Regulations Compliance Report

Printed on 28 October 2020 at 14:55		ma FSAP 2012 program, Version: 1.0.5.9)
Project Information:			
Assessed By: Zahid Ashraf (S	RO001082)	Building Type: Flat	
Dwelling Details:			
NEW DWELLING DESIGN STAGE		Total Floor Area: 63.82m ²	
Site Reference : Hermitage Lane		Plot Reference: Plot 7	
Address :			
Client Details:			
Name:			
Address :			
This report covers items included	within the SAP calculations.		
It is not a complete report of regul			
1a TER and DER	-		
Fuel for main heating system: Mains	gas (c)		
Fuel factor: 1.00 (mains gas (c))			
Target Carbon Dioxide Emission Rat	e (TER)	20.67 kg/m ²	
Dwelling Carbon Dioxide Emission R	ate (DER)	13.29 kg/m²	OK
1b TFEE and DFEE			
Target Fabric Energy Efficiency (TFE		58.4 kWh/m²	
Dwelling Fabric Energy Efficiency (D	FEE)	45.0 kWh/m²	
			ОК
2 Fabric U-values			
Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	OK
2a Thermal bridging			
	from linear thermal transmitta	nces for each junction	
3 Air permeability			
Air permeability at 50 pascals		3.00 (design value)	01/
Maximum		10.0	OK
4 Heating efficiency			
Main Heating system:	Community heating schem	nes - mains gas	
		-	
Secondary heating system:	None		
5 Cylinder insulation			
Hot water Storage:	No cylinder		
6 Controls			
Space heating controls		use of community heating,	
	programmer and at least to	wo room thermostats	OK
Hot water controls:	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%	OK
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	
Floors U-value	0.12 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

			User De	etails:						
Assessor Name:	Zahid Ashraf		ę	Stroma	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 201	2	:	Softwa	re Ver	sion:		Versio	n: 1.0.5.9	
		Pr	operty A	ddress:	Plot 7					
Address :										
1. Overall dwelling dimer	isions:									
One word file on			Area	. ,	<i></i> .		ight(m)	1	Volume(m ³)	_
Ground floor				3.82	(1a) x	2	2.5	(2a) =	159.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)) 63	3.82	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:										_
		econdary neating	/ (other		total			m ³ per hour	,
Number of chimneys		0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	i + 🗖	0] = [0	x	20 =	0	(6b)
Number of intermittent fan	s					0	x ′	10 =	0](7a)
Number of passive vents						0	x ^	10 =	0	 (7b)
Number of flueless gas fire	25					-	×4	40 =	-	<u> </u>
Number of nucless gas in	55					0	^		0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans = (6)	a)+(6b)+(7a	a)+(7b)+(7	′c) =	Г	0	<u> </u>	÷ (5) =	0	(8)
If a pressurisation test has be	en carried out or is intende	ed, proceed	to (17), o	therwise c	ontinue fro	om (9) to (
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2					•	uction			0	(11)
if both types of wall are pre deducting areas of opening			ine greate		a (allel					
If suspended wooden flo	oor, enter 0.2 (unsea	led) 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 st	ripped				0.01			0	(14)
Window infiltration				0.25 - [0.2		-	(45)		0	(15)
Infiltration rate Air permeability value, c	50 overessed in sub	via motros		(8) + (10) ·		<i>·</i> · · <i>·</i>		araa	0	(16)
If based on air permeabilit			•				invelope	alea	3	(17) (18)
Air permeability value applies	•					is being u	sed		0.15	
Number of sides sheltered	1		-		-	-			3	(19)
Shelter factor			((20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor		((21) = (18)	x (20) =				0.12	(21)
Infiltration rate modified fo	r monthly wind speed	k L					1		1	
Jan Feb N	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe		,	,						I	
(22)m= 5.1 5 4	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	I	I – I					I		I	

Adjust	ed infiltra	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]	
	ate effec echanica		change i	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N (2	3b) = (23a	a) x Fmv (e	equation (N	N5)) , othei	wise (23h) = (23a)			0.5	
								n Table 4h) = (20u)			0.5	(23b)
					U		,			2b)m i (22b) v [·	1 (22a)	79.05	(23c)
(24a)m=		0.25	0.25	0.23	0.23	0.22	0.22	HR) (24a 0.21	0.22	0.23	230) × [0.24	0.24]]	(24a)
												0.24	J	(210)
0) II (24b)m=								۷V) (24b 0	0 = (22)	20)m + (2 0	230)	0	1	(24b)
									-	0	0	0	J	(210)
,					•	•		on from c c) = (22b		5 x (23h)			
(24c)m=	<u>, </u>	0	0		0		0		0	0	0	0]	(24c)
			-	-				on from I		-			J	
,					•			0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (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)
2 40	at loose	o ond ha	eat loss p	oromot	or			•					•	
		Gros		Openin		Net Ar	00	U-valı		AXU		k-value	Δ Δ	Xk
		area		m	-	A,r		W/m2		(W/I	<)	kJ/m ² ·l		J/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	, x1	/[1/(1.4)+	0.04] =	8.08				(27)
Floor						63.82	3 x	0.12		7.65876				(28)
Walls ⁻	Tvpe1	20.9	95	8.12	,	12.83		0.15		1.92			\dashv	(29)
Walls		29.6		2		27.62		0.14		3.91	╡╏		\dashv	(29)
Walls		18.6				18.64			=		╡╏		\dashv	
	area of e			0				0.13	=	2.46	[(29)
				foctivo wi	ndowlly	133.0		, formula 1	/[/1/11.volu	(a) = 0.041 c	n aivon in	naragraph	22	(31)
			sides of in				aleu using	nonnula 1,	/[(1/ 0- vait	ie)+0.04j d	is given in	parayrapi	1 3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				29.52	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	5613.96	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For des	ign assess	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
			tailed calcu											
	-		x Y) cal			-	<						13.8	(36)
	s of therma abric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			40.00	(37)
			alculated	monthly						= 0.33 × (25)m v (5)		43.32	(37)
v Gritile	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	= 0.33 x (Nov	Dec	1	
(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)
				0								I	1	x/
	ransfer of 56.64	56.49	nt, VV/K 56.33	55.57	55.42	54.65	54.65	54.5	(39)m 54.96	= (37) + (3 55.42	55.72	56.03	1	
(39)m=	50.04	50.49	50.55	55.57	00.42	54.00	54.05	54.5		Average =			55.53	(39)
										· - · ~ g ~ -		·····		N/

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.89	0.89	0.88	0.87	0.87	0.86	0.86	0.85	0.86	0.87	0.87	0.88		
Numbe	ar of day		nth (Tab	le 12)		I			,	Average =	Sum(40)1	.12 /12=	0.87	(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	iter 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	2. 9)	09		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o	88 f	.19		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	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		
Enerav	content of	hot water	used - cal	culated m	onthly – 4	190 x Vd r	n y nm y [)Tm / 3600			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		
(43)11=	143.05	125.02	129.03	113.19	108.01	93.72	00.05	99.00			m(45) ₁₁₂ =		1387.5	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46					1007.0	
(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		inaludir		- 		-						I	
-		. ,		• •			•	within sa	ame ves	501	()		(47)
	•	-		ank in dw er (this ir	-			ombi boil	ers) ente	er '0' in (47)			
	storage			·										
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				()		(48)
•			m Table								()		(49)
•••			-	e, kWh/ye cylinder l		or is not		(48) x (49)) =		11	10		(50)
				rom Tabl							0.	02		(51)
If comr	munity h	eating s	ee secti	on 4.3			• •							
		from Ta		0							1.	03		(52)
•			m Table								0.	.6		(53)
		m water (54) in (5	-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.			(54) (55)
		. , .	,	for each	month			((56)m = ((55) × (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	l	(56)
· · ·											30.96 H11) is fro		ix H	(30)
(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)
					I)		(58)
		•		om Table for each		59)m = ((58) ÷ 36	65 × (41)	m			,		(00)
	•						. ,	ng and a		r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

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	1	
(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)

Southwest0.9x	0.77	×	2.03	x	118.15]	0.63	x	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	×	2.03	x	113.91	İ	0.63	x	0.7	=	70.49	(79)
Southwest0.9x	0.77	x	2.03	x	104.39		0.63	x	0.7	=	64.6	(79)
Southwest0.9x	0.77	×	2.03	x	92.85		0.63	x	0.7	=	57.46	(79)
Southwest0.9x	0.77	x	2.03	x	69.27		0.63	x	0.7	=	42.87	(79)
Southwest0.9x	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	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m											

		,						<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 – ir	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	neating 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	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.95	0.94	0.9	0.83	0.72	0.56	0.43	0.47	0.68	0.86	0.93	0.96		(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=	19.33	19.52	19.86	20.31	20.67	20.89	20.97	20.95	20.8	20.35	19.77	19.29		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, Tl	n2 (°C)					
(88)m=	20.18	20.18	20.18	20.19	20.19	20.2	20.2	20.21	20.2	20.19	20.19	20.19		(88)
Utilisa	ation fac	tor for g	ains for I	rest of d	welling, I	h2,m (se	e Table	9a)					-	
(89)m=	0.95	0.93	0.89	0.81	0.68	0.51	0.36	0.4	0.63	0.83	0.92	0.95		(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=	17.92	18.2	18.69	19.33	19.82	20.1	20.18	20.17	19.99	19.39	18.58	17.88		(90)
			-				-		f	LA = Livin	g area ÷ (4	4) =	0.51	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(2.2)	40.00	· · ·	<u>,</u>						, 	40.07	40.40	40.50	1	(00)

				-		• /							
(92)m=	18.63	18.87	19.28	19.82	20.25	20.5	20.58	20.57	20.4	19.87	19.18	18.59	(92)
													-

