.51	20.52	20.		20.49	20.28	19.89	19.57		(92)
(93)m=	19.6	nent to th	20.02	20.28	20.44	1	0.51	20.52	20.		20.49	20.28	19.89	19.57]	(93)
		ting requ			20.44		0.51	20.52	20.	52	20.49	20.20	19.69	19.57		(33)
					ro obtair	ممط	at et	on 11 of	Tabl	la Oh	o co tha	t Ti m-(76)m an	d ro-calc	culato	
		factor fo		•		icu	at sit	эр ттог	Tabl	ie si), 30 iiia	t 11,111—(7 Ojiii aii	u ie-caic	Julate	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:									•	<u>.</u>		
(94)m=	0.99	0.98	0.96	0.89	0.76	(0.56	0.39	0.4	13	0.68	0.92	0.99	1		(94)
Usefu	l gains,	hmGm ,	W = (94	1)m x (84	4)m											
(95)m=	342.17	405.16	445.65	451.28	397.63	28	33.84	190.8	199	.83	299.7	362.98	338.95	321.47		(95)
Month	nly avera	age exte	rnal tem	perature	from T	able	e 8						-	_		
(96)m=	4.3	4.9	6.5	8.9	11.7	1	14.6	16.6	16	.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	for mea	an intern	al tempe	erature,	Lm	, W =	=[(39)m	x [(9	3)m-	– (96)m]				
(97)m=	770.72	747.77	677.53	563.33	431.78	28	38.59	191.31	200	.68	313.35	477.77	634.51	766.33		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh.	/mont	h = 0.02	24 x	(97)	m – (95)m] x (4	1)m			
(98)m=	318.85	230.23	172.52	80.68	25.41		0	0	C)	0	85.41	212.8	330.98		
										Total	l per year	(kWh/yea	r) = Sum(9	8) _{15,912} =	1456.87	(98)
Space	e heating	g require	ement in	kWh/m²	/year										28.64	(99)
•		•														_

8c. Sp	ace 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	459.21	361.51	370.53	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	ss hm										•	
(101)m=	0	0	0	0	0	0.96	0.98	0.98	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	440.56	355.47	362.26	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)
•	,	g require zero if (lwelling,	continuo	ous (kW	h') = 0.02	24 x [(10	03)m – (102)m] :	x (41)m	
(104)m=	0	0	0	0	0	156.94	207.31	183.82	0	0	0	0		
•									Total	= Sum(104)	=	548.06	(104)
Cooled	fraction	ו							f C =	cooled	area ÷ (4	4) =	1	(105)
1		actor (Ta	able 10b)				1					1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
_		_							Total	' = Sum(104)	=	0	(106)
		requirer												
(107)m=	0	0	0	0	0	39.23	51.83	45.95	0	0	0	0		_
									Total	= Sum(107)	=	137.02	(107)
Space	cooling	requiren	ment in k	:Wh/m²/y	/ear				(107)	÷ (4) =			2.69	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Energy	/ Efficier	псу						(99) -	+ (108) =	=		31.34	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								36.04	(109)

