Regulations Compliance Report

Printed on 28 Octo	ber 2020 at 14:54:1	, England assessed by Stroma 1	a FSAP 2012 program, Ve	rsion: 1.0.5.9	
Project Informatic	on:				
Assessed By:	Zahid Ashraf (STR	O001082)	Building Type:	Flat	
Dwelling Details:					
NEW DWELLING	DESIGN STAGE		Total Floor Area: 6	3.82m ²	
Site Reference :	Hermitage Lane		Plot Reference:	Plot 33	
Address :	0				
Client Details:					
Name:					
Address :					
	s itoms included w	thin the SAP calculations.			
•	te report of regulat				
1a TER and DER					
Fuel for main heat	ing system: Mains ga	as (c)			
Fuel factor: 1.00 (r					
-	xide Emission Rate	. ,	17.19 kg/m ²		
	ioxide Emission Rat	e (DER)	10.28 kg/m ²		OK
1b TFEE and DF			40 E LIMIL (+2		
-	gy Efficiency (TFEE		40.5 kWh/m ²		
Dweiling Fabric En	ergy Efficiency (DFE	:E)	32.5 kWh/m ²		ок
2 Fabric U-value	S				OR
Element		Average	Highest		
External v	wall	0.14 (max. 0.30)	0.15 (max. 0.70)		ок
Floor		(no floor)			
Roof		(no roof)			
Openings	i	1.40 (max. 2.00)	1.40 (max. 3.30)		ОК
2a Thermal bridg	ging				
Thermal b	oridging calculated fr	om linear thermal transmittanc	es for each junction		
3 Air permeabilit	t y				
	pility at 50 pascals		3.00 (design val	ue)	
Maximum			10.0		OK
4 Heating efficie	ncy				
Main Heatir	ig system:	Community heating schemes	s - mains gas		
			-		
Secondary	heating system:	None			
5 Cylinder insula	ation				
Hot water S		No cylinder			
6 Controls					
Space heat	ing controls	Charging system linked to us	se of community besting		
Opace rieal		programmer and at least two			ок
Hot water c	ontrols:	No cylinder thermostat			
		No cylinder			

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7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	ОК
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	2.03m ²	
Windows facing: North West	6.1m ²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
External Walls U-value	0.13 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

			User D	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20	012		Stroma Softwa					001082 n: 1.0.5.9	
		Pi	roperty /	Address:	Plot 33					
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor			-	a(m²) 3.82	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³ 159.56) (3a)
Total floor area TFA = (1a	n)+(1b)+(1c)+(1d)+(1e)+(1n) 6	3.82	(4)			_		_
Dwelling volume					(3a)+(3b))+(3c)+(3c	l)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m ³ per hou	r
Number of chimneys	0 +	0	+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	x	20 =	0	(6b)
Number of intermittent far	IS	L				0	x /	10 =	0	(7a)
Number of passive vents						0	x /	10 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
U U					L					
								Air ch	anges per ho	ur
Infiltration due to chimney If a pressurisation test has be					continuo fr	$0 \frac{(0)}{(0)}$		÷ (5) =	0	(8)
Number of storeys in th		idea, proceet	<i>110 (11),</i> C		onunue n	0111 (9) 10 (10)		0	(9)
Additional infiltration	3(-)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timbe	er frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre		responding to	the greate	er wall area	a (after					
deducting areas of opening If suspended wooden fl	- · · ·	ealed) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ent			,	,,					0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) ·	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in c	ubic metre	s per ho	our per so	quare m	etre of e	nvelope	area	3	(17)
If based on air permeabili	•								0.15	(18)
Air permeability value applies		has been don	e or a deg	ree air pei	rmeability	is being u	sed		_	
Number of sides sheltered Shelter factor				(20) = 1 - [[0.075 x (1	9)] =			3 0.78	(19) (20)
Infiltration rate incorporati	ng shelter factor			(21) = (18)					0.10	(21)
Infiltration rate modified for	-	ed							0.12	
	Mar Apr Ma	- I I	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Easter (22a) - (22										
Wind Factor (22a)m = (22 (22a)m = 1.27 1.25 1	.)m ÷ 4 .23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
		0.00	0.00	0.02	'				l	

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
		ctive air al ventila	change i	rate for t	he appli	cable ca	se						0.5	(220)
			using Appe	andix N (2	3h) - (23a) × Emv (c	auation (N	N5)) other	nwise (23b)) - (232)			0.5	(23a)
) – (238)			0.5	(23b)
			overy: effici	-	-						006)	4 (00 s)	79.05	(23c)
	0.25	0.25	0.25	0.23	0.23	0.22		1R) (24a	0.22	2D)m + (. 0.23	230) × [0.24	1 – (23c) 0.24	÷ 100]	(24a)
(24a)m=												0.24		(244)
,		1	anical ve				· · · · ·	r Ó	ŕ	, ,	,		l	(24b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
			tract ven < (23b), t		-	-				5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or wh en (24d)							0.5]	-			
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	iter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)			-		
(25)m=	0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(25)
3 Ho	at losso	s and he	eat loss p	aramot	or.			•						
ELEN		Gros		Openin		Net Ar	62	U-valı		AXU		k-value	. <i>1</i>	A X k
		area		m		A,r		W/m2		(W/I	<)	kJ/m²·ł		κJ/K
Doors						2	x	1.4	= [2.8				(26)
Window	ws Type	e 1				2.025	5 x1,	/[1/(1.4)+	0.04] =	2.68				(27)
Window	ws Type	2				6.097	y x1,	/[1/(1.4)+	0.04] =	8.08				(27)
Walls ⁻	Гуре1	22.	3	8.12	2	14.18	3 X	0.15] = [2.13	= 1			(29)
Walls ⁻	Гуре2	31.5	52	2		29.52	2 X	0.14	 	4.18			\exists	(29)
Walls -	ГуреЗ	19.8	34	0		19.84		0.13	[2.62	= i		\dashv	(29)
		lements				73.65			เ	-	L			(31)
			-	ffective wi	ndow U-va			formula 1	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	3.2	
			sides of in				-				-			
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				22.49	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	889.46	(34)
Therm	al mass	parame	ter (TMF	? = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Low		100	(35)
	-		ere the de tailed calcu		constructi	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						5.65	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			28.15	(37)
Ventila	tion hea	at loss ca	alculated	monthly	/			1	(38)m	= 0.33 × (25)m x (5)	1	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	13.32	13.17	13.01	12.25	12.1	11.33	11.33	11.18	11.64	12.1	12.4	12.71		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	41.47	41.31	41.16	40.4	40.24	39.48	39.48	39.32	39.78	40.24	40.55	40.85		
									/	Average =	Sum(39)1	12 /12=	40.36	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.65	0.65	0.64	0.63	0.63	0.62	0.62	0.62	0.62	0.63	0.64	0.64		
Numbe	er of day		nth (Tab	le 12)				!		Average =	Sum(40)1.	12 /12=	0.63	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	⁻ A -13.9)2)] + 0.(0013 x (⁻	TFA -13.		09		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.19		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-	-				
(44)m=	97	93.48	89.95	86.42	82.89	79.37	79.37	82.89	86.42	89.95	93.48	97		
Energy of	content of	hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	m x nm x [)))))))))))))))))))			m(44) ₁₁₂ = ables 1b, 10		1058.22	(44)
(45)m=	143.85	125.82	129.83	113.19	108.61	93.72	86.85	99.66	100.85	117.53	128.29	139.31		
lf instan	taneous w	ator hoati	na at point	t of use (n	l bot water	r storage)	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	-	1387.5	(45)
		18.87	19.47	16.98			13.03	14.95	i	17.63	19.24	20.0		(46)
(46)m= Water	21.58 storage		19.47	10.90	16.29	14.06	13.03	14.95	15.13	17.03	19.24	20.9		(40)
	-) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel	(0		(47)
	-	-		ank in dw	-			. ,						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage		eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
			m Table				"day).					0		(49)
•				, kWh/ye	ear			(48) x (49) =		1	-		(50)
			-	cylinder		or is not		(- / (-)	, ,			10		(00)
		0		rom Tabl	le 2 (kW	h/litre/da	ay)				0.	02		(51)
	-	leating s from Ta	ee secti	on 4.3								00		(50)
			m Table	2b								03 .6		(52) (53)
•				e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		03		(54)
•••		(54) in (5	-	,, .	Jul				, (- , (03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	n = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	1 7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3						(0		(58)
	-						. ,	65 × (41)						
					I	1	r	ng and a	-	1	· · ·	1		
(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 eac	h n	nonth (61)m =	(60)) ÷ 36	65 × (41))m						_	
(61)m=	0	0	0		0	0		0	0	0	0)	0	0	0		(61)
Total h	eat req	uired for	water l	hea	ating ca	alculated	l fo	r eacl	n month	(62)m	= 0.85	5 × ((45)m +	(46)m +	(57)m +	· (59)m + (61)m	
(62)m=	199.13	175.74	185.11	Ţ,	166.68	163.88	14	47.21	142.12	154.9	3 154	.34	172.8	181.78	194.59]	(62)
Solar DH	-IW input	calculated	using Ap	pen	ndix G or	Appendix	н ((negativ	ve quantity	/) (entei	'0' if no	sola	r contribu	tion to wate	er heating)	-	
(add a	dditiona	al lines if	FGHR	Sa	nd/or V	VWHRS	ap	plies,	, see Ap	pendix	(G)						
(63)m=	0	0	0		0	0		0	0	0	0	-	0	0	0		(63)
Output	from w	ater hea	ter														
(64)m=	199.13	175.74	185.11	ſ	166.68	163.88	14	47.21	142.12	154.9	3 154	.34	172.8	181.78	194.59]	
										0	utput fro	m wa	ater heate	er (annual)	12	2038.34	(64)
Heat g	ains fro	m water	heating	g, k	Wh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m] + 0).8 x	د [(46)m	+ (57)m	+ (59)m	n]	
(65)m=	92.05	81.78	87.39		80.43	80.33	7	3.96	73.1	77.36	76.	33	83.3	85.45	90.54]	(65)
inclu	de (57)	m in calo	ulation	n of	(65)m	only if c	ylir	nder is	s in the c	dwellir	g or ho	ot w	ater is f	rom com	munity ł	neating	
5. Int	ernal a	ains (see	e Table	5 a	and 5a):	-				-				-	-	
		ns (Table			ſ												
metab	Jan	Feb	Mar		Apr	May		Jun	Jul	Au		ер	Oct	Nov	Dec]	
(66)m=	104.37	104.37	104.37	-	- 104.37	104.37		04.37	104.37	104.3			104.37	104.37	104.37		(66)
Liahtin	ι α αains	(calcula	ted in A	- App	endix	. equat	ion	L9 oi	r L9a), a	lso se	- Table	2 5	I			1	
(67)m=	17.82	15.83	12.87		9.75	7.29	i —	6.15	6.65	8.64	11.		14.72	17.18	18.32	1	(67)
		ins (calc		in 4										_		J	
(68)m=	182.48	184.37	179.6	-	169.44	156.62	r –	44.56	136.51	134.6			149.55	162.37	174.42	1	(68)
														102.07	174.42	1	()
(69)m=	33.44	(calcula 33.44	33.44	<u> </u>	33.44	23.44	<u> </u>	3.44	33.44	, aiso 33.44			33.44	33.44	33.44	1	(69)
						55.44		5.44	55.44	55.44	. 33.	44	55.44	33.44	55.44	J	(00)
-		ns gains	r.	5a	-		_									1	(70)
(70)m=	0	0	0		0	0		0	0	0	0)	0	0	0		(70)
		/aporatic	<u> </u>	ativ		, ,	r –						1	1	1	1	
(71)m=	-83.5	-83.5	-83.5		-83.5	-83.5	-	83.5	-83.5	-83.5	-83	5.5	-83.5	-83.5	-83.5	J	(71)
		gains (T	<u> </u>	<u> </u>									· · · · ·			1	
(72)m=	123.73	121.69	117.46	; [^	111.71	107.98	10	02.72	98.25	103.9	7 106	.01	111.96	118.68	121.7		(72)
Total i		gains =	:					(66)	m + (67)m	ı + (68)ı	n + (69)r	m + ((70)m + (7	71)m + (72))m	-	
(73)m=	378.34	376.2	364.24	. 3	345.21	326.19	30	07.74	295.72	301.5	4 311	.31	330.54	352.55	368.75		(73)
	lar gain																
-			•	lar fl		Table 6a	and			tions to	convert	to th	ie applica	ble orientat	tion.		
Orienta		Access F Table 6d			Area m ²			Flu Tał	x ole 6a		g_ Table	6h	т	FF able 6c		Gains (W)	
0 11				г							Table	00	, 			. ,	-
Southw		0.77		׼	2.0	3	x	3	6.79		0.63	3		0.7	=	22.77	(79)
Southw	Ļ	0.77		׼	2.0	3	x	6	2.67	ļĻ	0.63	3		0.7	=	38.79	(79)
Southw		0.77		׼	2.0	3	x	8	5.75	ļĹ	0.63	3	×	0.7	=	53.07	(79)
Southw		0.77		׼	2.0	3	x	1(06.25	ļĹ	0.63	3	_ × [0.7	=	65.76	(79)
Southw	est <mark>0.9x</mark>	0.77	:	×	2.0	3	x	1'	19.01		0.63	3	×	0.7	=	73.65	(79)