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

				10.00								10.50	l	(00)
· /	18.63	18.87	19.28	19.82	20.25	20.5	20.58	20.57	20.4	19.87	19.18	18.59		(93)
8. Space					re obtair	ned at st	on 11 of	Table 9t	n so tha	t Ti m–(76)m an	d re-calc	ulate	
the utilis				•					, 30 tha	(, , , , , , , , , , , , , , , , , , ,	<i>i</i> 0)111 an			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatic	on fact	or for g	ains, hm	:				-			-			
(94)m= (0.93	0.91	0.88	0.8	0.68	0.53	0.39	0.43	0.64	0.82	0.91	0.94		(94)
Useful g	·			ŕ	· · · · · · · · · · · · · · · · · · ·	1	1	1		1		1		()
	93.21	417.77	432.89	430.89	389.95	296.26	209.75	216.62	296.29	350.82	368.24	380.15		(95)
Monthly	-	-		r <u> </u>		i	40.0	40.4	444	10.0	74	4.0		(06)
``	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)
	11.75	789	720.06	606.95	473.85	322.59	217.37	x [(93)m·	- (96)m 346.24	513.96	673.32	806.34		(97)
	-							24 x [(97)				000.04		(01)
	311.4	249.46	213.65	126.76	62.42	0	0	0	0	121.38	219.66	317.09		
								Tota	l per year	(kWh/yea	I r) = Sum(9	8)15,912 =	1621.83	(98)
Space h	pating		amont in	$kM/h/m^2$	woor						, , , , , , , , , , , , , , , , , , ,		25.41	(99)
	-	· •											20.41	(33)
9b. Energ									ded by					
This part Fraction of						-		• •	•		unity scr	ieme.	0	(301)
Fraction							-	(/ -				1	(302)
					•		,	- 11			- 11 1 1			(302)
The commu includes bo	-	-								up to tour	other heat	sources; ti	ne latter	
Fraction of	of hea	t from C	Commun	ity boiler	S								1	(303a)
Fraction of	of tota	l space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for	r contr	ol and o	charging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1	(305)
Distributio	on los	s factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space he	eating												kWh/yea	ar
Annual s	pace h	eating	requiren	nent									1621.83	
Space he	eat fror	m Comr	nunity b	oilers					(98) x (30	04a) x (30	5) x (306)	=	1702.92	(307a)
Efficiency	y of se	condary	//supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space he	eating	requirer	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water he	eating													
Annual w		eating r	equirem	ent									2038.34	
lf DHW fr Water he			•						(64) x (30	03a) x (30	5) x (306) :	-	2140.25	(310a)
Electricity	y used	for hea	t distrib	ution				0.01	× [(307a).	(307e) +	- (310a)((310e)] =	38.43	(313)
Cooling S	System	n Energ	y Efficie	ncy Rati	0								0	(314)
Space co	oling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	- (314) =			0	(315)
Electricity mechanic														(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 Appendix L)				314.76	(332)
Electricity generated by PVs (Appendix M) (ne	gative quantity)			-642.21	(333)
Electricity generated by wind turbine (Appendi	x M) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating scl	neme				
	Energy kWh/year	Emission fac kg CO2/kWh		nissions g CO2/year	
CO2 from other sources of space and water h Efficiency of heat source 1 (%)	eating (not CHP) If there is CHP using two fuels repeat (363) to (366) for the secon	nd fuel	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	883.11	(367)
Electrical energy for heat distribution	[(313) x	0.52	=	19.95	(372)
Total CO2 associated with community system	S (363)(366) + (368)(372))	=	903.06	(373)
CO2 associated with space heating (secondar	y) (309) ×	0	=	0	(374)

(373) + (374) + (375) =

(332))) x

Dwelling CO2 Emission Rate

Total CO2, kg/year

Item 1

Total CO2 associated with space and water heating

CO2 associated with electricity for lighting

CO2 associated with electricity for pumps and fans within dwelling (331)) x

sum of (376)...(382) =

(383) ÷ (4) =

Energy saving/generation technologies (333) to (334) as applicable

El rating (section 14)

x 0.01 =

0.52

0.52

0.52

=

=

(376)

(378)

(379)

(380)

(383)

(384)

(385)

903.06

114.92

163.36

-333.31

848.03

13.29

89.56

SAP 2012 Overheating Assessment

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

Property Details: Plot 7

Transmission heat loss coefficient: 43.3 253.94 (P2) Overhangs: (P2) Orientation: Ratio: Z_overhangs: South West (SW) 0 1 North West (NW) 0 1 Solar shading: Solar access: Overhangs: Z summer: South West (SW) 1 0.9 1 0.9 (P8) North West (SW) 1 0.9 1 0.9 (P8) Solar gains: Solar access: Overhangs: Z summer: Solar gains: Orientation Area Flux g FF Shading Gains South West (SW) 0.9 x 2.03 119.92 0.63 0.7 0.9 86.75 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 86.75 Internal gains: June July August 425.22 409.98 417.86 Internal gains: 2.95 2.8 2.66 (P5) 2.95 2.8 2.66 (P5) 59 Summer gain/loss ratio Mean sum	Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass param Night ventilation: Blinds, curtains, shut Ventilation rate durin Overheating Details:	es: eter: tters: g hot we	-		No 1 North E Averag None Indicat False 4 (Wir	s valley East e or unknown ive Value Low ndows fully open)			(P1)	
Overhangs: Ratio: Z_overhangs: South West (SW) 0 1 North West (NW) 0 1 Solar shading: Solar shading: Orientation: Z blinds: Solar access: Overhangs: Z summer: South West (SW) 1 0.9 1 0.9 (P8) North West (SW) 1 0.9 1 0.9 (P8) South West (SW) 1 0.9 1 0.9 (P8) South West (SW) 1 0.9 1 0.9 (P8) South West (SW) 0.9 x 2.03 119.92 0.63 0.7 0.9 86.75 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 Total 302.02 (P3/P4) Internal gains Total 302.02 (P3/P4) Internal gains 748.69 712 674.9 (P5) 2.95 2.8 2.66 (P6) Mean summer external temperature	Transmission heat lo	ss coeffi	cient:	ent.					. ,	
Orientation: South West (SW)Ratio: 0Z_overhangs: 1South West (SW)01Solar shading:Z blinds:Solar access: 0.9Overhangs: 1Z summer: 0.9South West (SW)10.91Orientation: South West (SW)2 blinds:Solar access: 0.9Overhangs: 1Z summer: 0.9South West (SW)10.91Orientation Solar gains:Area 2.03Flux 11.92FFShading 0.63Gains 0.7Orientation South West (SW)Area 0.9 xFlux 2.03g_ 11.92FFShading 0.63Gains 0.7South West (SW) North West (NW)0.9 x2.03119.920.630.70.9215.28 TotalGains 302.02(P3/P4)Internal gains Total gainsJune 425.22July 409.98August 417.86August 417.86Internal gains Total summer gain/loss ratio Hean summer external temperature (Thames valley)June 1.6July 1.3August 2.952.8Internal gains Threshold temperature1.31.31.31.31.31.31.31.31.31.31.31.40.952.952.82.66(P7)Medium1.31.31.31.31.31.31.31.31.31.31.31.40.952.952.22.1.76(P7)		efficient:			253.94				(P2)	
South West (SW) 0 1 North West (NW) 0 1 Solar shading: Overhangs: Z summer: South West (SW) 1 0.9 1 0.9 (P8) North West (NW) 1 0.9 1 0.9 (P8) South West (SW) 1 0.9 1 0.9 (P8) Solar gains: Solar gains: Solar gains: Solar gains: Solar south West (SW) 0.9 x 2.03 119.92 0.63 0.7 0.9 86.75 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 Total 302.02 (P3/P4) Total 302.02 (P3/P4) Internal gains June July August 417.86 Total summer gains Z Summer gain/loss ratio 2.95 2.8 2.66 (P5) Summer gain/loss ratio Z Sola 1.3 1.3 1.3 1.3 Threshold temperature <th coli<="" th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th>	<th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>									
North West (NW) 0 1 Solar shading: Overhangs: Z summer: South West (SW) 1 0.9 1 0.9 (P8) North West (NW) 1 0.9 1 0.9 (P8) Solar gains: Overhangs: Z summer: Shading Gains South West (SW) 0.9 x 2.03 119.92 0.63 0.7 0.9 86.75 South West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 Internal gains Total 302.02 (P3/P4) Internal gains June July August 425.22 409.98 417.86 Total summer gain/loss ratio Summer summer external temperature (Thames valley) 16 17.9 17.8 Internal mass temperature increment 1.3 1.3 1.3 1.3 1.3 Threshold temperature Weak				_ •						
Solar shading: Orientation: Z blinds: Solar access: Overhangs: Z summer: South West (SW) 1 0.9 1 0.9 (P8) North West (NW) 1 0.9 1 0.9 (P8) Solar gains: Orientation Area Flux g_ FF Shading Gains South West (SW) 0.9 x 2.03 119.92 0.63 0.7 0.9 86.75 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 Internal gains Total 302.02 (P3/P4) 117.86 171.2 674.9 (P5) Summer gain/loss ratio June July August 425.22 409.98 417.86 674.9 (P5) Summer gain/loss ratio 2.95 2.8 2.66 (P6) 1.3 1.3 1.3 1.3	• •									
South West (SW) 1 0.9 1 0.9 (P8) North West (NW) 1 0.9 1 0.9 (P8) Solar gains:	• •									
South West (SW) 1 0.9 1 0.9 (P8) North West (NW) 1 0.9 1 0.9 (P8) Solar gains: Solar gains: FF Shading Gains Gains South West (SW) 0.9 x 2.03 119.92 0.63 0.7 0.9 86.75 South West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 Internal gains June July August 425.22 409.98 417.86 Total summer gains 2.95 2.8 2.66 (P5) Summer gain/loss ratio 2.95 2.8 2.66 (P6) Mean summer external temperature increment 1.3 1.3 1.3 1.3 Threshold temperature 1.3 1.3 1.3 1.3 1.3 Likelihood of high internal temperature Not significant Medium Slight P7	Orientation:	Z blind	ls:	Solar access:	c)verhangs:	Z summer:			
Solar gains: Area Flux g_ FF Shading Gains South West (SW) 0.9 x 2.03 119.92 0.63 0.7 0.9 86.75 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 Internal gains: Total 302.02 (P3/P4) Total 302.02 (P3/P4) Internal gains June July August Total summer gains 425.22 409.98 417.86 Summer gain/loss ratio 2.95 2.8 2.66 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Threshold temperature 1.3 1.3 1.3 1.3 Likelihood of high internal temperature Xot significant Medium Slight						-			(P8)	
Orientation Area South West (SW) 0.9 x 2.03 6.1 119.92 98.85 0.63 0.63 0.7 0.7 0.9 0.9 Shading 86.75 0.9 Gains 86.75 215.28 302.02 FF North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 302.02 (P3/P4) Internal gains: June July August 425.22 409.98 417.86 674.9 (P5) Summer gains/ Total summer gains/ Summer gain/loss ratio 2.95 2.8 2.66 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 1.3 Threshold temperature 1.3 1.3 1.3 1.3 1.3 Likelihood of high internal temperature Vertice Vertice Vertice Vertice Vertice	North West (NW)	1		0.9	1		0.9		(P8)	
South West (SW) 0.9 x 2.03 119.92 0.63 0.7 0.9 86.75 North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 Total 302.02 (P3/P4) Internal gains Internal gains June July August Internal gains 425.22 409.98 417.86 Total summer gains 748.69 712 674.9 (P5) Summer gain/loss ratio 2.95 2.8 2.66 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Threshold temperature 1.3 1.3 1.3 1.3 20.25 22 21.76 (P7) Not significant Medium Slight	Solar gains:									
North West (NW) 0.9 x 6.1 98.85 0.63 0.7 0.9 215.28 302.02 (P3/P4) Internal gains: June July August Internal gains 425.22 409.98 417.86 Total summer gains 2.95 2.8 426.9 Summer gain/loss ratio 2.95 2.8 2.66 Mean summer external temperature (Thames valley) 16 17.9 17.8 Threshold temperature 1.3 1.3 1.3 1.3 Z0.25 22 21.76 (P7) Not significant Medium Slight	Orientation		Area	Flux	g_	FF	Shading	Gains		
Total302.02 (P3/P4)Internal gains:JuneJulyAugustInternal gains425.22409.98417.86Total summer gains748.69712674.9 (P5)Summer gain/loss ratio2.952.82.66 (P6)Mean summer external temperature (Thames valley)1617.917.8Thermal mass temperature increment1.31.31.3Threshold temperature20.252221.76 (P7)Likelihood of high internal temperatureNot significantMediumSlight	. ,									
JuneJulyAugustInternal gains425.22409.98417.86Total summer gains748.69712674.9(P5)Summer gain/loss ratio2.952.82.66(P6)Mean summer external temperature (Thames valley)1617.917.8Thermal mass temperature increment1.31.31.3Threshold temperature20.252221.76(P7)Likelihood of high internal temperatureNot significantMediumSlight	North West (NW)	0.9 x	6.1	98.85	0.63	0.7			(P3/P4)	
JuneJulyAugustInternal gains425.22409.98417.86Total summer gains748.69712674.9(P5)Summer gain/loss ratio2.952.82.66(P6)Mean summer external temperature (Thames valley)1617.917.8Thermal mass temperature increment1.31.31.3(P7)Likelihood of high internal temperatureNot significantMediumSlight	Internal gains:							302.02	(1 0/1 1)	
Assessment of likelihood of high internal temperature:	Internal gains Total summer gains Summer gain/loss ratio Mean summer externa Thermal mass tempera Threshold temperature	I tempera ature incre	ement			425.22 748.69 2.95 16 1.3 20.25	409.98 712 2.8 17.9 1.3 22	417.86 674.9 2.66 17.8 1.3 21.76	(P5) (P6)	
Assessment of international of high internation perature. <u>Medium</u>	Assessment of likelih	nood of h	igh inte	ernal temperatu	re:	<u>Medium</u>				

