Regulations Compliance Report

••	ent L1A, 2013 Editio tober 2020 at 14:55:2	-	ma FSAP 2012 program, Ver	sion: 1.0.5.9
Project Informati	on:			
Assessed By:	Zahid Ashraf (STI	RO001082)	Building Type:	Flat
Dwelling Details:	:			
NEW DWELLING	DESIGN STAGE		Total Floor Area: 6	1.27m²
Site Reference :	Hermitage Lane		Plot Reference:	Plot 4
Address :				
Client Details:				
Name: Address :				
•	rs items included w ete report of regula	vithin the SAP calculations. tions compliance.		
1a TER and DE	R			
	ting system: Mains g	as (c)		
Fuel factor: 1.00 (• • • • • •		00 50 1 4 / 42	
-	oxide Emission Rate Dioxide Emission Ra	. ,	20.52 kg/m² 13.20 kg/m²	ОК
1b TFEE and DI		le (DER)	13.20 Kg/III-	UN
	ergy Efficiency (TFEE	E)	57.0 kWh/m²	
-	nergy Efficiency (DF		44.2 kWh/m ²	
				ОК
2 Fabric U-valu	es			
Element	-	Average	Highest	
External	wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Floor Roof		0.12 (max. 0.25) (no roof)	0.12 (max. 0.70)	OK
Opening	s	(10100) 1.40 (max. 2.00)	1.40 (max. 3.30)	ОК
2a Thermal brid		1.10 (max. 2.00)	1. To (max. 0.00)	UN
		rom linear thermal transmitta	nces for each junction	
3 Air permeabil				
Air permea	bility at 50 pascals		3.00 (design valu	ne)
Maximum			10.0	OK
4 Heating efficie	ency			
Main Heati	ng system:	Community heating schem	nes - mains gas	
Secondary	booting overam:	None		
Secondary	heating system:	NOTE		
5 Cylinder insu	lation			
Hot water \$		No cylinder		
6 Controls				
Space hea	ting controls		use of community heating,	
	e e e facelle	programmer and at least t	wo room thermostats	OK
Hot water of	controis:	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	ОК
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.17m ²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Floors U-value	0.12 W/m²K	
Community heating, heat from boilers – mains gas		

Photovoltaic array

		l	User Deta	ils:						
Assessor Name:	Zahid Ashraf		St	roma	Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 20 ²	12	Sc	oftwar	e Ver	sion:		Versio	n: 1.0.5.9	
		Pro	operty Add	dress: F	Plot 4					
Address :										
1. Overall dwelling dime	nsions:									
			Area(m	·		Av. He	ight(m)	1	Volume(m ³)	_
Ground floor			61.27	7 (1	a) x	2	2.5	(2a) =	153.18	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	61.27	7 <mark>(4</mark>	+)					
Dwelling volume				(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	153.18	(5)
2. Ventilation rate:										
		econdary heating	oth	ner		total			m ³ per hour	
Number of chimneys		0	+	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0	= [0	x2	20 =	0	(6b)
Number of intermittent far	าร				F	0	x ^	0 =	0	(7a)
Number of passive vents					F	0	x ^	0 =	0	(7b)
Number of flueless gas fir	es				Ē	0	x 4	40 =	0	_ _(7c)
					L			Air ob		
					_			1	anges per ho	-
Infiltration due to chimney					ntinuo fre	0		÷ (5) =	0	(8)
If a pressurisation test has be Number of storeys in th		ea, proceea i	io (17), oine	i wise coi	nunue no)))) (9 <i>)</i> (0 (10)		0	(9)
Additional infiltration	g (···)						[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber	frame or 0).35 for ma	asonry	constr	uction			0	(11)
if both types of wall are pro deducting areas of openin		sponding to tl	he greater w	all area	(after			I		-
If suspended wooden fl	oor, enter 0.2 (unsea	led) or 0.1	(sealed),	else e	nter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				5 - [0.2 x		-			0	(15)
Infiltration rate				· · ·		2) + (13) -			0	(16)