_		_		_		_		_				_
Southwest _{0.9x}	0.77	x	2.03	x	118.15		0.63	x	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.03	x	113.91]	0.63	x	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	x	2.03	x	104.39]	0.63	x	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	x	2.03	x	92.85]	0.63	x	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	x	2.03	x	69.27]	0.63	x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	x	2.03	x	44.07]	0.63	x	0.7	=	27.27	(79)
Southwest0.9x	0.77	x	2.03	x	31.49]	0.63	x	0.7	=	19.49	(79)
Northwest 0.9x	0.77	x	6.1	x	11.28	x	0.63	x	0.7	=	21.02	(81)
Northwest 0.9x	0.77	x	6.1	x	22.97	x	0.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	x	6.1	x	41.38	x	0.63	x	0.7	=	77.1	(81)
Northwest 0.9x	0.77	x	6.1	x	67.96	x	0.63	x	0.7	=	126.62	(81)
Northwest 0.9x	0.77	x	6.1	x	91.35	x	0.63	x	0.7	=	170.21	(81)
Northwest 0.9x	0.77	x	6.1	x	97.38	x	0.63	x	0.7	=	181.46	(81)
Northwest 0.9x	0.77	x	6.1	x	91.1	x	0.63	x	0.7	=	169.75	(81)
Northwest 0.9x	0.77	x	6.1	x	72.63	x	0.63	x	0.7	=	135.33	(81)
Northwest 0.9x	0.77	x	6.1	x	50.42	x	0.63	x	0.7	=	93.95	(81)
Northwest 0.9x	0.77	x	6.1	x	28.07	x	0.63	x	0.7	=	52.3	(81)
Northwest 0.9x	0.77	x	6.1	x	14.2	x	0.63	x	0.7	=	26.45	(81)
Northwest 0.9x	0.77	x	6.1	x	9.21	x	0.63	x	0.7	=	17.17	(81)
Solar <u>g</u> ains in	watts, calcul	ated	for each mon	th		(83)m	n = Sum(74)m(82)m				

	janis iri	waiis, ce	alculated					(00)11 = 0	uni(74)	(02)	_	_	-	
(83)m=	43.79	81.58	130.17	192.38	243.86	254.58	240.25	199.93	151.41	95.17	53.73	36.66		(83)
Total g	jains – ii	nternal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts							
(84)m=	422.13	457.78	494.41	537.58	570.05	562.32	535.97	501.48	462.72	425.71	406.28	405.41		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livii	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	living are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.94	0.91	0.86	0.76	0.61	0.44	0.32	0.36	0.56	0.79	0.9	0.94		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	19.99	20.16	20.42	20.72	20.9	20.98	21	20.99	20.95	20.72	20.33	19.97		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)					
(88)m=	20.39	20.39	20.39	20.4	20.4	20.41	20.41	20.42	20.41	20.4	20.4	20.39		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.93	0.9	0.85	0.74	0.58	0.4	0.28	0.31	0.52	0.77	0.89	0.94		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)		-		
(90)m=	19.02	19.26	19.63	20.05	20.29	20.39	20.41	20.41	20.36	20.06	19.52	18.99		(90)
I									f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	_A × T1	+ (1 – fL	.A) × T2					
(92)m=	19.51	19.72	20.03	20.39	20.6	20.69	20.71	20.7	20.66	20.39	19.93	19.48		(92)
						· /					1			

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.51	19.72	20.03	20.39	20.6	20.69	20.71	20.7	20.66	20.39	19.93	19.48		(93)
8. Sp	ace hea	ting requ	uirement											
				mperatur using Ta		ed at ste	ep 11 of	Table 9t	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		
Utilisa	ation fac	tor for g	ains, hm	I:										
(94)m=	0.92	0.89	0.84	0.73	0.59	0.42	0.3	0.33	0.54	0.77	0.88	0.93		(94)
Usefu	ıl gains,	hmGm ,	, W = (94	4)m x (84	4)m		-							
(95)m=	387.45	408.08	414.89	395	334.46	235.73	161.13	167.83	248.39	325.93	358.18	375.31		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8							l	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			i	al tempe			1		· · ·	Ē.			I	
(97)m=	630.84	612.12	556.94	464.2	358.24	240.42	162.09	169.28	260.78	394.13	520.11	624.4		(97)
•		- ·	i	r each m							r i		I	
(98)m=	181.08	137.11	105.68	49.82	17.69	0	0	0	0	50.74	116.59	185.32		1
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	844.04	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								13.22	(99)
9b. En	ergy rec	luiremer	nts – Cor	mmunity	heating	scheme)							
				ting, spa							unity sch	neme.		•
Fractio	n of spa	ace heat	from se	condary/	/supplen	nentary l	heating ((Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
				eat from se						up to four (other heat	sources; ti	he latter	
			-	<i>nal and wa</i> ity boiler		ioni powei	stations.	See Apper	iuix C.				1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table 4	4c(3)) fo	r commu	unity hea	iting sys	tem			1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syste	m					1.05	(306)
Space	heating	3											kWh/year	
-		-	requiren	nent									844.04	
Space	heat fro	m Comr	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	=	886.24	(307a)
Efficier	ncy of se	econdary	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	E)		0	(308
Space	heating	requirer	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
	heating I water h		equirem	ent									2038.34	1
If DHW	/ from co	ommunit	ty schen	ne:]
			nunity bo								5) x (306) =		2140.25	(310a)
	•		t distribu					0.01	× [(307a)	(307e) +	· (310a)(310e)] =	30.26	(313)
			•	ncy Ratio									0	(314)
•	-			d cooling					= (107) ÷	· (314) =			0	(315)
				within dw ced, extra				outside					221.43	(330a)

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		221.43	(331)
Energy for lighting (calculated in Appendix L)				314.76	(332)
Electricity generated by PVs (Appendix M) (negative	ve quantity)			-642.21	(333)
Electricity generated by wind turbine (Appendix M)	(negative quantity)			0	(334)
12b. CO2 Emissions – Community heating scheme	9				
	Energy kWh/year	Emission factors kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heatin Efficiency of heat source 1 (%)	ng (not CHP) here is CHP using two fuels repeat (363) to	(366) for the second	fuel	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	695.45	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	15.71	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	=	711.16	(373)

CO2 associated with space heating (se	condary)	(309) x		0	=	0	(374)
CO2 associated with water from immer	sion heater or instanta	neous heater	(312) x	0.22	=	0	(375)
Total CO2 associated with space and w	vater heating	(373) + (374) +	(375) =			711.16	(376)
CO2 associated with electricity for pum	ps and fans within dwe	elling (331)) x		0.52] =	114.92	(378)
CO2 associated with electricity for light	ing	(332))) x		0.52	=	163.36	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	icable		0.52 × 0.	01 =	-333.31	(380)
Total CO2, kg/year	sum of (376)(382) =					656.13	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =					10.28	(384)
El rating (section 14)						91.92	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 33

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling fac Overshading: Overhangs: Thermal mass param Night ventilation: Blinds, curtains, shu Ventilation rate durin Overheating Details: Summer ventilation I Transmission heat lo	es: neter: htters: ng hot we heat loss	coeffici		None Indicativ False	valley			(P1)
Summer heat loss co				28.1 238.76				(P2)
Overhangs:								
Orientation: South West (SW) North West (NW) Solar shading:	Ratio: 0 0		Z_overhangs: 1 1					
J. J								
Orientation: South West (SW) North West (NW)	Z blind 1 1	ls:	Solar access: 0.9 0.9	O v 1 1	verhangs:	Z summer: 0.9 0.9		(P8) (P8)
Solar gains:								
Orientation South West (SW) North West (NW)	0.9 x 0.9 x	Area 2.03 6.1	Flux 119.92 98.85	g_ 0.63 0.63	FF 0.7 0.7	Shading 0.9 0.9 Total	Gains 86.75 215.28 302.02	(P3/P4)
Internal gains:								
Internal gains					June 425.22 748.69	July 409.98 712	August 417.86 674.9	(P5)
Total summer gains Summer gain/loss ration Mean summer externa Thermal mass temperature Likelihood of high in	al tempera ature incre e	ement			3.14 16 1.3 20.44 Not significant	2.98 17.9 1.3 22.18 Medium	2.83 17.8 1.3 21.93 Slight	(P6) (P7)

			User D	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20	12		Stroma Softwa					001082 n: 1.0.5.9	
		Pro	operty A	Address:	Plot 33					
Address :										
1. Overall dwelling dimen	isions:		-	()						
Ground floor			Area	· ·	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³) 159.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n)	63	3.82	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:										
		secondary heating	/	other		total			m ³ per hour	
Number of chimneys		0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	1+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fan	s		- <u> </u>		Ī	2	x ′	10 =	20	(7a)
Number of passive vents						0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s. flues and fans = (6a)+(6b)+(7a	a)+(7b)+(7	⁷ C) =	Г	20	<u> </u>	÷ (5) =	0.13	(8)
If a pressurisation test has be					ontinue fro				0.10	
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	sent, use the value corre					uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	aled) or 0.1	l (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2	· · ·	- C			0	(15)
Infiltration rate				(8) + (10) ·					0	(16)
Air permeability value, c If based on air permeabilit			•	•	•	etre of e	nvelope	area	3	(17)
Air permeability value applies	-					is heina u	sed		0.28	(18)
Number of sides sheltered			, or a dog		incusiinty i	o bonng ut			3	(19)
Shelter factor			((20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor		((21) = (18)	x (20) =				0.21	(21)
Infiltration rate modified fo	r monthly wind spee	d								
Jan Feb M	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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									
(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		

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
	0.27	0.27	0.26	0.23	0.23	0.2	0.2	0.2	0.21	0.23	0.24	0.25		
			change i	rate for t	he appli	cable ca	se	-						
	echanica			ondix N (2	(2b) = (22c)		oquation (I	N5)) , othe	nuico (22h) = (22a)			0	(23a)
) = (23a)			0	(23b)
			-	-	_			n Table 4h			001.) [4 (00 s)	0	(23c)
			i		i	i	1	1	1		<u> </u>	1 – (23c)	÷100]	(24a)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0		(24a)
,						1	, <u>, ,</u>	MV) (24b	í .	, <u>,</u>	, 		1	(2.41)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•	•		on from c c) = (22t		5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•			on from l 0.5 + [(2		0.5]				
(24d)m=	0.54	0.54	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53		(24d)
Effe	ctive air	change	rate - er	ter (24a) or (24t) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.54	0.54	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53		(25)
3 He	at losse	s and he	eat loss p	haramet	≏r.			-				-	•	
	/IENT	Gros		Openin		Net Ar	ea	U-valı	IE	AXU		k-value	2	AXk
		area		m		A ,r		W/m2		(W/I		kJ/m²·l		kJ/K
Doors						2	x	1.4	=	2.8				(26)
Windo	ws Type	e 1				2.025	5 x1	/[1/(1.4)+	0.04] =	2.68				(27)
Windo	ws Type	2				6.097	7 x1	/[1/(1.4)+	0.04] =	8.08	=			(27)
Walls ⁻	Type1	22.	3	8.12	2	14.18	3 X	0.15		2.13				(29)
Walls	Type2	31.5	52	2		29.52	<u>2</u> x	0.14	=	4.18			$\neg \square$	(29)
Walls	ТуреЗ	19.8	34	0		19.84	1 X	0.13		2.62	i F			(29)
Total a	area of e	lements	, m²			73.65	5							(31)
			ows, use e sides of in				lated using	g formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				22.49	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	889.46	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
	•		ere the de tailed calcu		construct	ion are noi	t known pr	recisely the	e indicative	values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	K						5.65	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								` `
Total f	abric he	at loss							(33) +	(36) =			28.15	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y	-	-		(38)m	= 0.33 × (25)m x (5)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	28.28	28.2	28.13	27.78	27.71	27.41	27.41	27.35	27.53	27.71	27.84	27.98		(38)
Heat ti	ransfer c	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	56.42	56.35	56.27	55.92	55.86	55.56	55.56	55.5	55.67	55.86	55.99	56.13		
									/	Average =	Sum(39)	12 /12=	55.92	(39)