			User D	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2	012		Stroma Softwa					001082 on: 1.0.5.9	
		P	roperty /	Address:	Plot 7					
Address :										
1. Overall dwelling dimen	sions:									
Ground floor				a(m²) 3.82	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³) 159.56	(3a)
Total floor area TFA = (1a))+(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 hour	
Number of chimneys	0 +		+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0] + [⁻	0] = [0	x	20 =	0	(6b)
Number of intermittent fan	s					2	x /	10 =	20	 _(7a)
Number of passive vents						0	x /	10 =	0	 (7b)
Number of flueless gas fire	es					0	x 4	40 =	0	(7c)
, i i i i i i i i i i i i i i i i i i i					L	-]	A :=		
					_			AIr Ch	anges per ho	ur —
Infiltration due to chimneys If a pressurisation test has be					continue fro	20 om (9) to (÷ (5) =	0.13	(8)
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 co				•	uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (uns	ealed) or 0.	1 (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 draugh	t stripped							0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate	EQ overcoord in a	ubio motro		(8) + (10)				oroo	0	(16)
Air permeability value, q If based on air permeabilit	•		•	•	•		invelope	alea	3	(17) (18)
Air permeability value applies						is being u	sed		0.28	
Number of sides sheltered				•		Ū			3	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)) x (20) =				0.21	(21)
Infiltration rate modified fo	r monthly wind spe	ed								
Jan Feb M	/lar Apr Ma	ay 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)	im ÷ 4									
(22a)m= 1.27 1.25 1.	23 1.1 1.08	3 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(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		
	<i>ate effec</i> echanica		change i	rate for t	he appli	cable ca	se							(23a)
				endix N (2	3h) - (23a	a) x Emv (e	equation (N	N5)) , othei	wise (23h) – (23a)			0	
								n Table 4h)) = (200)			0	(23b)
			-	-	-					2b)m i (f	226) v [/	1 (22a)	0	(23c)
(24a)m=								HR) (24a	0 = (22)	$\frac{20}{0}$	23D) × [1 - (230)	÷ 100]	(24a)
		-		-	-	-		-	÷	-	ů	0		(210)
,								ИV) (24b 0	m = (22)	$\frac{1}{2} \frac{1}{2} \frac{1}$	230)	0		(24b)
(24b)m=		-		-	-	-	-	•	Ţ	0	0	0		(240)
,					•			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=	0.54	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	nter (24a) or (24t	o) 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)
2 1 10	et lesses				o #1			1						
		s and ne Gros	eat loss p			Net Ar	200	U-valı	10	AXU		k-value	Λ	Xk
ELEN	IENT	area		Openin rr		A ,r		W/m2		(W/ł	<)	kJ/m²·l		J/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)
Floor						63.82	3 X	0.12		7.65876	3			(28)
Walls ⁻	Type1	20.9	95	8.12	!	12.83	3 X	0.15] = [1.92	ז ר		= _	(29)
Walls	Type2	29.6	52	2		27.62	<u>2</u> x	0.14		3.91				(29)
Walls ⁻	Туре3	18.6	64	0		18.64	+ ×	0.13		2.46			\dashv	(29)
Total a	area of e			L		133.0			เ		L			(31)
				effective wi	ndow U-va			formula 1	/[(1/U-valu	ie)+0.04] a	ns given in	paragraph	3.2	
** incluc	le the area	as on both	sides of ir	nternal wal	ls and par	titions								
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				29.52	(33)
Heat c	apacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	5613.96	(34)
Therm	al mass	parame	eter (TMF	P = Cm -	- TFA) ir	∩ kJ/m²K			Indica	tive Value:	: Low		100	(35)
	-		ere the de tailed calci		construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						13.8	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								
	abric he								(33) +	(36) =			43.32	(37)
Ventila	ation hea	at loss ca	alculated	l monthly	y 		r		(38)m	= 0.33 × (25)m x (5)		I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		<i>i</i> = 1
(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 o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		L	
(39)m=	71.6	71.52	71.45	71.1	71.03	70.73	70.73	70.67	70.85	71.03	71.16	71.3		
										Average =	Sum(39)1	12 /12=	71.1	(39)

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.12	1.12	1.12	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.12	1.12		
Numbe	er of day	/s in mo	nth (Tab	le 1a)	•	•	•	•	,	Average =	Sum(40)1.	.12 /12=	1.11	(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	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	349 x (TF	- A -13.9)2)] + 0.(0013 x (⁻	TFA -13	2. .9)	09		(42)
Reduce	the annua	al average	hot water	usage by		welling 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 i	n litres pei	r day for ea		Vd,m = fa	ctor from	Table 1c x	-						
(44)m=	97	93.48	89.95	86.42	82.89	79.37	79.37	82.89	86.42	89.95	93.48	97		
_											m(44) ₁₁₂ =		1058.22	(44)
Energy o	content of	. <u> </u>	used - cal	culated me	· ·	190 x Vd,ı	m x nm x [DTm / 3600) kWh/mor	· ·	ables 1b, 1	c, 1d)	I	
(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 instant	taneous v		1387.5	(45)										
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage										·			
-		. ,		• •			-	within sa	ame ves	sel	(0		(47)
	•	-			velling, e			ı (47) ombi boil	ore) onto	ar '∩' in <i>(</i>	(17)			
	storage		not wat	51 (ti 115 11		nstantai								
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):				(C		(48)
Tempe	erature f	actor fro	m Table	2b							()		(49)
•••			-	e, kWh/ye				(48) x (49)) =		(C		(50)
				•	loss fact									(= 1)
		age loss neating s			le 2 (kW	n/iitre/da	ay)				()		(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 (5	55)								()		(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	rage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	i0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3						(D		(58)
	•						. ,	65 × (41)						
•			· · · · · ·	I	· · · · · ·	· · · · · ·	r	ng and a	· ·	· · · · · ·	, 		l	(==)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

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)
		J 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	1 .	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)

Southwest0.9x	0.77	x	2.	03	x	1	18.15]	0.63		x	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.	03	x	1	13.91	1	0.63		x	0.7	_ =	70.49	(79)
Southwest _{0.9x}	0.77	x	2.	03	x	1	04.39]	0.63		x	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	x	2.	03	x	g	2.85]	0.63		x	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	x	2.	03	x	6	9.27]	0.63		x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	x	2.	03	x	4	4.07]	0.63		x	0.7	=	27.27	(79)
Southwest0.9x	0.77	x	2.	03	x	3	31.49]	0.63		x	0.7	=	19.49	(79)
Northwest 0.9x	0.77	x	6	.1	x	1	1.28	x	0.63		x	0.7	=	21.02	(81)
Northwest 0.9x	0.77	x	6	.1	x	2	22.97	x	0.63		x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	x	6	.1	x	4	1.38	x	0.63		x	0.7	=	77.1	(81)
Northwest 0.9x	0.77	x	6	6.1 ×		6	67.96	x	0.63		x	0.7	=	126.62	(81)
Northwest 0.9x	0.77	x	6	6.1 ×		g	91.35	x	0.63		x	0.7	=	170.21	(81)
Northwest 0.9x	0.77	x	6	.1	x	g	97.38	x	0.63		x	0.7	=	181.46	(81)
Northwest 0.9x	0.77	x	6	.1	x	ļ	91.1	x	0.63		x	0.7	=	169.75	(81)
Northwest 0.9x	0.77	x	6	.1	x	7	2.63	x	0.63		x	0.7	=	135.33	(81)
Northwest 0.9x	0.77	x	6	.1	x	5	50.42	x	0.63		x	0.7	=	93.95	(81)
Northwest 0.9x	0.77	x	6	.1	x	2	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	ļ	9.21	x	0.63		x	0.7	=	17.17	(81)
_								-							_
Solar <u>g</u> ains in	Solar gains in watts, calculated for each month $(83)m = Sum(74)m \dots (82)m$														
(83)m= 43.79	43.79 81.58 130.17 192.38 243.				2	54.58	240.25	199	.93 151.	41	95.17	53.73	36.66		(83)
Total gains – i	nternal a	nd sola	r (84)m	= (73)m	+ (8	33)m	. watts		•						