Air permeability value, of If based on air permeabili				• •		etre of e	nvelope	area	3	(17)
Air permeability value applies						s beina u	sed		0.15	(18)
Number of sides sheltered			<u>-</u> <u>-</u>		,	· · · · · · · · · · · · · · · · ·			3	(19)
Shelter factor			(20)) = 1 - [0.	.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporati	ng shelter factor		(21)) = (18) x	(20) =				0.12	(21)
Infiltration rate modified for	or monthly wind spee	d								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7	·								
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4									
	i.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 sł	nelter an	d wind s	peed) =	(21a) x	(22a)m			-		
0.1.	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
		<i>ctive air</i> al ventila	0	rate for t	he appli	cable ca	Se						0.5	(23a)
				endix N. (2	(23a) = (23a	a) × Fmv (e	equation (1	N5)) , othe	rwise (23b) = (23a)			0.5	(23b)
								n Table 4h		, (,			79.05	(23c)
			-	-	-			HR) (24a		2b)m + (ʻ	23h) x ['	1 – (23c)		(200)
(24a)m=	r	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)
		l d mech		L entilation		L heat rec	L Coverv (N	I MV) (24b))m = (22	1 2b)m + (;	23b)			
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	tract ver	tilation of	r positiv	e input v	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 l 0.5 + [(2		0.51				
(24d)m=	r ,	0	0	0	0	0	0	0	0	0	0	0		(24d)
		L change	rate - er	i Inter (24a) or (24t) or (24	L c) or (24	u 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)
					l		I	1	l			1		
			eat loss			Not An		11						V I.
ELEN	MENT	Gros area		Openin m	-	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-valu∉ kJ/m²⋅ł		J/K
Doors						2	x	1.4	=	2.8				(26)
Windo	WS					8.167	7 x1	/[1/(1.4)+	0.04] =	10.83				(27)
Floor						61.27	4 x	0.12		7.35288	 3 [(28)
Walls	Type1	44.	8	8.17	,	36.63	3 X	0.15		5.5	i F		\neg	(29)
Walls	Type2	27.5	53	2		25.53	3 X	0.14	= [3.66	i F			(29)
Total a	area of e	lements	, m²			133.6	3	L	'					(31)
			ows, use e sides of ir				ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	is given in	paragraph	3.2	
			= S (A x		is and par			(26)(30)	+ (32) =				30.13	(33)
		Cm = S(•)						(30) + (32	2) + (32a).	(32e) =	7610.42	(34)
			. ,	² = Cm -	- TFA) ir	n kJ/m²K				tive Value:		· · ·	100	(35)
For des	ign asses:	sments wh		tails of the				recisely the	e indicative	e values of	TMP in Ta	able 1f	100	()
					usina Ar	pendix ł	<						10.05	(36)
	-	•	are not kn		• •	•	·						10.05	(00)
	abric he			()	,	,			(33) +	(36) =			40.18	(37)
Ventila	ation hea	at loss ca	alculated	I monthly	y				(38)m	= 0.33 × (25)m x (5))	-	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.79	12.64	12.49	11.76	11.61	10.88	10.88	10.73	11.17	11.61	11.91	12.2		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	52.97	52.83	52.68	51.94	51.8	51.06	51.06	50.92	51.36	51.8	52.09	52.38		
										Average =	Sum(39)1	12 /12=	51.91	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	0.86	0.86	0.86	0.85	0.85	0.83	0.83	0.83	0.84	0.85	0.85	0.85		
Numbe	er of day	s in mo	nth (Tab	le 1a)		1				Average =	Sum(40)1	.12 /12=	0.85	(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	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		02		(42)
Annua <i>Reduce</i>	l averag	e hot wa al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.44		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	95.08	91.62	88.16	84.71	81.25	77.79	77.79	81.25	84.71	88.16	91.62	95.08		-
Energy o	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		1037.23	(44)