Heat lo	oss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.88	0.88	0.88	0.88	0.88	0.87	0.87	0.87	0.87	0.88	0.88	0.88		
Numbe	er of dav	vs in mo	nth (Tab	le 1a)				-		Average =	Sum(40)1	.12 /12=	0.88	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x (⁻	TFA -13.	<u>2.</u> 9)	09		(42)
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o	688. f	.19		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	· · · · ·					
(44)m=	97	93.48	89.95	86.42	82.89	79.37	79.37	82.89	86.42	89.95	93.48	97		
Enorm	contant of	hot water	unad an	loulotod m	onthly - 1	100 v Vd r		Tm / 2600			$m(44)_{112} =$		1058.22	(44)
			. <u> </u>	. <u> </u>			. <u> </u>	DTm / 3600		·		-		
(45)m=	143.85	125.82	129.83	113.19	108.61	93.72	86.85	99.66	100.85	117.53	128.29 m(45) ₁₁₂ =	139.31	1387.5	(45)
lf instant	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		10tal = Su	III(45) ₁₁₂ =		1307.5	
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage								1		··			
-		. ,		• •			-	within sa	ame ves	sel	(0		(47)
	•	-			/elling, e			ı (47) ombi boil	ars) ante	ər '()' in <i>(</i>	47)			
	storage		not wate	51 (1113 11	iciuues i	nstantai	16003 60		ers) erite					
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):				(0		(48)
Tempe	erature fa	actor fro	m Table	2b							(C		(49)
			-	e, kWh/ye				(48) x (49)) =		(0		(50)
				•	loss fact le 2 (kWl									(54)
		•	ee secti			1/11110/02	ay)				()		(51)
		from Ta									(C		(52)
Tempe	erature fa	actor fro	m Table	2b							(C		(53)
0.			•	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	(0		(54)
		(54) in (8									(0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	50), else (5	7)m = (56)	m where (H11) is from	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3						(D		(58)
	•					,	. ,	65 × (41)						
				I	I	1		ng and a	· ·	· · · · · ·	<u> </u>	0		(59)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(39)

Combi	loss ca	alculated	for eac	ch	month ((61)m =	(60	D) ÷ 36	65 × (41))m								
(61)m=	0	0	0		0	0		0	0	0		0	0	0	0			(61)
Total h	neat rec	uired for	water	he	ating ca	alculated	d fo	or eacl	h month	(62)	m =	0.85 ×	(45)m +	(46)m +	(57)m	1+((59)m + (61)m	
(62)m=	122.28	106.94	110.36	3	96.21	92.32	7	79.66	73.82	84.	71	85.72	99.9	109.05	118.4	2		(62)
Solar DI	-IW input	calculated	using A	ppe	ndix G or	Appendix	(H)	(negati	ve quantity	/) (ent	er '0	' if no sola	r contribu	tion to wat	er heatin	ng)		
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	s ap	oplies	, see Ap	penc	lix C	G)	-					
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0			(63)
Output	t from w	vater hea	ter															
(64)m=	122.28	106.94	110.36	3	96.21	92.32	7	79.66	73.82	84.	71	85.72	99.9	109.05	118.4	2		
									-		Outp	out from w	ater heate	er (annual)	112		1179.37	(64)
Heat g	ains fro	om water	heatin	g,	kWh/mo	onth 0.2	5 ′	[0.85	× (45)m	ı + (6	1)m	n] + 0.8 x	k [(46)m	n + (57)m	ı + (59))m []	
(65)m=	30.57	26.74	27.59		24.05	23.08	1	9.92	18.45	21.	18	21.43	24.97	27.26	29.6			(65)
inclu	de (57))m in cal	culatior	۰ ۱o	f (65)m	only if c	: ylir	nder i	s in the a	dwell	ing	or hot w	ater is f	rom com	munity	y he	eating	
5. In	ternal g	ains (see	e Table	5	and 5a):												
		ns (Table																
motab	Jan	Feb	Mai		Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec	с		
(66)m=	104.37	104.37	104.37	7	104.37	104.37	1	04.37	104.37	104	.37	104.37	104.37	104.37	104.3	7		(66)
Lightin	g gains	; (calcula	ted in <i>i</i>	Ар	pendix	L, equat	ion	1 L9 oi	r L9a), a	lso s	ee ⁻	Table 5		1				
(67)m=	17.82	15.83	12.87	<u> </u>	9.75	7.29	1	6.15	6.65	8.6		11.6	14.72	17.18	18.32	2		(67)
Applia	nces da	ains (calc	ulated	in	Append	dix L. ea	uat	tion L	13 or L1	3a). ;	alsc	see Ta	ble 5	1	<u> </u>			
(68)m=	182.48	184.37	179.6	- T	169.44	156.62	<u> </u>	44.56	136.51	134		139.39	149.55	162.37	174.4	2		(68)
Cookir	L gains	s (calcula	ated in	 Ap	pendix	L. equat	tior	า L15	u or L15a`), als	0.56	e Table	5	1				
(69)m=	33.44	33.44	33.44	-i-	33.44	33.44	-	33.44	33.44	33.		33.44	33.44	33.44	33.44	4		(69)
	s and fa	I Ins gains	I (Table	- L 2 5	a)		L			I								
(70)m=				T	0	0		0	0	0		0	0	0	0			(70)
		u vaporatio	I n (neo	L		L es) (Tab	L Je	5)										
(71)m=	-83.5	-83.5	-83.5		-83.5	-83.5	r –	·83.5	-83.5	-83	5	-83.5	-83.5	-83.5	-83.5	5		(71)
		gains (1		_	0010		I	0010	0010			00.0						
(72)m=	41.09	39.79	37.08	ŕ	33.41	31.02		27.66	24.8	28.	46	29.76	33.57	37.86	39.79	3		(72)
		l gains =			00.11	01.02								71)m + (72		<u> </u>		(/
(73)m=	295.7	294.3	283.86	<u>a</u> [266.9	249.23	2	32.69	222.28	226		235.06	252.15	· ·	286.84	4		(73)
	lar gain	1	200.00	<u> </u>	200.0	240.20		02.00	222.20	220	.00	200.00	202.10	211.10	200.0			(, ,
	Ŭ	calculated	using sc	olar	flux from	Table 6a	and	l associ	iated equa	tions	to co	onvert to th	ne applica	ble orienta	tion.			
Orient	ation:	Access F	actor		Area			Flu	x			g_		FF			Gains	
		Table 6d			m²			Tal	ole 6a		Т	able 6b	٦	able 6c			(W)	
Southw	/est <mark>0.9x</mark>	0.77		x	2.0)3	x	3	6.79	1		0.63	X	0.7		= Г	22.77	(79)
Southw	/est <mark>0.9x</mark>	0.77		x	2.0		x	r	2.67	1		0.63	× [0.7	-	- Ē	38.79	(79)
Southw	/est <mark>0.9x</mark>	0.77		x	2.0		x		5.75	1		0.63		0.7	-	- Ē	53.07	(79)
Southw	/est <mark>0.9x</mark>	0.77		x	2.0		x		06.25	1		0.63		0.7	-	- Ē	65.76	(79)
Southw	/est <mark>0.9x</mark>	0.77		x	2.0)3	x		19.01	1		0.63		0.7	-	- F	73.65	(79)

Southwest _{0.9x}	0.77	x	2.0	3	×	118.	15		0.63	}	x	0.7		=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.0	3	×	113.	.91	İ	0.63	;	x	0.7		= İ	70.49	(79)
Southwest _{0.9x}	0.77	x	2.0	3	×	104.	.39		0.63	;	x	0.7		= [64.6	(79)
Southwest _{0.9x}	0.77	x	2.0	3	×	92.8	35		0.63	}	x	0.7		= [57.46	(79)
Southwest _{0.9x}	0.77	x	2.0	3	× [69.2	27		0.63	}	x	0.7		=	42.87	(79)
Southwest _{0.9x}	0.77	x	2.0	3	×	44.()7		0.63	}	x	0.7		=	27.27	(79)
Southwest _{0.9x}	0.77	x	2.0	3	× [31.4	49		0.63	3	x	0.7		=	19.49	(79)
Northwest 0.9x	0.77	x	6.	1	× [11.2	28	x	0.63	}	x	0.7		=	21.02	(81)
Northwest 0.9x	0.77	x	6.	1	× [22.9	97	x	0.63	3	x	0.7		=	42.79	(81)
Northwest 0.9x	0.77	x	6.	1	× [41.3	38	x	0.63	3	x	0.7		= [77.1	(81)
Northwest 0.9x	0.77	x	6.1	1	× [67.9	96	x	0.63	3	x	0.7		=	126.62	(81)
Northwest 0.9x	0.77	x	6.1	1	× [91.3	35	x	0.63	3	x	0.7		=	170.21	(81)
Northwest 0.9x	0.77	x	6.	1	×	97.3	38	x	0.63	}	x	0.7		=	181.46	(81)
Northwest 0.9x	0.77	x	6.	1	×	91.	1	x	0.63	3	x	0.7		=	169.75	(81)
Northwest 0.9x	0.77	x	6.	1	×	72.6	63	x	0.63	}	x	0.7		=	135.33	(81)
Northwest 0.9x	0.77	x	6.	1	×	50.4	42	x	0.63	}	x	0.7		=	93.95	(81)
Northwest 0.9x	0.77	x	6.	1	×	28.0	07	x	0.63	3	x	0.7		= [52.3	(81)
Northwest 0.9x	0.77	x	6.	1	× [14.	2	x	0.63	3	x	0.7		= [26.45	(81)
Northwest 0.9x	0.77	x	6.	1	× [9.2	1	x	0.63	3	x	0.7		= [17.17	(81)
Solar <u>g</u> ains in	watts, ca	lculated	for eac	n month	<u> </u>			(83)m	= Sum(74	l)m((82)m					
(83)m= 43.79	81.58	130.17	192.38	243.86	25	64.58 2	240.25	199	.93 151	.41	95.17	53.73	36.66	6		(83)
Total gains – i	nternal a	nd solar	(84)m =	= (73)m	+ (8	33)m , w	vatts									

rotar y	ains – ii	itemai a	inu solai	(04)111 =	= (73)111 -	+ (03)111	, walls							
(84)m=	339.49	375.88	414.04	459.28	493.09	487.26	462.52	425.96	386.47	347.32	325.46	323.5		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)	-						-
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.97	0.96	0.94	0.88	0.78	0.63	0.49	0.54	0.76	0.91	0.96	0.98		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.11	19.32	19.68	20.16	20.58	20.85	20.95	20.93	20.71	20.18	19.56	19.06		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.18	20.18	20.18	20.19	20.19	20.19	20.19	20.19	20.19	20.19	20.19	20.19		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, l	n2,m (se	e Table	9a)						
(89)m=	0.97	0.96	0.93	0.86	0.74	0.57	0.41	0.47	0.71	0.89	0.95	0.97		(89)
									•					

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

(90)m=	18.43	18.63	18.99	19.46	19.85	20.09	20.17	20.15	19.99	19.49	18.88	18.39		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.51	(91)