Total gains – internal and solar $(84)m = (73)m + (83)m$, watts														
(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	Utilisation factor for gains for living area, h1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.97	0.96	0.95	0.9	0.82	0.7	0.57	0.62	0.81	0.92	0.96	0.98		(86)
Mean	Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)													
(87)m=	18.56	18.77	19.18	19.74	20.28	20.68	20.87	20.83	20.5	19.82	19.09	18.5		(87)
Temp	erature	during h	eating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.98	19.98	19.98	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99	19.99		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	0.97	0.96	0.94	0.89	0.79	0.63	0.47	0.53	0.75	0.91	0.96	0.97		(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=	17.74	17.95	18.36	18.91	19.42	19.79	19.93	19.91	19.64	18.99	18.27	17.69		(90)

$fLA = Living area \div (4) =$	0.51	(91)
--------------------------------	------	------

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

													_
(92)m=	18.15	18.37	18.77	19.33	19.85	20.24	20.41	20.37	20.07	19.41	18.68	18.1	(92)
								4		• •			•

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

(93)m=	18.15	18.37	18.77	19.33	19.85	20.24	20.41	20.37	20.07	19.41	18.68	18.1		(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	n:											
(94)m=	0.96	0.95	0.92	0.87	0.78	0.65	0.52	0.57	0.76	0.9	0.95	0.97		(94)	
Usefu	l gains,	hmGm	W = (9	4)m x (84	4)m										
(95)m=	326.2	356.35	382.15	400.2	385.93	317.44	238.45	240.77	293.48	310.89	308.27	312.2		(95)	
Month	nly avera	age exte	rnal tem	perature	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	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]					
(97)m=	991.75	963.05	876.7	741.27	579.24	398.94	269.15	280.92	423.02	625.68	824.39	991.24		(97)	
Space	Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$														
(98)m=	8)m= 495.17 407.7 367.95 245.57 143.82 0 0 0 0 234.2 371.6 505.21 Total per year (kWh/year) = Sum(98) ₁₅₉₁₂ =														
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2771.21	(98)	
Space	e heatin	g require	ement in	kWh/m²	/year								43.42	(99)	
8c Sr	nace co	oling rec	uiremer	nt											
				August.	See Tal	ole 10b									
Calcu	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Heat I	oss rate														
(100)m=	0	0	0	0	0	664.86	523.4	537.12	0	0	0	0		(100)	
Utilisa	ation fac	tor for lo	ss hm												
(101)m=	0	0	0	0	0	0.72	0.78	0.75	0	0	0	0		(101)	
Usefu	l loss, h	mLm (V	/atts) =	(100)m x	(101)m								I		
(102)m=	0	0	0	0	0	477.39	410.63	404.25	0	0	0	0		(102)	
Gains	(solar g	gains ca	culated	for appli	cable we	eather re	egion, se	e Table	10)				I		
(103)m=	0	0	0	0	0	647.72	617.34	576.03	0	0	0	0		(103)	
						lwelling,	continu	ous (kW	/h) = 0.0	24 x [(10)3)m – (102)m]:	x (41)m		
-	-			< 3 × (98							1		I		
(104)m=	0	0	0	0	0	122.64	153.79	127.81	0	0	0	0		_	
										= Sum(,	=	404.24	(104)	
	I fractior			`					f C =	cooled	area ÷ (4	4) =	1	(105)	
		actor (Ta		í		0.05	0.05	0.05		0			I		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0			
Spage	oooling	roquiror	nont for	month =	(104)m	v (105)	w (106)	~	Total	l = Sum(104)	=	0	(106)	
(107)m=	0				0	30.66	38.45	31.95	0	0	0	0	l		
	0	0	0		0	00.00	00.40	01.30		= Sum(=	101.00	(107)	
												-	101.06		
· ·	-	· ·		-					. ,) ÷ (4) =			1.58	(108)	
				alculated	only un	der spec	cial conc	litions, s						_	
Fabrio	Energy	y Efficier	псу						(99) -	+ (108) =	=		45	(109)	

SAP Input

Property Details: Pl	ot 7							
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: sclosure: arameter:	New dv New dv Unknov No rela Indicati	s valley 2020 ober 2020 velling design sta velling	ge				
Property description	ר:							
Dwelling type: Detachment:		Flat						
Year Completed:		2020						
Floor Location:		Floor	area:					
Floor 0		63.823	m²		Storey height 2.5 m	•		
Living area:			m ² (fraction 0.5	05)				
Front of dwelling fa	aces:	North E	ast					
Opening types:	Courses	Τ.	112.0 .	Clasing		Argon	Fram	
Name: NE	Source: Manufacturer	-	/pe: lid	Glazing:		Argon:	Fram	ie:
SW NW	Manufacturer Manufacturer		indows indows	double-glaze double-glaze		Yes Yes		
	Manufacturer	vv		-				
Name: NE	Gap: mm		Frame Facto	or: g-value:	U-value: 1.4	Area: 2	No. c	of Openings:
SW	16mm o		0.7	0.63	1.4	2.025	1	
NW	16mm o	r more	0.7	0.63	1.4	6.097	1	
Name: NE	Type-Name		ocation: prridor Wall	Orient: North East		Width: 0	Heig 0	ht:
SW			ternal Wall	South West		0	0	
NW		Ex	ternal Wall	North West		0	0	
Overshading: Opaque Elements:		Average	e or unknown					
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall:	Карра:
External Elements External Wall	20.954	8.12	12.83	0.15	0	False		N/A
Corridor Wall Stairwell Wall	29.617 18.639	2 0	27.62 18.64	0.15 0.15	0.4 0.9	False False		N/A N/A
Exposed Floor	63.823	0	10.04	0.13	0.9	Faise		N/A N/A
Internal Elements Party Elements								
Thermal bridges:								
Thermal bridges:		Lengt	h Psi-valu					
		4.56	0.289	E2 Other	r lintels (including	other steel linte	ls)	

SAP Input

[Approved]	13.2 25.397 8.175 10.9 5.45 5.45 25.397 16.145 16.145	0.047 0.061 0.074 -0.077 0.096 0.06 0.28 0 0.16	E4 E7 E16 E17 E25 E18 E20 P3 P7	Jamb Party floor between dwellings (in blocks of flats) Corner (normal) Corner (inverted internal area greater than external area) Staggered party wall between dwellings Party wall between dwellings Exposed floor (normal) Intermediate floor between dwellings (in blocks of flats) Exposed floor (normal)
Ventilation:				
Pressure test: Ventilation:	Number of w Ductwork: In	jned) h heat recovery et rooms: Kitch sulation, rigid stallation Schem	ien + 1	
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered:	0 0 0 0 3			
Pressure test: Main heating system:	3			
Main heating system:	Heat source: heat from b Piping>=199 Central heati	1, pre-insulated ng pump : 2013 emperature: U	ilers gas, hea d, low te 3 or late	t fraction 1, efficiency 94 mp, variable flow r
Main heating Control:	Doner Interior	50. 105		
Main heating Control:	Charging sys thermostats Control code		se of co	mmunity heating, programmer and at least two room
Secondary heating system:				
Secondary heating system: Water heating:	None			
Water heating:	From main h Water code: Fuel :mains g No hot water Solar panel: I	jas cylinder		
Others: Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics:	English No <u>Photovoltaic</u> Installed Pea Tilt of collect Overshading:	ory an / suburban <u>: 1</u> k power: 0.78		