		l Isar I	Details:						
Assessor Name:	Zahid Ashraf	03011	Stroma	Mum	bor		STDO	001082	
Software Name:	Stroma FSAP 2012		Softwa					on: 1.0.5.9	
		Property	Address:	Plot 42					
Address :									
Overall dwelling dime	ensions:	A	- (··· 2)		A 11 .	last (Cost)		V - l	
Ground floor			ea(m²) 50.86	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
Total floor area TFA = (1)	a)+(1b)+(1c)+(1d)+(1e)+			(4)]`` ''	127.10	
Dwelling volume	۵,۰(۱۵,۰(۱۵,۰(۱۵,۰	()	30.00)+(3c)+(3c	d)+(3e)+	.(3n) =	127.15	(5)
				(5.5) (5.6)	, (, , , , , , , , , , , , , , , , , ,	., . (,		127.15	
2. Ventilation rate:		ondary	other		total			m³ per hou	r
Number of chimneys	heating hea	$\frac{\mathbf{ating}}{0}$ + Γ	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0]	0	x 2	20 =	0	(6b)
Number of intermittent fa				, <u>F</u>	0	x ·	10 =	0	(7a)
Number of passive vents				F	0	x	10 =	0	(7b)
Number of flueless gas fi				F	0	x 4	40 =	0	(7c)
rambor of hadioco gao n	100			L				0	
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+	-(6b)+(7a)+(7b)+	(7c) =	Γ	0		÷ (5) =	0	(8)
	een carried out or is intended,	proceed to (17),	otherwise c	ontinue fr	om (9) to	(16)	ĺ		_
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9).	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber fra	me or 0.35 fo	r masonr	v constr	uction	[(0)]	1]XO.1 =	0	(11)
if both types of wall are p	resent, use the value correspo			•				<u> </u>	` ′
deducting areas of opening	ngs); if equal user 0.35 floor, enter 0.2 (unsealed	I) or 0.1 (soal	ad) also	antar O			ı		7(42)
If no draught lobby, en	•	i) Ui U. i (Seai	eu), eise i	enter o				0	(12)
•	s and doors draught strip	ned						0	(14)
Window infiltration	o and accide arangin comp	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic	metres per h	our per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabil	ity value, then (18) = [(17)	÷ 20]+(8), otherv	vise (18) = (16)				0.15	(18)
	es if a pressurisation test has be	een done or a de	egree air per	meability	is being u	sed	•		_
Number of sides sheltere	ed		(20) – 1 [0 075 v /4	10)1 –			3	(19)
Shelter factor	iina ahaltar faatar		(20) = 1 - [19)] =			0.78	(20)
Infiltration rate incorporat	-		(21) = (18)	X (20) =				0.12	(21)
Infiltration rate modified f Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec	1	
		Juli Jul	Aug	Sep	Oct	I NOV	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7]	
()	1	0.0	1 0.,	-	I +.0	I +.0]	I	
Wind Factor (22a)m = (2	' 		, , , , , , , , , , , , , , , , , , , 		1	1	,	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		