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

(92)m= 18.78 18.98 19.34 19.81 20.22 20.47 20.56 20.55 20.35 19.84 19.22 18.73 (92)										
	(92)m=	18.78		19.81	20.47	20.56	20.55	20.35	19.22	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	18.78	18.98	19.34	19.81	20.22	20.47	20.56	20.55	20.35	19.84	19.22	18.73		(93)
8. Spa	ace hea	ting requ	uirement	t										
				mperatui using Ta		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		
Utilisa	tion fac	tor for g	ains, hm	1 <u></u> 1:										
(94)m=	0.96	0.95	0.92	0.85	0.74	0.59	0.45	0.5	0.72	0.88	0.94	0.97		(94)
Usefu	l gains,	hmGm	W = (9	4)m x (84	4)m									
(95)m=	326.01	355.35	379	391.24	366.58	288.28	208.21	213.36	276.94	306.18	307.37	312.19		(95)
Month	nly avera	age exte	rnal terr	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 I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	816.77	793.25	722.43	610.21	475.88	326.3	220.07	230.06	348.17	515.97	678.85	815.42		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Nh/mon	th = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m=	365.12	294.27	255.51	157.66	81.32	0	0	0	0	156.09	267.47	374.4		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	1951.84	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								30.58	(99)
8c Sr		oling rec	uiremer	ht.]
				August.	See Tal	ole 10b								
Calcu	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I				using 2				· ·	· ·		_			
(100)m=	0	0	0	0	0	522.22	411.11	421.79	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.83	0.88	0.86	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) =	(100)m x	(101)m									
(102)m=	0	0	0	0	0	434.61	363.76	362.96	0	0	0	0		(102)
Gains	(solar g	gains ca	culated	for appli	cable we	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	647.72	617.34	576.03	0	0	0	0		(103)
Space	e coolin	g require	ement fo	r month,	whole c	lwelling,	continu	ous (kW	(h) = 0.0	24 x [(10)3)m – (102)m]:	x (41)m	
set (1	04)m to	zero if (104)m <	: 3 × (98)m		i	i						
(104)m=	0	0	0	0	0	153.44	188.66	158.52	0	0	0	0		_
										= Sum(,	=	500.63	(104)
	I fractior								f C =	cooled	area ÷ (4	4) =	1	(105)
		actor (Ta		í									I	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		-
0					(10.1)		(400)		Total	l = Sum(104)	=	0	(106)
· ·		· ·		month =	· · ·	<u>, </u>	<u> </u>	i i i i i i i i i i i i i i i i i i i					I	
(107)m=	0	0	0	0	0	38.36	47.17	39.63	0 Total	0	0	0		
_										= Sum(10.7)	=	125.16	(107)
Space	cooling	requirer	nent in l	‹Wh/m²/y	/ear				(107)	$(+) \div (+) = (+)$			1.96	(108)
8f. Fab	ric Ener	rgy Effici	ency (ca	alculated	l only un	der spec	cial conc	litions, s	ee sectio	on 11)				
Fabrio	Energy	y Efficier	псу						(99) ·	+ (108) =	=		32.54	(109)

SAP Input

Property Details: Pl	ot 33						
Address: Located in: Region: UPRN: Date of assessm Date of certificat Assessment type Transaction type Tenure type: Related party dis Thermal Mass Pa Water use <= 12 PCDF Version:	te: e: e: sclosure: arameter:	08 Ju 28 Oc New 0 New 0 Unkn No re Indica	ies valley ly 2020 ctober 2020 dwelling design stag dwelling	le			
Property description	ו:						
Dwelling type:		Flat					
Detachment: Year Completed:		2020					
Floor Location:		Floo	r area:				
Floor 0		63.82	2 m ²		Storey height 2.5 m	:	
Living area:			3 m ² (fraction 0.50)5)	2.5 11		
Front of dwelling fa	aces:	North					
Opening types:							
Name:	Source:		Type:	Glazing:		Argon:	Frame:
NE SW	Manufacturer Manufacturer		Solid Windows	double-glaze	d	Yes	
NW	Manufacturer	,	Windows	double-glaze		Yes	
Name: NE	Gap: mm		Frame Facto	r: g-value:	U-value: 1.4	Area: 2	No. of Openings:
SW	16mm or m		0.7	0.63	1.4	2.025	1
NW	16mm or m	ore	0.7	0.63	1.4	6.097	1
Name:	Type-Name:		Location:	Orient:		Width:	Height:
NE SW			Corridor Wall External Wall	North East South West		0 0	0 0
NW			External Wall	North West		0	0
Overshading:		Avera	ige or unknown				
Opaque Elements:		7.11010					
Туре:	Gross area: 0	penings:	Net area:	U-value:	Ru value:	Curtain	wall: Kappa:
External Elements							
External Wall Corridor Wall	22.3 31.519	8.12 2	14.18 29.52	0.15 0.15	0 0.4	False False	N/A N/A
Stairwell Wall	19.836	0	19.84	0.15	0.4	False	N/A
Internal Elements Party Elements							
rarty clements							
Thermal bridges:							
Thermal bridges:		User- Leng	defined (individual F th Psi-value		e = 0.0768		

SAP Input

11.6-0.077E17Corner (inverted internal area greater than external area)5.80.096E25Staggered party wall between dwellings[Approved]5.80.06E18Party wall between dwellings32.290P3Intermediate floor between dwellings (in blocks of flats)	A]	pproved]	5.8		E18	Party wall between dwellings
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Ventilation:	
Pressure test: Ventilation: Number of chimneys:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True 0
Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test: Main heating system:	0 0 0 3 3
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: Water heating:	None
Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False
Others:	
Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics:	Standard Tariff Unknown No conservatory 100% Low rise urban / suburban English No <u>Photovoltaic 1</u> Installed Peak power: 0.78 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West
Assess Zero Carbon Home:	No

		ι	User De	tails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 201	12	-		a Numi ire Ver				001082 n: 1.0.5.9	
		Pro	operty Ad	ddress:	Plot 33					
Address :										
1. Overall dwelling dimen	sions:									
Ground floor			Area((1a) x	Av. He	2.5	(2a) =	Volume(m ³) 159.56	(3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e	e)+(1n)	63.	.82	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:										
		econdary heating	0	ther		total			m ³ per hour	
Number of chimneys		0	+	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fan	S				Γ	2	x ′	10 =	20	(7a)
Number of passive vents					Γ	0	x	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimneys	s, flues and fans = (6)	6a)+(6b)+(7a))+(7b)+(7c	c) =	Г	20	<u> </u>	÷ (5) =	0.13	(8)
If a pressurisation test has be					ontinue fro				0110	
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	sent, use the value corres				•	uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	led) or 0.1	(sealed	l), else (enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration					x (14) ÷ 1	- C			0	(15)
Infiltration rate	50				+ (11) + (1				0	(16)
Air permeability value, q If based on air permeabilit			•	•	•	etre of e	nvelope	area	5	(17)
Air permeability value applies	-					s heina u	sed		0.38	(18)
Number of sides sheltered			or a abgre		inousinty i	o boing a	Jou		3	(19)
Shelter factor			(2	20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporatir	ng shelter factor		(2	21) = (18)	x (20) =				0.29	(21)
Infiltration rate modified fo	r monthly wind speed	d								
Jan Feb M	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed 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									
(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		

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m					
	0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34		
			change i	rate for t	he appli	cable ca	se							
	echanica		using Appe	ondix N (2	(2b) = (22c)		oquation (I	NE)) othou	nuico (22h)) = (22a)			0	(23a)
) = (23a)			0	(23b)
			overy: effici	-	_)	006)	4 (00-)	0	(23c)
			i		i	i	1	1	<u> </u>		· -	1 – (23c)	÷100]	(24a)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0		(244)
,			anical ve			1	, <u>, ,</u>	r Ó	ŕ	, ,	, 		1	(2.41)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,			tract ven < (23b), t		•	•				5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or wh en (24d)		•					0.5]	•	-		
(24d)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24d)
Effe	ctive air	change	rate - er	iter (24a) or (24b) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25)
3 Ho	atlosso	s and he	eat loss p	aramot	or.		•	•	•					
ELEN		Gros		Openin		Net Ar	·ea	U-valı		AXU		k-value	2	AXk
		area		m		A,r		W/m2		(W/I	K)	kJ/m²·l		kJ/K
Doors						2	x	1		2				(26)
Windo	ws Type	e 1				2.025	5 x1	/[1/(1.4)+	0.04] =	2.68				(27)
Windo	ws Type	2				6.097	7 x1	/[1/(1.4)+	0.04] =	8.08	=			(27)
Walls ⁻	Type1	22.	3	8.12	2	14.18	3 X	0.18] = [2.55	= r			(29)
Walls	Type2	31.5	52	2		29.52	<u>2</u> x	0.18	= =	5.31	- i			(29)
Walls	ТуреЗ	19.8	34	0		19.84	1 X	0.18	= =	3.57	_ i			(29)
Total a	area of e	lements	, m²			73.65	5							(31)
			ows, use e sides of in				ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	a 3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)) + (32) =				24.2	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	889.46	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K	,		Indica	tive Value	: Medium		250	(35)
	-		ere the de tailed calcu		construct	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						4.83	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			29.04	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	29.95	29.81	29.67	29.02	28.9	28.34	28.34	28.23	28.55	28.9	29.15	29.4		(38)
Heat ti	ansfer c	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	58.98	58.84	58.71	58.06	57.94	57.37	57.37	57.27	57.59	57.94	58.18	58.44		
									/	Average =	Sum(39)1	12 /12=	58.06	(39)

Heat Ic	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.92	0.92	0.92	0.91	0.91	0.9	0.9	0.9	0.9	0.91	0.91	0.92		
Numbe	er of day	/s in mo	nth (Tab	le 1a)				•		Average =	Sum(40)1.	12 /12=	0.91	(40)
- turnoe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
					1		I	1	1	1				
4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		: [1 - exp	(-0.0003	849 x (TF	- A -13.9	9)2)] + 0.(0013 x (⁻	TFA -13		09		(42)
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.78		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	. <u> </u>					
(44)m=	92.15	88.8	85.45	82.1	78.75	75.4	75.4	78.75	82.1	85.45	88.8	92.15		
_											m(44) ₁₁₂ =		1005.31	(44)
					· ·			DTm / 3600		· ·			I	
(45)m=	136.66	119.52	123.34	107.53	103.18	89.03	82.5	94.67	95.8	111.65	121.88	132.35		
lf instant	taneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1318.12	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		ļ	ļ	!	I	!	1	!	!	!			
Storag	e volum	ne (litres)) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
		-			/elling, e			. ,	ara) ant	or (0' in (47)			
	storage		not wate	er (uns n	iciudes i	nstantai	ieous cu	ombi boil	ers) erne		47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	lost fro	om water	· storage	e, kWh/ye	ear			(48) x (49)) =			0		(50)
				•	loss fact								I	(= 4)
		-	ee secti		le 2 (kW	n/litre/da	iy)					0		(51)
	•	from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	om water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (8	55)									0		(55)
Water	storage	loss cal	culated	for each	month	-	-	((56)m = (55) × (41)	m	-			
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain:	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	50), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
								65 × (41)						
					· · · · · ·	1	· · · · · ·	ng and a	· ·	· · · · · ·	, 		I	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for ea	ch	month ((61)m =	(60)) ÷ 36	65 × (41)	m						
(61)m=	0	0	0		0	0		0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r each	h month	(62)m	= 0.85 ×	(45)m -	+ (46)m +	(57)m +	· (59)m + (61)m	
(62)m=	116.16	101.6	104.8	4	91.4	87.7	7	′5.68	70.13	80.47	81.43	94.9	103.59	112.5]	(62)
Solar DH	-IW input	calculated	using A	ppe	endix G or	Appendix	(H)	(negativ	ve quantity) (enter	'0' if no sola	ar contrib	ution to wate	er heating)	-)	
(add a	dditiona	al lines if	FGHR	S a	and/or V	VWHRS	i ap	oplies,	, see Ap	pendix	G)					
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter													
(64)m=	116.16	101.6	104.8	4	91.4	87.7	7	75.68	70.13	80.47	81.43	94.9	103.59	112.5]	
							•			Οι	tput from w	ater hea	er (annual)	112	1120.4	(64)
Heat g	ains fro	m water	heatir	ng,	kWh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (61)	m] + 0.8 :	x [(46)r	n + (57)m	+ (59)m	n]	
(65)m=	29.04	25.4	26.21	Ī	22.85	21.93	1	8.92	17.53	20.12	20.36	23.73	25.9	28.12]	(65)
inclu	Ide (57)	m in calo	ulatio	n o	f (65)m	only if c	vlir	nder is	s in the c	dwellin	g or hot w	/ater is	from com	imunity h	neating	
	. ,	ains (see			. ,	•	,				5			,	Ŭ	
		ns (Table														
Melab	Jan	Feb	<u>, 5), w</u> Ma		S Apr	May	Γ	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m=	104.37	104.37	104.3	-	104.37	104.37	-	04.37	104.37	104.37	· ·	104.37	-	104.37		(66)
											Table 5]	
(67)m=	9 9ans 17.82	15.83	12.87	<u> </u>	9.75	2, equat 7.29	-	6.15	6.65	8.64	11.6	14.72	17.18	18.32	1	(67)
											_		17.10	10.02]	(0.)
		<u>,</u>	r	-			r –			,	so see Ta	T	400.07	474.40	1	(68)
(68)m=	182.48	184.37	179.6		169.44	156.62		44.56	136.51	134.62		149.55	5 162.37	174.42]	(00)
	<u> </u>	<u> </u>		-i		· ·	<u> </u>				see Table	1			1	(00)
(69)m=	33.44	33.44	33.44		33.44	33.44	3	3.44	33.44	33.44	33.44	33.44	33.44	33.44	J	(69)
Pumps	and fa	ns gains	(Table	e 5a	a)		-								7	
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatic	on (neg	gati	ve valu	es) (Tab	le	5)							-	
(71)m=	-83.5	-83.5	-83.5	;	-83.5	-83.5	-	83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5		(71)
Water	heating	gains (T	able 5	5)											_	
(72)m=	39.03	37.8	35.23	3	31.74	29.47	2	26.28	23.56	27.04	28.28	31.89	35.97	37.8		(72)
Total i	nterna	gains =						(66)	m + (67)m	ı + (68)m	+ (69)m +	(70)m +	(71)m + (72)m		
(73)m=	293.64	292.31	282.0	1	265.23	247.68	2	231.3	221.04	224.61	233.57	250.47	269.84	284.86]	(73)
6. So	lar gain	s:														
Solar g	ains are	calculated	using so	olar	flux from	Table 6a	and	associ	ated equa	tions to	convert to th	ne applic	able orienta	tion.		
Orienta		Access F			Area			Flu					FF		Gains	
		Table 6d			m²			Tat	ole 6a		Table 6b		Table 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77		x	2.0)3	x	3	6.79		0.63	x	0.7	=	22.77	(79)
Southw	est <mark>0.9x</mark>	0.77		x	2.0)3	x	6	2.67		0.63	x	0.7	=	38.79	(79)
Southw	est <mark>0.9x</mark>	0.77		x	2.0)3	x	8	5.75		0.63	x	0.7	=	53.07	(79)
Southw	est <mark>0.9x</mark>	0.77		x	2.0)3	x	10	06.25		0.63	x	0.7	=	65.76	(79)
Southw	est <mark>0.9x</mark>	0.77		x	2.0)3	x	1	19.01		0.63	×	0.7	=	73.65	(79)