(45)m=	141	123.32	127.25	110.94	106.45	91.86	85.12	97.68	98.85	115.2	125.74	136.55		
lf instant	aneous w	ater heati	ng at point	t of use (no	o hot water	storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	:	1359.97	(45)
(46)m=	21.15	18.5	19.09	16.64	15.97	13.78	12.77	14.65	14.83	17.28	18.86	20.48		(46)
Water	storage	loss:												
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel	(C		(47)
	•	•			velling, e			· · ·	ora) ont	or (0) in (47)			
	storage		not wate	er (unis ir	iciuues i	1151011101		ombi boil	ers) erne		47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):				(C		(48)
Tempe	rature f	actor fro	m Table	2b							(C		(49)
			-	e, kWh/ye				(48) x (49)) =		1'	10		(50)
,					loss fact le 2 (kWl						0.	02		(51)
		-	ee secti			1,1110,00	xy)				0.	02		(01)
	-	from Ta									1.	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
	. ,	(54) in (5	,								1.	03		(55)
Water	-		culated 1	for each	month		1	((56)m = (55) × (41)ı I	m				
(56)m=	32.01	28.92 dedicate	32.01 d solar sto	30.98	32.01 m = (56)m	30.98 x [(50) – (32.01 H11)] ∸ (5	32.01 0), else (5	30.98	32.01 m where (30.98 H11) is fro	32.01 m Append	ix H	(56)
(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)
						30.90	52.01	32.01	30.90	52.01				
	-	•		om Table for each		59)m = ((58) ÷ 36	65 × (41)	m			0		(58)
	-					,	. ,	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)

Comb	loss ca	lculated	for eac	h m	onth (61)m =	(60)) ÷ 36	65 × (41))m									
(61)m=	0	0	0		0	0		0	0	0		0	0		0	C)		(61)
Total h	neat req	uired for	water I	neat	ing ca	lculated	l fo	r eacł	n month	(62)n	า =	0.85 × ((45)m ·	+ (46)m +	(57)	m +	(59)m + (61)m	
(62)m=	196.28	173.25	182.53	16	64.44	161.73	14	45.35	140.4	152.9	96	152.34	170.4	7 17	'9.24	191	.83		(62)
Solar D	HW input	calculated	using Ap	pend	lix G or	Appendix	:H(negativ	ve quantity	/) (ente	r '0'	if no sola	r contrib	ution t	o wate	er hea	ting)		
(add a	dditiona	al lines if	FGHR	S an	id/or V	VWHRS	ap	plies,	see Ap	pendi	хG	S)							
(63)m=	0	0	0		0	0		0	0	0		0	0		0	C)		(63)
Outpu	t from w	ater hea	ter																
(64)m=	196.28	173.25	182.53	16	64.44	161.73	14	45.35	140.4	152.9	96	152.34	170.4	7 17	9.24	191	.83		
										C	Outp	out from wa	ater hea	ter (ar	inual)	112		2010.81	(64)
Heat g	jains fro	m water	heating	g, kV	Nh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m) + 0.8 ×	((46)r	n + (57)m	+ (5	9)m]	
(65)m=	91.1	80.95	86.53	7	9.68	79.62	7	3.34	72.52	76.7	,	75.66	82.52	: 8	4.6	89.	62		(65)
inclu	ude (57)	m in calo	culation	of ((65)m	only if c	ylir	nder is	s in the c	dwellir	ng (or hot w	ater is	from	com	mun	ity h	leating	
5. In	ternal a	ains (see	e Table	5 ar	nd 5a)	:	-				-							-	
		ns (Table			,														
Wietab	Jan	Feb	Mar		Apr	May		Jun	Jul	Au	a	Sep	Oct		Nov	D	ес		
(66)m=	100.87	100.87	100.87	—	00.87	100.87		00.87	100.87	100.8		100.87	100.8 [.]		0.87	100			(66)
Liahtir	u dains	(calcula	ted in A		endix I	equat	ion	L9 or	r L9a), a	lso se	e T	Table 5	I			1			
(67)m=	17.03	15.13	12.3	<u> </u>	9.31	6.96	i —	5.88	6.35	8.25	- 1	11.08	14.07	1	6.42	17	.5		(67)
		ins (calc				lix Lea						see Ta							
(68)m=	176.15	177.98	173.37		63.56	151.19	r –	39.55	131.78	129.9	_	134.56	144.3	6 15	6.74	168	.38	l	(68)
		calcula																	
(69)m=	33.09	33.09	33.09	<u></u>	33.09	33.09	_	3.09	33.09	33.0	-	33.09	33.09	3	3.09	33.	na	l	(69)
						00.00	Ŭ	0.00	00.00	00.0	~ I	00.00	00.00		0.00	00.	00		(00)
(70)m=		ns gains		5a)	0	0		0	0	0		0	0		0	C		l	(70)
									0	0		0	0		0		,		(10)
