Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:54:27

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 73.31m² Plot Reference: Site Reference : Hermitage Lane Plot 27

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

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

Dwelling Carbon Dioxide Emission Rate (DER) 9.62 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 39.1 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 32.3 kWh/m²

OK

OK

2 Fabric U-values

Element Average Highest External wall 0.15 (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

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	1.02	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	7.66m²	
Windows facing: South East	3.82m ²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Community heating, heat from boilers – mains gas		

Photovoltaic array

		llser_[Details:								
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					001082 on: 1.0.5.9			
Address :	F	Property	Address	Plot 27							
1. Overall dwelling dime	ensions:										
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)		
Ground floor			73.31	(1a) x	2	2.5	(2a) =	183.28	(3a)		
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	73.31	(4)							
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(5)		
2. Ventilation rate:											
	main seconda heating heating	ry	other		total			m³ per hou	ır		
Number of chimneys	0 + 0	_ + [0] = [0	X 4	40 =	0	(6a)		
Number of open flues	0 + 0	<u> </u>	0	Ī - [0	x 2	20 =	0	(6b)		
Number of intermittent fa	ns				0	x ²	10 =	0	(7a)		
Number of passive vents				Ē	0	x ′	10 =	0	(7b)		
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)		
				L							
Air changes per hour											
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$			[0		÷ (5) =	0	(8)		
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	ed to (17),	otnerwise (continue tr	om (9) to	(16)		0	(9)		
Additional infiltration	g ()					[(9)-	-1]x0.1 =	0	(10)		
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)		
if both types of wall are 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 ().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 $(18) = [(17) \div 20] +$	•	•	•	etre of e	envelope	area	3	(17)		
•	es if a pressurisation test has been do				is being u	sed		0.15	(18)		
Number of sides sheltere			,	,	J			2	(19)		
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(20)		
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.13	(21)		
Infiltration rate modified f	- 1 	1	T .		Τ_	1	I _	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 45	1.7	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 infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effecture of the contract of the con		_	rate for t	he appli	cable ca	se	•	•		•		0.5	(23
If exhaust air h	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				79.05	(23
a) If balance	d mech	anical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1	1 – (23c)	÷ 100]	
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	MV) (24b)m = (22	2b)m + (23b)		_	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n				•	•		on from (c) = (22b		5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural if (22b)n					•		on from I 0.5 + [(2		0.5]			•	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(2
3. Heat losse	s and he	eat loss i	paramet	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	K)	k-value kJ/m²-l		A X k kJ/K
oors					2	x	1.4	=	2.8				(2
/indows Type	1				7.661	x1	/[1/(1.4)+	0.04] =	10.16				(2
/indows Type	2				3.819	x1.	/[1/(1.4)+	0.04] =	5.06				(2
/alls Type1	48.1	7	11.4	3	36.69) x	0.15	= [5.5			$\neg \vdash$	(2
/alls Type2	17.6	68	2		15.68	3 x	0.14	=	2.22			\exists \Box	(2
otal area of e	lements	, m²			65.85	5							(3
for windows and include the area						ated using	g formula 1	/[(1/U-valu	re)+0.04] a	as given in	paragraph	1 3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				25.74	(3
eat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	733.25	(3
hermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design assess				construct	ion are no	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
an be used inste hermal bridge				ısina Ar	nendix k	<						6.82	(3
details of therma	`	,		٠.	•	•						0.02	(
otal fabric he			. ,	, -	•			(33) +	(36) =			32.57	(3
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
8)m= 16.17	15.97	15.78	14.82	14.63	13.66	13.66	13.47	14.05	14.63	15.01	15.4]	(3
eat transfer of	coefficier	nt, W/K					<u> </u>	(39)m	= (37) + (37)	38)m			
	40.54	40.05	47.00	47.40	46.00	46.00	46.04	16.61	47.40	47.50	47.06	1	
9)m= 48.74	48.54	48.35	47.39	47.19	46.23	46.23	46.04	46.61	47.19	47.58	47.96		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.66	0.66	0.66	0.65	0.64	0.63	0.63	0.63	0.64	0.64	0.65	0.65		
		!							Average =	Sum(40) ₁	12 /12=	0.65	(40)
Number of day	<u> </u>	<u> </u>	<u> </u>					-					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(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	ar:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		32		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target c		.09		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								*F		· · · ·			
(44)m= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5		
									Total = Su	m(44) ₁₁₂ =		1129.13	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		
If in atomton acres	vator booti	'na at naint	of upo (no	bot water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	-	1480.46	(45)
If instantaneous v			·	1	,.		· · ·	, , , I		1	i I		(40)
(46)m= 23.02 Water storage	20.14	20.78	18.12	17.38	15	13.9	15.95	16.14	18.81	20.53	22.3		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	,					_							, ,
Otherwise if n	-			-			, ,	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•	•		!4		(48) x (49)) =		1	10		(50)
b) If manufactHot water stor			-								02		(51)
If community h	-			<u> </u>	., 0, 0.0	-97				0.	UZ		(0.)
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	om wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in ((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 contain	s 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 Appendi	хH	
(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	t loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated	for each	month ((61)m =	(60) ÷ 3	65 × (41)m							
(61)m = 0 0	0	0	0	0	00 % (11)) 0		0	0	0	0	1	(61)
Total heat required for	· water he	eating ca	Lulated	L I for eac	h month	(62)ı	—— m =	0 85 x (45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 208.77 184.17	193.81	174.27	171.16	153.49	147.94	161.	_	161.1	180.68	190.38	203.93]	(62)
Solar DHW input calculated	using Appe	endix G or	Appendix	L H (negat	I ive quantity	v) (ent	 l er '0'	if no sola	r contribu	tion to wate	r heating)	1	
(add additional lines if											0,		
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water hea	ter					•					•		
(64)m= 208.77 184.17	193.81	174.27	171.16	153.49	147.94	161.	.61	161.1	180.68	190.38	203.93	1	
				Į.		•	Outp	out from wa	ater heate	er (annual)	12	2131.3	(64)
Heat gains from water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	: [(46)m	+ (57)m	+ (59)m	ı]	
(65)m= 95.26 84.58	90.28	82.95	82.75	76.04	75.03	79.	58	78.57	85.92	88.31	93.65	1	(65)
include (57)m in cal	culation c	of (65)m	only if c	ylinder i	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (see	e Table 5	and 5a):										
Metabolic gains (Table	e 5), Watt	:S											
Jan Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec]	
(66)m= 116.19 116.19	116.19	116.19	116.19	116.19	116.19	116.	.19	116.19	116.19	116.19	116.19		(66)
Lighting gains (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee T	Table 5		-		•	
(67)m= 19.14 17	13.82	10.47	7.82	6.61	7.14	9.2	8	12.45	15.81	18.45	19.67]	(67)
Appliances gains (cald	culated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ole 5	-		•	
(68)m= 204.9 207.02	201.67	190.26	175.86	162.33	153.29	151.	.16	156.52	167.93	182.32	195.86		(68)
Cooking gains (calcula	ated in Ap	pendix	L, equat	ion L15	or L15a), als	o se	e Table	5	-		•	
(69)m= 34.62 34.62	34.62	34.62	34.62	34.62	34.62	34.6	62	34.62	34.62	34.62	34.62		(69)
Pumps and fans gains	(Table 5	a)										•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. evaporation	on (negat	ive valu	es) (Tab	le 5)	-					-	-	•	
(71)m= -92.95 -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.	95	-92.95	-92.95	-92.95	-92.95		(71)
Water heating gains (Γable 5)			-	-						-	•	
(72)m= 128.03 125.86	121.35	115.21	111.23	105.62	100.85	106.	.96	109.13	115.48	122.65	125.87		(72)
Total internal gains =	• •			(66)m + (67)m	n + (68	3)m +	- (69)m + (70)m + (71)m + (72))m	•	
(73)m= 409.93 407.74	394.69	373.79	352.77	332.41	319.13	325.	.25	335.96	357.07	381.29	399.26]	(73)
6. Solar gains:													
Solar gains are calculated	•	flux from	Table 6a	and assoc	ciated equa	tions t	to co	nvert to th	e applica		tion.		
Orientation: Access I		Area m²		Flu			_	g_ able 6b	-	FF able 6c		Gains	
Table 6c	! 				ble 6a		1	able ob	_ '	able 60		(W)	7
Northeast 0.9x 0.77	X	7.6	66	X	11.28	X		0.63	X	0.7	=	26.42	(75)
Northeast 0.9x 0.77	Х	7.6	66	x	22.97	X		0.63	x	0.7	=	53.77	(75)
Northeast 0.9x 0.77	X	7.6	66	X A	41.38	X		0.63	X	0.7	=	96.88	(75)
Northeast 0.9x 0.77	X	7.6	66	× (67.96	X		0.63	x	0.7	=	159.11	(75)
Northeast 0.9x 0.77	X	7.6	66	x	91.35	X		0.63	X	0.7	=	213.87	(75)

		_			_		, ,		_				_
Northeast _{0.9x}	0.77	X	7.6	6	X	97.38	X	0.63	X	0.7	=	228.01	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	72.63	X	0.63	X	0.7	=	170.04	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	50.42	X	0.63	X	0.7	=	118.05	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	28.07	x	0.63	X	0.7	=	65.71	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	14.2	x	0.63	X	0.7	=	33.24	(75)
Northeast _{0.9x}	0.77	x	7.6	66	x	9.21	x	0.63	X	0.7	=	21.57	(75)
Southeast 0.9x	0.77	x	3.8	32	x	36.79	x	0.63	X	0.7	=	42.94	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	62.67	x	0.63	X	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	85.75	x	0.63	X	0.7	=	100.08	(77)
Southeast 0.9x	0.77	×	3.8	32	x	106.25	x	0.63	x	0.7		124.01	(77)
Southeast 0.9x	0.77	×	3.8	32	x	119.01	x	0.63	x	0.7		138.9	(77)
Southeast 0.9x	0.77	×	3.8	32	x	118.15	x	0.63	×	0.7	<u> </u>	137.9	(77)
Southeast 0.9x	0.77	×	3.8	32	x	113.91	x	0.63	×	0.7		132.95	(77)
Southeast 0.9x	0.77	×	3.8	32	x	104.39	х	0.63	×	0.7	=	121.84	(77)
Southeast 0.9x	0.77	×	3.8	32	x	92.85	х	0.63	×	0.7	=	108.37	(77)
Southeast 0.9x	0.77	×	3.8	32	x	69.27	х	0.63	x	0.7	=	80.84	(77)
Southeast 0.9x	0.77	×	3.8	32	x	44.07	х	0.63	x	0.7	=	51.44	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	31.49	x	0.63	×	0.7		36.75	(77)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m= 69.36	126.92 19	96.97	283.12	352.77	365.9	346.24	291	.88 226.42	146.5	84.68	58.32		(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m	+ (83)n	n , watts				_		•	
(84)m= 479.29	534.66 59	91.66	656.91	705.54	698.31	665.37	617	.13 562.38	503.63	3 465.96	457.58		(84)
7. Mean inter	nal tempera	ature ((heating	season)								
Temperature	during heat	ting p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	tor for gains	s for li	iving are	ea, h1,m	(see T	able 9a)							_
Jan	Feb I	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 0.94	0.91 0).85	0.74	0.58	0.42	0.3	0.3	0.54	0.78	0.91	0.95		(86)
Mean interna	l temperatu	re in I	iving are	ea T1 (fo	ollow st	eps 3 to 7	7 in T	able 9c)					
(87)m= 19.94	 	0.42	20.74	20.91	20.98	21	20.9		20.72	20.29	19.9		(87)
Temperature	during heat	tina p	eriods ir	rest of	dwellin	g from Ta	able 9	Th2 (°C)		•	!		
(88)m= 20.37	<u>_</u>	0.38	20.39	20.39	20.4	20.4	20.	· · · · ·	20.39	20.39	20.38		(88)
Utilisation fac	tor for going	o for r	oot of d	wolling	h2 m /a		. 00)	<u> </u>		<u>.</u> !	<u> </u>		
(89)m= 0.93).84	0.71	0.55	0.38	0.26	0.3	3 0.5	0.76	0.89	0.94		(89)
` '	ļ	!				.	<u> </u>	<u> </u>		0.00	0.01		()
Mean interna	 	- 1		1	,	`	ri —			10.40	40.00	1	(00)
(90)m= 18.93	19.22	9.63	20.06	20.29	20.39	20.4	20.		20.05	19.46 ving area ÷ (4	18.89	0.00	(90)
								'	LA - LI\	my ar c a → (4	-, -	0.32	(91)
Mean interna		`				1	1 ·					1	
Mean interna (92)m= 19.25 Apply adjustr	19.51 19	9.88	20.28	20.49	20.58	20.59	20.	59 20.54	20.26		19.22		(92)