Southwest _{0.9x}	0.77	x	2.03	×	118.15]	0.63	x	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.03	×	113.91	i	0.63	x	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	x	2.03	×	104.39	İ	0.63	x	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	x	2.03	×	92.85	j	0.63	x	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	x	2.03	×	69.27]	0.63	x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	x	2.03	x	44.07]	0.63	x	0.7	=	27.27	(79)
Southwest0.9x	0.77	x	2.03	×	31.49]	0.63	x	0.7	=	19.49	(79)
Northwest 0.9x	0.77	x	6.1	×	11.28	×	0.63	x	0.7	=	21.02	(81)
Northwest 0.9x	0.77	x	6.1	x	22.97	x	0.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	x	6.1	x	41.38	x	0.63	x	0.7	=	77.1	(81)
Northwest 0.9x	0.77	x	6.1	×	67.96	x	0.63	x	0.7	=	126.62	(81)
Northwest 0.9x	0.77	x	6.1	x	91.35	x	0.63	x	0.7	=	170.21	(81)
Northwest 0.9x	0.77	x	6.1	×	97.38	x	0.63	x	0.7	=	181.46	(81)
Northwest 0.9x	0.77	x	6.1	×	91.1	x	0.63	x	0.7	=	169.75	(81)
Northwest 0.9x	0.77	x	6.1	x	72.63	x	0.63	x	0.7	=	135.33	(81)
Northwest 0.9x	0.77	x	6.1	×	50.42	x	0.63	x	0.7	=	93.95	(81)
Northwest 0.9x	0.77	x	6.1	×	28.07	x	0.63	x	0.7	=	52.3	(81)
Northwest 0.9x	0.77	x	6.1	x	14.2	x	0.63	x	0.7	=	26.45	(81)
Northwest 0.9x	0.77	x	6.1	×	9.21	x	0.63	x	0.7	=	17.17	(81)
Solar gains in	watts, calcul	ated	for each mon	th		(83)m	ı = Sum(74)m(82)m				

Colui g		<i>mailo</i> , ot	aloulutoo	101 000				(00) 0	<u> </u>				_	
(83)m=	43.79	81.58	130.17	192.38	243.86	254.58	240.25	199.93	151.41	95.17	53.73	36.66		(83)
Total g	ains – ii	nternal a	and solar	⁻ (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	337.44	373.89	412.18	457.61	491.54	485.88	461.28	424.54	384.99	345.64	323.56	321.51		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
							from Tak	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for I	living are	ea, h1,m	(see Ta	ble 9a)					l		
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.9	0.72	0.54	0.61	0.87	0.99	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Table	e 9c)		-			
(87)m=	20.01	20.12	20.32	20.6	20.85	20.97	21	20.99	20.91	20.6	20.25	19.98		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	h2 (°C)		-			
(88)m=	20.15	20.15	20.15	20.16	20.16	20.17	20.17	20.17	20.17	20.16	20.16	20.15		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, I	h2,m (se	e Table	9a)					•	
(89)m=	1	1	0.99	0.96	0.86	0.64	0.44	0.5	0.81	0.98	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)			•	
(90)m=	19.23	19.34	19.55	19.83	20.06	20.15	20.17	20.17	20.11	, 19.83	19.49	19.21		(90)
l									f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwei	llina) – fl	Ι Δ 🗸 T1	+ (1 – fL	Δ) v T2				<u> </u>	
										00.00	40.07	10.0	1	(02)

									,				_
(92)m=	19.62	19.74	19.94	20.22	20.46	20.57	20.59	20.58	20.51	20.22	19.87	19.6	(92)
													•

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.62	19.74	19.94	20.22	20.46	20.57	20.59	20.58	20.51	20.22	19.87	19.6		(93)
8. Spa	ace hea	ting requ	uirement	t										
				mperatu using Ta		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm						·					
(94)m=	1	1	0.99	0.96	0.87	0.68	0.49	0.56	0.84	0.98	1	1		(94)
Usefu	l gains.	hmGm	. W = (9	4)m x (84	4)m		1	1	1		1	1		
(95)m=	336.87	372.59	408.22	441.01	428.79	329.58	227.13	236.47	323.87	338.26	322.4	321.11		(95)
Month	nly avera	age exte	rnal terr	nperature	e 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 I	oss rate	e for mea	an interr	nal tempe	erature.	L	L =[(39)m :	r x [(93)m	– (96)m	1	1			
(97)m=	903.74	872.94	788.91	657.32	507.29	342.37	228.68	239.6	369.28	557.16	743.15	900.17		(97)
Space	e heatin	a require	ement fo	r each n	nonth, k	u Wh/mon ⁻	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	421.75	336.24	283.23	155.74	58.41	0	0	0	0	162.86	, 302.94	430.82		
I						1		Tota	l per year	(kWh/yeai	·) = Sum(9	8)15,912 =	2152	(98)
Space	e heatin	g require	ement in	n kWh/m²	²/year								33.72	(99)
8c Sr		oling rec	wiremer	ht								L. L. L. L. L. L. L. L. L. L. L. L. L. L]
				August.	Soo Tal	blo 10b								
Calcu	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I									· ·			able 10)		
(100)m=	0		0			539.3	424.56	435.24		0	0			(100)
` ´ I		tor for lo	l <u> </u>		Ĵ				Ŭ		Ŭ	Ŭ,		(/
(101)m=	0		0	0	0	0.93	0.97	0.95	0	0	0	0		(101)
· · · ·	-	-		1 (100)m x	-					-	-	-		
(102)m=	0	0	0			498.9	410.19	413.14	0	0	0	0		(102)
· · I				for appli	_					Ű	Ů	ů		(-)
(103)m=	0					646.34	616.1	574.61	0	0	0	0		(103)
												 102)m]>	x(41)m	(/
•				< 3 × (98		wenng,	continua	503 (117	11) = 0.0		(102)111]7	((+ 1)))	
(104)m=	0	0	0	0	0	106.16	153.2	120.13	0	0	0	0		
							1		Total	= Sum(104)	=	379.48	(104)
Cooled	fraction	า							f C =	cooled	área ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)								I		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
•									Tota	l = Sum((104)	=	0	(106)
Space	cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n		_	-			
(107)m=	0	0	0	0	0	26.54	38.3	30.03	0	0	0	0		
		-			-				Total	= Sum(107)	=	94.87	(107)
Space	cooling	requirer	ment in l	kWh/m²/y	/ear				(107)) ÷ (4) =		İ	1.49	(108)
8f. Fab	ric Enei	rgy Effici	iency (ca	alculated	l only un	der speo	cial cond	litions, s	ee sectio	on 11)				
Fabric	Energ	y Efficier	псу						(99) ·	+ (108) =	=		35.2	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								40.49	(109)

		ι	Jser Detai	ls:					
Assessor Name:	Zahid Ashraf		Str	oma Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 20	12	So	ftware Ve	rsion:		Versio	n: 1.0.5.9	
		Pro	perty Add	ess: Plot 33					
Address :									
1. Overall dwelling dimer	nsions:								
Ground floor			Area(m ² 63.82) (1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 159.56) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1n)	63.82	(4)			-		_
Dwelling volume				(3a)+(3b)+(3c)+(3d	l)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:									
		secondary heating	oth	er	total			m ³ per hou	r
Number of chimneys	0 +	0	+ (=	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	+ (= [0	x 2	20 =	0	(6b)
Number of intermittent far	าร			L	0	x 1	10 =	0	(7a)
Number of passive vents				Г	0	x 1	10 =	0	(7b)
Number of flueless gas fir	es			Г	0	x 4	40 =	0	(7c)
				L					
							Air ch	anges per ho	our
Infiltration due to chimney If a pressurisation test has be				vise continue fr	0 rom (9) to (÷ (5) =	0	(8)
Number of storeys in th			o (<i>11)</i> , outor		011 (0) 10 (10)		0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timbe	r frame or 0	.35 for ma	sonry consti	ruction			0	(11)
if both types of wall are pro deducting areas of openin		esponding to th	he greater wa	ll area (after					
If suspended wooden fl	- / /	aled) or 0.1	(sealed),	else enter 0				0	(12)
If no draught lobby, ent								0	(13)
Percentage of windows	and doors draught	stripped						0	(14)
Window infiltration			0.25	- [0.2 x (14) ÷ 1	= [00]			0	(15)
Infiltration rate			(8) +	(10) + (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value, o			· ·	-	etre of e	nvelope	area	3	(17)
If based on air permeabili								0.15	(18)
Air permeability value applies Number of sides sheltered		as been done	or a degree	air permeability	is being us	sed			
Shelter factor			(20)	= 1 - [0.075 x (′	19)] =			3 0.78	(19) (20)
Infiltration rate incorporati	ng shelter factor			= (18) x (20) =				0.12	(21)
Infiltration rate modified for	0	ed						0.12	
	Mar Apr May	- i - i	Jul A	ug Sep	Oct	Nov	Dec		
Monthly average wind spe	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 = (22	2)m ∸ 4								
	.23 1.1 1.08	0.95	0.95 0.	92 1	1.08	1.12	1.18		
	<u> </u>							I	