SAP Input

Assess Zero Carbon Home: No

			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 7									
Address :														
1. Overall dwelling dimen	isions:			<i>(</i>)										
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)+(3c	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] + [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	× 4	40 =	0	(7c)				
Air changes per hour														
Infiltration due to chimney	s flues and fans = $($	6a)+(6b)+(7a	a)+(7b)+(7	′c) =	Г	20		÷ (5) =	0.13	(8)				
If a pressurisation test has be					ontinue fro			. (0)	0.15					
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									0	(13)				
Percentage of windows	and doors draught s	stripped							0	(14)				
Window infiltration				0.25 - [0.2	· · ·	· ·	(4.5)		0	(15)				
Infiltration rate		h :		(8) + (10) ·					0	(16)				
Air permeability value, c If based on air permeabilit			•	•	•	etre of e	nvelope	area	5	(17)				
Air permeability value applies	-					is heina u	sed		0.38	(18)				
Number of sides sheltered			, or a dog		incusiinty i	o bonng u			3	(19)				
Shelter factor			((20) = 1 - [0.075 x (1	9)] =			0.78	(20)				
Infiltration rate incorporation	ng shelter factor		((21) = (18)	x (20) =				0.29	(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 sh	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 ettec</i> echanica		change i	rate for t	he appli	cable ca	se						0	(23a)
				endix N (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) , othei	wise (23h) = (23a)			0	
								n Table 4h) = (200)			0	(23b)
			-	-	-			HR) (24a		2b)m i (f	22b) v [·	1 (22a)	0	(23c)
(24a)m=	i			0					$0^{11} = (22)^{11}$			1 - (230)	- 100j	(24a)
		-	_		-			UV) (24b	-	-	Ů	Ů	l	()
(24b)m=				0				0	0 = (22)		230)	0	1	(24b)
		-	-	Ţ	-	-	_	_		0	0	0	J	(210)
,					•	•		on from c c) = (22b		.5 × (23b))			
(24c)m=	r í í	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	iter (24a) or (24t	o) 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)
2 40	at losso	e and he	eat loss p	aramat	or:			•						
		Gros		Openin		Net Ar	222	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)
Floor						63.82	3 X	0.13		8.29699	 Э			(28)
Walls	Type1	20.9	95	8.12	2	12.83	3 X	0.18		2.31	i F		\exists	(29)
Walls ⁻	Type2	29.6	62	2		27.62	2 x	0.18	= 	4.97	= i		\dashv	(29)
Walls ⁻	Туре3	18.6	64	0	=	18.64	+ ×	0.18		3.36	= i		\dashv	(29)
Total a	area of e					133.0		L	(L			(31)
			ows, use e sides of in				ated using	g formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				31.7	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	5613.9	96 (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	recisely the	indicative	e values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix I	<						13.78	3 (36)
			are not kn	own (36) =	= 0.05 x (3	1)								
	abric hea								(33) +	(36) =			45.49) (37)
Ventila			alculated			-			_	= 0.33 × (L _	1	
(2.2)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(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	J	(38)
	ransfer c		· ·			_	_		. ,	= (37) + (3	·	I _	1	
(39)m=	75.43	75.29	75.16	74.51	74.39	73.82	73.82	73.72	74.04	74.39	74.63	74.89	74 54	(39)
										Average =	Juni(39)1	12 / 12=	74.51	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.18	1.18	1.18	1.17	1.17	1.16	1.16	1.16	1.16	1.17	1.17	1.17		
Numbe	er of day	/s in mo	nth (Tab	le 1a)	•	•	•	•	,	Average =	Sum(40)1.	12 /12=	1.17	(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	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				(1 - exp	(-0.0003	349 x (TI	FA -13.9	9)2)] + 0.0	0013 x (⁻	TFA -13.		09		(42)
Reduce	the annua	al average	hot water	usage by		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 wate	er usage i	n litres pei	r day for e	ach month	Vd,m = fa	ctor from	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 - ca	lculated m	onthly — A	100 v Vd i	n v nm v l	DTm / 3600			m(44) ₁₁₂ =		1005.31	(44)
	136.66	119.52	123.34	107.53	103.18	89.03	82.5	94.67	95.8	111.65	121.88	132.35	l	
(45)m=	130.00	119.52	123.34	107.55	103.16	89.03	02.5	94.07			m(45) ₁₁₂ =		1318.12	(45)
lf instan	taneous w	vater heati	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		10101 - 00	····(+0)112 -	-	1010.12	()
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage			!									1	
-		. ,					-	within sa	ame ves	sel		150		(47)
	•	-			velling, e ocludes i			n (47) ombi boil	ers) ente	er '0' in <i>(</i>	47)			
	storage			. (,		,			
a) If m	nanufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
0,			•	e, kWh/ye				(48) x (49)	=			0		(50)
				•	loss fact le 2 (kW							0		(51)
		-	ee secti			.,	~])					0		(0.)
		from Ta										0		(52)
			m Table									0		(53)
			-	e, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0	r	(54)
	. ,	(54) in (8	,	for oach	month			((EC)m (EE) (44)	~		0		(55)
				for each			1	((56)m = (, , ,	r	1		I	(50)
(56)m=	0	0 s dedicate	0 d solar sto	0	0 = (56)m	$0 \times ((50) - ($	0 (H11)] \div (5	0 50), else (5	0 7)m - (56)	0 m where (0 H11) is fro	0 m Append	iv H	(56)
-				- · ·		1								(57)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•	•	,	om Table		50)						0		(58)
								65 × (41) ing and a		r thermo	istat)			
(1100 (59)m=		0							0			0		(59)
(/···									-				l	

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	1	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	×	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)

Southwest0.9x	0.77	x	2.03	x	118.15]	0.63	x	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.03	×	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)
Southwest0.9x	0.77	x	2.03	x	92.85		0.63	x	0.7	=	57.46	(79)
Southwest0.9x	0.77	x	2.03	x	69.27		0.63	x	0.7	=	42.87	(79)
Southwest0.9x	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	×	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	x	6.1	×	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	×	0.63	x	0.7	=	170.21	(81)
Northwest 0.9x	0.77	x	6.1	x	97.38	×	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	×	72.63	×	0.63	x	0.7	=	135.33	(81)
Northwest 0.9x	0.77	x	6.1	x	50.42	×	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	×	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 gains in	watts, calcul	ated	for each mon	th		(83)m	n = Sum(74)m(82)m			1	(22)

								、	· · ·	× /			_	
(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)								
Temp	erature	during h	neating p	eriods ir	n the livir	ng area l	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.98	0.94	0.82	0.66	0.73	0.93	0.99	1	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=	19.65	19.77	20	20.34	20.66	20.89	20.97	20.96	20.77	20.37	19.95	19.63		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)					
(88)m=	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.96	19.95	19.95	19.94	19.94		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	1	0.99	0.98	0.91	0.74	0.53	0.6	0.88	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=	18.7	18.82	19.06	19.39	19.7	19.9	19.95	19.94	19.81	19.43	19.01	18.68		(90)
I									f	LA = Livin	g area ÷ (4	ł) =	0.51	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwel	lina) = fl	_A x T1	+ (1 – fL	A) × T2					
	10.10	· · ·	40.54	i	20.40		20.47	<u>`</u>	· ·	10.0	10.40	10.16	1	(02)

(92)m=	19.18	19.3	19.54	19.87	20.19	20.4	20.47	20.45	20.3	19.9	19.49	19.16	(92)

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

(93)m=	19.18	19.3	19.54	19.87	20.19	20.4	20.47	20.45	20.3	19.9	19.49	19.16		(93)
8. Spa	ace hea	ting requ	uiremen	t										
				mperatu using Ta		ed at ste	ep 11 of	Table 9t	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, hr	<u>ו י</u> ווי	· · · ·									
(94)m=	1	1	0.99	0.97	0.92	0.78	0.6	0.66	0.9	0.98	1	1		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (84	4)m						1	11		
(95)m=	336.8	372.59	408.82	445.95	451.13	377.44	274.91	281.53	345.33	340.06	322.41	321.03		(95)
Month	ly aver	age exte	rnal ter	nperature	e from Ta	able 8					1	II		
(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,	Lm , W =	- =[(39)m :	r x [(93)m∙	– (96)m]				
(97)m=	1122.54	1084.48	979.78	817.38	631.41	428.3	285.34	298.89	458.9	691.93	924.48	1120.4		(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=	584.59	478.39	424.79	267.43	134.12	0	0	0	0	261.78	433.49	594.73		
I		<u> </u>		1	<u> </u>	<u> </u>	<u> </u>	Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	3179.33	(98)
Space	e heatin	g require	ement ir	n kWh/m²	²/year							[49.81	(99)
8c Sr	bace co	oling rec	uiremer	nt								ſ		
		Ŭ		August.	See Tal	ole 10b								
Calou	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I				using 2				<u> </u>	· ·					
(100)m=	0	0	0	0	0	693.94	546.29	560.26	0	0	0	0		(100)
i í	ition fac	tor for lo	i Dss.hm											
(101)m=	0	0	0	0	0	0.8	0.88	0.84	0	0	0	0		(101)
· · ·	l loss. h	i mLm (V	i Vatts) =	ı (100)m x	(101)m									
(102)m=	0	0	0	0	0	556.86	480.32	472.81	0	0	0	0		(102)
· · I	(solar d	i Dains ca	ı Iculated	for appli	L cable w	eather re	eaion. se	e Table	10)					
(103)m=	0	0	0	0	0	646.34	616.1	574.61	0	0	0	0		(103)
· · ·	e coolin	ı a reauire	ement fo	r month.	whole d	ı İwellina.	continu	us (kW	(h) = 0.0	24 x [(1(1)3) <i>m – (</i>	ـــــــــــــــــــــــــــــــــــــ	(41)m	
				< 3 × (98		, j,			,	21		- /]		
(104)m=	0	0	0	0	0	64.43	101.02	75.73	0	0	0	0		
•				•					Total	= Sum(104)	=	241.18	(104)
Cooled	fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)										
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	' = Sum((104)	=	0	(106)
· ·	cooling	<u> </u>	i	month =	(104)m	× (105)	<u> </u>	n				·		_
(107)m=	0	0	0	0	0	16.11	25.25	18.93	0	0	0	0		
									Total	= Sum(107)	=	60.3	(107)
Space	cooling	requirer	ment in l	kWh/m²/y	/ear				(107)	÷ (4) =			0.94	(108)
8f. Fab	ric Enei	rgy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabric	Energ	y Efficier	псу						(99) ·	+ (108) =	=		50.76	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)							[58.37	(109)