												1	
(93)m= 19.25	19.51	19.88	20.28	20.49	20.58	20.59	20.59	20.54	20.26	19.72	19.22		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l	l	<u> </u>	ividy	Ouri	Oui	/ rug	ОСР	000	1101	DCO		
(94)m= 0.92	0.89	0.83	0.71	0.55	0.39	0.28	0.31	0.51	0.75	0.88	0.93		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	!	<u> </u>	!			ļ			
(95)m= 440.47	474.01	488.6	466.22	391.29	271.89	183.59	191.53	287.63	379.54	410.51	424.52		(95)
Monthly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			ı	
(97)m= 728.64	709.25	646.93	539.16	414.88	276.27	184.45	192.87	300.21	455.9	600.65	720.2		(97)
Space heatin		1	ı							r -		1	
(98)m= 214.4	158.08	117.79	52.52	17.55	0	0	0	0	56.81	136.89	219.98		¬
							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	974.03	(98)
Space heatin	g require	ement in	kWh/m²	?/year								13.29	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme								
This part is us										unity sch	neme.		_
Fraction of spa	ace heat	from se	condary	/supplen	nentary l	neating ((Table 1	1) '0' if n	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The community so	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and เ	up to four	other heat	sources; ti	he latter	
includes boilers, h		-			rom powei	stations.	See Appei	ndix C.				4	7(2020)
Fraction of hea			-									1	(303a)
Fraction of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for o	commun	ity heatir	ng syste	m					1.05	(306)
Space heating	a										!	kWh/yea	_ r
Annual space	_	requiren	nent									974.03	7
Space heat fro	m Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	1022.73	(307a)
Efficiency of se		•		heating	system	in % (fro	m Table	4a or A	nnendix	F)		0	(308
•			•		•	•				,			╡
Space heating	require	ment fro	m secon	dary/su	opiemen	tary sysi	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating											,		_
Annual water h	neating r	equirem	ent									2131.3	
If DHW from c								(0.4) (0.6))-\ (20	T) (200)	I	2027.07	7(240=)
Water heat fro		•								5) x (306) :		2237.87	(310a)
Electricity used for heat distribution 0.0									(307e) +	· (310a)(310e)] =	32.61	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	oumps a	nd fans	within dv	vellina (1	Γable 4f)	:							_
mechanical ve							outside					285.09	(330a)
											•		_

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330l	o) + (330g) =	2	85.09	(331)
Energy for lighting (calculated in Appendix L)			3	38.01	(332)
Electricity generated by PVs (Appendix M) (negative	quantity)		-7	'41.01	(333)
Electricity generated by wind turbine (Appendix M) (r	negative quantity)			0	(334)
12b. CO2 Emissions – Community heating scheme					_
	Energy kWh/year	Emission factor kg CO2/kWh		sions 02/year	
CO2 from other sources of space and water heating Efficiency of heat source 1 (%)	(not CHP) e is CHP using two fuels repeat (363) to	(366) for the second fu	uel	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	749.24	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	16.92	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	766.17	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or	instantaneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			766.17	(376)
CO2 associated with electricity for pumps and fans w	vithin dwelling (331)) x	0.52	=	147.96	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	175.43	(379)
Energy saving/generation technologies (333) to (334 Item 1) as applicable	0.52 x 0.01 =	=	-384.59	(380)
Total CO2, kg/year sum of (376)	(382) =			704.97	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				9.62	(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 27

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: South West

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

Night ventilation: False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach):6 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient: 362.89 (P1)

Transmission heat loss coefficient: 32.6

Summer heat loss coefficient: 395.46 (P2)

Overhangs:

Orientation: Ratio:	Z_overhangs:
---------------------	--------------

North East (NE) 0 1 South East (SE) 0 1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
North East (NE)	1	0.9	1	0.9	(P8)
South East (SE)	1	0.9	1	0.9	(P8)

Solar gains

Orientation		Area	Flux	g _	FF	Shading	Gains
North East (NE)	0.9 x	7.66	98.85	0.63	0.7	0.9	270.5
South East (SE)	0.9 x	3.82	119.92	0.63	0.7	0.9	163.6
						Total	434.09 (P3/P4)

Internal gains.

	June	July	August	
Internal gains	462.15	445.22	453.51	
Total summer gains	925.91	879.32	827.42 (P5))
Summer gain/loss ratio	2.34	2.22	2.09 (P6))
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	1.3	1.3	1.3	
Threshold temperature	19.64	21.42	21.19 (P7))
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

Stroma Number: Stroma FSAP 2012 Stroma Number: STRO001082			l Iser F	Details:						
### Coveral works Structural in lititation of the tense has been carried out or is immended, proceed to (77), attensives containing from (87) to (87			- 036 1 L	Strom						
Area(m²)		F	Property	Address	: Plot 27	•				
A		ansions:								
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(2n) Total floor area TFA = (1a)+(1b)+(1c)+(1b)+(1c)+(1c)+(1c)+(1c)+(1c)+(1c)+(1c)+(1c	1. Overall awelling unite	,	Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Dwelling volume	Ground floor				(1a) x			(2a) =	<u>`</u>	<u>^</u>
2. Ventilation rate: main heating heati	Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 7	73.31	(4)			_		
Number of chimneys	Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(5)
Number of chimneys	2. Ventilation rate:									
Number of chimneys			ry	other		total			m³ per hou	ır
Number of intermittent fans 3	Number of chimneys		+ [0	=	0	X 4	40 =	0	(6a)
Number of passive vents	Number of open flues	0 + 0		0	Ī = Ī	0	x2	20 =	0	(6b)
Number of flueless gas fires	Number of intermittent fa	ns				3	x ′	10 =	30	(7a)
Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 30	Number of passive vents				Ē	0	x ′	10 =	0	(7b)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 30	Number of flueless gas fi	res			Ī	0	X 4	40 =	0	(7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 30					_					
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)			_	- \	_				nanges per ho	_
Number of storeys in the dwelling (ns) Additional infiltration (19)-1)x0.1 = 0 (10) (10)	'				continue fr			÷ (5) =	0.16	(8)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration 0.25 - [0.2 x (14) ÷ 100] = 0.15 Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0.16 Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) + 20] + (8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = 0.27 (21) Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed 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 = (22)m ÷ 4						o (o) to	(1.5)		0	(9)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration 0.25 · [0.2 x (14) ÷ 100] = 0 (15) Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = 0 (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 · [0.075 x (19)] = 0.85 (20) Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed 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 = (22)m ÷ 4	Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)					•	ruction			0	(11)
If no draught lobby, enter 0.05, else enter 0		-	o ine great	ler wall are	a (aner					
Percentage of windows and doors draught stripped Window infiltration $0.25 - [0.2 \times (14) \div 100] = 0.25 - [0.2 \times$	•	,	.1 (seale	ed), else	enter 0				0	=
Window infiltration $0.25 - [0.2 \times (14) + 100] = 0.25 - [$	•	•								=
Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = O (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 × (19)] = D.85 (20) Infiltration rate incorporating shelter factor (21) = (18) × (20) = D.27 (21) Infiltration rate modified for monthly wind speed Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	-	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	1001 =				= '
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = 0.85 (20) Infiltration rate incorporating shelter factor (21) = $(18) \times (20) = 0.27$ (21) Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed 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 = (22) m \div 4				(8) + (10)	+ (11) + (1	- 12) + (13) ·	+ (15) =			=
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.85 (20)$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.27 (21)$ Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed 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 $(22a)m = (22)m \div 4$	Air permeability value,	q50, expressed in cubic metre	es per ho	our per s	quare m	etre of e	envelope	area	3	=
Number of sides sheltered $ (20) = 1 - [0.075 \times (19)] = 0.85 $ (20) $ (21) = (18) \times (20) = 0.27 $ (21) $ (21) = (18) \times (20) = 0.27 $ (22) $ (31) = (18) \times (20) = 0.27 $ (21) $ (31) = (18) \times (20) = 0.27 $ (22) $ (31) = (18) \times (20) = 0.27 $ (21) $ (31) = (18) \times (20) = 0.27 $ (22) $ (31) = (18) \times (20) = 0.27 $ (23) $ (31) = (18) \times (20) = 0.27 $ (24) $ (31) = (18) \times (20) = 0.27 $ (25) $ (31) = (18) \times (20) = 0.27 $ (26) $ (31) = (18) \times (20) = 0.27 $ (27) $ (31) = (18) \times (20) = 0.27 $ (28) $ (31) = (18) \times (20) = 0.27 $ (29) $ (31) = (18) \times (20) = 0.27 $ (21) $ (31) = (18) \times (20) = 0.27 $ (21) $ (31) = (18) \times (20) = 0.27 $ (21) $ (31) = (18) \times (20) = 0.27 $ (21) $ (31) = (18) \times (20) = 0.27 $ (22) $ (31) = (18) \times (20) = 0.27 $ (23) $ (31) = (18) \times (20) = 0.27 $ (24) $ (31) = (18) \times (20) = 0.27 $ (25) $ (31) = (18) \times (20) = 0.27 $ (26) $ (31) = (18) \times (20) = 0.27 $ (27) $ (31) = (18) \times (20) = 0.27 $ (28) $ (31) = (18) \times (20) = 0.27 $ (29) $ (31) = (18) \times (20) = 0.27 $ (21) $ (31) = (18) \times (20) = 0.27 $ (22) $ (31) = (18) \times (20) = 0.27 $ (23) $ (31) = (18) \times (20) = 0.27 $ (24) $ (31) = (18) \times (20) = 0.27 $ (25) $ (31) = (18) \times (20) = 0.27 $ (26) $ (31) = (18) \times (20) = 0.27 $ (27) $ (31) = (18) \times (20) = 0.27 $ (28) $ (31) = (18) \times (20) = 0.27 $ (28) $ (31) = (18) \times ($	•								0.31	(18)
Shelter factor $ (20) = 1 - [0.075 \times (19)] = 0.85 $			ne or a de	gree air pe	rmeability	is being u	sed			7(10)
Infiltration rate incorporating shelter factor (21) = (18) \times (20) = 0.27 (21) Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed 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 = (22)m \div 4		cu		(20) = 1 -	[0.075 x (19)] =				→ ' ' '
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	Infiltration rate incorporat	ting shelter factor		(21) = (18	s) x (20) =					=
Monthly average wind speed from Table 7 (22)m= $\begin{bmatrix} 5.1 & 5 & 4.9 & 4.4 & 4.3 & 3.8 & 3.8 & 3.7 & 4 & 4.3 & 4.5 & 4.7 \end{bmatrix}$ Wind Factor (22a)m = (22)m \div 4	Infiltration rate modified f	or monthly wind speed								
(22)m =	Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind Factor (22a)m = (22)m ÷ 4	Monthly average wind sp	eed from Table 7		_						
	(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
	Wind Factor (22a)m = (2	2)m ÷ 4								
1.27 1.20 1.10 1.10 0.00 0.00 0.00 1.12 1.10		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	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.34	0.33	0.33	0.29	0.29	0.25	0.25	0.25	0.27	0.29	0.3	0.31		
Calculate effe If mechanic		_	rate for t	he appli	cable ca	se	-	-		-	-		
If exhaust air h			endix N. (2	3b) = (23a	a) × Fmv (e	equation (1	N5)) . othe	rwise (23b) = (23a)			0	(23
If balanced wit) — (20 0)			0	
a) If balance		•	•	J		`		,	Dh\m ı (22h) v [1 (220)	0 : 1001	(23
24a)m= 0	0		0	0	0	0	0	0	0	0	0	- 100] 	(24
b) If balance												J	(-
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole I	nouse ex	tract ver	ntilation o	or positiv	e input v	/entilatio	n from o	outside				J	•
<u> </u>	n < 0.5 >	(23b), t	then (24)	c) = (23b)	ŕ –	vise (24	c) = (22k	o) m + 0.	5 × (23b) -		1	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)	ventilation $m = 1$, th				•				0.5]			_	
24d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55		(24
Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
25)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55		(25
3. Heat losse	es and he	eat loss i	paramete	er.									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value	-	A X k kJ/K
Doors	u.ou	()	••	•	2	 x	1.4	 	2.8		110/111		(26
Vindows Typ	e 1				7.661	٧,	/[1/(1.4)+		10.16	=			(27
Vindows Typ					3.819	= .	- ` / /[1/(1.4)+	L	5.06	=			(27
Valls Type1		7	11.4	<u>. </u>		_				╡ ,			(29
Valls Type1	48.1		11.4	<u> </u>	36.69	=	0.15	= <u> </u>	5.5			╣╠	
• •	17.6		2		15.68	=	0.14	= [2.22				(29
otal area of		•	effo odivo vvi	ndou II v	65.85		formula 1	/[/4/ L vol	·a) · 0 041 a	a airan in	naraaranl		(3
for windows and * include the are						ateu usirig	i ioiiiiuia i	/[(1/ U- valu	(e)+0.04j a	is giveri iri	paragrapi	1 3.2	
abric heat lo	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				25.74	(3:
leat capacity	Cm = S	(A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	733.25	(34
hermal mass	s parame	ter (TMF	c = Cm ÷	TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(3
or design asses an be used inste				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
hermal bridg				using Ap	pendix I	<						6.82	(30
details of therm	al bridging	are not kn	own (36) =	= 0.05 x (3	11)								
otal fabric he	eat loss							(33) +	(36) =			32.57	(3
entilation he	at loss c	alculated	monthly	У				(38)m	= 0.33 × ((25)m x (5))		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 33.74	33.6	33.47	32.84	32.73	32.18	32.18	32.08	32.39	32.73	32.96	33.21		(3
leat transfer	coefficie	nt, W/K						(39)m	= (37) + (37)	38)m		_	
	66.47	66.02	65.41	65.29	64.75	64.75	64.65	64.96	65.29	65.53	65.78	1	
39)m= 66.3	66.17	66.03	05.41	05.29	04.73	04.73	J 07.03	04.30	05.29	05.55	05.70		