00/01/15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
Calculate effe If mechanic		-	rate for t	he appli	cable ca	se	!	<u>.</u>	!	!	!		
If exhaust air h			endix N. (2	3b) = (23a	ı) × 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	лV) (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	tilation c	or positiv	e input v	entilatio	n from o	utside	l .	l		1	
if (22b)r	n < 0.5 ×	(23b), t	hen (24d	c) = (23b); other	vise (24	c) = (22k	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				
	n = 1, the	en (24d) 0	m = (220)	o)m othe	rwise (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)	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	28.7	74	8.65	\neg	20.09	=	0.15		3.01	╡┌		\neg	\ \(2
Valls Type2	25.2		2	=	23.21	=	0.14	╡┇	3.28	륵 ¦			(2
otal area of e		i			53.95	=	0.14		0.20				(3
for windows and		•	ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	n 3.2	(5
										_			
* include the area													
	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				20.57	(3
abric heat los leat capacity	Cm = S((A x k)	ŕ				(26)(30)		(30) + (32	2) + (32a).	(32e) =	20.57	==
abric heat los leat capacity hermal mass	Cm = S(parame	(A x k) eter (TMF	P = Cm ÷	,				((28) Indica	tive Value	: Low	, ,		(3
* include the area Fabric heat los Heat capacity Thermal mass For design assess an be used inste	Cm = S(s paramessments wh	(A x k) eter (TMF	$P = Cm \div tails of the$,				((28) Indica	tive Value	: Low	, ,	606.2	(3
Fabric heat los Heat capacity Thermal mass For design assess an be used inste	Cm = S(s parame sments wheread of a des	(A x k) eter (TMF ere the de tailed calcu	P = Cm ÷ tails of the ulation.	construct	ion are not	t known pr		((28) Indica	tive Value	: Low	, ,	606.2 100	(3
Fabric heat lost leat capacity Thermal mass For design assess an be used inste	Cm = S(s parame sments whead 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) Indica	tive Value	: Low	, ,	606.2	(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 dec 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	tive Value	: Low	, ,	606.2 100	(3
Fabric heat lost leat capacity Thermal mass for design assess an be used instevential bridged details of thermal fotal fabric he	Cm = S(s parame sments wh ead of a de- es : S (L al bridging	(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 co	ion are not pendix l	t known pr		((28) Indica e indicative	tive Value	: Low TMP in T	able 1f	606.2	(3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (
fabric heat lost leat capacity Thermal mass for design assessan be used instead thermal bridged details of thermal fotal fabric he	Cm = S(s parame sments wh ead of a de- es : S (L al bridging	(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 co	ion are not pendix l	t known pr		((28) Indica e indicative	tive Value e values of (36) =	: Low TMP in T	able 1f	606.2	(3
Fabric heat lost leat capacity Thermal mass for design assess an be used instead for thermal bridge details of thermal fotal fabric head fabric head and the details of the	Cm = S(parame sments wh had of a de- 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	on are not pendix h	t known pr	ecisely the	((28) Indica e indicative (33) + (38)m	tive Value e values of (36) = = 0.33 × (: Low : TMP in To	able 1f	606.2	(3
Fabric heat losseleat capacity Thermal massessan be used inste Thermal bridge Tetalis of thermal Total fabric head Total fabric head Total fabric head Total fabric head Total fabric head Total fabric head Total fabric head	Cm = S(parame sments wh had of a dec es : S (L hal bridging eat 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	constructs using Ap = 0.05 x (3	opendix k	known pr	ecisely the	((28) Indica e indicative (33) + (38)m Sep 9.27	tive Value e values of (36) = = 0.33 × (25)m x (5 Nov 9.88	able 1f	606.2	(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 dec es : S (L hal bridging eat 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	constructs using Ap = 0.05 x (3	opendix k	known pr	ecisely the	((28) Indica e indicative (33) + (38)m Sep 9.27	(36) = = 0.33 × (Oct 9.64	25)m x (5 Nov 9.88	able 1f	606.2	(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 dec es : S (L hal bridging eat loss at loss ca Feb 10.49 coefficier 37.25	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37 nt, W/K 37.12	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 9.76	constructions are constructed using April 20.05 x (3) / May 9.64	pendix k	t known pr	Aug 8.91	((28) Indicative (33) + (38)m Sep 9.27 (39)m 36.03	(36) = = 0.33 × (Oct 9.64 = (37) + (36) = (37) + (25)m x (5 Nov 9.88 38)m 36.64 Sum(39) ₄	Dec 10.13	606.2	(3