Adjust	ed infiltra	ation rat	e (allowi	ng for sl	nelter an	d wind s	peed) =	(21a) x	(22a)m				_		
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14			
	<i>ate effec</i> echanica		change i	ate for t	he appli	cable ca	se								(23a)
			using Appe	endix N (2	(23a) = (23a	a) x Fmv (e	equation (1	N5)) othe	rwise (23h) = (23a)			0.5		4
			overy: effici		, ,	, ,) = (200)			0.5		(23b)
			anical ve		0				,	2b)m + ('	23h) v [1 _ (23c)	79.0 - 1001)5	(23c)
(24a)m=		0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	 		(24a)
			anical ve									0.2	I		
(24b)m=				0					0	0	0	0	1		(24b)
			tract ven	-	-				-]		. ,
,			(23b), tl		•	•				5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
d) If	natural	ventilatio	on or wh	ole hous	se positiv	ve input	ventilatio	n from l	oft			<u>.</u>	1		
	if (22b)n	n = 1, th	en (24d)	m = (22	b)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]					
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effe			rate - en	ter (24a	<u> </u>	o) or (24	c) or (24	d) in boy	(25)						
(25)m=	0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24			(25)
3. He	at losse	s and he	eat loss p	aramet	er:										
ELEN	IENT	Gros	SS	Openin	igs	Net Ar	ea	U-valu		ΑXU		k-value		АX	
		area	(m²)	n	²	A ,r	n²	W/m2	:Κ,	(W/ł	<)	kJ/m²∙l	K	kJ/	K
Doors						2	x	1.4	=	2.8					(26)
Windo	ws Type	e 1				2.025	; x1	/[1/(1.4)+	0.04] =	2.68					(27)
Windo	ws Type	2				6.097	·	/[1/(1.4)+	0.04] =	8.08					(27)
Walls	Type1	22.3	3	8.12	2	14.18	s x	0.15	= [2.13					(29)
Walls	Type2	31.5	52	2		29.52	<u>x</u>	0.14	=	4.18					(29)
Walls ⁻	ТуреЗ	19.8	34	0		19.84	x	0.13	=	2.62					(29)
Total a	area of e	lements	, m²			73.65	5								(31)
			ows, use e sides of in				ated using	g formula 1	/[(1/U-valu	e)+0.04] a	is given in	paragraph	1 3.2		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				22.4	19	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	889.	46	(34)
Therm	al mass	parame	ter (TMF	? = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	C	(35)
	•		ere the dei tailed calcu		construct	ion are not	t known pr	recisely the	e indicative	values of	TMP in T	able 1f			_
Therm	al bridge	es : S (L	x Y) cale	culated	using Ap	pendix ł	<						5.6	5	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
	abric he								(33) +	(36) =			28.1	15	(37)
Ventila			alculated		í	1			r	= 0.33 × (i –	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	13.32	13.17	13.01	12.25	12.1	11.33	11.33	11.18	11.64	12.1	12.4	12.71			(38)
Heat tr	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	41.47	41.31	41.16	40.4	40.24	39.48	39.48	39.32	39.78	40.24	40.55	40.85			-
									,	Average =	Sum(39)1	12 /12=	40.3	36	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.65	0.65	0.64	0.63	0.63	0.62	0.62	0.62	0.62	0.63	0.64	0.64		
Numb	er of day		nth (Tab	le 12)				!		Average =	Sum(40)1.	12 /12=	0.63	(40)
Numbe	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)
						<u> </u>	I	I						
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.(0013 x (⁻	TFA -13.		09		(42)
Annua <i>Reduce</i>	l averag	e hot wa al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.19		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ii	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-	-	-			
(44)m=	97	93.48	89.95	86.42	82.89	79.37	79.37	82.89	86.42	89.95	93.48	97		-
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x [)))))))))))))))))))			m(44) ₁₁₂ = ables 1b, 1		1058.22	(44)
(45)m=	143.85	125.82	129.83	113.19	108.61	93.72	86.85	99.66	100.85	117.53	128.29	139.31		
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	^r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1387.5	(45)
(46)m=	21.58	18.87	19.47	16.98	16.29	14.06	13.03	14.95	15.13	17.63	19.24	20.9		(46)
	storage		· · · ·	1							·			
-		. ,					-	within sa	ame ves	sel		0		(47)
	•	•		ank in dw er (this ir	•			(47) ombi boil	ers) ente	er '0' in (47)			
	storage			- (· -					,	(
a) If m	nanufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
			-	e, kWh/ye cylinder l		or io not		(48) x (49)) =		1	10		(50)
,				rom Tabl							0.	02		(51)
If com	munity h	eating s	ee secti		,		• /					-		
		from Ta									1.	03		(52)
			m Table								0	.6		(53)
		m water (54) in (5	-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		03		(54) (55)
	. , .	. , .		for each	month			((56)m = (55) x (41)	m	1.	03		(55)
(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)
											H11) is fro		ix H	(00)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	-						. ,	65 × (41)		u 41a - u				
•		-	r	r		1		ng and a	· ·	i	, 	22.26		(59)
(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	alculated	for eac	ch	month ((61)m =	(60)) ÷ 36	65 × (41))m									
(61)m=	0	0	0		0	0		0	0	0		0	0		0	0)		(61)
Total h	neat rec	uired for	water	he	ating ca	alculated	l fo	r eacl	h month	(62)m	= 0.	85 × ((45)m	+ (4	l6)m +	(57)r	m +	(59)m + (61)m	
(62)m=	199.13	175.74	185.1	1	166.68	163.88	1.	47.21	142.12	154.9	3 1	54.34	172.8	3	181.78	194	.59]	(62)
Solar DI	-IW input	calculated	using A	ope	ndix G or	Appendix	(H)	(negati	ve quantity	/) (entei	'0' if r	no sola	r contrib	outio	n to wate	er heat	ting)	-	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	ap	plies	, see Ap	pendix	(G)		_			-		_	
(63)m=	0	0	0		0	0		0	0	0		0	0		0	0)		(63)
Output	t from w	vater hea	iter																
(64)m=	199.13	175.74	185.1	1	166.68	163.88	1.	47.21	142.12	154.9	3 1	54.34	172.8	3	181.78	194	.59		
										0	utput f	from wa	ater hea	ater (annual)₁	12		2038.34	(64)
Heat g	ains fro	om water	heatin	g, I	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	ı + (61)m] +	- 0.8 ×	د [(46)۱	m +	(57)m	+ (59	9)m]	
(65)m=	92.05	81.78	87.39	Τ	80.43	80.33	7	3.96	73.1	77.36	; 7	76.33	83.3		85.45	90.	54		(65)
inclu	de (57))m in cal	culation	י ז ס	f (65)m	only if c	: ylir	nder i	s in the c	dwellir	g or	hot w	ater is	fro	m com	muni	ity h	heating	
5. In	ternal d	ains (see	e Table	5	and 5a):	-				-						-	_	
		ns (Table																	
motab	Jan	Feb	Ma		Apr	May		Jun	Jul	Au		Sep	Oct	t	Nov	D	ес]	
(66)m=	125.24	125.24	125.2	+	125.24	125.24	-	25.24	125.24	125.2	_	25.24	125.2	4	125.24	125			(66)
Liahtin	a aains	s (calcula	ted in <i>i</i>	- L Api	pendix	L. equat	ion	L9 o	r L9a). a	lso se	e Tal	ble 5	1			1		1	
(67)m=	44.56	39.58	32.19	<u> </u>	24.37	18.21	-	5.38	16.62	21.6		28.99	36.81	1	42.96	45.	.8]	(67)
Applia	nces da	ains (calc	ulated	in	Append	lixlea	L Uat	tion L	13 or I 1	i 3a) al		ee Ta	l ble 5	_				1	
(68)m=	272.35	· ·	268.0	-	252.89	233.76	r –	15.77	203.75	200.9		08.05	223.2	1	242.35	260	.33]	(68)
		s (calcula		_							_							1	
(69)m=	49.61	49.61	49.61	-i-	49.61	49.61	<u> </u>	9.61	49.61	49.61	_	19.61	49.61	1	49.61	49.0	61	1	(69)
		Ins gains															-	1	. ,
(70)m=) 	0	0		0	0	0		0	0	Т	0	0)	1	(70)
		vaporatio							Ů	Ů		0	Ů		•			J	. ,
(71)m=	-83.5	-83.5	-83.5	-	-83.5	-83.5	<u> </u>	-83.5	-83.5	-83.5	Τ.	-83.5	-83.5	;	-83.5	-83	5	1	(71)
					00.0	00.0		00.0	00.0	00.0		00.0	00.0	<u></u>	00.0			J	()
(72)m=	123.73	g gains (1 121.69	117.4	ŕ	111.71	107.98	1	02.72	98.25	103.9	7 1	06.01	111.9	6	118.68	121	7	1	(72)
				<u>,</u>	111.71	107.30			m + (67)m								.1	J	(12)
(73)m=	532	I gains =	509.0		480.33	451.3		(00) 25.22	409.98	417.8		134.4	463.3	<u> </u>	495.35	519.	10	1	(73)
	lar gain	1	509.0	<u> </u>	460.33	401.3	4.	25.22	409.98	417.8	0 4	134.4	403.3	4	495.35	519.	.19		(13)
	Ŭ	calculated	using so	lar	flux from	Table 6a	and	associ	iated equa	itions to	conve	ert to th	e applic	able	orientat	tion			
		Access F	•	iai	Area		ana	Flu			g_				FF			Gains	
Onorm		Table 6d			m ²				ble 6a			le 6b		Tał	ole 6c			(W)	
Southw	/est <mark>0.9x</mark>	0.77		x	2.0	13	x	3	86.79	I L	0	.63	x		0.7		_	22.77	(79)
	/est _{0.9x}	0.77		x	2.0		x		62.67			.63		\vdash	0.7		_	38.79](79)
	/est <u>0.9x</u>	0.77		x	2.0		x		35.75	ı L I F		.63		F	0.7		_	53.07](79)
	/est <u>0.9x</u>	0.77		^ x	2.0		x		06.25	IL T		.63		⊨	0.7		_	65.76](79)
	/est <u>0.9x</u>	0.77		x	2.0		x		19.01	」		.63		⊨	0.7		_	73.65	(79)
00000	00.0.3	0.77		^	2.0	13	^	'	19.01		0.	.63	^	1	0.7		_	73.05	(13)

Southwest _{0.9x}	0.77	x	2.0	3	x	118.15]	0.63	×	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.0	3	x	113.91	1	0.63	×	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	x	2.0	3	x	104.39]	0.63	×	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	x	2.0	3	x	92.85]	0.63	×	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	x	2.0	3	x	69.27]	0.63	×	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	x	2.0	3	x	44.07]	0.63	×	0.7	=	27.27	(79)
Southwest0.9x	0.77	x	2.0	3	x	31.49]	0.63	x	0.7	=	19.49	(79)
Northwest 0.9x	0.77	x	6.	1	x	11.28	x	0.63	x	0.7	=	21.02	(81)
Northwest 0.9x	0.77	x	6.1	1	x	22.97	x	0.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	x	6.	1	x	41.38	x	0.63	x	0.7	=	77.1	(81)
Northwest 0.9x	0.77	x	6.	1	x	67.96	x	0.63	×	0.7	=	126.62	(81)
Northwest 0.9x	0.77	x	6.1	1	x	91.35	x	0.63	×	0.7	=	170.21	(81)
Northwest 0.9x	0.77	x	6.	1	x	97.38	x	0.63	×	0.7	=	181.46	(81)
Northwest 0.9x	0.77	x	6.1	1	x	91.1	x	0.63	x	0.7	=	169.75	(81)
Northwest 0.9x	0.77	x	6.1	1	x	72.63	x	0.63	x	0.7	=	135.33	(81)
Northwest 0.9x	0.77	x	6.	1	x	50.42	x	0.63	×	0.7	=	93.95	(81)
Northwest 0.9x	0.77	x	6.	1	x	28.07	x	0.63	×	0.7	=	52.3	(81)
Northwest 0.9x	0.77	x	6.1	1	x	14.2	x	0.63	x	0.7	=	26.45	(81)
Northwest 0.9x	0.77	x	6.	1	x	9.21	x	0.63	×	0.7	=	17.17	(81)
_													
Solar <u>g</u> ains in	watts, ca	alculated	for eacl	n month			(83)m	n = Sum(74)m .	(82)m			_	
(83)m= 43.79	81.58	130.17	192.38	243.86	254.58	240.25	199	.93 151.41	95.17	53.73	36.66		(83)

(83)m=	43.79	81.58	130.17	192.38	243.86	254.58	240.25	199.93	151.41	95.17	53.73	36.66		(83)
Total g	ains – ir	nternal a	nd solar	⁻ (84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	575.79	609.38	639.23	672.71	695.16	679.8	650.22	617.79	585.82	558.5	549.08	555.84		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	rom Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.86	0.83	0.77	0.66	0.52	0.37	0.27	0.29	0.46	0.67	0.81	0.87		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	20.33	20.45	20.64	20.84	20.95	20.99	21	21	20.97	20.85	20.59	20.31		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	20.39	20.39	20.39	20.4	20.4	20.41	20.41	20.42	20.41	20.4	20.4	20.39		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.85	0.81	0.75	0.63	0.49	0.33	0.23	0.25	0.42	0.64	0.79	0.86		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.5	19.67	19.93	20.2	20.34	20.4	20.41	20.41	20.38	20.22	19.87	19.48		(90)
ľ									f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	lling) = fl	_A × T1	+ (1 – fL	.A) × T2			I		
		<u> </u>	· · ·		-			`	<u> </u>		i			