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 0.9	0.9	0.9	0.89	0.89	0.88	0.88	0.88	0.89	0.89	0.89	0.9		
		ļ		<u> </u>	<u>I</u>	<u> </u>	<u> </u>		Average =	: Sum(40) ₁ .	12 /12=	0.89	(40)
Number of day	s in mo	nth (Tabl	e 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 heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed east	nanav	NI											(40)
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		32		(42)
Annual averag											.09		(43)
Reduce the annua not more that 125	_				-	-	to achieve	a water us	se target o	of			
			- '			·	Α.	0					
Jan Hot water usage ii	Feb	Mar day for ea	Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec		
						1		00.04	05.00	00.74	400 5		
(44)m= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5	1100.10	7(44)
Energy content of	hot water	used - cal	culated m	onthly = 4 .	190 x Vd,r	n x nm x D	OTm / 3600			ım(44) ₁₁₂ = ables 1b, 1		1129.13	(44)
(45)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		
(40)1112	104.20	100.00	120.77	110.00	100	02.00	100.00	l		Im(45) ₁₁₂ =	l l	1480.46	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotal – od	IIII(40)112 =	- I	1400.40	(```
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage	loss:				<u> </u>	l	l	<u> </u>	<u>!</u>	<u>!</u>			
Storage volum	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	eating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in ((47)			
Water storage		المعدمان	ft-		/1.\^/L	- /-l : \ .							(40)
a) If manufact				or is kno	wn (kvvr	n/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro b) If manufact		_	-		or io not		(48) x (49)) =			0		(50)
Hot water stora			-								0		(51)
If community h	•			(-57					<u> </u>		(-1)
Volume factor	from Ta	ble 2a									0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	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	or each	month			((56)m = (55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder 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	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				•	•	. ,	, ,						
(modified by					i				·	- 			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calc	ulated fo	or each	month ((61)m =	(60) ÷ '	365 v (41)m							
(61)m= 0	0	0	0	0	0	0) 0		0	0	0	0]	(61)
Total heat requi	red for v	water he	eating ca	alculated	L I for ea	 ch month	(62)ı	— n =	0.85 × (′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
		117.75	102.66	98.5	85	78.76	90.3	_	91.46	106.59	116.35	126.35]	(62)
Solar DHW input ca	lculated u	sing Appe	endix G or	· Appendix	H (nega	tive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	.	
(add additional I												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from wat	ter heate	er									•	•	•	
(64)m= 130.47	114.11	117.75	102.66	98.5	85	78.76	90.3	38	91.46	106.59	116.35	126.35]	
	•	•						Outp	ut from wa	ater heate	er (annual) ₁	l12	1258.39	(64)
Heat gains from	water h	neating,	kWh/mo	onth 0.2	5 ′ [0.8	5 × (45)m	+ (6	1)m	i] + 0.8 x	((46)m	+ (57)m	+ (59)m	ı]	
(65)m= 32.62	28.53	29.44	25.66	24.63	21.25	19.69	22.	6	22.87	26.65	29.09	31.59]	(65)
include (57)m	in calcu	ulation c	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	- neating	
5. Internal gair	ns (see	Table 5	and 5a):										
Metabolic gains	(Table	5), Watt	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec]	
(66)m= 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.	.19	116.19	116.19	116.19	116.19]	(66)
Lighting gains (d	calculate	ed in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee 7	Γable 5				-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.2	8	12.45	15.81	18.45	19.67]	(67)
Appliances gain	ıs (calcu	lated in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5		-	-	
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.	.16	156.52	167.93	182.32	195.86]	(68)
Cooking gains (calculat	ed in Ap	pendix	L, equat	ion L1	or L15a), als	o se	e Table	5		•	•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.6	62	34.62	34.62	34.62	34.62]	(69)
Pumps and fans	s gains (Table 5	ia)										•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0]	(70)
Losses e.g. eva	poration	n (negat	ive valu	es) (Tab	le 5)	-						-	-	
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.	95	-92.95	-92.95	-92.95	-92.95]	(71)
Water heating g	ains (Ta	able 5)				-					-	-	-	
(72)m= 43.84	42.45	39.57	35.64	33.1	29.51	26.47	30.3	37	31.76	35.82	40.4	42.46]	(72)
Total internal g	jains =				(6	6)m + (67)m	า + (68)m +	- (69)m + ((70)m + (7	71)m + (72))m	-	
(73)m= 325.73	324.33	312.91	294.23	274.64	256.3	244.75	248.	.67	258.59	277.41	299.03	315.84]	(73)
6. Solar gains:														
Solar gains are cal	lculated u	sing solar	flux from	Table 6a	and asso	ciated equa	tions t	о со	nvert to th	e applica		tion.		
Orientation: Ac		actor	Area			ux able 6a		т.	g_ able 6b	т	FF		Gains	
	able 6d		m²			abie 6a		- 1	able ob	_ '	able 6c		(W)	,
Northeast _{0.9x}	0.77	X	7.6	66	x	11.28	X		0.63	x	0.7	=	26.42	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	22.97	X		0.63	x	0.7	=	53.77	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	41.38	X		0.63	x	0.7	=	96.88	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	67.96	X		0.63	x	0.7	=	159.11	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	91.35	X		0.63	X	0.7	=	213.87	(75)

							_		_				_
Northeast _{0.9x}	0.77	X	7.6	6	×	97.38	X	0.63	X	0.7	=	228.01	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	72.63	X	0.63	X	0.7	=	170.04	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	50.42	X	0.63	X	0.7	=	118.05	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	28.07	x	0.63	X	0.7	=	65.71	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	14.2	x	0.63	X	0.7	=	33.24	(75)
Northeast 0.9x	0.77	X	7.6	66	x [9.21	x	0.63	X	0.7	=	21.57	(75)
Southeast _{0.9x}	0.77	X	3.8	32	x [36.79	x	0.63	X	0.7	=	42.94	(77)
Southeast _{0.9x}	0.77	X	3.8	32	x	62.67	x	0.63	X	0.7	=	73.15	(77)
Southeast 0.9x	0.77	X	3.8	32	x	85.75	x	0.63	x	0.7	=	100.08	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	106.25	×	0.63	x	0.7		124.01	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	119.01	×	0.63	x	0.7		138.9	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	118.15	X	0.63	×	0.7		137.9	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	113.91	X	0.63	×	0.7		132.95	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	104.39	T x	0.63	x	0.7	=	121.84	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x [92.85	٦ ×	0.63	X	0.7	=	108.37	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x [69.27	T x	0.63	x	0.7	=	80.84	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x [44.07	T x	0.63	x	0.7	=	51.44	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x [31.49	T ×	0.63	×	0.7		36.75	(77)
•		_					_						
Solar gains in	watts, calc	ulated	for eacl	h month			(83)m	n = Sum(74)m .	(82)m				
(83)m= 69.36	126.92 1	96.97	283.12	352.77	36	55.9 346.24	291	.88 226.42	146.56	6 84.68	58.32		(83)
Total gains – i	nternal and	l solar	(84)m =	= (73)m ·	+ (8	3)m , watts							
(84)m= 395.09	451.25 5	09.88	577.34	627.41	62	2.21 590.99	540	.55 485.01	423.9	7 383.71	374.17		(0.4)
7. Mean inter							-	.00 100.01					(84)
	nal temper	ature ((heating	season)			100.01					(84)
Temperature	· · · · · · · · · · · · · · · · · · ·		`		′	area from Ta	able 9					21	(84)
Temperature Utilisation fac	during hea	iting p	eriods ir	the livi	ng a							21	_
·	during hea	iting p	eriods ir	the livi	ng a		<u> </u>		Oct	Nov	Dec	21	_
Utilisation fac	during hea	nting p	eriods ir	the livinea, h1,m	ng a	e Table 9a)	<u> </u>	, Th1 (°C)	Oct	Nov 0.96	Dec 0.98	21	_
Utilisation fac	during hea ctor for gain Feb	nting points for li Mar 0.93	eriods ir iving are Apr 0.86	the living the living the hand	ng a (se	ee Table 9a) Jun Jul .59 0.45	A 0.5	, Th1 (°C) ug Sep	-	+		21	(85)
Utilisation fac	during hea etor for gain Feb 0.96	nting points for li Mar 0.93	eriods ir iving are Apr 0.86	the living the living the hand	ng a (se 0.	ee Table 9a) Jun Jul .59 0.45	A 0.5	Th1 (°C) Sep 0.72 Table 9c)	-	0.96		21	(85)
Utilisation factors Jan (86)m= 0.97 Mean internation (87)m= 19.07	during head ctor for gain Feb 0.96 ctor for gain 19.31 1	Mar 0.93 ure in I	eriods ir iving are Apr 0.86 iving are	n the living the hand may 0.74 ea T1 (for 20.62	ng a (se 0.	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96	7 in T	Sep 51 0.72 Table 9c) 94 20.74	0.9	0.96	0.98	21	(85)
Utilisation factors Jan (86)m= 0.97	during head ctor for gain Feb 0.96 ctor for gain 1.96 ctor for gain 1.	Mar 0.93 ure in I	eriods ir iving are Apr 0.86 iving are	n the living the hand may 0.74 ea T1 (for 20.62	ng a (se	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96	7 in T	Sep 51 0.72 Sable 9c) 94 20.74 9, Th2 (°C)	0.9	0.96	0.98	21	(85)
Utilisation factors Jan (86)m= 0.97 Mean internation (87)m= 19.07 Temperature (88)m= 20.16	during head ctor for gain Feb 0.96 ctor for gain 19.31 during head 20.17 2	nting points for line Mar 0.93 ure in line 19.71 atting points 19.71	eriods ir Apr 0.86 iving are 20.21 eriods ir 20.17	May 0.74 ea T1 (for 20.62 n rest of 20.18	ng a (se 0. ollow 20 dwe	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96 elling from T 0.18 20.18	7 in T 20. Cable 9	Sep 51 0.72 Sable 9c) 94 20.74 9, Th2 (°C)	20.2	0.96	0.98	21	(85) (86) (87)
Utilisation factors (86)m= 0.97 Mean internation (87)m= 19.07 Temperature (88)m= 20.16 Utilisation factors (80)m= 10.00000000000000000000000000000000000	during head ctor for gain Feb 0.96 ctor for gain 19.31 1 during head 20.17 2 ctor for gain	nting points for line Mar 0.93 ure in lating points for r	eriods ir iving are 0.86 iving are 20.21 eriods ir 20.17	n the living the part of the living the part of the pa	ng a (see	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96 elling from T 0.18 20.18 m (see Table	A 0.5 7 in T 20. Cable 9 20.	Sep 0.72 Table 9c) 94 20.74 9, Th2 (°C) 18 20.18	20.2	0.96 19.55 3 20.17	0.98 19.02 20.17	21	(85) (86) (87) (88)
Utilisation factors Jan (86)m= 0.97 Mean internation (87)m= 19.07 Temperature (88)m= 20.16 Utilisation factors (89)m= 0.97	during head ctor for gain Feb 0.96 ctor for gain 19.31 1 during head 20.17 2 ctor for gain 0.95 ctor for gain 19.95 ctor for g	nting points for line Mar 0.93 ure in line 19.71 uting points for r 0.92	eriods ir iving are 0.86 iving are 20.21 eriods ir 20.17 est of do	may hand the living the man of the living the man of th	ng a (see) 0.000	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96 elling from T 0.18 20.18 m (see Table .53 0.38	A 0.5 7 in T 20. Cable 9 20. e 9a) 0.4	Sep 0.72 Table 9c) 94 20.74 9, Th2 (°C) 18 20.18	0.9 20.2 20.18	0.96	0.98	21	(85) (86) (87)
Utilisation factors Jan	during head ctor for gain Feb 0.96 ctor for gain 19.31 during head 20.17 2 ctor for gain 0.95 ctor for gain 19.95 ctor for gai	nting points for line in lating points for roughly lating points for r	eriods ir Apr 0.86 iving are 20.21 eriods ir 20.17 est of do 0.84 the rest	m the living the sea, h1,m May 0.74 rea T1 (for 20.62 rest of 20.18 rest of 0.71 of dwelling,	ng a (see) (see	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96 elling from T 0.18 20.18 m (see Table .53 0.38 T2 (follow st	A 0.5 7 in T 20. Cable 9 20. e 9a) 0.4 teps 3	Sep 51 0.72 Table 9c) 94 20.74 9, Th2 (°C) 18 20.18 3 0.67 to 7 in Table	0.9 20.2 20.18 0.88 e 9c)	0.96 19.55 20.17	0.98 19.02 20.17	21	(85) (86) (87) (88) (89)
Utilisation factors Jan (86)m= 0.97 Mean internation (87)m= 19.07 Temperature (88)m= 20.16 Utilisation factors (89)m= 0.97	during head ctor for gain Feb 0.96 ctor for gain 19.31 1 during head 20.17 2 ctor for gain 0.95 ctor for gain 19.95 ctor for g	nting points for line Mar 0.93 ure in line 19.71 uting points for r 0.92	eriods ir iving are 0.86 iving are 20.21 eriods ir 20.17 est of do	may hand the living the man of the living the man of th	ng a (see) (see	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96 elling from T 0.18 20.18 m (see Table .53 0.38	A 0.5 7 in T 20. Cable 9 20. e 9a) 0.4	Th1 (°C) ug Sep 51 0.72 Table 9c) 94 20.74 9, Th2 (°C) 18 20.18 13 0.67 to 7 in Table 15 20	0.9 20.2 20.18 0.88 e 9c) 19.5	0.96 19.55 20.17 0.95	0.98 19.02 20.17 0.97		(85) (86) (87) (88) (89) (90)
Utilisation factors Jan	during head ctor for gain Feb 0.96 ctor for gain 19.31 during head 20.17 2 ctor for gain 0.95 ctor for gain 19.95 ctor for gai	nting points for line in lating points for roughly lating points for r	eriods ir Apr 0.86 iving are 20.21 eriods ir 20.17 est of do 0.84 the rest	m the living the sea, h1,m May 0.74 rea T1 (for 20.62 rest of 20.18 rest of 0.71 of dwelling,	ng a (see) (see	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96 elling from T 0.18 20.18 m (see Table .53 0.38 T2 (follow st	A 0.5 7 in T 20. Cable 9 20. e 9a) 0.4 teps 3	Th1 (°C) ug Sep 51 0.72 Table 9c) 94 20.74 9, Th2 (°C) 18 20.18 13 0.67 to 7 in Table 15 20	0.9 20.2 20.18 0.88 e 9c) 19.5	0.96 19.55 20.17	0.98 19.02 20.17 0.97	0.32	(85) (86) (87) (88) (89)
Utilisation factors Jan (86)m= 0.97 Mean internation (87)m= 19.07 Temperature (88)m= 20.16 Utilisation factors (89)m= 0.97 Mean internation (90)m= 18.38	during head stor for gain Feb 0.96 constant 19.31 during head 20.17 2 deter for gain 0.95 constant 18.62 determined by the storest for gain 19.31 during head 20.17 duri	nting points for line Mar 0.93 ure in lating points for r 0.92 ure in tage of the lating points for r 19 ure (for lating point	eriods ir iving are Apr 0.86 iving are 20.21 eriods ir 20.17 est of dr 0.84 the rest 19.5	may 0.74 ea T1 (for 20.62 may rest of 20.18 welling, 0.71 of dwelling, 19.88 ole dwe	ng a (see	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96 elling from T 0.18 20.18 m (see Table .53 0.38 T2 (follow st 0.1 20.16	A 0.5 7 in T 20. Fable 9 20. e 9a) 0.4 teps 3 20. I + (1	Th1 (°C) ug Sep 51 0.72 Table 9c) 94 20.74 9, Th2 (°C) 18 20.18 13 0.67 to 7 in Table 15 20 fl.A) × T2	0.9 20.2 20.18 0.88 (e 9c) 19.5 (LA = Liv	0.96 19.55 20.17 0.95 18.86 ving area ÷ (-	0.98 19.02 20.17 0.97 18.34 4) =		(85) (86) (87) (88) (89) (90) (91)
Utilisation factors Jan	during head attention for gain feet of the	nting points for line in line	eriods ir iving are Apr 0.86 iving are 20.21 eriods ir 20.17 est of do 0.84 the rest 19.5 r the wh	n the living the hand the living the hand the ha	dwe 20 h2,r 0.	ee Table 9a) Jun Jul .59 0.45 w steps 3 to 0.87 20.96 elling from T 0.18 20.18 m (see Table .53 0.38 T2 (follow st 0.1 20.16 g) = fLA × T1 0.34 20.41	A 0.5 7 in T 20. Cable 9 20. e 9a) 0.4 teps 3 20. I + (1 20	Th1 (°C) ug Sep 51 0.72 Table 9c) 94 20.74 9, Th2 (°C) 18 20.18 13 0.67 to 7 in Table 15 20 f - fLA) × T2 4 20.23	0.9 20.2 20.18 0.88 e 9c) 19.5 LA = Liv	0.96 19.55 20.17 0.95 18.86 ving area ÷ (0.98 19.02 20.17 0.97		(85) (86) (87) (88) (89) (90)