		/aporatic	<u> </u>	-	80.7		r –	-	90.7	00	- 1	90.7	-80.7		20.7	0	7	I	(71)
(71)m=	-80.7		-80.7		-80.7	-80.7	-	80.7	-80.7	-80.	′	-80.7	-80.7	-(30.7	-80).7		(71)
		gains (T	<u>, </u>		40.07	407.04			07.40	100.0		405.00				1 100	10	I	(70)
(72)m=	122.45	120.45	116.31	1	10.67	107.01	10	01.86	97.48	103.0		105.08	110.9		7.51	120	.46		(72)
		gains =	r		1				m + (67)m	. ,		. ,	r –	<u> </u>				I	(70)
(73)m=	368.89	366.82	355.24	33	36.81	318.42	30	00.55	288.87	294.5	56	303.98	322.6	1 34	3.93	359	9.6		(73)
	lar gain	s: calculated		or flu	w from	Table Co.	and		otod oguo	tiono to		nuart to th			rianta	tion			
		Access F	•	arnu	Area	I able ba	anu	Flu					e applic		FF	uon.		Gains	
Onent		Table 6d			m ²				x ble 6a		Та	g_ able 6b		Table				(W)	
Northe	ast <u>0.9</u> x	0.77		×Г	0.4	7	、	4	1.00	∣ x [0.62	Тx		0.7		=	29.16	(75)
	ast 0.9x	0.77		-	8.1		x		1.28			0.63	4		0.7	\neg		28.16	
	ast 0.9x	0.77			8.1		x		2.97	× _× [0.63			0.7		=	57.32	(75)
	ast 0.9x	0.77			8.1		x		1.38			0.63			0.7	\dashv	=	103.28	(75)
	L	0.77			8.1		X		7.96			0.63	×		0.7	=	=	169.61	(75)
Northe	ast <mark>0.9x</mark>	0.77		×	8.1	7	x	9	1.35	X		0.63	X		0.7		=	227.99	(75)

Northeast 0.9x	0.77	x	8.1	7	x 9	97.38	x	0.63	x	0.7	=	243.07	(75)
Northeast 0.9x	0.77	×	8.1	7	x	91.1	x	0.63	×	0.7	=	227.38	(75)
Northeast 0.9x	0.77	x	8.1	7	x	72.63	x	0.63	x	0.7	=	181.27	(75)
Northeast 0.9x	0.77	x	8.1	7	x e	50.42	x	0.63	x	0.7	=	125.85	(75)
Northeast 0.9x	0.77	x	8.1	7	x 2	28.07	x	0.63	x	0.7	=	70.05	(75)
Northeast 0.9x	0.77	x	8.1	7	x	14.2	x	0.63	x	0.7	=	35.43	(75)
Northeast 0.9x	0.77	x	8.1	7	x	9.21	x	0.63	x	0.7	=	23	(75)
Solar <u>g</u> ains ir	n watts, ca	alculated	for eac	n month			(83)m = 5	Sum(74)m .	(82)m				
(83)m= 28.16		103.28	169.61	227.99	243.07	227.38	181.27	125.85	70.05	35.43	23		(83)
Total gains –			. ,	. ,	· ,	, watts						1	
(84)m= 397.05	6 424.14	458.52	506.42	546.41	543.62	516.25	475.83	429.83	392.67	379.36	382.6		(84)
7. Mean inte	ernal temp	erature	(heating	season)								
Temperatur	e during h	eating p	eriods ir	n the livi	ng area	from Tal	ole 9, Tł	n1 (°C)				21	(85)
Utilisation fa	ctor for ga	ains for I	iving are	ea, h1,m	(see Ta	able 9a)			-				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.95	0.94	0.91	0.84	0.71	0.55	0.42	0.47	0.68	0.87	0.93	0.96		(86)
Mean intern	al tempera	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in Tab	le 9c)					
(87)m= 19.36		19.88	20.33	20.7	20.91	20.97	20.96	20.8	20.35	19.8	19.33		(87)
Temperatur	e durina h	eating n	eriods ir	rest of	dwelling	i from Ta		h2 (°C)					
(88)m= 20.2	20.2	20.2	20.21	20.21	20.22	20.22	20.23	20.22	20.21	20.21	20.21		(88)
						I		-		-	-		
Utilisation fa	0.93	ains for i 0.9	0.81	veiling, 0.67	n2,m (se 0.49	e Table	9a) 0.4	0.63	0.84	0.92	0.95		(89)
						I				0.92	0.95		(00)
Mean intern	<u> </u>			1	r č (r	r –	1	r	1		I	(00)
(90)m= 17.99	18.24	18.73	19.38	19.87	20.14	20.2	20.19	20.02	19.42	18.63	17.95		(90)
								1	ila = livir	ig area ÷ (4	4) =	0.4	(91)
Mean intern	al tempera	ature (fo	r the wh	ole dwe	lling) = f	LA x T1	+ (1 – fl	_A) × T2			i		
(92)m= 18.54		19.19	19.76	20.2	20.44	20.51	20.5	20.33	19.79	19.1	18.5		(92)
Apply adjust				· ·	1	r	1	1	r –	1		I	(00)
(93)m= 18.54	<u> </u>	19.19	19.76	20.2	20.44	20.51	20.5	20.33	19.79	19.1	18.5		(93)
8. Space he									· .	70)		1.4	
Set Ti to the the utilisatio			•		ied at st	ep 11 of	Table 9	b, so tha	it II,m=(76)m an	d re-cald	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa								1					