Fabric heat losseleat capacity Thermal massessan be used inste Thermal bridge Total fabric he Ventilation hea Jan 38)m= 10.61	Cm = S(parame sments wh had of a dec es : S (L hal bridging eat loss at loss ca Feb 10.49 coefficier 37.25	(A x k) eter (TMF ere the de tailed calcu x Y) calc are not kn alculated Mar 10.37 nt, W/K 37.12	P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr 9.76	constructions are constructed using April 20.05 x (3) / May 9.64	pendix k	t known pr	Aug 8.91	((28) Indicative (33) + (38)m Sep 9.27 (39)m 36.03	(36) = = 0.33 × (Oct 9.64 = (37) + (36.39)	25)m x (5 Nov 9.88 38)m 36.64 Sum(39) ₄	Dec 10.13	606.2 100 6.19 26.75	(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	ut 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 .	92.85	x	0.63	×	0.7		245.49	(77)
Southeast 0.9x	0.77	x	8.6	65	X	69.27	x	0.63	x	0.7	=	183.13	(77)
Southeast 0.9x	0.77	х	8.6	65	X .	44.07	х	0.63	X	0.7	=	116.52	(77)
Southeast 0.9x	0.77	x	8.6	65	x :	31.49	х	0.63	X	0.7	=	83.25	(77)
													_
Solar gains in	watts, ca	alculated	for eacl	h month			(83)m = S	um(74)m .	(82)m				
(83)m= 97.28	165.7	226.72	280.91	314.65	312.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains –	internal a	nd solar	(84)m =	= (73)m -	+ (83)m	, watts						l	
(84)m= 552.99	618.06	663.76	694.37	704.34	680.44	656.34	637.82	620.67	582.09	541.9	528.26		(84)
7. Mean inte	rnal temp	erature ((heating	season)	•							
Temperature			`			from Tal	ole 9. Th	1 (°C)				21	(85)
Utilisation fa	_	٠.			_		o.o o,	()					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.77	0.69	0.58			+	l 	0.39			0.84		(86)
(86)m= 0.82	0.77	0.09	0.56	0.46	0.33	0.24	0.26	0.39	0.59	0.76	0.64		(00)
Mean interna	al temper	ature in I	iving are	ea T1 (fo	llow ste	eps 3 to 7	7 in Tabl	e 9c)				•	
(87)m= 20.31	20.48	20.68	20.85	20.95	20.99	21	21	20.98	20.86	20.59	20.27		(87)
Temperature	e during h	eating p	eriods ir	rest of	dwelling	g from Ta	able 9, T	h2 (°C)					
(88)m= 20.31	20.31	20.31	20.33	20.33	20.34	20.34	20.34	20.33	20.33	20.32	20.32		(88)
	otor for a	cina far r	oot of di	u allin a	2 m (a	a Tabla	00)						
Utilisation fa	0.75	0.67	0.56			1	T	0.36	0.56	0.74	0.82	İ	(89)
(89)m= 0.81	0.75	0.67	0.56	0.43	0.3	0.2	0.22	0.36	0.56	0.74	0.62		(09)
Mean interna	al temper	ature in t	he rest	of dwelli	ng T2 (1	follow ste	eps 3 to	7 in Tab	e 9c)				
(90)m= 19.4	19.65	19.91	20.14	20.27	20.33	20.34	20.34	20.31	20.17	19.8	19.36		(90)
								f	fLA = Livin	g area ÷ (4) =	0.45	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lina) = f	fLA × T1	+ (1 – fl	A) x T2					_
(92)m= 19.81	20.03	20.25	20.46	20.58	20.63	20.64	20.64	20.61	20.48	20.16	19.77		(92)
Apply adjust	ment to t	he mean	internal	temper	ature fro	l .	. 4e. whe	ere appro	noriate	<u> </u>	<u> </u>		
(93)m= 19.81	20.03	20.25	20.46	20.58	20.63	20.64	20.64	20.61	20.48	20.16	19.77		(93)
8. Space hea	ating regu	uirement						l			l		
Set Ti to the	•		nperatur	re obtain	ed at st	en 11 of	Table 9	b so tha	t Ti m=(76)m an	d re-calc	culate	
the utilisation					ou ui oi	.ор о.	1 45.0	o, oo aa	()	. 0, a	a i o oaic	diate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm:	·				<u>. </u>						
(94)m= 0.8	0.74	0.67	0.56	0.44	0.31	0.22	0.24	0.37	0.57	0.73	0.81		(94)
Useful gains	, hmGm	, W = (94)m x (84	4)m			!	!			!		
(95)m= 440.6	458.48	443.67	391.18	312.02	213.36	143.95	150.45	230.26	332.27	395.73	428.84		(95)
Monthly ave	rage exte	rnal tem	perature	from Ta	able 8	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 loss rat	te for mea	an interna	al tempe	erature.	Lm , W	=[(39)m	x [(93)m	– (96)m	<u> </u>	I	1	1	
(97)m= 579.65	i e	510.62	422.26	322.98	215.64	144.41	151.06	234.64	359.73	478.47	574.3		(97)
Space heating			r each m	nonth. k\	Wh/mon		24 x [(97	<u> </u>		<u> </u>	<u>!</u>	1	
(98)m= 103.46		49.81	22.38	8.16	0	0	0	0	20.43	59.58	108.23		
		<u> </u>				1	Tota	l Il per year	(kWh/year	<u> </u>		442.55	(98)
Chase best	og rogula	oment in	L\\/h/~~?	lycor					, , , , , , , , , , , , , , , , , , , ,	, (=	, 		╡``
Space heating	ng require	zinent III	KVVII/II1°	, y c ai								8.7	(99)