(93)m=	18.6	18.84	19.23	19.72	20.12	20.34	20.41	20.4	20.23	19.72	19.08	18.56		(93)
` '			uirement		20.12	20.04	20.41	20.4	20.20	10.72	10.00	10.00		(==)
					ro obtair	and at et	on 11 of	Table 9b	o so tha	t Ti m_/	76)m an	d ro-calc	ulato	
				using Ta		ieu at st	ер 11 ог	Table 31	J, 30 IIIA	(11,111–(r O)III air	u re-caic	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac		ains, hm	· ·	,		Į.		•					
(94)m=	0.96	0.94	0.9	0.83	0.7	0.54	0.4	0.45	0.68	0.87	0.94	0.96		(94)
Usefu	ıl gains,	hmGm .	W = (94	1)m x (8	4)m		!	!				<u> </u>		
(95)m=	378.63	423.72	459.74	476.55	440.92	337.29	237.06	244.29	328.32	366.78	360.69	360.6		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8	ļ	ļ						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	loss rate	for mea	an intern	al tempe	erature,	Lm,W =	=[(39)m :	x [(93)m-	– (96)m	1				
(97)m=	948.25	922.26	840.52	707.92	549.5	371.89	246.98	258.73	398.43	595.58	784.9	944.25		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)	m – (95)m] x (4	1)m			
(98)m=	423.8	335.02	283.31	166.58	80.79	0	0	0	0	170.23	305.43	434.23		
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2199.39	(98)
Space	, hoatin	a roquir	omont in	kWh/m²	2/voor				. ,	` ,	,	,	20	(99)
•		•			7уваі							l	30	(99)
8c. Sp	pace co	oling red	uiremen	nt										
Calcu				August.			1			_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		<u> </u>						and exte				r i		(100)
(100)m=	0	0	0	0	0	608.64	479.14	491.33	0	0	0	0		(100)
		tor for lo										- 1		(151)
(101)m=		0	0	0	0	0.85	0.9	0.88	0	0	0	0		(101)
1				(100)m x	<u> </u>									
(102)m=	0	0	0	0	0	518.93	431.27	430.68	0	0	0	0		(102)
1								e Table						
(103)m=		0	0	0	0	813.73	775.54	718.08	0	0	0	0		(103)
						dwelling,	continue	ous (kW	h') = 0.02	24 x [(10	03)m – (102)m] x	(41)m	
` 1	04)m to	2ero II (3 × (98		212.26	256.14	213.82	0	0	0			
(104)m=	U	U	0	0	0	212.20	256.14	213.62	0 T -1-1	0	0	0		7(101)
Cooled	I fraction	,								= Sum(าม4) area ÷ (4	= 1\	682.22	(104) (105)
			able 10b)					10-	coolea	aica - (-	' ''	1	(103)
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)		-	-				1			' = Sum(=	0	(106)
Space	coolina	requirer	nent for	month =	(104)m	× (105)	× (106)r	m	70107	_ <i>Gam</i> (1608 17	_ I		(,
(107)m=		0	0	0	0	53.06	64.03	53.46	0	0	0	0		
` /							ļ	ļ	Total	= Sum(107)	=	170.55	(107)
Cnass	ممانمم	roguiron	nant in l	\	/00F					`	160081)	_		┥
•		•		:Wh/m²/y					` '	÷ (4) =			2.33	(108)
				alculated	only un	der spec	cial cond	litions, se		· ·				
Fabrio	Energy	/ Efficier	псу						(99) -	+ (108) =	=		32.33	(109)

SAP Input

Property Details: Plot 27

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 73.311 m^2 2.5 m

Living area: 23.389 m² (fraction 0.319)

Front of dwelling faces: South West

Opening types:

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

SW Manufacturer Solid

NE Manufacturer Windows double-glazed Yes
SE Manufacturer Windows double-glazed Yes

U-value: Name: Gap: Frame Factor: g-value: Area: No. of Openings: SW 1.4 mm 0 NF 0.7 0.63 1.4 7.661 16mm or more 1 0.63 3.819 SE 16mm or more 0.7 1.4 1

Width: Location: Orient: Height: Name: Type-Name: Corridor Wall South West SW n North East NE External Wall 0 0 SE External Wall South East 0 0

Overshading: Average or unknown

Opaque Elements:

Openings: Net area: U-value: Ru value: Curtain wall: Kappa: Type: Gross area: **External Elements** External Wall 48.174 11.48 36.69 0.15 Λ False N/A Corridor Wall 15.68 0.15 False N/A 17.681 2 0.4

Internal Elements
Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1036

Length Psi-value

4.918 0.29 E2 Other lintels (including other steel lintels)

SAP Input

	17.7	0.048	E4	Jamb
	48.335	0.067	E7	Party floor between dwellings (in blocks of flats)
[Approved]	5.45	0.06	E18	Party wall between dwellings
	5.45	0.098	E25	Staggered party wall between dwellings
	8.175	0.085	E16	Corner (normal)
[Approved]	2.725	-0.09	E17	Corner (inverted internal area greater than external area)
	38.438	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 + 2

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: 2
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

thora.

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: 0.9 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		User [Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 27					
Address :									
Overall dwelling dime	ensions:	۸ro	ea(m²)		۸۷ ۵۰	ight(m)		Volume(m ³	31
Ground floor				(1a) x		2.5	(2a) =	183.28	(3a)
Total floor area TFA = (1:	a)+(1b)+(1c)+(1d)+(1e)+(1		73.31	(4)			` ′		`
	a) · (12) · (13) · (13) · (13) ·(73.31	J)+(3c)+(3c	4)+(30)+	(3n) -		— (5)
Dwelling volume				(3a)+(3b)+(30)+(30	J)+(3C)+	(311) =	183.28	(5)
2. Ventilation rate:	main seconda	arv	other		total			m³ per hou	r
Number of chimneys	heating heating			7 = [40 =	-	_
Number of chimneys		ᆜ	0	╛╘	0		20 =	0	(6a)
Number of open flues	0 + 0	+	0	┚╺┖	0			0	(6b)
Number of intermittent fa				Ĺ	3		10 =	30	(7a)
Number of passive vents					0	X	10 =	0	(7b)
Number of flueless gas fi	res				0	X	40 =	0	(7c)
							Δir ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+	(7a)±(7h)±	(7c) –	г					_
· · · · · · · · · · · · · · · · · · ·	ys, flues and fails = $(0a)+(0b)+$ been carried out or is intended, proce			continue fi	30 rom (9) to	(16)	÷ (5) =	0.16	(8)
Number of storeys in the		(),			(-)	(-)		0	(9)
Additional infiltration						[(9)-1]x0.1 =	0	(10)
	.25 for steel or timber frame of			•	ruction			0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value corresponding ngs); if equal user 0.35	to the grea	ter wall are	a (after					
If suspended wooden f	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
-	s and doors draught stripped		0.05 10.0		1001			0	(14)
Window infiltration			0.25 - [0.2]		100] = 12) + (13) ·	± (15) =		0	(15)
Infiltration rate	q50, expressed in cubic meta	es ner h					area	0	(16)
• • • • •	lity value, then $(18) = [(17) \div 20]$	•	•	•	ietie oi e	rivelope	aica	0.41	(17)
·	es if a pressurisation test has been d				is being u	sed		0.11	()
Number of sides sheltere	ed		(22)					2	(19)
Shelter factor			(20) = 1 -	`	19)] =			0.85	(20)
Infiltration rate incorporat	-		(21) = (18	6) x (20) =				0.35	(21)
Infiltration rate modified f		Jul	Διια	Sep	Oct	Nov	Dec	1	
	1 ' 1 ' 1	Jui	Aug	l Seb	1 001	INOV	l 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	
\ - <i>y</i>	- 1 1 3.0	1 5.0	1	<u> </u>	L	<u> </u>	1	J	
Wind Factor (22a)m = (2								1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m		_		ī	
0.45	0.44	0.43	0.39	0.38	0.33	0.33	0.33	0.35	0.38	0.4	0.41		
Calculate effect If mechanica		_	rate for t	пе арріі	саріе са	se						0	(23
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	d mech	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mech	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b)m = (22	2b)m + (23b)	_		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)n					•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n				•	•			oft 2b)m² x	0.5]			•	
24d)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(24
Effective air	change	rate - er	iter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(2
3. Heat losse	s and he	eat loss r	paramete	er:									
LEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/l	K)	k-value kJ/m²·l		A X k kJ/K
Ooors					2	х	1	= [2				(2
Vindows Type	. 1				7.661	x1.	/[1/(1.4)+	0.04] =	10.16				(2
Vindows Type	2				3.819	x1.	/[1/(1.4)+	0.04] =	5.06				(2
Valls Type1	48.1	7	11.48	В	36.69	x	0.18	=	6.6				(2
Valls Type2	17.6	68	2		15.68	x	0.18	=	2.82			=	(2
otal area of e	lements	, m²			65.85								(3
for windows and * include the area						ated using	ı formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				26.65	(3
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	733.25	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(3
or design assess an be used inste				construct	ion are not	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		_
hermal bridge	•	,			•	<						5.66	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			32.31	(3
entilation hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 × ((25)m x (5)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 36.32	36.08	35.85	34.77	34.56	33.62	33.62	33.44	33.98	34.56	34.97	35.4		(3
leat transfer of	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
		r —							r —			1	
89)m= 68.63	68.39	68.16	67.07	66.87	65.92	65.92	65.75	66.29	66.87	67.28	67.71		

eat loss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	(4)			
0.94	0.93	0.93	0.91	0.91	0.9	0.9	0.9	0.9	0.91	0.92	0.92		
umber of day	rs in mor	nth (Tah	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	0.91	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
 Water heat 	ing ener	gy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9))2)] + 0.0	0013 x (⁻	TFA -13.		32		(42
nnual averag educe the annua ot more that 125	ıl average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.39		(4:
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)			•			
4)m= 98.33	94.75	91.18	87.6	84.03	80.45	80.45	84.03	87.6	91.18	94.75	98.33		— ,,
nergy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 1	<u>L</u>	1072.67	(4
5)m= 145.82	127.53	131.6	114.73	110.09	95	88.03	101.02	102.22	119.13	130.04	141.22		
			-f (amtan O in	havea (40		Total = Su	m(45) ₁₁₂ =		1406.44	(4
instantaneous w													(4
6)m= 0 ater storage	0 loss:	0	0	0	0	0	0	0	0	0	0		(4
torage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
therwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
ater storage) If manufact		aclared l	nee facto	nr is kna	wn (k\//k	u/dav/).							(4
emperature fa				JI IS KIIO	wii (Kvvi	i/day).					0		
nergy lost fro							(48) x (49)				0		(4
) If manufact		•	•		or is not		(40) X (49)	, =			0		(5
ot water stora			-								0		(5
community h	_		on 4.3										
olume factor			0.1								0		(5
emperature fa	actor fro	m Table	2b								0		(5
nergy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(5
nter (50) or (54) in (5	55)									0		(5
ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	Н	
	0	0	0	0	0	0	0	0	0	0	0		(5
7)m= 0													
′ <u> </u>	loss (an	inual) fro	m Table	3							0		(5
mary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m			0		(5
imary circuit	loss cal	culated f	for each	month (•	. ,	, ,		r thermo		0		(!