								. (_
(92)m=	19.92	20.07	20.29	20.52	20.65	20.7	20.71	20.71	20.68	20.54	20.23	19.9	(9
												-	-

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

((0.00												I	(02)
(93)m=	19.92	20.07	20.29 uirement	20.52	20.65	20.7	20.71	20.71	20.68	20.54	20.23	19.9		(93)
					re obtair	ed at ste	en 11 of	Table 9t	n so tha	t Ti m=(76)m an	d re-calo	ulate	
			or gains	•					o, oo ala		, ojin an			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	:				-						
(94)m=	0.84	0.81	0.74	0.64	0.5	0.35	0.25	0.27	0.44	0.65	0.78	0.85		(94)
ſ	-		, W = (94	, <u>,</u>	r Ó						1		l	
(95)m=	482.36	490.67	476.16	427.83	346.51	238.31	161.69	168.72	255.84	362.21	430.57	471.51		(95)
r		-	ernal tem		i	i							l	(00)
(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)
r			i		i	ì		x [(93)m	· ,		522.54	644.00	l	(07)
(97)m=	647.68	626.6	567.41	469.45	360.06	240.79	162.16	169.41	261.87	399.97	532.54	641.32		(97)
(98)m=	123	91.35	67.89	29.97	10.08	0	n = 0.02	24 x [(97))m – (95 0	28.1	73.41	126.34		
(90)11=	123	91.55	07.09	29.97	10.00	0	0		-		r) = Sum(9		550.13	(98)
-					.,			TOLA	i per year	(KVVII/yeal	r) = Sum(9	O)15,912 =	550.15	
Space	e heatin	g require	ement in	kWh/m ²	?/year								8.62	(99)
			nts – Cor											
•		•		• •		-		• •	•		unity sch	neme.	0	(301)
	This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none													
	Fraction of space heat from community system 1 – (301) = 1 The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter													
	-							See Apper			ou <i>non</i> nout			
Fractio	n of hea	at from C	Commun	ity boiler	'S								1	(303a)
Fractio	n 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 4	4c(3)) fo	r commu	unity hea	ting sys	tem			1	(305)
Distribu	ution los	s factor	(Table 1	2c) for c	commun	ity heatir	ng syste	m					1.05	(306)
Space	heating	9											kWh/yea	r
Annual	space	heating	requiren	nent									550.13	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	-	577.64	(307a)
Efficier	icy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	e 4a or A	ppendix	: E)		0	(308
Space	heating	require	ment fro	m secon	dary/sup	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water	heating													
	_		equirem	ent									2038.34	
			ty schem nunity bo						(64) x (30	03a) x (30	5) x (306) :	=	2140.25	(310a)
Electric	ity used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	- (310a)([310e)] =	27.18	(313)
Cooling	g Syster	n Energ	y Efficie	ncy Rati	0								0	(314)
Space	cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	· (314) =			0	(315)
Electric	ity for p	oumps a	nd fans v	within dv	velling (1	Table 4f)	:							
			- balanc					outside					221.43	(330a)

warm air heating system fans			0 ((330b)
pump for solar water heating			0 ((330g)
Total electricity for the above, kWh/	/year	=(330a) + (330b) + (330g) =	221.43 ((331)
Energy for lighting (calculated in Ap	ppendix L)		314.76 ((332)
Electricity generated by PVs (Appen	ndix M) (negative quantity)		-642.21 ((333)
Electricity generated by wind turbin	e (Appendix M) (negative quantity)		0 ((334)
10b. Fuel costs – Community heat	ting scheme			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0	.01 = 24.49 ((340a)
Water heating from CHP	(310a) x	4.24 × 0	.01 = 90.75 ((342a)
		Fuel Price		
Pumps and fans	(331)	13.19 × 0	.01 =((349)
Energy for lighting	(332)	13.19 × 0	.01 = 41.52 ((350)
Additional standing charges (Table	12)		120 ((351)
Energy saving/generation technolog Total energy cost	= (340a)(342e) + (345)(354) =		305.96 ((355)
11b. SAP rating - Community heat	ting scheme			
Energy cost deflator (Table 12)			0.42 ((356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =			(357)
SAP rating (section12)			83.53 ((358)
12b. CO2 Emissions – Community		nergy Emission fa	ctor Emissions	
		Wh/year kg CO2/kWh		
CO2 from other sources of space a Efficiency of heat source 1 (%)	3 ()	els repeat (363) to (366) for the seco	nd fuel 94 ((367a)
CO2 associated with heat source 1	[(307b)+(310b)] >	x 100 ÷ (367b) x 0.22	= 624.54 ((367)
Electrical energy for heat distributio	on [(313) x	0.52	= 14.11 ((372)
Total CO2 associated with commun	nity systems (363)(366) + (368)(372)	= 638.64 ((373)
CO2 associated with space heating	g (secondary) (309) x	0	= 0 ((374)
CO2 associated with water from im-	mersion heater or instantaneous he	eater (312) x 0.22	= 0 ((375)
Total CO2 associated with space a	nd water heating (373) + ((374) + (375) =	638.64 ((376)
CO2 associated with electricity for p	pumps and fans within dwelling (33	31)) x 0.52	= 114.92 ((378)
CO2 associated with electricity for I	lighting (332))) x	0.52	= 163.36 ((379)
Energy saving/generation technolog	gies (333) to (334) as applicable	0.52 × 0	.01 =333.31 ((380)
Total CO2, kg/year	sum of (376)(382) =		583.61	(383)

Dwelling CO2 Emission Rate (383) ÷ (4) = El rating (section 14)				9.14	(384)
13b. Primary Energy – Community heating scheme				02.01	
	Energy kWh/year	Primary factor		Energy Nh/year	
Energy from other sources of space and water heating (no Efficiency of heat source 1 (%) If there is CH	t CHP) P using two fuels repeat (363) to	(366) for the second	fuel	94	(367a)
Energy associated with heat source 1 [(3	307b)+(310b)] x 100 ÷ (367b) x	1.22	=	3527.47	(367)
Electrical energy for heat distribution	[(313) x		=	83.44	(372)
Total Energy associated with community systems	(363)(366) + (368)(37)	2)	=	3610.91	(373)
if it is negative set (373) to zero (unless specified otherw	vise, see C7 in Appendix C)		3610.91	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from immersion heater or ins	stantaneous heater(312) x	1.22	=	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =			3610.91	(376)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Energy associated with electricity for pumps and fans with	in dwelling (331)) x	3.07	=	679.78	(378)
Energy associated with electricity for lighting	(332))) x	3.07	=	966.32	(379)
Energy saving/generation technologies Item 1		3.07 × 0.01	=	-1971.59	(380)
Total Primary Energy, kWh/year sum of	(376)(382) =			3285.41	(383)

		Usei	r Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 201	2		a Numb are Vers				001082 n: 1.0.5.9	
			ty Address:						
Address :									
1. Overall dwelling dimer	nsions:								
Ground floor			r ea(m²) 63.82	(1a) x	Av. Hei g 2.		(2a) =	Volume(m ³) 159.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	63.82	(4)					
Dwelling volume				(3a)+(3b)+	-(3c)+(3d)	+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:	-	_							
Number of chimneys	heating H	econdary neating 0 +	other] = [total 0		40 = 20 =	m ³ per hour	(6a)
Number of open flues		0 +	0	」⁻∟	0			0	(6b)
Number of intermittent fan	S				2	x 1	0 =	20	(7a)
Number of passive vents					0	x 1	0 =	0	(7b)
Number of flueless gas fire	es				0	x 4	- 0	0	(7c)
							Air ch	anges per hou	ur
Infiltration due to chimney				ontinue froi	20 m (9) to (1		÷ (5) =	0.13	(8)
Number of storeys in the Additional infiltration	e dwelling (ns)					[(9)-	1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	esent, use the value corres gs); if equal user 0.35	ponding to the gr	eater wall area	a (after	iction			0](11)
If suspended wooden flo		led) or 0.1 (sea	aled), else (enter 0				0	(12)
If no draught lobby, ente		win n o d						0	(13)
Percentage of windows Window infiltration	and doors draught s	прреа	0.25 - [0.2	x (14) ÷ 10	01 =			0	(14)
Infiltration rate				⊦ (11) + (12	- C	(15) =		0	(15) (16)
Air permeability value, c	150. expressed in cub	oic metres per					area	5	(17)
If based on air permeabilit		•						0.38	(18)
Air permeability value applies	if a pressurisation test ha	s been done or a	degree air per	meability is	s being us	ed	I		
Number of sides sheltered	ł		((/				3	(19)
Shelter factor				0.075 x (19))] =			0.78	(20)
Infiltration rate incorporation	-		(21) = (18)	x (20) =				0.29	(21)
Infiltration rate modified fo		1 1			<u> </u>		_		
	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe						1		I	
(22)m= 5.1 5 4	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				<u> </u>				
(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		

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m					
	0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34		
	<i>ate effec</i> echanica		change i	rate for t	he appli	cable ca	se							(00-)
				andix N (2	(25) = (23)	a) v Emv (a	acuation (I	N5)) , othe	nwise (23b) - (232)			0	(23a)
) = (23a)			0	(23b)
			-	-	-			n Table 4h)	006)	4 (00-)	0	(23c)
					i			HR) (24a	m = (22)	20)m + (. 0	23D) × [0	1 – (23c)	÷100]	(24a)
(24a)m=		-	0	-	0	-			-	-	Ů	0		(24a)
					1	1		ИV) (24b	,	, ,	· · · · · · · · · · · · · · · · · · ·		l	(0.4b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•	•		on from c c) = (22b		5 × (23b))		_	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,								on from l 0.5 + [(2		0.5]				
(24d)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in boy	x (25)		-	-		
(25)m=	0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25)
3 Ho	at losse	s and he	eat loss p	haramet	≏r.									
	MENT	Gros		Openin		Net Ar	ea	U-valı	IE	AXU		k-value	2	AXk
		area		n		A ,r		W/m2		(W/I	K)	kJ/m²·l		kJ/K
Doors						2	x	1	=	2				(26)
Windo	ws Type	e 1				2.025	5 x1	/[1/(1.4)+	0.04] =	2.68				(27)
Windo	ws Type	2				6.097	7 x1	/[1/(1.4)+	0.04] =	8.08				(27)
Walls [•]	Type1	22.	3	8.12	2	14.18	3 X	0.18] = [2.55	= r			(29)
Walls	Type2	31.5	52	2		29.52	2 X	0.18	; = [5.31	i F		\exists	(29)
Walls	ТуреЗ	19.8	34	0		19.84	1 X	0.18		3.57	ו ד		\exists	(29)
Total a	area of e	lements	, m²			73.65	5		เ		L			(31)
* for win	ndows and	roof wind				alue calcul		formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				24.2	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	889.4	
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K	,		Indica	tive Value	: Medium		250	(35)
	-		ere the de tailed calc		construct	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
			x Y) cal		using Ap	pendix l	K						4.83	(36)
	-		, are not kn			-								()
	abric he			. ,	·				(33) +	(36) =			29.04	(37)
Ventila	ation hea	at loss ca	alculated	I monthly	y				(38)m	= 0.33 × (25)m x (5)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	29.95	29.81	29.67	29.02	28.9	28.34	28.34	28.23	28.55	28.9	29.15	29.4		(38)
Heat t	ransfer c	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	58.98	58.84	58.71	58.06	57.94	57.37	57.37	57.27	57.59	57.94	58.18	58.44		
	·					•	•	•	/	Average =	Sum(39)	12 /12=	58.06	3) (39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.92	0.92	0.92	0.91	0.91	0.9	0.9	0.9	0.9	0.91	0.91	0.92		
Numb	er of day		nth (Tab	le 12)					,	Average =	Sum(40)1.	12 /12=	0.91	(40)
Numb	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
. ,														
4. Wa	ater heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
if TF	ned occu A > 13.9 A £ 13.9	9, N = 1		: [1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.(0013 x (⁻	TFA -13.		09		(42)
Annua <i>Reduce</i>	l averag	e hot wa al average	hot water		5% if the a	welling is	designed	(25 x N) to achieve		se target o		.78		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage il	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)		-				
(44)m=	92.15	88.8	85.45	82.1	78.75	75.4	75.4	78.75	82.1	85.45	88.8	92.15		_
Energy	content of	hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,r	m x nm x E	DTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1005.31	(44)
(45)m=	136.66	119.52	123.34	107.53	103.18	89.03	82.5	94.67	95.8	111.65	121.88	132.35		
			·		· · · ·	· · ·		·		Total = Su	m(45) ₁₁₂ =	-	1318.12	(45)
			· ·		-			boxes (46)	1	i	1		l	
(46)m= Water	^{20.5} storage	17.93 loss:	18.5	16.13	15.48	13.36	12.38	14.2	14.37	16.75	18.28	19.85		(46)
	-		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
Otherv Water	vise if no storage	o stored loss:	hot wate	ank in dw er (this ir oss facto	ncludes i	nstantar	neous co	(47) ombi boil	ers) ente	er '0' in (39		(48)
,	erature f					,	, , , , , , , , , , , , , , , , , , ,					54		(49)
Energ	y lost fro	m water	. storage	e, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
Hot wa		age loss	factor fi	cylinder l rom Tabl								0		(51)
	e factor	-		011 4.5								0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
-			-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	(50) or (,		_						0.	75		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m= If cylind	23.33 er contains	21.07 dedicate	23.33 d solar sto	22.58 rage, (57)	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)] ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Append	ix H	(56)
(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)
Prima	v circuit	loss (ar	nual) fro	om Table	• 3			•				0		(58)
Prima	ry circuit	loss cal	culated	for each	month (. ,	65 × (41) ng and a		r thermo			I	
(110 (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)
1	L		I	I			I	I		I	I			