9b. Energy requirements – Community heating so				
This part is used for space heating, space cooling Fraction of space heat from secondary/supplement			0	(301)
Fraction of space heat from community system 1	- (301) =		1	(302)
The community scheme may obtain heat from several sources			he latter	_
includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community boilers	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/year	-
Annual space heating requirement			442.55	
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	464.67	(307a)
Efficiency of secondary/supplementary heating sy	rstem 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				7
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)] =	24.51	(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 (Tabmechanical ventilation - balanced, extract or posit		le	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 x 0.01 =	19.7	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	84.23	(342a)
5	(004)	Fuel Price		_
Pumps and fans	(331)	13.19 x 0.01 =	23.27	(349)

(332)

Energy for lighting

(350)

32.01

13.19

x 0.01 =

Additional standing charges (Table 12)				120	(351)
Energy saving/generation technologies					_
	= (340a)(342e) + (345)(354) =		279.22	(355)
11b. SAP rating - Community heating so	heme				
Energy cost deflator (Table 12)				0.42	(356)
Energy cost factor (ECF)	(355) x (356)] ÷ [(4) + 45.0] =			1.22	(357)
SAP rating (section12)				82.93	(358)
12b. CO2 Emissions - Community heatin	g scheme				
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other courses of opens and week	tor booting (not CUD)	KWII/yeai	kg CO2/kWII	kg CO2/year	
CO2 from other sources of space and war Efficiency of heat source 1 (%)		o fuels repeat (363) to (366) for the second fue	94	(367a)
CO2 associated with heat source 1	[(307b)+(31	0b)] x 100 ÷ (367b) x	0.22	563.28	(367)
Electrical energy for heat distribution	[(31	3) x	0.52	12.72	(372)
Total CO2 associated with community sys	stems (36	3)(366) + (368)(372)	=	576	(373)
CO2 associated with space heating (seco	ondary) (30	9) x	0 =	0	(374)
CO2 associated with water from immersion	on heater or instantaneou	s heater (312) x	0.22	0	(375)
Total CO2 associated with space and wat	ter heating (37	3) + (374) + (375) =		576	(376)
CO2 associated with electricity for pumps	and fans within dwelling	(331)) x	0.52	91.58	(378)
CO2 associated with electricity for lighting	(33:	2))) x	0.52	125.95	(379)
Energy saving/generation technologies (3 Item 1	33) to (334) as applicable		0.52 x 0.01 =	-269.21	(380)
	sum of (376)(382) =		0.52	524.33](383)
rotar ooz, kg/year	383) ÷ (4) =			10.31	(384)
El rating (section 14)				92.67	(385)
13b. Primary Energy – Community heatin	g scheme				
		Energy	-	P.Energy	
		kWh/year	factor	kWh/year	
Energy from other sources of space and v Efficiency of heat source 1 (%)		o fuels repeat (363) to (366) for the second fue	94	(367a)
Energy associated with heat source 1	[(307b)+(31	0b)] x 100 ÷ (367b) x	1.22 =	3181.49	(367)
Electrical energy for heat distribution	[(31	3) x		75.26	(372)
Total Energy associated with community	systems (36)	3)(366) + (368)(372)	=	3256.74	(373)
if it is negative set (373) to zero (unless	s specified otherwise, see	C7 in Appendix C)		3256.74	(373)
Energy associated with space heating (se	econdary) (30)	9) x	0 =	. 0	(374)
Energy associated with water from immer	sion heater or instantane	ous heater(312) x	1.22	. 0	(375)
Total Energy associated with space and v	vater heating (37	3) + (374) + (375) =		3256.74	(376)
Energy associated with space cooling	(31:	5) x	3.07	. 0	(377)
				P	_

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) 2951.08

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			001082 on: 1.0.5.9	
Address :	F	roperty	Address	: Plot 42	!				
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He		Volume(m³)		
Ground floor		:	50.86	(1a) x	2	2.5	(2a) =	127.15	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) [50.86	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	127.15	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0] + [0	= [0	X 4	10 =	0	(6a)
Number of open flues	0 + 0	7 + [0	=	0	x 2	20 =	0	(6b)
Number of intermittent fa	ins				2	x 1	10 =	20	(7a)
Number of passive vents	3			Ē	0	x 1	10 =	0	(7b)
Number of flueless gas f	ires			F	0	x 4	10 =	0	(7c)
				L					
							Air ch	anges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$				20		÷ (5) =	0.16	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otnerwise (continue ti	rom (9) to	(16)		0	(9)
Additional infiltration	no awaiing (no)					[(9)-	·1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	ry consti	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding to	o the grea	ter wall are	ea (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	,	•	,,					0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(15)
Infiltration rate					12) + (13)			0	(16)
•	q50, expressed in cubic metre	-	•	•	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div 20] + (6)$ es if a pressurisation test has been do.				is boing u	sod		0.41	(18)
Number of sides sheltere		ie or a de	gree air pe	ппеаышу	is being u	seu		3	(19)
Shelter factor			(20) = 1 -	[0.075 x (19)] =			0.78	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.32	(21)
Infiltration rate modified t	for monthly wind speed								<u> </u>
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	2)m ÷ 4								
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
								J	