			User D	etails:						
	Zahid Ashraf Stroma FSAP 20'	12		Stroma Softwa					001082 n: 1.0.5.9	
		Р	roperty A	Address:	Plot 7					
Address :										
1. Overall dwelling dimens	ions:									
Ground floor				a(m²) 3.82	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³) 159.56	(3a)
Total floor area TFA = (1a)+	(1b)+(1c)+(1d)+(1e	e)+(1r	n) 6	3.82	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:									<u> </u>	
Number of chimneys		econdar neating 0	у] + [_	other 0] = [total 0	X 4	40 =	m ³ per hour	(6a)
Number of open flues	0 +	0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fans					- <u> </u>	0	x ′	10 =	0	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fires	i				L L	0	x 4	40 =	0	(7c)
					L			Air ch	anges per ho	_ ur
Infiltration due to chimneys,	fluor and fans - (f	3)+(6h)+(7	′a)+(7b)+(3	7c) -	Г			1		_
If a pressurisation test has beer					continue fro	0 om (9) to (÷ (5) =	0	(8)
Number of storeys in the			()/				,		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.25	for steel or timber	frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are prese deducting areas of openings,	; if equal user 0.35		-							-
If suspended wooden floo		led) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, enter									0	(13)
Percentage of windows a	nd doors draught s	trippea		0.25 - [0.2	$x(14) \cdot 1$	001 -			0	(14)
Window infiltration Infiltration rate				(8) + (10)			⊧ (15) –		0	(15)
Air permeability value, q5	0 expressed in cul	nic metre						area	0	(16) (17)
If based on air permeability	•		•				inelope	aica	3 0.15	(17)
Air permeability value applies if						is being us	sed		0.15	
Number of sides sheltered			-		-	-			3	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporating	shelter factor			(21) = (18)) x (20) =				0.12	(21)
Infiltration rate modified for	monthly wind spee	b						-		
Jan Feb Ma	ar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spee	d 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)n	ו ÷ 4									
(22a)m= 1.27 1.25 1.2	3 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(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		
		•	rate for t	he appli	cable ca	se						0.5	(23a)
			endix N. (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) . other	wise (23b) = (23a)				(23b)
									, (,				(23c)
			•	U		`	,		2h)m + ('	23h) x [[,]	1 – (23c)		(200)
	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)
	d mecha	L anical ve	entilation	without	heat rec	L Coverv (N	I /IV) (24b)m = (22	2b)m + (2	23b)		l	
0	0	0	0	0	0	0	0	0	0	0	0		(24b)
whole h	ouse ex	ract ver	tilation o	or positiv	re input v	ı ventilatio	n from c	outside				1	
				•	•				5 × (23b)			
0	0	0	0	0	0	0	0	0	0	0	0		(24c)
											-		
, í		r <u>, ,</u>	r Ì	,	,	<u> </u>	<u>-``</u>	2b)m² x	0.5]			1	
		-	-		-	_		-	0	0	0		(24d)
		i	· · ·		r i	<u>, ,</u>	r i i i i i i i i i i i i i i i i i i i					1	
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)
at losse	s and he	eat loss	paramete	er:									
IENT		-							A X U (W/ł	≺)			X k J/K
					2	x	1.4	=	2.8				(26)
ws Type	e 1				2.025	5 x1	/[1/(1.4)+	0.04] =	2.68				(27)
ws Type	2				6.097	7 x1	/[1/(1.4)+	0.04] =	8.08				(27)
					63.82	3 X	0.12		7.65876	 3 [(28)
Гуре1	20.9	95	8.12		12.83	3 X	0.15		1.92	i F		-	(29)
Type2	29.6	2	2		27.62	2 x	0.14		3.91	= i		\dashv	(29)
										= 1			(29)
										L			(31)
			ffective wi	ndow U-va			, formula 1,	/[(1/U-valu	e)+0.04] a	s given in	paragraph	1 3.2	()
						-				-			
heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				29.52	(33)
		. ,						((28)	.(30) + (32	2) + (32a).	(32e) =	5613.96	(34)
	•											100	(35)
•				construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						13.8	(36)
		are not kn	own (36) =	= 0.05 x (3	1)			(00)	(00)				
			1							0.5) (5)		43.32	(37)
		i	i		l	11	۸				1	1	
			· · · · · ·										(38)
			12.20	12.1	11.33	11.33	11.10				12./1	l	(00)
		r	FF F7	EE 40	E4.05	E4.05	EAC	. ,	. , .	,	50.00	1	
50.64	30.49	00.00	00.07	00.42	04.00	04.00	04.0				I	55.53	(39)
	0.15 ate effect echanica aust air he anced with balance 0.25 balance 0 whole h f (22b)n 0 tive air 0.25 at losse f (22b)n 0 ctive air 0 ctive br>ai bridge of therma at 13.32	0.15 0.15 ate effective airachanical ventilaaust air heat pumpanced with heat recordbalanced mecha 0.25 0.25 balanced mecha 0.25 0.25 balanced mecha 0 0 whole house exitf (22b)m < 0.5 > 0 0 natural ventilationf (22b)m = 1, the 0 0 natural ventilationf (22b)m = 1, the 0 0 ctive air change 0.25 0.25 at losses and heIENTGrossareaws Type 1 20.9 rea of elementsdows and roof winderthe areas on bothheat loss, W/K =apacity Cm = S(al mass paramegn assessments whused instead of a deelal bridges : S (Lof thermal bridgingabric heat losstion heat loss caJanFeb13.3213.17ansfer coefficier	0.150.150.14ate effective air changeachanical ventilation:aust air heat pump using Appeanced with heat recovery: efficbalanced mechanical ventilation0.250.250.250.25balanced mechanical ventilation or where0000whole house extract verifies00 <td>0.15 0.15 0.14 0.13 ate effective air change rate for techanical ventilation: aust air heat pump using Appendix N, (2 anced with heat recovery: efficiency in % balanced mechanical ventilation 0.25 0.25 0.23 balanced mechanical ventilation 0 0 0 0 0 0 0 0 0 whole house extract ventilation of f (22b)m < 0.5 × (23b), then (24c)</td> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.15 0.15 0.14 0.13 ate effective air change rate for techanical ventilation: aust air heat pump using Appendix N, (2 anced with heat recovery: efficiency in % balanced mechanical ventilation 0.25 0.25 0.23 balanced mechanical ventilation 0 0 0 0 0 0 0 0 0 whole house extract ventilation of f (22b)m < 0.5 × (23b), then (24c)	0.150.150.140.130.12ate effective air change rate for the applicate anced wentilation:aust air heat pump using Appendix N, (23b) = (23a)anced with heat recovery: efficiency in % allowing fbalanced mechanical ventilation with heat0.250.250.230.23balanced mechanical ventilation without00000000whole house extract ventilation or positive f(22b)m < 0.5 x (23b), then (24c) = (23b)	0.150.140.130.120.11ate effective air change rate for the applicable calculation:aust air heat pump using Appendix N, (23b) = (23a) × Fmv (element)aust air heat pump using Appendix N, (23b) = (23a) × Fmv (element)aust air heat pump using Appendix N, (23b) = (23a) × Fmv (element)aust air heat pump using Appendix N, (23b) = (23a) × Fmv (element)aust air heat pump using Appendix N, (23b) = (23a) × Fmv (element)aust air heat pump using Appendix N, (23b) = (23a) × Fmv (element)aust air heat pump using Appendix N, (23b) = (23a) × Fmv (element)balanced mechanical ventilation with heat recove0.250.250.250.2500000000000000000000000000000000 <td>0.150.140.130.120.110.11ate effective air change rate for the applicable case echanical ventilation: aust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (financed mechanical ventilation with heat recovery (fform balanced mechanical ventilation with heat recovery (MVI 0.250.250.230.230.220.22balanced mechanical ventilation without heat recovery (fform 00122b)m = 1, then (24d)m = (22b)m otherwise (24d)m =00000000000000000000122b)m ethrage rate - enter (24a) or (24b) or (24c) or (24c)000000000001250.250.250.230.230.220.22120ses and heat loss parameter:12.83xx19pe229.62227.62x19pe318.64018.64<td>0.150.150.140.130.120.110.110.11ate effective air change rate for the applicable case schanical ventilation:aust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), other anced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) balanced mechanical ventilation with heat recovery (MVHR) (24a)0.250.250.260.230.220.220.21balanced mechanical ventilation without heat recovery (MV) (24b)0000000000000ibalanced mechanical ventilation or positive input ventilation from cf (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b)</td>0000000000001f (22b)m 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(20000000000000.250.250.230.230.220.21at losses and heat loss parameter:IENTGross area (m²)Openings m²Net Area A,m²U-vali A,m²11.111.11ype318.64011.64018.64011.640.13rea of elements, m²133.03dows and roof windows, use effective window U-value calculated using formula for te the areas on bath sides of internal walls and partitions heat loss, W/K = S (A x U)(26)(30) apac</td> <td>the effective air change hate for the applicable casechanical ventilation:aust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b)inced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (220.250.250.230.230.220.210.22balanced mechanical ventilation without heat recovery (MV) (24b)m = (22balanced mechanical ventilation or positive input ventilation from outsidef (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.</td> 0000000000000000000012(2b)m 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m ² x0000000000000000000000000.250.250.250.230.220.220.250.250.250.230.220.220.250.250.250.230.220.2210:ex1414141411:exGross area (m2)m2A, m2W/m2K12:ex141141414:ex13:830.15=15:ex0.250.250.222214:ex <td>0.15 0.15 0.14 0.13 0.12 0.11 0.11 0.11 0.12 0.12 ate effective air change rate for the applicable case schanical ventilation: aust air hat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) aust air hat pump using Appendix N, (22b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (7 0.25 0.25 0.25 0.23 0.22 0.21 0.22 0.23 balanced mechanical ventilation without heat recovery (MVV (24b)m = (22b)m + (5 × (23b)) 0</td> <td>0.15 0.15 0.14 0.13 0.12 0.11 0.11 0.11 0.12 0.12 0.13 also of the applicable case schanical ventilation: usual air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) inced with heat recovery: (MVHR) (24a)m = (22b)m + (23b) × [0.25 0.25 0.23 0.22 0.21 0.22 0.21 0.22 0.23 0.24 balanced mechanical ventilation without heat recovery (MVV (24b)m = (22b)m + (23b) × [0</td> <td>0.15 0.14 0.13 0.12 0.11 0.11 0.12 0.12 0.13 0.14 Description of the set of the applicable case exchanical ventilation: aust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) need with heat recovery: (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) 0 0.25 0.23 0.23 0.22 0.21 0.23 0.24 0.24 0</td> <td>0.15 0.14 0.13 0.12 0.11 0.11 0.11 0.12 0.12 0.13 0.14 diag of the transportable case optimize the transportable case optimize the transportable case optimize the transportable case optimize the transportable case optimize the transportable case optimize the transportable transport</td>	0.150.140.130.120.110.11ate effective air change rate for the applicable case echanical ventilation: aust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (financed mechanical ventilation with heat recovery (fform balanced mechanical ventilation with heat recovery (MVI 0.250.250.230.230.220.22balanced mechanical ventilation without heat recovery (fform 00122b)m = 1, then (24d)m = (22b)m otherwise (24d)m =00000000000000000000122b)m ethrage rate - enter (24a) or (24b) or (24c) or (24c)000000000001250.250.250.230.230.220.22120ses and heat loss parameter:12.83xx19pe229.62227.62x19pe318.64018.64 <td>0.150.150.140.130.120.110.110.11ate effective air change rate for the applicable case schanical ventilation:aust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), other anced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) balanced mechanical ventilation with heat recovery (MVHR) (24a)0.250.250.260.230.220.220.21balanced mechanical ventilation without heat recovery (MV) (24b)0000000000000ibalanced mechanical ventilation or positive input ventilation from cf (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b)</td> 0000000000001f (22b)m 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(20000000000000.250.250.230.230.220.21at losses and heat loss parameter:IENTGross area (m²)Openings m²Net Area A,m²U-vali A,m²11.111.11ype318.64011.64018.64011.640.13rea of elements, m²133.03dows and roof windows, use effective window U-value calculated using formula for te the areas on bath sides of internal walls and partitions heat loss, W/K = S (A x U)(26)(30) apac	0.150.150.140.130.120.110.110.11ate effective air change rate for the applicable case schanical ventilation:aust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), other anced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) balanced mechanical ventilation with heat recovery (MVHR) (24a)0.250.250.260.230.220.220.21balanced mechanical ventilation without heat recovery (MV) (24b)0000000000000ibalanced mechanical ventilation or positive input ventilation from cf (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b)	the effective air change hate for the applicable casechanical ventilation:aust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b)inced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (220.250.250.230.230.220.210.22balanced mechanical ventilation without heat recovery (MV) (24b)m = (22balanced mechanical ventilation or positive input ventilation from outsidef (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.	0.15 0.15 0.14 0.13 0.12 0.11 0.11 0.11 0.12 0.12 ate effective air change rate for the applicable case schanical ventilation: aust air hat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) aust air hat pump using Appendix N, (22b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (7 0.25 0.25 0.25 0.23 0.22 0.21 0.22 0.23 balanced mechanical ventilation without heat recovery (MVV (24b)m = (22b)m + (5 × (23b)) 0	0.15 0.15 0.14 0.13 0.12 0.11 0.11 0.11 0.12 0.12 0.13 also of the applicable case schanical ventilation: usual air heat pump using Appendix N. (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) inced with heat recovery: (MVHR) (24a)m = (22b)m + (23b) × [0.25 0.25 0.23 0.22 0.21 0.22 0.21 0.22 0.23 0.24 balanced mechanical ventilation without heat recovery (MVV (24b)m = (22b)m + (23b) × [0	0.15 0.14 0.13 0.12 0.11 0.11 0.12 0.12 0.13 0.14 Description of the set of the applicable case exchanical ventilation: aust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) need with heat recovery: (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) 0 0.25 0.23 0.23 0.22 0.21 0.23 0.24 0.24 0	0.15 0.14 0.13 0.12 0.11 0.11 0.11 0.12 0.12 0.13 0.14 diag of the transportable case optimize the transportable case optimize the transportable case optimize the transportable case optimize the transportable case optimize the transportable case optimize the transportable transport