Combi loss ca	alculated	for each	month ((61)m –	(60) · ·	365 v (<i>1</i> 1	/m						
(61)m= 0	0	0	0	0 0	00) +	T 0	0	T 0	0	0	0	1	(61)
												J (59)m + (61)m	(-)
(62)m= 123.94		111.86	97.52	93.58	80.75	74.83	85.80		101.26	110.54	120.03]	(62)
Solar DHW input	<u> </u>											J	(-)
(add additiona										morrio wan	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	rater hea	ter				-1	!		ļ .	-1	!	ı	
(64)m= 123.94		111.86	97.52	93.58	80.75	74.83	85.80	86.89	101.26	110.54	120.03]	
		<u> </u>		l .			C	utput from w	ater heat	er (annual)	112	1195.47	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61)m] + 0.8	x [(46)m	n + (57)m	+ (59)m]	_
(65)m= 30.99	27.1	27.97	24.38	23.39	20.19	18.71	21.4		25.32	27.63	30.01]	(65)
include (57)	m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is	from com	munity h	neating	
5. Internal g					•						•		
Metabolic gair	ns (Table	e 5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.1	9 116.19	116.19	116.19	116.19		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e Table 5			-	-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.28	12.45	15.81	18.45	19.67]	(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	lso see Ta	ıble 5	-	_	-	
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.1	6 156.52	167.93	182.32	195.86]	(68)
Cooking gains	s (calcula	ted in A	ppendix	L, equat	ion L1	or L15a), also	see Table	5	•	-	•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62]	(69)
Pumps and fa	ns gains	(Table 5	5a)					-		-	-	-	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. e	vaporatio	n (negat	tive valu	es) (Tab	le 5)			-		-	-		
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.9	5 -92.95	-92.95	-92.95	-92.95]	(71)
Water heating	gains (T	able 5)		-				-		-	-		
(72)m= 41.65	40.33	37.59	33.86	31.44	28.04	25.14	28.8	30.17	34.03	38.38	40.33]	(72)
Total interna	l gains =				(6	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	-	
(73)m= 323.54	322.21	310.94	292.45	272.99	254.83	243.42	247.1	5 257	275.62	297.01	313.72]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	tions to	convert to the	ne applica		tion.		
Orientation:			Area			ux able 6a		g_ Table 6b	-	FF		Gains	
•	Table 6d		m²			abie ba	. –	Table 6b		Table 6c		(W)	-
Northeast _{0.9x}	0.77	Х	7.6	66	x	11.28	x	0.63	x [0.7	=	26.42	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	22.97	X	0.63	x	0.7	=	53.77	(75)
Northeast _{0.9x}	0.77	X	7.6	66	x	41.38	x	0.63	x [0.7	=	96.88	(75)
Northeast _{0.9x}	0.77	Х	7.6	66	x _	67.96	x	0.63	x [0.7	=	159.11	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	91.35	X	0.63	X	0.7	=	213.87	(75)

		_					, ,		_				_
Northeast _{0.9x}	0.77	X	7.6	66	X	97.38	X	0.63	X	0.7	=	228.01	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	72.63	X	0.63	X	0.7	=	170.04	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	50.42	X	0.63	X	0.7	=	118.05	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	28.07	X	0.63	X	0.7	=	65.71	(75)
Northeast _{0.9x}	0.77	X	7.6	6	X	14.2	X	0.63	X	0.7	=	33.24	(75)
Northeast 0.9x	0.77	X	7.6	66	X	9.21	x	0.63	X	0.7	=	21.57	(75)
Southeast _{0.9x}	0.77	X	3.8	32	x	36.79	x	0.63	X	0.7	=	42.94	(77)
Southeast _{0.9x}	0.77	X	3.8	32	x	62.67	x	0.63	X	0.7	=	73.15	(77)
Southeast 0.9x	0.77	×	3.8	32	x	85.75	x	0.63	X	0.7	=	100.08	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	106.25	X	0.63	X	0.7	=	124.01	(77)
Southeast _{0.9x}	0.77	X	3.8	32	x	119.01	x	0.63	x	0.7	=	138.9	(77)
Southeast _{0.9x}	0.77	X	3.8	32	x	118.15	х	0.63	x	0.7	=	137.9	(77)
Southeast _{0.9x}	0.77	X	3.8	32	x	113.91	х	0.63	x	0.7	=	132.95	(77)
Southeast _{0.9x}	0.77	X	3.8	32	x	104.39	x	0.63	x	0.7	=	121.84	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	92.85	x	0.63	x	0.7	=	108.37	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	69.27	x	0.63	x	0.7	_ =	80.84	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	44.07	x	0.63	x	0.7		51.44	(77)
Southeast _{0.9x}	0.77	×	3.8	32	х	31.49	х	0.63	x	0.7	=	36.75	(77)
Solar gains in						T	`	n = Sum(74)m.	·	1		1	(00)
(83)m= 69.36		96.97	283.12	352.77	365.9	346.24	291	.88 226.42	146.5	6 84.68	58.32		(83)
Total gains – i (84)m= 392.9		07.9	575.56	625.76	620.73		539	.03 483.42	422.1	8 381.69	372.04	1	(84)
(4)	<u> </u>					309.07	333	.03 403.42	422.10	301.09	372.04		(04)
7. Mean inter			`		<i></i>			- 1 ((2.2)					_
Temperature	· ·	٠.			Ū		ble 9,	, Th1 (°C)				21	(85)
Utilisation fac					`	– –	١.			T		1	
Jan	 	Mar	Apr	May	Jun	Jul	 	ug Sep	Oct	+	Dec		(00)
(86)m= 1	1 0).99	0.96	0.86	0.66	0.49	0.5	0.83	0.98	1	1		(86)
Mean interna	, 	1		,	1	i —	1				ı	1	
(87)m= 20	20.13 2	0.35	20.65	20.88	20.98	21	20.	99 20.93	20.62	20.26	19.98		(87)
Temperature	during hea	ting p	eriods ir	rest of	dwellin	g from Ta	able 9	9, Th2 (°C)			_	-	
(88)m= 20.14	20.14 2	0.14	20.15	20.16	20.17	20.17	20.	17 20.16	20.16	20.15	20.15		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,m (s	ee Table	9a)				_		
(89)m= 1	1 0).99	0.95	0.81	0.58	0.4	0.4	0.77	0.97	1	1		(89)
Mean interna	l temperatu	re in t	the rest	of dwell	ing T2 (follow ste	eps 3	to 7 in Tabl	e 9c)				
(90)m= 19.21	19.35	9.57	19.87	20.08	20.16	20.17	20.	17 20.12	19.85	19.49	19.2		(90)
				•	-	•	•	f	LA = Liv	ving area ÷ (4) =	0.32	(91)
Mean interna	l temperatu	re (fo	r the wh	ole dwe	llina) =	fLA x T1	+ (1	– fLA) × T2					
(92)m= 19.46	 	9.82	20.12	20.34	20.42	20.43	20.		20.1	19.73	19.45]	(92)
Apply adjustr	nent to the	mean	interna	l temper	ature fr	om Table	4e,	where appro	priate	<u> </u>		l	, ,

(93)m=	19.46	19.6	19.82	20.12	20.34	20.42	20.43	20.43	20.38	20.1	19.73	19.45		(93)
` '			uirement			-								. ,
			ernal ter		re obtair	ed at st	ep 11 of	Table 9	o, so tha	t Ti.m=(76)m an	d re-calc	culate	
			or gains	•			ор о.		o, oo	, (. 0,			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:									•	
(94)m=	1	1	0.99	0.95	0.82	0.61	0.43	0.49	0.79	0.97	1	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	392.15	447.08	500.84	544.2	514.39	375.94	251.84	263.4	380.95	409.63	380.02	371.53		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]	•	•	•	
(97)m=	1040.45	1005.04	907.88	752.69	577.52	383.81	252.63	265.11	416.3	635.04	849.92	1032.48		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m		•	
(98)m=	482.34	374.95	302.84	150.11	46.97	0	0	0	0	167.7	338.33	491.75		
'			•				•	Tota	l per year	(kWh/yeaı) = Sum(9	8) _{15,912} =	2354.99	(98)
Space	e heatin	a reauir	ement in	kWh/m²	²/vear								32.12	(99)
•		• .			.,									
		- T	quiremen		Can Tal	hla 10h								
Calcu	Jan	Feb	July and Mar	August. Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat			lculated	<u> </u>		L								
(100)m=		0	0	0	0	619.66	487.82	499.67	0	0	0	0		(100)
		tor for lo			<u> </u>	010.00	107.02	100.07	ŭ	ŭ				(100)
(101)m=		0	0	0	0	0.95	0.98	0.96	0	0	0	0		(101)
			/atts) = (l	0.00	0.00						
(102)m=		0	0	0	0	587.14	476.87	481.93	0	0	0	0		(102)
			lculated	<u> </u>				<u> </u>						
(103)m=		0	0	0	0	812.25	774.21	716.56	0	0	0	0		(103)
			ement fo	l	l	l					l		l x (41)m	, ,
			(104)m <			.woming,	oomma	540 (N.	11) — 0.0.		(102)111] 2	A (11)111	
(104)m=	0	0	0	0	0	162.08	221.22	174.56	0	0	0	0		
'				•	•	•			Total	= Sum(104)	=	557.87	(104)
Cooled	I fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)
		actor (Ta	able 10b)										_
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	l = Sum((104)	=	0	(106)
			ment for		`	``	<u> </u>	r					1	
(107)m=	0	0	0	0	0	40.52	55.31	43.64	0	0	0	0		_
									Total	= Sum(107)	=	139.47	(107)
Space	cooling	require	ment in k	kWh/m²/	year				(107)	÷ (4) =			1.9	(108)
8f. Fab	ric Ene	gy Effic	iency (ca	alculatec	l only un	der spec	cial cond	litions, s	ee sectic	on 11)				
Fabrio	: Energy	/ Efficie	псу						(99)	+ (108) =	=		34.03	(109)
Targe	et Fabri	c Enera	y Efficie	encv (TF	EE)					-			39.13	(109)
J		3	-	• `	•									