Adjusted i	nfiltration	rate (all	owing for s	helter an	nd wind s	speed) =	: (21a) x	(22a)m					
	0.3	9 0.3	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37		
	<i>effective</i> anical ver		ge rate for	the appli	cable ca	ise		!				-	
			ppendix N, (23h) - (23:	a) v Emy (aguation (N5)) othe	rwisa (23h	n) – (23a)			0	(23a)
		-	efficiency in %) = (25a)			0	(23b)
		-	ventilation	_					2h\m + /	(22h) v [1 (226	0	(23c)
· -	0 0	1	0	0	0	0	0	$\frac{1}{0}$	0	0	$\frac{1-(230)}{0}$) - 100]]	(24a)
` '			 ventilation									_	,
	0 0		0	0	0	0	0	0	0	0	0]	(24b)
	ole house	extract	I ventilation	or positiv	/e input	ı ventilatio	on from (L outside		ļ	ļ		
•), then (24	-	-				.5 × (23k	၁)			
(24c)m=	0 0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If nat	ural venti	lation or	whole hou	se positi	ve input	ventilati	on from	oft				_	
		<u>`</u>	4d)m = (22)	b)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]	_	1	7	
(24d)m = 0	.58 0.5	8 0.5	7 0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(24d)
			enter (24	í `	í `	í `		` 	•		1	7	4
(25)m= 0	.58 0.5	8 0.5	7 0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
3. Heat lo	osses and	d heat lo	ss parame	er:									
ELEMEI	• •	Gross	Openii		Net Ar		U-val		AXU		k-valu		AXk
D	а	rea (m²)	r	n²	A ,ı		W/m2		(W/	K)	kJ/m²•	K	kJ/K
Doors					2	×	1	=	2	=			(26)
Windows	. —				8.65	1 x1	/[1/(1.4)+	0.04] =	11.47	╡,			(27)
Walls Typ		28.74	8.6	5	20.09	=	0.18	=	3.62	_		_	(29)
Walls Typ		25.21	2		23.2	1 ×	0.18	=	4.18				(29)
Total area		•			53.9								(31)
			se effective w of internal wa			lated using	g formula 1	/[(1/U-valu	ue)+0.04] a	as given in	n paragrapi	h 3.2	
Fabric hea				no arra par			(26)(30) + (32) =				21.26	(33)
Heat capa	•	`	,					((28).	(30) + (3	2) + (32a)	(32e) =	606.2	(34)
Thermal n	nass para	meter (1	MP = Cm	÷ TFA) ir	n kJ/m²K	,		Indica	ntive Value	: Medium		250	(35)
For design a	ssessment	s where the	details of the	e construct	ion are no	t known pi	recisely the	e indicative	e values of	f TMP in T	able 1f		
can be used													
	•	,	calculated	• •	•	K						4.72	(36)
Total fabri		-	t known (36)	= 0.05 x (3	31)			(33) +	- (36) =			25.99	(37)
			ted month	v						(25)m x (5)	25.99	(37)
	lan Fe	1	i	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	7	
<u> </u>	1.38 24.			23.4	22.87	22.87	22.77	23.07	23.4	23.63	23.87		(38)
Heat trans							<u> </u>	<u> </u>	1 = (37) + (_	. ,
	0.36 50.3			49.38	48.85	48.85	48.75	49.06	49.38	49.61	49.85	7	
(00)111-	30	-5 50.	. -0.43	1-70.00	I 70.00	I 70.00	10.73		<u> </u>	Sum(39)		49.49	(39)
Heat loss	paramete	er (HLP),	W/m²K						$i = (39)m \div$				` <i>'</i>
(40)m= 0	.99 0.9	9 0.9	0.97	0.97	0.96	0.96	0.96	0.96	0.97	0.98	0.98		
									Average =	Sum(40)	₁₁₂ /12=	0.97	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	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	J	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 I 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>			<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	x	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)