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.89	0.89	0.88	0.87	0.87	0.86	0.86	0.85	0.86	0.87	0.87	0.88		
Numb	er of day	in mo	nth (Tab	L		I			,	Average =	Sum(40)1.	12 /12=	0.87	(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	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	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 ii	n litres per	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 [OTm / 3600			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	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)
Water	storage	loss:						I						
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	•		nk in dw	•			(47) ombi boil	ore) onto	or 'O' in <i>(</i>	(17)			
	storage		not wate	51 (1115 11	iciuues i	nstantai			ers) erite		<i>(11)</i>			
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)
			-	, kWh/ye				(48) x (49)) =		1	10		(50)
,				cylinder l om Tabl								00		(51)
		-	ee secti			1/1110/00	xy)				0.	02		(51)
	e factor	-									1.	03		(52)
Tempe	erature fa	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/y€	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
	(50) or (. , .	,								1.	03		(55)
Water	storage	loss cal	culated t	for each	month	i	i	((56)m = (55) × (41)ı	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 H11) is fro	32.01	iv 11	(56)
-				- · ·				r	· · ·					
(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)
		•		om Table		-0)					(0		(58)
					•		. ,	65 × (41) ng and a		r thermo	istat)			
(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)
· /				I	-	· ·		I	I			-		

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	ec]	
(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	×	118.15]	0.63	×	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.0	3	×	113.91]	0.63	x	0.7	=	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	×	92.85]	0.63	x	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	x	2.0	3	×	69.27]	0.63	x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	x	2.0	3	x	44.07		0.63	x	0.7	=	27.27	(79)
Southwest0.9x	0.77	x	2.0	3	×	31.49]	0.63	x	0.7	=	19.49	(79)
Northwest 0.9x	0.77	x	6.	1	×	11.28	x	0.63	x	0.7	=	21.02	(81)
Northwest 0.9x	0.77	x	6.	1	×	22.97	x	0.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	x	6.	1	×	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	×	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	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	×	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	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 <u>g</u> ains in	watts, ca	lculated	for eacl	n month	۱ <u> </u>		(83)m	n = Sum(74)m .	(82)m				
(83)m= 43.79	81.58	130.17	192.38	243.86		4.58 240.25	199	.93 151.41	95.17	53.73	36.66]	(83)

													1	
Total g	jains — ir	nternal a	ind 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	7. Mean internal temperature (heating season)													
Temp	Temperature during heating periods in the living area from Table 9, Th1 (°C)												21	(85)
Utilisa	Utilisation factor for gains for living area, h1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.9	0.88	0.84	0.76	0.64	0.48	0.36	0.39	0.58	0.77	0.87	0.91		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				-	
(87)m=	19.69	19.85	20.14	20.5	20.77	20.93	20.98	20.97	20.87	20.55	20.08	19.65		(87)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)	-				

Temp	Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)												
(88)m=	20.18	20.18	20.18	20.19	20.19	20.2	20.2	20.21	20.2	20.19	20.19	20.19	(88)
Utilisa	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)												_
(89)m=													
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)			

(90)m=	18.44	18.67	19.07	19.58	19.94	20.14	20.19	20.19	20.08	19.65	19	18.4		(90)	
fLA = Living area ÷ (4) =													0.51	(91)	

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

						0,							_
(92)m=	19.07	19.27	19.61	20.04	20.36	20.54	20.59	20.58	20.48	20.1	19.55	19.03	(92)
										• •			•

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

													I	(00)
(93)m=	19.07	19.27	19.61	20.04	20.36	20.54	20.59	20.58	20.48	20.1	19.55	19.03		(93)
			uirement ernal ter	mperatu	re obtair	ed at ste	on 11 of	Table 9	n so tha	t Ti m=(76)m an	d re-calc	rulate	
				using Ta					5, 50 tha	c 11,111–(<i>i ojin an</i>			
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	1:										
(94)m=	0.87	0.85	0.81	0.73	0.6	0.45	0.33	0.36	0.54	0.74	0.84	0.88		(94)
r	<u> </u>		i È	4)m x (84	· · · · · · · · · · · · · · · · · · ·								I	
(95)m=	503.4	518.74	516.2	487.94	420.54	307.46	213.39	221.81	318.88	410.71	459.83	490.65		(95)
r	4.3	age exte 4.9		nperature	e from Ta	able 8 14.6	16.6	16.4	14.1	10.6	7.4	4.2	l	(96)
(96)m=		_	6.5	8.9 al tempe			16.6	16.4	14.1 (06)m	10.6	7.1	4.2		(90)
(97)m=	836.54	811.62	738.52	619.06	479.93	324.63	218.01	228.02	350.57	526.72	693.6	831		(97)
				r each n								001		(0.)
(98)m=	247.85	196.82	165.41	94.41	44.19	0	0	0	0	86.31	168.31	253.22		
Ľ								Tota	l per year	(kWh/yeai	l [.]) = Sum(9	8)15,912 =	1256.52	(98)
Snace	heatin	a require	ement in	ı kWh/m²	?/vear						, ,		19.69	(99)
•					•								19.09	(33)
				mmunity				ting prov	ided by		unity onk			
	nt is use n of spa	ieme.	0	(301)										
Fractio	n of spa		1	(302)										
The com	Fraction of space heat from community system 1 – (301) = The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the													
includes	boilers, h	eat pumps	s, geotherr	mal and wa	aste heat f									
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 o	charging	g method	(Table 4	4c(3)) fo	r commu	unity hea	ting sys	tem			1	(305)
Distribu	ution los	s factor	(Table 1	12c) for c	commun	ity heatir	ng syste	m					1.05	(306)
Space	heating	9											kWh/yea	r
Annual	space l	heating	requiren	nent									1256.52	
Space	heat fro	m Comr	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	1319.34	(307a)
Efficien	icy of se	econdary	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)
Wator	heating													
	_		equirem	nent									2038.34	
			ty schem nunity bo						(64) x (30	03a) x (30	5) x (306) :	=	2140.25	(310a)
Electric	ity used	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	· (310a)([310e)] =	34.6	(313)
Cooling	g Syster	n Energ	y Efficie	ncy Rati	0								0	(314)
Space	cooling	(if there	is a fixe	ed cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electric	ity for n	umps a	nd fans v	within dv	vellina (1	Table 4f)	:							1
				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) + (330b) + (330g) =	221.43	(331)
Energy for lighting (calculated in Ap	opendix 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 =	55.94	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	90.75	(342a)
		Fuel Price		_
Pumps and fans	(331)	13.19 × 0.01 =	29.21	(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) =		337.41	(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] =		1.3	(357)
SAP rating (section12)	La setta e se la seco		81.83	(358)
12b. CO2 Emissions – Community	E	nergy Emission factor Wh/year kg CO2/kWh	r Emissions kg CO2/year	
CO2 from other sources of space a Efficiency of heat source 1 (%)	nd water heating (not CHP)	els repeat (363) to (366) for the second fu		(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x 0.22	= 794.97	(367)
Electrical energy for heat distributio	on [(313) x	0.52	= 17.96	(372)
Total CO2 associated with commun	nity systems (363)((366) + (368)(372)	= 812.93	(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) =	812.93	(376)
CO2 associated with electricity for p	pumps and fans within dwelling (3	31)) x 0.52	= 114.92	(378)
CO2 associated with electricity for I	lighting (332))) >	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) =		757.9	(383)

Dwelling CO2 Emission Rate (383) ÷ (4) =				11.88	(384)
El rating (section 14)				90.67	(385)
13b. Primary Energy – Community heating scheme					
	Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and water heating (Efficiency of heat source 1 (%) If there is	(not CHP) CHP using two fuels repeat (363) to	(366) for the second f	uel	94	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	1.22	=	4490.12	(367)
Electrical energy for heat distribution	[(313) x		=	106.21	(372)
Total Energy associated with community systems	(363)(366) + (368)(372	2)	=	4596.33	(373)
if it is negative set (373) to zero (unless specified othe	erwise, see C7 in Appendix C	;)		4596.33	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from immersion heater or	instantaneous heater(312) x	1.22	=	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =			4596.33	(376)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Energy associated with electricity for pumps and fans w	ithin 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 x 0.01 =	=	-1971.59	(380)
Total Primary Energy, kWh/year sum	of (376)(382) =			4270.83	(383)

			User De	etails:						
Assessor Name:	Zahid Ashraf			Stroma	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 201	2		Softwa	re Ver	sion:		Versio	n: 1.0.5.9	
		Pro	operty A	ddress:	Plot 7					
Address :										
1. Overall dwelling dimer	nsions:									
			Area	. ,		Av. He	ight(m)	1 I	Volume(m ³)	_
Ground floor				3.82	(1a) x	2	2.5	(2a) =	159.56	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	63	3.82	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:										_
		econdary neating	/ (other		total			m ³ per hour	,
Number of chimneys		0	+	0] = [0	x 4	40 =	0	(6a)
Number of open flues		0] + [0	1 = F	0	x2	20 =	0	(6b)
Number of intermittent fan	IS L				, r	2	x ^	10 =	20](7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	 (7c)
Ŭ					L	<u> </u>			, and the second	
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans = (6)	a)+(6b)+(7a	a)+(7b)+(7	′c) =		20		÷ (5) =	0.13	(8)
If a pressurisation test has be		ed, proceed	to (17), o	therwise c	ontinue fro	om (9) to ((16)			- -
Number of storeys in the Additional infiltration	e dwelling (ns)						[(0)]	11-0 1 -	0	(9)
Structural infiltration: 0.2	25 for steel or timber	frame or (0 35 for	masonr	v constr	uction	[(9)-	-1]x0.1 =	0	(10) (11)
if both types of wall are pre deducting areas of opening	esent, use the value corres								0	
If suspended wooden fle	oor, enter 0.2 (unsea	led) or 0.1	l (sealed	d), else	enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2		-			0	(15)
Infiltration rate				(8) + (10) -		<i>·</i> · · <i>·</i>			0	(16)
Air permeability value, of If based on air permeabilit			•		•	etre of e	nvelope	area	5	(17)
Air permeability value applies						is beina u	sed		0.38	(18)
Number of sides sheltered			i i i i j		,	J			3	(19)
Shelter factor			((20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporation	ng shelter factor		((21) = (18)	x (20) =				0.29	(21)
Infiltration rate modified for	r monthly wind speed	t.								
Jan Feb I	Mar 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									
	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
······································		!								