		llser_E	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					001082 on: 1.0.5.9	
Address :	F	Property	Address	Plot 27					
1. Overall dwelling dime	ensions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			73.31	(1a) x	2	2.5	(2a) =	183.28	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	73.31	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys	0 + 0	_ + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	<u> </u>	0	Ī - [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				0	x ²	10 =	0	(7a)
Number of passive vents				Ē	0	x ′	10 =	0	(7b)
Number of flueless gas fi	res			F	0	X 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6b)+(6a)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6a)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b)+(6b$			[0		÷ (5) =	0	(8)
Number of storeys in the	een carried out or is intended, proced ne dwelling (ns)	ed to (17),	otnerwise (continue tr	om (9) to	(16)		0	(9)
Additional infiltration	g ()					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)
if both types of wall are 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 ().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 $(18) = [(17) \div 20] +$	•	•	•	etre of e	envelope	area	3	(17)
•	es if a pressurisation test has been do				is being u	sed		0.15	(18)
Number of sides sheltere			,	,	J			2	(19)
Shelter factor			(20) = 1 -	[0.0 75 x (1	19)] =			0.85	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.13	(21)
Infiltration rate modified f	- 1 	1	T .		Τ_	1	I _	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 45	1.7	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 infiltration rate (allowing for shelter and wind	eed) = (21a) x (22a)m
0.16 0.16 0.16 0.14 0.14 0.12	0.12
Calculate effective air change rate for the applicable	
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) x Fm	0.5 (23a)
If balanced with heat recovery: efficiency in % allowing for in-us	(an (from Tokio Ala)
	13.00
(24a)m= 0.27 0.26 0.26 0.25 0.24 0.23	$y (MVHR) (24a)m = (22b)m + (23b) \times [1 - (23c) \div 100]$ 0.23 0.22 0.23 0.24 0.25 0.25 (24a)
b) If balanced mechanical ventilation without heat r	
(24b)m= 0 0 0 0 0 0 0	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
c) If whole house extract ventilation or positive input	
if $(22b)m < 0.5 \times (23b)$, then $(24c) = (23b)$; other	
(24c)m= 0 0 0 0 0 0	0 0 0 0 0 0 (24c)
d) If natural ventilation or whole house positive input	entilation from loft
if $(22b)m = 1$, then $(24d)m = (22b)m$ otherwise	$d)m = 0.5 + [(22b)m^2 \times 0.5]$
(24d)m= 0 0 0 0 0 0	0 0 0 0 0 0 (24d)
Effective air change rate - enter (24a) or (24b) or (2	or (24d) in box (25)
(25)m= 0.27 0.26 0.26 0.25 0.24 0.23	0.23 0.22 0.23 0.24 0.25 0.25 (25)
3. Heat losses and heat loss parameter:	
ELEMENT Gross Openings Net	
area (m²) m² A	W/m2K (W/K) kJ/m²·K kJ/K
Doors	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Windows Type 1 7.6	
Windows Type 2 3.8	
Walls Type1 48.17 11.48 36	x 0.15 = 5.5 (29)
Walls Type2 17.68 2 15	x 0.14 = 2.22 (29)
Total area of elements, m ² 65	(31)
* for windows and roof windows, use effective window U-value calc ** include the areas on both sides of internal walls and partitions	ed using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2
Fabric heat loss, W/K = S (A x U)	(26)(30) + (32) = 25.74 (33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) = 733.25 (34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ²	Indicative Value: Low 100 (35)
For design assessments where the details of the construction are a	100
can be used instead of a detailed calculation.	
Thermal bridges: S (L x Y) calculated using Appendix	6.82 (36)
if details of thermal bridging are not known (36) = $0.05 \times (31)$	(22) 1 (26) -
Total fabric heat loss	(33) + (36) = 32.57 (37)
Ventilation heat loss calculated monthly Jan Feb Mar Apr May Jur	(38)m = 0.33 × (25)m × (5) Jul Aug Sep Oct Nov Dec
Jan Feb Mar Apr May Jun	Jul Aug Sep Oct Nov Dec 13.66 13.47 14.05 14.63 15.01 15.4 (38)
Heat transfer coefficient, W/K	
(39)m= 48.74 48.54 48.35 47.39 47.19 46.23	(39)m = (37) + (38)m 46.23
40.23	Average = Sum(39) ₁₁₂ /12= 47.34 (39)
	(45)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.66	0.66	0.66	0.65	0.64	0.63	0.63	0.63	0.64	0.64	0.65	0.65		
		!							Average =	Sum(40) ₁	12 /12=	0.65	(40)
Number of day	<u> </u>	<u> </u>	<u> </u>					-					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(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	ar:	
Assumed occi if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		32		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target c		.09		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage								*F		· · · ·			
(44)m= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5		
									Total = Su	m(44) ₁₁₂ =		1129.13	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x C	OTm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		
If in atomton acres	vator booti	'na at naint	of upo (no	bot water	, ataragal	antar O in	haves (46		Total = Su	m(45) ₁₁₂ =	-	1480.46	(45)
If instantaneous v			·	1	,.		· · ·	, , , I		1	i I		(40)
(46)m= 23.02 Water storage	20.14	20.78	18.12	17.38	15	13.9	15.95	16.14	18.81	20.53	22.3		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	,					_							, ,
Otherwise if n	-			-			, ,	ers) ente	er '0' in ((47)			
Water storage													
a) If manufac				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•	•		!4		(48) x (49)) =		1	10		(50)
b) If manufactHot water stor			-								02		(51)
If community h	-			<u> </u>	., 0, 0.0	-97				0.	UZ		(0.)
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro	om wate	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in ((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 contain	s 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 Appendi	хH	
(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	t loss (ar	nnual) fro	m Table	 e 3							0		(58)
Primary circuit	`	,			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss ca	lculated	for each	month ((61)m –	(60) :	365 v (41	/m							
(61)m= 0	0	0	0	01)111 =	00) +	0) i i)	0	0	0	0	1	(61)
	<u> </u>								<u> </u>			<u> </u>	J · (59)m + (61)m	(-)
(62)m= 208.77	184.17	193.81	174.27	171.16	153.49		161		161.1	180.68	190.38	203.93]	(62)
Solar DHW input			<u> </u>	<u> </u>	<u> </u>		ļ						<u></u>	` '
(add additiona												-: ····································		
(63)m= 0	0	0	0	0	0	0	C		0	0	0	0	7	(63)
Output from w	ater hea	ter	ı			-!	!						_	
(64)m= 208.77	184.17	193.81	174.27	171.16	153.49	147.94	161	.61	161.1	180.68	190.38	203.93]	
			ı	ı				Outp	out from w	ater heate	er (annual)	112	2131.3	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	า + (6	31)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	 n]	
(65)m= 95.26	84.58	90.28	82.95	82.75	76.04	75.03	79.	58	78.57	85.92	88.31	93.65]	(65)
include (57)	m in calc	culation	of (65)m	only if c	ylinder	is in the	dwell	ling	or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ains (see	Table 5	and 5a):										
Metabolic gair	ns (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec]	
(66)m= 139.43	139.43	139.43	139.43	139.43	139.43	139.43	139	.43	139.43	139.43	139.43	139.43]	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5				_	
(67)m= 47.85	42.5	34.56	26.17	19.56	16.51	17.84	23.	19	31.13	39.53	46.13	49.18]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a),	alsc	see Ta	ble 5			_	
(68)m= 305.82	308.99	300.99	283.97	262.48	242.28	228.79	225	.61	233.61	250.64	272.13	292.32]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a), als	o se	ee Table	5				
(69)m= 51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.	27	51.27	51.27	51.27	51.27]	(69)
Pumps and fa	ns gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	C)	0	0	0	0]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92	.95	-92.95	-92.95	-92.95	-92.95]	(71)
Water heating	gains (T	able 5)											_	
(72)m= 128.03	125.86	121.35	115.21	111.23	105.62	100.85	106	.96	109.13	115.48	122.65	125.87]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68	3)m +	+ (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 579.44	575.09	554.65	523.09	491.01	462.15	445.22	453	.51	471.61	503.38	538.65	565.11		(73)
6. Solar gains														
Solar gains are		•				•	ations	to co		ne applica		tion.		
Orientation: /	Access F Table 6d	actor	Area m²			lux able 6a		Т	g_ able 6b	Т	FF able 6c		Gains (W)	
_					_		1					_	. ,	1,75
Northeast 0.9x	0.77	X			X	11.28] X	_	0.63	X	0.7	=	26.42	(75)
Northeast 0.9x	0.77	X			x	22.97] X] .,		0.63		0.7	_ =	53.77](75)] ₍₇₅₎
Northeast 0.9x	0.77	X	7.6		x	41.38] X]	_	0.63	×	0.7	=	96.88	[(75)
Northeast 0.9x	0.77	X	7.6		X	67.96] X]		0.63	×	0.7	=	159.11](75)] ₍₇₅₎
Northeast _{0.9x}	0.77	X	7.6	56	X	91.35	X		0.63	X	0.7	=	213.87	(75)

		_					, ,						_
Northeast _{0.9x}	0.77	X	7.6	66	X	97.38	X	0.63	×	0.7	=	228.01	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	91.1	x	0.63	X	0.7	=	213.3	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	72.63	x	0.63	x	0.7	=	170.04	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	50.42] x	0.63	X	0.7	=	118.05	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	28.07] x	0.63	x	0.7	=	65.71	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	14.2] x [0.63	x	0.7	=	33.24	(75)
Northeast 0.9x	0.77	X	7.6	66	x	9.21] x [0.63	x [0.7	=	21.57	(75)
Southeast _{0.9x}	0.77	x	3.8	32	x	36.79] x [0.63	x	0.7	=	42.94	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	62.67] x [0.63	x	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	85.75] x [0.63	x	0.7	=	100.08	(77)
Southeast _{0.9x}	0.77	×	3.8	32	X ·	106.25	×	0.63	×	0.7	=	124.01	(77)
Southeast _{0.9x}	0.77	×	3.8	32	X	119.01	×	0.63	×	0.7	=	138.9	(77)
Southeast 0.9x	0.77	×	3.8	32	x ·	118.15	x	0.63	x	0.7	=	137.9	(77)
Southeast _{0.9x}	0.77	×	3.8	32	X ·	113.91	x	0.63	x	0.7	=	132.95	(77)
Southeast _{0.9x}	0.77	×	3.8	32	х -	104.39	x	0.63	x	0.7	=	121.84	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	92.85	x	0.63	x	0.7	=	108.37	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	69.27	x	0.63	x	0.7	=	80.84	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	44.07	x	0.63	x	0.7	=	51.44	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	31.49	i x	0.63	×	0.7	=	36.75	(77)
-		_					-		_ '				
Solar gains in	watts, calcu	ılated	for eac	h month			(83)m	= Sum(74)m .	(82)m				
(83)m= 69.36	126.92 19	6.97	283.12	352.77	365.9	346.24	291.	88 226.42	146.56	84.68	58.32		(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m	+ (83)m	, watts					_		
(84)m= 648.8	702.01 75	51.61	806.2	843.78	828.06	791.46	745.	39 698.03	649.94	623.33	623.44		(84)
7. Mean inter	nal tempera	ature ((heating	season	1)								
Temperature	during heat	ting p	eriods ir	n the livi	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gains	s for l	iving are	ea, h1,m	(see T	able 9a)							
Jan	Feb I	Mar	Apr	May	Jun	Jul	Αι	ıg Sep	Oct	Nov	Dec		
(86)m= 0.87	0.83 0).76	0.64	0.5	0.35	0.26	0.28	8 0.45	0.67	0.82	0.88		(86)
Mean interna	l temperatu	re in l	iving ar	ea T1 (fo	ollow ste	eps 3 to 7	7 in Ta	able 9c)			-		
(87)m= 20.27	 	0.63	20.84	20.95	20.99	21	21		20.84	20.55	20.24		(87)
Temperature	during heat	tina n	eriods ir	rest of	dwellin	r from Ta	hle 9	Th2 (°C)		_!			
(88)m= 20.37	 	0.38	20.39	20.39	20.4	20.4	20.4	<u> </u>	20.39	20.39	20.38		(88)
	<u> </u>	!		<u> </u>	ļ .	a Tabla	00)						
Utilisation fac		0.74	0.62	0.47	0.32	0.22	9a) 0.2	5 0.41	0.64	0.8	0.87		(89)
` ′	<u> </u>	!		<u> </u>	ļ					0.0	0.07		(00)
Mean interna	 			ı	, 	1	ri —			T	l	İ	(00)
	19.61 1	9.9	20.19	20.33	20.39	20.4	20.4	4 20.37	20.2	19.81	19.37		(90)
(90)m= 19.4	10.01	!			-				$I \Delta = I \cdots$	na aroa · /	4) -	2 22	1041
(90)III= 19.4	10.01	!			-	•		f	LA = Liv	ing area ÷ (4	4) =	0.32	(91)
Mean interna	l temperatu	`		i		1	'	- fLA) × T2		•	,	0.32	
. ,	ıl temperatu 19.87 20	0.13	20.4	20.53	20.58	20.59	20.5	- fLA) × T2	20.4	20.05	19.65	0.32	(91)