Combi	loss ca	lculated	for eac	h mont	h (61)m =	(60	D) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0		0	0	0	0	0	0	0]	(61)
Total h	eat req	uired for	water I	neating	calculate	d fo	or eac	h month	(62)m :	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	183.26	161.61	169.93	152.6	2 149.77	1	34.13	129.1	141.27	140.9	158.25	166.97	178.94		(62)
Solar DH	IW input	calculated	using Ap	pendix G	or Appendi	хH	(negati	ve quantity	/) (enter '	0' if no sola	r contribu	tion to wate	er heating)	-	
(add ad	dditiona	l lines if	FGHR	S and/o	r WWHR	S aj	oplies	, see Ap	pendix	G)					
(63)m=	0	0	0	0	0	Γ	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter		-							-		•	
(64)m=	183.26	161.61	169.93	152.6	2 149.77	1	34.13	129.1	141.27	140.9	158.25	166.97	178.94]	
									Ou	tput from w	ater heate	∎ er (annual)₁	12	1866.74	(64)
Heat g	ains fro	m water	heating	g, kWh/	month 0.2	25 ´	[0.85	× (45)m	+ (61)ı	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1]	
(65)m=	82.72	73.41	78.29	71.8		-	- 65.68	64.71	68.75	67.93	74.4	76.6	81.28	Ī	(65)
inclu	de (57)	n in calo	culation	of (65)	m only if	cvli	nder i	s in the c	dwelling	ı or hot w	vater is f	rom com	nunitv h	reating	
		ains (see		. ,	-	- ,				,				J	
					<i>i</i> a).										
Melabo	Jan	ns (Table Feb	Mar		· May	Т	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m=	104.37	104.37	104.37	<u> </u>			04.37	104.37	104.37	104.37	104.37	104.37	104.37		(66)
												101.07	101.01	1	()
(67)m=	9 yans 17.82	15.83	12.87	9.75	x L, equa	-	6.15	6.65	8.64	11.6	14.72	17.18	18.32	1	(67)
		I			_							17.10	10.32	J	(07)
		<u>,</u>	r		ndix L, ed	T		-	,	T	r —			1	(69)
(68)m=	182.48	184.37	179.6	169.4			44.56	136.51	134.62	139.39	149.55	162.37	174.42	J	(68)
1		<u> </u>		<u> </u>	ix L, equa	-					1		ı —	1	
(69)m=	33.44	33.44	33.44	33.44	33.44	3	33.44	33.44	33.44	33.44	33.44	33.44	33.44]	(69)
Pumps	and fa	ns gains	(Table	5a)				-					i	•	
(70)m=	3	3	3	3	3		3	3	3	3	3	3	3		(70)
Losses	s e.g. e\	/aporatio	on (neg	ative va	lues) (Tal	ole	5)						-	_	
(71)m=	-83.5	-83.5	-83.5	-83.5	-83.5		-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5		(71)
Water	heating	gains (T	able 5))											
(72)m=	111.18	109.24	105.22	99.76	96.21	9	91.22	86.97	92.41	94.35	100	106.38	109.25		(72)
Total i	nternal	gains =					(66)	m + (67)m	ı + (68)m	+ (69)m +	- (70)m + (71)m + (72))m	•	
(73)m=	368.79	366.75	355.01	336.2	6 317.43	2	99.25	287.44	292.98	302.64	321.58	343.25	359.3]	(73)
6. Sol	ar gain:	s:	•								•				
Solar g	ains are o	calculated	using sol	ar flux fro	om Table 6a	anc	lassoc	iated equa	tions to c	onvert to th	ne applica	ble orientat	tion.		
Orienta		Access F		Ar			Flu			g_		FF		Gains	
	-	Table 6d		m	2		Tal	ole 6a	-	Table 6b	T	able 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77	;	×	2.03	x	3	6.79		0.63	x	0.7	=	22.77	(79)
Southw	est <mark>0.9x</mark>	0.77	;	×	2.03	x	6	2.67		0.63	x [0.7	=	38.79	(79)
Southw	est <mark>0.9x</mark>	0.77	:	× 🗌	2.03	x	8	5.75		0.63	X	0.7	=	53.07	(79)
Southw	est <mark>0.9x</mark>	0.77	;	× 🗌	2.03	x	1	06.25	i F	0.63		0.7	=	65.76	(79)
Southw	est <mark>0.9x</mark>	0.77		×	2.03	x	1	19.01	i F	0.63	× [0.7	=	73.65	(79)

Southwest _{0.9x}	0.77	x	2.03	x	118.15		0.63	x	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.03	x	113.91	ĺ	0.63	x	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	x	2.03	x	104.39	İ	0.63	x	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	×	2.03	x	92.85	İ	0.63	x	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	×	2.03	x	69.27	İ	0.63	x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	x	2.03	x	44.07	İ	0.63	x	0.7	=	27.27	(79)
Southwest0.9x	0.77	x	2.03	x	31.49	İ	0.63	x	0.7	=	19.49	(79)
Northwest 0.9x	0.77	×	6.1	x	11.28	×	0.63	x	0.7	=	21.02	(81)
Northwest 0.9x	0.77	x	6.1	x	22.97	×	0.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	×	6.1	x	41.38	×	0.63	x	0.7	=	77.1	(81)
Northwest 0.9x	0.77	x	6.1	x	67.96	x	0.63	x	0.7	=	126.62	(81)
Northwest 0.9x	0.77	x	6.1	x	91.35	x	0.63	x	0.7	=	170.21	(81)
Northwest 0.9x	0.77	x	6.1	x	97.38	x	0.63	x	0.7	=	181.46	(81)
Northwest 0.9x	0.77	x	6.1	x	91.1	x	0.63	x	0.7	=	169.75	(81)
Northwest 0.9x	0.77	x	6.1	x	72.63	x	0.63	x	0.7	=	135.33	(81)
Northwest 0.9x	0.77	x	6.1	x	50.42	x	0.63	x	0.7	=	93.95	(81)
Northwest 0.9x	0.77	x	6.1	x	28.07	x	0.63	x	0.7	=	52.3	(81)
Northwest 0.9x	0.77	x	6.1	x	14.2	x	0.63	x	0.7	=	26.45	(81)
Northwest 0.9x	0.77	x	6.1	x	9.21	×	0.63	x	0.7	=	17.17	(81)

Solar g	ains in	watts, ca	alculated	for eac	n month			(83)m = S	um(74)m .	(82)m	_	_		
(83)m=	43.79	81.58	130.17	192.38	243.86	254.58	240.25	199.93	151.41	95.17	53.73	36.66		(83)
Total g	ains – ii	nternal a	and solar	(84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	412.58	448.33	485.18	528.64	561.28	553.82	527.69	492.91	454.06	416.75	396.98	395.96		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	eating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	living are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.99	0.95	0.84	0.64	0.48	0.53	0.8	0.96	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	20.12	20.23	20.43	20.69	20.9	20.98	21	21	20.94	20.69	20.36	20.1		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	20.15	20.15	20.15	20.16	20.16	20.17	20.17	20.17	20.17	20.16	20.16	20.15		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, l	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.93	0.79	0.57	0.39	0.44	0.73	0.95	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.97	19.13	19.42	19.8	20.06	20.16	20.17	20.17	20.12	19.8	19.33	18.94		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	ling) = fl	_A × T1	+ (1 – fL	.A) × T2					
(92)m=	19.55	19.69	19.93	20.25	20.48	20.58	20.59	20.59	20.54	20.25	19.85	19.53		(92)
م ا م م ۸			h a 100 a a a		10.000.00		m Tabla	10						

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(00)	10.00	40.00	00.05	00.40	00.50	00.50	00.50	00.54	00.05	40.05	40.50	l	(02)
(93)m= 19.55	19.69	19.93	20.25	20.48	20.58	20.59	20.59	20.54	20.25	19.85	19.53		(93)
8. Space heating requirement													
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ictor for g	ı Jains, hm			1		<u> </u>						
(94)m= 0.99	0.99	0.98	0.93	0.81	0.61	0.43	0.48	0.76	0.95	0.99	1		(94)
Useful gains	s, hmGm	, W = (94	4)m x (8-	4)m	•		•						
(95)m= 410.51	444.28	474.86	494.05	456.78	335.75	227.99	238.29	345.08	396.59	392.81	394.38		(95)
Monthly average external temperature from Table 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 mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]													
<mark>(97)m=</mark> 899.54	870.08	788.28	658.89	508.91	342.82	228.75	239.75	370.77	559.24	741.98	895.68		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m													
(98)m= 363.84	286.14	233.18	118.69	38.78	0	0	0	0	121.01	251.4	372.97		_
Total per year (kWh/year) = Sum(98) _{15,912} =										8)15,912 =	1786.02	(98)	
Space heating requirement in kWh/m²/year										27.98	(99)		
9a. Energy re	auireme	nts – Indi	ividual h	eating s	vstems i	ncludina	micro-C	CHP)					
Space heat				outing o	y otornio i	lioidanig		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
Fraction of space heat from secondary/supplementary system								0	(201)				
Fraction of space heat from main system(s) $(202) = 1 - (201) =$									1	(202)			
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$									1	(204)			
									93.5	(206)			
Efficiency of main space heating system 1													
Efficiency of secondary/supplementary heating system, %									0	(208)			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heati	- · · ·	i È	1	1								l	
363.84	286.14	233.18	118.69	38.78	0	0	0	0	121.01	251.4	372.97		
(211)m = {[(9	-i	04)] } x 1	00 ÷ (20)6)	1		1				1	1	(211)
389.13	306.03	249.4	126.94	41.48	0	0	0	0	129.42	268.88	398.9		_
							Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	2=	1910.18	(211)
Space heati	•			month									
= {[(98)m x (2		1	<u> </u>										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		-
							lota	l (kWh/yea	ar) = Sum(2)	215) _{15,1012}	2	0	(215)
Water heatin	•												
Output from 183.26		169.93	ulated a	bove) 149.77	134.13	129.1	141.27	140.9	158.25	166.97	178.94		
Efficiency of			102.02	149.77	134.13	129.1	141.27	140.9	156.25	100.97	176.94	70.0	(216)
-		· · · · · ·	04.45	04 70	70.0	70.0	70.0	70.0	04.44	05.0	00.70	79.8	
(217)m= 86.61 86.32 85.66 84.15 81.79 79.8 79.8 79.8 79.8 84.11 85.9 86.73									(217)				
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m													
(219)m= 211.59	T	198.39	181.36	183.12	168.08	161.78	177.03	176.56	188.14	194.37	206.32		
L	<u> </u>	1	1	1	1		Tota	l = Sum(2	19a) ₁₁₂ =	1		2233.95	(219)
Annual totals kWh/year										kWh/yea			
Space heating fuel used, main system 1									1910.18	7			
											I		1

Water heating fuel used	2233.95]			
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	sum of (230a		75	(231)	
Electricity for lighting				314.76	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	412.6	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	482.53	(264)
Space and water heating	(261) + (262) + (263) + (264) =			895.13	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	163.36	(268)
Total CO2, kg/year	sum	of (265)(271) =		1097.42	(272)

TER =

(273)

17.19