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(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>ctive air</i> al ventila	change i	rate for t	he appli	cable ca	se							(23a)
				endix N. (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0	(23a)
								n Table 4h		/ (/			0	(23c)
			-	-	-			HR) (24a		2h)m + (ʻ	23h) y [1 – (23c)	-	(200)
(24a)m=				0	0	0	0	0	0	0	0	0		(24a)
		l d mech	I anical ve	Intilation	without	L heat rec	L coverv (N	I MV) (24b	l = (2)	L 2b)m + (2	L 23b)			
(24b)m=	0	0		0	0	0	0	0	0	0	0	0		(24b)
	whole h	i ouse ex	ract ver	tilation o	or positiv	input v	ı ventilatio	n from c	utside					
,					•	•		c) = (22t		.5 × (23b)			
(24c)m=	- 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,								on from I				-		
	<u> </u>	r	r <u>`</u>	r Ì	, 	<u>`</u>	, 	0.5 + [(2	, <u> </u>	0.5]		-	I	(N
(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)
				· · ·	, <u>,</u>	r i	<u>, ,</u>	d) in boy	r <u>, í</u>			i	1	
(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. He	at losse	s and he	eat loss p	paramete	er:									
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²⋅I		A X k 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	e 2				6.097	, x1	/[1/(1.4)+	0.04] =	8.08				(27)
Floor						63.82	3 ×	0.13		8.29699				(28)
Walls	Type1	20.9	95	8.12	,	12.83	_	0.18		2.31			\dashv	(29)
Walls		29.6		2		27.62	_	0.18		4.97			\exists	(29)
Walls		18.6		0	=	18.64		0.18		3.36			\dashv	(29)
		elements				133.0		0.10		0.00	[(20)
				effective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.041 a	s aiven in	paragraph	3.2	(31)
			sides of in					,			- J	p =		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				31.7	(33)
Heat c	apacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	5613.9	6 (34)
Therm	al mass	parame	eter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
	0		ere the de tailed calci		construct	ion are not	t known pi	recisely the	e indicative	e values of	TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						13.78	(36)
			are not kn	own (36) =	= 0.05 x (3	1)							_	
	abric he									(36) =			45.49	(37)
Ventila			alculated	i			i	<u>.</u>	· · ·	= 0.33 × (1	I	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(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)
		coefficier	· ·						- · ·	= (37) + (3		1	I	
(39)m=	75.43	75.29	75.16	74.51	74.39	73.82	73.82	73.72	74.04	74.39	74.63	74.89		
										Average =	Juii(39)1	12 / 12=	74.51	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.18	1.18	1.18	1.17	1.17	1.16	1.16	1.16	1.16	1.17	1.17	1.17		
Numb	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) ₁ .	12 /12=	1.17	(40)
- turno	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 hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		09		(42)
Reduce	the annua	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 i	n litres pei	r 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		
Enerav	content of	hot water	used - cal	culated m	onthly — A	100 v Vd r	m v nm v [)))))))))))))))))))			m(44) ₁₁₂ =		1005.31	(44)
	136.66	119.52	123.34	107.53	103.18	89.03	82.5	94.67	95.8	111.65	121.88	132.35	l	
(45)m=	130.00	119.52	123.34	107.55	103.16	09.03	02.5	94.07			m(45) ₁₁₂ =		1318.12	(45)
lf instan	taneous w	vater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46		10101 - 00	111(+J)112 -		1010.12	(10)
(46)m=	20.5	17.93	18.5	16.13	15.48	13.36	12.38	14.2	14.37	16.75	18.28	19.85		(46)
	storage							•			·		1	
-		. ,					-	within sa	ame ves	sel		150		(47)
	•	-		nk in dw	-			ı (47) ombi boil	ore) onte	or '()' in (47)			
	storage		not wate	51 (1115 11		nsianiai					47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Tempe	erature f	actor fro	m Table	2b							0.	54		(49)
0.	•		•	, kWh/ye				(48) x (49)) =		0.	75		(50)
,				cylinder l									I	(= ()
		age loss leating s		om Tabl	ie z (kvv	n/litre/da	iy)					0		(51)
		from Ta		011 4.0								0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energ	y lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	55)								0.	75		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
	•	•				59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		L	
(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 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	ı —			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	×	2.03	x	118.15		0.63	x	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	×	2.03	x	113.91		0.63	x	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	×	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	×	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	×	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	×	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	×	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	×	6.1	x	9.21	x	0.63	x	0.7	=	17.17	(81)
Solar gains in	watts, calcula	ated	for each mont	th		(83)m	ı = Sum(74)m …(82)m				

Oolul g	juino in	<i>mailo</i> , ot	aloulutot	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 gains – internal 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. Mean internal temperature (heating season)														
Temperature during heating periods in the living area from Table 9, Th1 (°C)										21	(85)			
Utilisation factor for gains for living area, h1,m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.97	0.91	0.76	0.59	0.65	0.88	0.98	0.99	1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)										•				
(87)m=	19.76	19.88	20.11	20.43	20.73	20.93	20.98	20.97	20.84	20.46	20.06	19.74		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)														
(88)m=	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.96	19.95	19.95	19.94	19.94		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)														
(89)m=	1	0.99	0.99	0.96	0.87	0.67	0.46	0.52	0.81	0.97	0.99	1		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)														
(90)m=	18.29	18.46	18.8	19.27	19.68	19.9	19.95	19.94	19.81	19.32	18.73	18.26		(90)
fLA = Living area ÷ (4) =										4) =	0.51	(91)		
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$														
(92)m=	19.03	19.18	19.46	19.85	20.21	20.42	20.47	20.46	20.33	19.9	19.4	19		(92)
				·			·	·					1	

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

(93)m=	19.03	19.18	19.46	19.85	20.21	20.42	20.47	20.46	20.33	19.9	19.4	19		(93)
8. Sp	ace hea	ting req	uirement	t										
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		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	1	0.99	0.98	0.96	0.88	0.71	0.53	0.59	0.84	0.97	0.99	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m			_						
(95)m=	410.59	444.79	477.22	505.34	493.01	395.03	279.53	289.4	381.22	402.72	393.43	394.39		(95)
Mont	nly aver	age exte	ernal tem	perature	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		ì	1	al tempe			- ,	<u> </u>	<u>, </u>	-	i			
(97)m=		1075.13	973.99	816.12	632.96	429.61	285.78	299.63	461.28	691.6	918.13	1108.71		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m										1				
(98)m=	521.29	423.59	369.6	223.77	104.13	0	0	0	0	214.92	377.78	531.45		٦
								Tota	l per year	(kWh/year	') = Sum(9	8)15,912 =	2766.52	(98)
Space heating requirement in kWh/m²/year											43.35	(99)		
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:										_				
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)			
Efficiency of main space heating system 1										93.5	(206)			
Efficiency of secondary/supplementary heating system, %										0	(208)			
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec										kWh/yea	J í			
Space	e heatin	g require	ement (c	alculate	d above))		<u> </u>					-	
	521.29	423.59	369.6	223.77	104.13	0	0	0	0	214.92	377.78	531.45		
(211)m	n = {[(98)m x (20)4)] } x 1	00 ÷ (20)6)									(211)
	557.53	453.03	395.29	239.32	111.36	0	0	0	0	229.86	404.04	568.4		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2958.85	(211)
Space heating fuel (secondary), kWh/month										4				
$= \{[(98)m \times (201)] \} \times 100 \div (208)$														
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
				-				Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	=	0	(215)
Water heating											-			
Output	from w	ater hea	ter (calc	ulated a	bove)									
	183.26	161.61	169.93	152.62	149.77	134.13	129.1	141.27	140.9	158.25	166.97	178.94		-
Efficier		ater hea	ater										79.8	(216)
(217)m=	87.45	87.27	86.83	85.83	83.87	79.8	79.8	79.8	79.8	85.63	86.93	87.54		(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$														
(219)m (219)m=		m x 100 185.19) ÷ (217) 195.7	m 177.81	178.58	168.08	161.78	177.03	176.56	184.8	192.08	204.41		
<u>رد اع)</u>	203.00	100.19	190.1	177.01	110.00	100.00	101.70		l = Sum(2		102.00	204.41	2211.57	(219)
Annual totals kWh/year													J ⁽²¹³⁾	
			ed. main	system	1					ĸ	wii/year		kWh/year 2958.85	1
Space heating fuel used, main system 1											2000.00	J		

Water heating fuel used	2211.57	1								
Electricity for pumps, fans and electric keep-hot					-					
central heating pump:	30		(230c)							
boiler with a fan-assisted flue	45		(230e)							
Total electricity for the above, kWh/year		75	(231)							
Electricity for lighting		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	ır					
Space heating (main system 1)	(211) x	0.216	=	639.11	(261)					
Space heating (secondary)	(215) x	0.519	=	0	(263)					
Water heating	(219) x	0.216	=	477.7	(264)					
Space and water heating	(261) + (262) + (263) + (264) =			1116.81	(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) =		1319.1	(272)					

TER =

(273)

20.67