												•	
(93)m= 19.68	19.87	20.13	20.4	20.53	20.58	20.59	20.59	20.56	20.4	20.05	19.65		(93)
8. Space hea													
Set Ti to the the utilisation			•		ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l	L	· ·				_ 3						
(94)m= 0.84	0.8	0.74	0.62	0.48	0.33	0.23	0.26	0.42	0.64	0.79	0.86		(94)
Useful gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m= 547.55	565.11	554	499.22	402.56	274.15	184.06	192.3	294.84	418.59	491.92	533.29		(95)
Monthly aver		T T		from T	1							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 loss rate	i	1	 		ì	- ,	· · ·	<u> </u>				1	(0-)
(97)m= 749.45	726.7	659.06	544.84	416.7	276.62	184.52	192.99	301.35	462.71	615.92	741.12		(97)
Space heatin (98)m= 150.21	g require 108.59	ement fo	r each n	10.52			24 x [(97])m – (95 0)m] x (4 32.83	1)m 89.28	154.63		
(98)m= 150.21	108.59	78.16	32.85	10.52	0	0					<u> </u>	057.07	7(08)
							rota	l per year	(Kvvn/yeai	r) = Sum(9	8)15,912 =	657.07	(98)
Space heatin	g requir	ement in	kWh/m²	² /year								8.96	(99)
9b. Energy red	quiremer	nts – Cor	mmunity	heating	scheme								
This part is us										unity sch	neme.		7(204)
Fraction of spa			•		•	_	(Table T	1) 0 11 11	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so									up to four	other heat	sources; t	he latter	
includes boilers, here		-			rom powei	r stations.	See Appei	naix C.				1	(303a)
Fraction of total			•		nilere				(3	02) x (303	a) =	1	(304a)
Factor for conf	•			•		r commi	ınity has	itina eve		02) X (000	u) –	1	(305)
				,	` ''		•	illing sys	CIII				╡`
Distribution los		(Table 1	(2c) for (commun	ity neatii	ng syste	m					1.05	(306)
Space heating	_		1									kWh/yea	r ¬
Annual space	•	·										657.07	╛
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	689.92	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	3												
Annual water		requirem	ent									2131.3	
If DHW from c								(0.4) (0.6	20-1 (00	T) (000)			
Water heat fro		•					0.04			5) x (306) :		2237.87	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)([310e)] =	29.28	(313)
Cooling System	_	-	•									0	(314)
Space cooling	,			•		,		= (107) ÷	(314) =			0	(315)
Electricity for p							outo!d-				I	007.00	7(220-)
mechanical ve	ะแแลแอก	- palanc	eu, extr	act of po	ositive in	out Irom	outside					285.09	(330a)

warm air heating system fans			0 (330b)
pump for solar water heating			0 (330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330b) + (330g) =	285.09 (331)
Energy for lighting (calculated in Appe	ndix L)		338.01 (332)
Electricity generated by PVs (Appendi	x M) (negative quantity)		-741.01 (333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0 (334)
10b. Fuel costs – Community heating	scheme		
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating from CHP	(307a) x	4.24 × 0.0°	1 = 29.25 (340a)
Water heating from CHP	(310a) x	4.24 × 0.0°	94.89 (342a)
		Fuel Price	
Pumps and fans	(331)	13.19 x 0.0°	37.6 (349)
Energy for lighting	(332)	13.19 x 0.0°	1 = 44.58 (350)
Additional standing charges (Table 12			120 (351)
Energy saving/generation technologies Total energy cost	s = (340a)(342e) + (345)(354) =		326.32 (355)
11b. SAP rating - Community heating	scheme		
Energy cost deflator (Table 12)			0.42 (356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =		1.16 (357)
SAP rating (section12)			83.84 (358)
12b. CO2 Emissions – Community hea	ating scheme		
		ergy Emission fact Vh/year kg CO2/kWh	or Emissions kg CO2/year
CO2 from other sources of space and		vii/yeai kg CO2/kvvii	kg CO2/year
Efficiency of heat source 1 (%)		Is repeat (363) to (366) for the second	fuel 94 (367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	100 ÷ (367b) x 0.22	= 672.77 (367)
Electrical energy for heat distribution	[(313) x	0.52	= 15.2 (372)
Total CO2 associated with community	systems (363)(366) + (368)(372)	= 687.96 (373)
CO2 associated with space heating (s	econdary) (309) x	0	= 0 (374)
CO2 associated with water from imme	rsion heater or instantaneous he	eater (312) x 0.22	= 0 (375)
Total CO2 associated with space and	water heating (373) + (374) + (375) =	687.96 (376)
CO2 associated with electricity for pur	nps and fans within dwelling (33	1)) x 0.52	= 147.96 (378)
CO2 associated with electricity for ligh	ting (332))) x	0.52	= 175.43 (379)
Energy saving/generation technologie	s (333) to (334) as applicable		
Item 1		0.52 x 0.0°	-384.59 (380)
Total CO2, kg/year	sum of (376)(382) =		626.76 (383)

Dwelling CO2 Emission Rate (383) ÷ (4) =				8.55	(384)
El rating (section 14)				92.9	(385)
13b. Primary Energy – Community heating scheme					
	Energy kWh/year	Primary factor		Energy /h/year	
Energy from other sources of space and water heating (not C Efficiency of heat source 1 (%) If there is CHP us	HP) sing two fuels repeat (363) to	o (366) for the second t	fuel	94	(367a)
Energy associated with heat source 1 [(307b	o)+(310b)] x 100 ÷ (367b) x	1.22	= [3799.89	(367)
Electrical energy for heat distribution	[(313) x		= [89.88	(372)
Total Energy associated with community systems	(363)(366) + (368)(37	(2)	= [3889.78	(373)
if it is negative set (373) to zero (unless specified otherwise	, see C7 in Appendix C	C)		3889.78	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from immersion heater or instar	ntaneous heater(312) x	1.22	= [0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =			3889.78	(376)
Energy associated with space cooling	(315) x	3.07	= [0	(377)
Energy associated with electricity for pumps and fans within d	lwelling (331)) x	3.07	= [875.22	(378)
Energy associated with electricity for lighting	(332))) x	3.07	= [1037.69	(379)
Energy saving/generation technologies Item 1		3.07 × 0.01	=	-2274.91	(380)
Total Primary Energy, kWh/year sum of (376	s)(382) =			3527.77	(383)

		He	ser Details:						
A consequently and	Zabial Aabaat	Us		- 11			OTDO	004000	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012)	Strom Softwa					001082 on: 1.0.5.9	
Software Hame.	Ottoma i O/ti 2012		erty Address				VCISIO	71. 1.0.0.0	
Address :		·							
1. Overall dwelling dime	ensions:								
Ground floor		Г	Area(m²)	l (4 -)		ight(m)	1 (0-)	Volume(m³	<u>-</u>
				(1a) x		2.5	(2a) =	183.28	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)	+(1n) L	73.31	(4)					_
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
N. sala and A. Parana	heating	eating					40		_
Number of chimneys	0 +		0	_ =	0		40 =	0	(6a)
Number of open flues	0 +	0	0] = [0		20 =	0	(6b)
Number of intermittent fa				L	3	X '	10 =	30	(7a)
Number of passive vents	3				0	X '	10 =	0	(7b)
Number of flueless gas f	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	Г	30		÷ (5) =	0.16	(8)
	peen carried out or is intended			continue fr			. (0) =	0.16	
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber frugger or steel or timber frugger from the steel or timber from the st			•	ruction			0	(11)
deducting areas of openi		onaing to the	greater wall are	a (aner					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 (s	sealed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
· ·	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubi	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has				is heina u	sad		0.41	(18)
Number of sides sheltere		been dene er	a aogree an pe	moubinty	io boilig a	00 0		2	(19)
Shelter factor			(20) = 1 -	[0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18) x (20) =				0.35	(21)
Infiltration rate modified f	or monthly wind speed						'		
Jan Feb	Mar Apr May	Jun J	Jul Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3	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		
				L		Ц	<u> </u>	J	

	Adjusted infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
If mechanical ventilation: If exhaust air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (NS)), otherwise (23b) = (23a) If exhaust air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (NS)), otherwise (23b) = (23a) If exhaust air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (NS)), otherwise (23b) = (23a) If exhaust air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (NS)), otherwise (23b) = (23b) If exhaust air heat pump using Appendix N. (23b) = (23b) = (23a) × Fmv (equation (NS)), otherwise (23b) = (23b) × If - (23b) × If		1					1	0.33	0.35	0.38	0.4	0.41]	
If exhaust air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (NS)), otherwise (23b) = (23a) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = a), if balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] 24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			_	rate for t	he appli	cable ca	se	•	•			•	-	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] 24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				endix N (2	3h) = (23a	a) × Fmv (e	equation (1	N5)) othe	rwise (23h) = (23a)				(23
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x 1 - (23c) ÷ 100 24a)m = 0) = (20 0)				
24a)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			•	•	J		`		,	2h\m . /	22h) v [1 (220)		(23
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· —	i	i	i		1	- ` ` 	, ``	í `	 		<u> </u>] - 100]]	(24
240/m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0													J	(= .
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b) d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m^2 x 0.5] 24d)m = 0.6	· -	1						, ``	í `	 		0	1	(24
if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b) 24c)m = 0						<u> </u>							J	(-
24e)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,					•				5 × (23b	o)			
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25 m		1	r Ó	· ` `	<u> </u>	ŕ	· ` `	ŕ	ŕ	· ` `		0	1	(24
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25 m	d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	loft	<u> </u>	<u> </u>	<u>!</u>	ı	
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 25)m= 0.6 0.6 0.5 0.57 0.57 0.56 0.56 0.55 0.56 0.57 0.58 0.59 3. Heat losses and heat loss parameter: ELEMENT Gross Openings Net Area U-value A X U k-value A X U kJ/m²-K k	,				•					0.5]				
3. Heat losses and heat loss parameter: ELEMENT Gross Openings Met Area W/m2K (W/K) kJ/m²-K k	24d)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59]	(24
### Section of the process of the pr	Effective air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in bo	x (25)	-	-	-	_	
Deprings area (m²) Openings area (m²) Opening	25)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59]	(25
Net Area area (m²) Openings area (m²) Openings area (m²) Openings area (m²) Net Area area (m²) Openings area (m²) Openins area (m²) Openings area (m²) Openings area (m²) Openings	3 Heat losse	es and he	at loss i	naramet	⊃r·									
area (m²) m² A ,m² W/m²K (W/K) kJ/m²-K kJ/h² Doors						Net Ar	ea	U-val	ue	AXU		k-value	<u> </u>	ΑΧk
Vindows Type 1 Vindows Type 2 3.819 Vin(1.4.) + 0.04] = 10.16 Vindows Type 2 3.819 Vin(1.4.) + 0.04] = 5.06 Valls Type1											K)		-	kJ/K
Vindows Type 2 Valls Type1	Doors					2	X	1	=	2				(26
Valls Type1 48.17 11.48 36.69 x 0.18 = 6.6	Vindows Type	e 1				7.661	x1.	/[1/(1.4)+	0.04] =	10.16				(27
Valls Type 2	Vindows Type	e 2				3.819	x1	/[1/(1.4)+	0.04] =	5.06	Ħ			(27
Total area of elements, m² for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 *include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28)(30) + (32) + (32a)(32e) = (38)(30) + (32) + (32a)(32e) = (38)(32e) + (32e)(32e) + (32e)(32e) = (38)(38)(38e) + (38e) + (38e)(38e) + (38e).	Valls Type1	48.1	17	11.4	В	36.69) x	0.18	i	6.6	= [(29
Total area of elements, m² for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 *include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28)(30) + (32) + (32a)(32e) = (38)(30) + (32) + (32a)(32e) = (38)(32e) + (32e)(32e) + (32e)(32e) = (38)(32e) + (32e)(32e) 32e) + (32e)(32e)(32e) + (32e)	Valls Type2	17.6	68	2		15.68	x	0.18	=	2.82	F i			(29
for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 *include the areas on both sides of internal walls and partitions fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 26.65 Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 733.25 Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium 250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f an be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 5.66 **details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 32.31 **Jentilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) **Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38.8m = 36.32 36.08 35.85 34.77 34.56 33.62 33.62 33.44 33.98 34.56 34.97 35.4 **Heat transfer coefficient, W/K (39)m = (37) + (38)m	otal area of e	elements	. m²				_							(3
Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 26.65 Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 733.25 Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f an be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K Indicative Value: Medium 250 Total fabric heat loss (33) + (36) = 32.31 Indicative Value: Medium 250 Indicative Value: Mediu			,	effective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	h 3.2	(-
Heat capacity $Cm = S(A \times K)$							_				-			
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Medium 250 For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f and be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 5.66 Indicative Value: Medium 250 Indicative Value: Medium 260 Indicative Value: Medium 260 Indicative Value: Medium 260 Indicative Value: Medium 260 Indicative Value: Me	abric heat los	ss, W/K	= S (A x	U)				(26)(30)) + (32) =				26.65	(33
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f an be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K	leat capacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	733.2	5 (34
Thermal bridges: S (L x Y) calculated using Appendix K Total fabric heat loss Tentilation heat loss calculated monthly The manufacture of a detailed calculation. Total fabric heat loss Total fabric heat loss Total fabric heat loss calculated monthly Total fabric heat loss ca	hermal mass	parame	ter (TMI	= Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35
Thermal bridges : S (L x Y) calculated using Appendix K If details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss If details of thermal bridging are not known (36) = 0.05 x (31) If otal fabric heat loss If otal fabric	J				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss					icina An	nondiy l							5.00	
Total fabric heat loss (33) + (36) = 32.31 Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m = 36.32 36.08 35.85 34.77 34.56 33.62 33.62 33.44 33.98 34.56 34.97 35.4 Heat transfer coefficient, W/K (39)m = (37) + (38)m	ŭ	,	,		• .	•	`						5.66	(36
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38)m= 36.32 36.08 35.85 34.77 34.56 33.62 33.62 33.44 33.98 34.56 34.97 35.4 Heat transfer coefficient, W/K			are not ki	iowii (30) -	- 0.00 X (0	'')			(33) +	(36) =			32.31	(37
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 36.32 36.08 35.85 34.77 34.56 33.62 33.62 33.44 33.98 34.56 34.97 35.4 Heat transfer coefficient, W/K (39)m = (37) + (38)m	entilation hea	at loss ca	alculated	d monthly	/						25)m x (5))	02.0	`
38)m= 36.32 36.08 35.85 34.77 34.56 33.62 33.62 33.44 33.98 34.56 34.97 35.4 Heat transfer coefficient, W/K (39)m = (37) + (38)m		1	i	· ·		Jun	Jul	Aua	<u> </u>	<u> </u>			1	
Heat transfer coefficient, W/K (39)m = (37) + (38)m		1	 			-		-		-	-		1	(38
	, L	<u> </u>	L	<u> </u>		<u> </u>	<u> </u>			<u> </u>	<u> </u>	<u> </u>	1	
NUMBER OFFICE AND AND AND A COURT OF AND		i e	·	67.07	66.87	65.02	65.02	65.75	- ` ´ 			67.71	1	
Average = Sum(39) ₁₁₂ /12= 67.07	00.03	00.38	00.10	07.07	00.07	05.92	00.92	05.75	<u> </u>	<u> </u>	<u> </u>	<u> </u>	67.07	7 (39