(94)m= 0.93	0.92	0.88	0.8	0.67	0.51	0.38	0.42	0.64	0.83	0.91	0.94		(94)
Useful gains	s, hmGm ,	W = (94	1)m x (84	4)m		<u>.</u>		•	!	!			
(95)m= 370.13	3 388.44	403.06	405.28	368.16	277.22	193.81	200.3	275.43	325.48	344.52	358.86		(95)
Monthly ave	rage 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 loss ra					1				ř – – –		1	I	
(97)m= 754.27		668.31	564.01	440.25	298.38	199.66	208.76	320.05	476.04	624.85	749.29		(97)
Space heati	- T - T				r	1	r	1	<u> </u>	<u> </u>		I	
(98)m= 285.8	231	197.34	114.29	53.63	0	0	0	0	112.02	201.84	290.48		

	Total per year (kWh/y	vear) = Sum(98) _{15,912} =	1486.39	(98)					
Space heating requirement in kWh/m²/year			24.26	(99)					
9b. Energy requirements – Community heating scheme									
This part is used for space heating, space cooling or water heatin Fraction of space heat from secondary/supplementary heating (T	.	nmunity scheme.	0	(301)					
Fraction of space heat from community system $1 - (301) =$			1	(302)					
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. Se		our other heat sources;	the latter	_					
Fraction of heat from Community boilers			1	(303a)					
Fraction of total space heat from Community boilers		(302) x (303a) =	1	(304a)					
Factor for control and charging method (Table 4c(3)) for commun	ity heating system		1	(305)					
Distribution loss factor (Table 12c) for community heating system			1.05	(306)					
Space heating			kWh/yea	r					
Annual space heating requirement			1486.39						
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	1560.71	(307a)					
Efficiency of secondary/supplementary heating system in % (from	n Table 4a or Appen	dix E)	0	(308					
Space heating requirement from secondary/supplementary system	Space heating requirement from secondary/supplementary system $(98) \times (301) \times 100 \div (308) =$								
Water heating Annual water heating requirement			2010.81	7					
If DHW from community scheme:			г						
Water heat from Community boilers	(64) x (303a) x		2111.35	(310a)					
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	36.72	(313)					
Cooling System Energy Efficiency Ratio			0	(314)					
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=	0	(315)					
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from o	utside		212.58	(330a)					
warm air heating system fans			0	(330b)					
pump for solar water heating			0	(330g)					
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	212.58	(331)					
Energy for lighting (calculated in Appendix L)			300.75	(332)					
Electricity generated by PVs (Appendix M) (negative quantity)			-617.51	(333)					
Electricity generated by wind turbine (Appendix M) (negative quarter	ntity)		0	(334)					
12b. CO2 Emissions – Community heating scheme									
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year						
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using t	wo fuels repeat (363) to	(366) for the second fue	94	(367a)					
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.22	843.79	(367)					
Electrical energy for heat distribution [(3	313) x	0.52	= 19.06	(372)					

Total CO2 associated with community sy	/stems	(363)(366) + (368)((372)	=	862.85	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	ion heater or instantar	eous heater (312)	x 0.22	=	0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =			862.85	(376)
CO2 associated with electricity for pump	s and fans within dwe	lling (331)) x	0.52	=	110.33	(378)
CO2 associated with electricity for lightin	ng	(332))) x	0.52	=	156.09	(379)