Southeas	st _{0.9x}	0.77	X	8.6	65	x	9	2.85	X		0.63	x	0.7	=	245.49	(77)
Southeas	st _{0.9x}	0.77	x	8.6	65	x	6	9.27	x		0.63	_ x _	0.7		183.13	(77)
Southeas	st _{0.9x}	0.77	X	8.6	65	x	4	4.07	x		0.63	x	0.7	=	116.52	(77)
Southeas	st _{0.9x}	0.77	X	8.6	65	x	3	1.49	x		0.63	_ x _	0.7	=	83.25	(77)
	_															_
Solar ga	ins in	watts, ca	alculated	for eacl	h month				(83)m	ı = Sı	um(74)m .	(82)m				
T-	97.28	165.7	226.72	280.91	314.65	1	12.37	301.16	275	.99	245.49	183.13	116.52	83.25		(83)
Total gai	ins – ir	nternal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts					!	!	ı	
(84)m=	416.96	483.66	534.9	573.48	591.64	5	74.15	552.92	532	.61	510.02	463.46	414.95	394.99		(84)
7. Mear	n inter	nal temp	erature	(heating	season)										
			eating p				area f	from Tab	ole 9.	Th	1 (°C)				21	(85)
•		Ū	ains for I			•			J.O 0,	,	. (0)				21	(0.07
	Jan	Feb	Mar	Apr	May	È	Jun	Jul	Δι	ug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.95	0.87	0.73	-	0.54	0.39	0.4	Ť	0.64	0.89	0.98	0.99		(86)
` '			ļ.							!		0.00	0.00	0.00		(00)
			ature in l			_							1	1	Ī	(07)
(87)m=	20.19	20.36	20.58	20.81	20.94	2	20.99	21	2'	1	20.98	20.81	20.46	20.15		(87)
Tempe	rature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Tł	n2 (°C)			_	-	
(88)m=	20.09	20.09	20.1	20.11	20.11	2	20.12	20.12	20.	12	20.11	20.11	20.1	20.1		(88)
Utilisati	ion fac	tor for g	ains for r	est of d	welling,	h2.	m (se	e Table	9a)							
(89)m=	0.99	0.97	0.93	0.84	0.67	Т	0.47	0.31	0.3	34	0.57	0.86	0.97	0.99		(89)
L Mean ir	ntornal	l tompor	ature in t	the rest	of dwalli	ina	T2 (f	allow etc	ne 3	to 7	7 in Tahl	0.00			l	
	19.02	19.28	19.59	19.9	20.06	Ť	20.11	20.12	20.		20.1	19.91	19.43	18.98		(90)
(00)	.0.02	.0.20	.0.00						0.				g area ÷ (4		0.45	(91)
														,	0.40	(0.7
			ature (fo			_	-		`						1	(00)
` ′	19.55	19.77	20.04	20.31	20.46	_	20.51	20.52	20.		20.5	20.32	19.89	19.51		(92)
· · · · -			ne mean		· ·	_			ī			·	40.00	10.54	1	(93)
` '	19.55	19.77	20.04	20.31	20.46	2	20.51	20.52	20.	52	20.5	20.32	19.89	19.51		(93)
			uirement		بامداد د.			- 11 of	Tabl	- Ob	46	4 T: /	7C) m an	ما سم مماد	vulata	
			ernal ter or gains u	•		ied	at Ste	ерттог	rabi	e st	o, so tha	t 11,m=(rojin an	d re-caid	culate	
Г	Jan	Feb	Mar	Apr	May	Г	Jun	Jul	Aı	ug	Sep	Oct	Nov	Dec		
∟ Utilisati			ains, hm		,					<u>-9 </u>					l	
	0.99	0.97	0.93	0.85	0.69		0.5	0.35	0.3	88	0.6	0.87	0.97	0.99		(94)
Useful (gains,	hmGm ,	W = (94	I)m x (84	4)m	_			<u> </u>				!			
(95)m= 4	410.91	468.43	498.22	484.84	410.88	2	286.1	191.07	200	0.3	306.33	401.63	401.71	390.55		(95)
Monthly	y avera	age exte	rnal tem	perature	from T	abl	e 8								ı	
(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	ss rate	for mea	an intern	al tempe	erature,	Lm	ı , W =	=[(39)m :	x [(93	3)m-	– (96)m]	•	•		
(97)m= 7	768.07	746.85	678.3	564.8	432.59	2	88.76	191.33	200	.72	313.83	479.78	634.75	763.29		(97)
Space I	heatin	g require	ement fo	r each n	nonth, k	Wh	/mont	h = 0.02	24 x [(97)	m – (95)m] x (4	1)m	•		
(98)m= 2	265.73	187.1	133.97	57.57	16.16		0	0	0		0	58.15	167.79	277.32		
										Total	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	1163.79	(98)
Space I	heatin	g require	ement in	kWh/m²	2/year										22.88	(99)
- J- 2.00 i	•••	J - 14			, 											 ` ′