Heat loss para	meter (ł	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.94	0.93	0.93	0.91	0.91	0.9	0.9	0.9	0.9	0.91	0.92	0.92		
Niverbar of day			la 4a)					,	Average =	Sum(40) ₁ .	12 /12=	0.91	(40)
Number of day 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)
		ļ								<u> </u>	<u> </u>		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	inancv	N									20		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		32		(42)
Annual averag	e hot wa										.39		(43)
Reduce the annua not more that 125	_				_	_	to achieve	a water us	se target o	of			
Jan	Feb	Mar	Apr	May	Jun	Jul	Λιια	Sep	Oct	Nov	Dec		
Hot water usage in							Aug (43)	Sep	Oct	INOV	Dec		
(44)m= 98.33	94.75	91.18	87.6	84.03	80.45	80.45	84.03	87.6	91.18	94.75	98.33		
(11)	• •	• • • • • • • • • • • • • • • • • • • •	00	000	00.10	00.10	000	L		m(44) ₁₁₂ =	l	1072.67	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	0Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 145.82	127.53	131.6	114.73	110.09	95	88.03	101.02	102.22	119.13	130.04	141.22		
		•							Total = Su	m(45) ₁₁₂ =	=	1406.44	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					
(46)m= 21.87	19.13	19.74	17.21	16.51	14.25	13.2	15.15	15.33	17.87	19.51	21.18		(46)
Water storage Storage volum		includin	a any c	olar or M	WHDC	etorago	within ec	ama vac	col		450		(47)
If community h	` ′		-			•		arric ves.	301		150		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water storage			•					,	`	,			
a) If manufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature fa	actor fro	m Table	2b							0.	54		(49)
Energy lost fro		_	-				(48) x (49)) =		0.	75		(50)
b) If manufact			-										(54)
Hot water stora	-			e z (kvv	n/iitre/da	ıy)					0		(51)
Volume factor	_		JII 4.5								0		(52)
Temperature fa			2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (_	,								75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	loss cal	culated f	or each	month (•	. ,	, ,						
(modified by		rom Tabl	le H5 if t		solar wat	er heatii		cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
$\begin{array}{c c} \text{Combinoss c} \\ \hline (61)\text{m} = & 0 \end{array}$	alculated	or each	month (0 1)m =	(6U) ÷ 30	05 × (41))m 0	0	0	Ο	0]	(61)
		ļ					<u> </u>	Ļ		ļ		(50) (64)	(01)
(62)m= 192.4	<u> </u>	178.2	159.83	156.69	140.09	134.63	(6∠)m =	147.32	(45)III + 165.73	175.13	(57)m + 187.81	(59)m + (61)m	(62)
` '								1				l	(02)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
(63)m= 0	0	0	0	0	0	0	0	0) 0	0	0	0	1	(63)
Output from								1				I	()
(64)m= 192.4		178.2	159.83	156.69	140.09	134.63	147.61	147.32	165.73	175.13	187.81]	
	_!						Out	put from w	ater heate	<u>r</u> (annual)₁	12	1955.06	(64)
Heat gains fr	om water	heating,	kWh/me	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	-
(65)m= 85.76	1	81.03	74.22	73.88	67.66	66.55	70.86	70.06	76.89	79.31	84.23	ĺ	(65)
include (57	7)m in cal	culation o	of (65)m	onlv if c	vlinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	<u> </u>											<u> </u>	
Metabolic ga													
Jan	T '	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 116.1	9 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5		-		-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.28	12.45	15.81	18.45	19.67		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.16	156.52	167.93	182.32	195.86		(68)
Cooking gair	ns (calcula	ated in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5	-		•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62		(69)
Pumps and f	ans gains	(Table 5	5a)							-		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)				-		-		
(71)m= -92.95	5 -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95		(71)
Water heatin	g gains (1	Table 5)		-		-	-		-	-	-		
(72)m= 115.2°	7 113.2	108.92	103.09	99.3	93.97	89.44	95.25	97.31	103.34	110.16	113.21		(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$													
(73)m= 400.1	6 398.08	385.26	364.67	343.84	323.76	310.73	316.54	327.14	347.94	371.79	389.6		(73)
6. Solar gai	ns:	•				•			•		•		
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu			g_ 	_	FF		Gains	
	Table 6d		m²			ble 6a		Table 6b	_	able 6c		(W)	-
Northeast 0.9x		X	7.6	66	x1	11.28	x	0.63	x	0.7	=	26.42	(75)
Northeast 0.9x		X	7.6	66	x2	22.97	X	0.63	x	0.7	=	53.77	(75)
Northeast 0.9x	U 1111	X	7.6	66	x	11.38	x	0.63	x	0.7	=	96.88	(75)
Northeast 0.9x		X	7.6	6	x 6	67.96	×	0.63	x	0.7	=	159.11	(75)
Northeast 0.9x	0.77	X	7.6	66	x 9	91.35	Х	0.63	х	0.7	=	213.87	(75)

		_			_		, ,						_
Northeast _{0.9x}	0.77	X	7.6	66	X	97.38	_ x	0.63	X	0.7	=	228.01	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	72.63	X	0.63	X	0.7		170.04	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	50.42	X	0.63	X	0.7	=	118.05	(75)
Northeast _{0.9x}	0.77	X	7.6	66	X	28.07	X	0.63	X	0.7	=	65.71	(75)
Northeast _{0.9x}	0.77	x	7.6	66	X	14.2	X	0.63	X	0.7	=	33.24	(75)
Northeast 0.9x	0.77	x	7.6	66	x	9.21	x	0.63	X	0.7	=	21.57	(75)
Southeast _{0.9x}	0.77	x	3.8	32	x	36.79	X	0.63	x	0.7	=	42.94	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	62.67	x	0.63	x	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	85.75	x	0.63	X	0.7	=	100.08	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	106.25	x	0.63	x	0.7	=	124.01	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	119.01	x	0.63	x	0.7	=	138.9	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	118.15	x	0.63	X	0.7	-	137.9	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	113.91	x	0.63	x	0.7		132.95	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	104.39	x	0.63	x	0.7	=	121.84	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	92.85	x	0.63	X	0.7	=	108.37	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	69.27	x	0.63	x	0.7	=	80.84	(77)
Southeast _{0.9x}	0.77	x	3.8	32	x	44.07	х	0.63	x	0.7	=	51.44	(77)
Southeast _{0.9x}	0.77	×	3.8	32	x	31.49	j x	0.63	×	0.7		36.75	(77)
Solar gains in	watts, calcu	ulated	for eac	h month			(83)m	= Sum(74)m .	(82)m				
(83)m= 69.36	126.92	96.97	283.12	352.77	365.9	346.24	291.	.88 226.42	146.56	84.68	58.32		(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts													
(84)m= 469.52	525.01 58	32.23	647.78	696.61	689.67	656.97	608.	42 553.56	494.49	456.47	447.92		(84)
7. Mean inter	nal temper	ature	(heating	season	1)								
Temperature	during hea	ting p	eriods ir	n the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fac	ctor for gain	s for I	iving are	ea, h1,m	(see T	able 9a)							_
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.94	0.81	0.6	0.44	0.4	9 0.77	0.96	0.99	1		(86)
Mean interna	ıl temperatu	ıre in l	iving ar	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)					
(87)m= 20.1	' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' 	0.44	20.72	20.92	20.99	21	21		20.7	20.36	20.08		(87)
Temperature	during hea	tina n	eriods ir	rest of	dwellin	g from Ta	able 9) Th2 (°C)		•	!		
(88)m= 20.14		0.14	20.15	20.16	20.17	20.17	20.	· · · /	20.16	20.15	20.15		(88)
Utilisation fac	tor for gain	c for r	oct of d	wolling	h2 m (c	oo Tabla	. 02/	ļ		ļ			
(89)m= 1		0.98	0.92	0.76	0.53	0.36	0.4	1 0.69	0.94	0.99	1		(89)
	<u> </u>			<u> </u>	ļ					0.00	<u>'</u>		()
Mean interna	ıl temperatu	ire in t		of dwell 20.08	ing 12 (20.16	1000 ste	i 		·	1 40.00	10.04	1	(00)
	40.40	~ 44 l		I /U UX	1 /U In	1 20.17	20.	17 20.13	19.82	19.32	18.91		(90)
(90)m= 18.93	19.12 1	9.44	19.84	20.00	20.10				I Δ = Liv	ing area ÷ /	<u>.</u> 4) –	0.00	(04)
	19.12 1	9.44	19.64	20.00	20.10	1 20	<u>!</u>	f	LA = Liv	ring area ÷ (4) =	0.32	(91)
(90)m= 18.93 Mean interna	ıl temperatu	ıre (fo	r the wh	ole dwe	lling) =	fLA × T1	- ` 	– fLA) × T2			i	0.32	
(90)m= 18.93	ıl temperatu 19.47 1	ıre (fo 9.76	r the wh	ole dwe	elling) =	fLA × T1	20.4	- fLA) × T2	20.1	19.65	19.28	0.32	(91) (92)

											1	1	l	
(93)m=	19.3	19.47	19.76	20.12	20.35	20.43	20.43	20.43	20.39	20.1	19.65	19.28		(93)
			uirement							. —. ,				
			ernal ter or gains	•		ed at ste	ep 11 of	Table 9	b, so tha	it Ti,m=(76)m an	d re-calc	ulate	
tilo ut	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm					19						
(94)m=	0.99	0.99	0.97	0.91	0.77	0.55	0.38	0.43	0.72	0.94	0.99	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m	!	!				•			
(95)m=	467.11	519.51	566.55	592.11	534.99	379.29	252.22	264.27	396.16	465.69	451.3	446.14		(95)
Month	nly aver	age exte	rnal tem	perature	from Ta	able 8		•	•		•			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	-			
(97)m=	1029.44	996.68	903.61	752.56	578.29	384.01	252.66	265.17	417.16	635.32	844.29	1021.14		(97)
Space		g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	, ,	ı	
(98)m=	418.37	320.66	250.78	115.52	32.21	0	0	0	0	126.21	282.95	427.8		_
								Tota	ıl per year	(kWh/yea	r) = Sum(9	18) _{15,912} =	1974.49	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								26.93	(99)
9a. En	erav red	uiremer	nts – Indi	ividual h	eating s	vstems i	ncluding	micro-C	CHP)					
	e heatir	•				,			,					
-		•	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction of space heat from main system(s) (202) = 1 - (201) =									1	(202)				
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$									1	(204)				
Efficiency of main space heating system 1									93.5	(206)				
Efficiency of secondary/supplementary heating system, %										0	(208)			
											」 ` ′			
Cnoo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	418.37	320.66	ement (c 250.78	115.52	32.21	0	0	0	0	126.21	282.95	427.8		
(0.1.1)								<u> </u>		120.21	202.55	427.0		(5.4.1)
(211)m	- ``	<u> </u>	4)] } x 1	· `				Ι ο		404.00	1 200 00	457.54		(211)
	447.46	342.95	268.21	123.55	34.45	0	0	O Tota	0 al (kWh/yea	134.98	302.62	457.54	0111.75	7(244)
•								1018	ii (KVVII/yea	ar) =Surri(2	Z I I) _{15,1012}	2	2111.75	(211)
		•	econdar	• •	month									
= {[(90 (215)m=	<u> </u>	0	00 ÷ (20	0	0	0	0	0	0	0	0	0		
(210)									l (kWh/yea				0	(215)
Water	heating								. ,	, ,	715,101	2		
	_		ter (calc	ulated al	hove)									
o arp ar	192.41	169.62	178.2	159.83	156.69	140.09	134.63	147.61	147.32	165.73	175.13	187.81		
Efficier	ncy of w	ater hea	ıter			ļ.	ļ.	!		ļ.	!		79.8	(216)
(217)m=	86.83	86.49	85.73	83.96	81.44	79.8	79.8	79.8	79.8	84.1	86.09	86.94		(217)
		heatina.	kWh/mo	onth						ı		1		
(219)m	1 = (64)	•) ÷ (217)					1	1		1	,	ı	
(219)m=	221.59	196.12	207.87	190.35	192.39	175.55	168.7	184.98	184.61	197.06	203.44	216.02		_
								Tota	al = Sum(2	19a) ₁₁₂ =			2338.67	(219)
Annual totals Space heating fuel used, main system 1									kWh/year	7				
Space	neating	tuel use	ea, main	system	1								2111.75	╛

Water heating fuel used				2338.67	٦
Electricity for pumps, fans and electric keep-hot					_
central heating pump:	30		(230c)		
boiler with a fan-assisted flue	45		(230e)		
Total electricity for the above, kWh/year		75	(231)		
Electricity for lighting				338.01	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission factors	tor	Emissions kg CO2/ye	
Space heating (main system 1)	(211) x	0.216	=	456.14	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	505.15	(264)
Space and water heating	(261) + (262) + (263) + (264) =	=		961.29	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	175.43	(268)
Total CO2, kg/year	su	ım of (265)(271) =		1175.64	(272)

TER =

(273)

16.04