9a. Energy requiremer	nts – Indi	ividual h	eating sy	vstems i	ncludina	ı micro-C	CHP)					
Space heating:					J		,					-
Fraction of space hea				mentary	-		(224)				0	(201)
Fraction of space hea		-	. ,			(202) = 1 -					1	(202)
Fraction of total heati	_	•				(204) = (204)	02) × [1 –	(203)] =			1	(204)
Efficiency of main spa		0 ,									93.5	(206)
Efficiency of seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heating require 265.73 187.1	ement (c	alculate	i i	0			_	58.15	167.79	277.32	1	
			16.16	U	0	0	0	56.15	167.79	211.32		(0.4.4)
$(211)m = \{[(98)m \times (200)] \\ 284.21 200.1$	143.29	00 ÷ (20 61.57	17.28	0	0	0	0	62.19	179.46	296.6	1	(211)
204.21 200.1	143.29	01.57	17.20	0	0				211) _{15.1012}		1244.69	(211)
Space heating fuel (s	econdar	v) k\//h/	month				. (,	- · · /15,1012	2	1244.09	(211)
= {[(98)m x (201)] } x 1		• / ·	monun									
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0]	
		-				Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}		0	(215
Water heating												
Output from water hea	ter (calc	ulated a	oove) 138.89	124.74	120.4	131.29	130.79	146.47	154.12	164.99	1	
Efficiency of water hea		141.20	130.09	124.74	120.4	131.29	130.79	140.47	134.12	104.99	79.8	(216
(217)m= 86.02 85.42	84.4	82.63	80.8	79.8	79.8	79.8	79.8	82.57	85.04	86.19	70.0	(217
Fuel for water heating,	kWh/mo	L onth				ļ			ļ	ļ	J	
$(219)m = (64)m \times 100$) ÷ (217)	m				ı	<u> </u>		ī	ī	1	
(219)m= 196.29 174.44	185.94	170.99	171.91	156.31	150.88	164.52	163.9	177.38	181.23	191.43		7,
Annual totals						Tota	I = Sum(2		Mhhraai		2085.21	(219)
Space heating fuel use	ed, main	system	1					K	Wh/year		kWh/yea 1244.69	ή
Water heating fuel use		,									2085.21	╡
Electricity for pumps, f		oloctric	kaan ha	•							2000.21	
		electric	кеер-по	L							1	(000
central heating pump										30]	(230
boiler with a fan-assis	sted flue									45		(230
Total electricity for the	above, k	kWh/yea	r			sum	of (230a).	(230g) =	:		75	(231)
Electricity for lighting											242.69	(232)
12a. CO2 emissions	– Individ	ual heat	ng syste	ems inclu	uding mi	cro-CHP)					
					ergy /h/year			Emiss kg CO	i on fac 2/kWh	tor	Emissions kg CO2/ye	
Space heating (main s	ystem 1)			I) x			0.2		=	268.85	(261
Space heating (second	•			(21	5) x			0.5		=	0	(263
Water heating					9) x					=		(264)
-	in a					T (383) T (264) -	0.2	10		450.41	_՝ ՝
Space and water heati	ng			(26)	1) + (202)	+ (263) + (<u> </u>				719.26	(265)

Electricity for pumps, fans and electric keep-hot (231) x 0.519 = 38.93 (267) Electricity for lighting (232) x 0.519 = 125.95 (268) Total CO2, kg/year sum of (265)...(271) = 884.14 (272)

TER = 17.38 (273)