Energy saving/generation technologies ((333) to (334) as appli	cable		.		_
Item 1		L	0.52	x 0.01 =	-320.49	(380)
Total CO2, kg/year	sum of (376)(382) =			[808.78	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			[13.2	(384)
El rating (section 14)				[89.8	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 4

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:	ather (a	ach):	None Indicativ False	valley			
Summer ventilation h Transmission heat lo			ient:	202.2 40.2				(P1)
Summer heat loss co				40.2 242.39				(P2)
Overhangs:								
Orientation:	Ratio:		Z_overhangs:					
North East (NE)	0		- C 1					
Solar shading:								
			.	-		_		
Orientation:	Z blind	S:	Solar access:		verhangs:	Z summer:		(P8)
North East (NE)	1		0.9	1		0.9		(F0)
Solar gains:								
Orientation		Area	Flux	g_	FF	Shading	Gains	
North East (NE)	0.9 x	8.17	98.85	0.63	0.7	0.9	288.36	
						Total	288.36	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer externa Thermal mass tempera Threshold temperature Likelihood of high inf	l temperat ature incre	ement	-		June 414.31 725.61 2.99 16 1.3 20.29 Not significant	July 399.51 687.88 2.84 17.9 1.3 22.04 Medium	August 407.16 643.07 2.65 17.8 1.3 21.75 Slight	(P5) (P6) (P7)
Assessment of likelih		•			<u>Medium</u>	moundin	ongin	
		-	•					

Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.9 Property Address: Property Address: Property Address: Address: Software Name: Ave. Height(m) Version: 1.0.5.9 Ground floor Area(m ²) Av. Height(m) Version: 1.0.5.9 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) G1.27 (a) X 2.5 (2a) Volume(m ^P) (3a) Number of chimneys Socondary other foldal m ³ per hour (a)				User D	etails:						
Aldress : 1. Overall divelling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Ground floor (13) : 13) : 133 (3a) Total floor area TFA = (1a)+(1b)+(1e)+(1e)+(1e)+(1n) 5127 (1a) : 2.5 (2a) : (2a)	Assessor Name: Software Name:		2012								
I. Overall dwelling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Ground floor 6127 $(1a) \times 2.5$ $(2a) = 1000$ 153.18 $(3a)$ Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 6127 (4) $(524)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d$			Р	roperty A	Address:	Plot 4					
Area(m ²)Av. Height(m)Volume(m ³)Ground floor 61.27 $(1a) \times 2.5$ $(2a) = 153.18$ $(3a)$ Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 61.27 $(1a) \times 2.5$ $(2a) = 153.18$ $(3a)$ Dwelling volume $(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+$	Address :										
Ground floor 61.27 $(1a) \times 2.5$ $(2a) = 153.18$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 61.27 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 153.18$ $(5a)$ 2. Ventilation rate: main heating	1. Overall dwelling dimer	nsions:									
Developme $(3a)+(3b)+(3c)+(3d)+(3c)+,(3n) = 153.18 (s)$ 2. Ventilation rate:main heating heatingsecondary heatingothertotalm³ per hourNumber of chimneys0+0=0x40 =0Number of open flues0+0=0x40 =0Number of intermittent fans2x10 =07(a)Number of passive vents0x10 =07(a)Number of flueless gas fires0x40 =07(a)Number of storeys in the dwelling (ns)Additional infiltration(b)-1(a) t =0Additional infiltration:0.25 for steel or timber frame or 0.35 for masony construction if but types of wild were allows and doors draught stripped(b)0Vindow infiltration0.25 - (0.2 x (14) + 100) =0(12)Window infiltration rate(b) + (10) + (11) + (12) + (13) + (15) =0(13)Air permeability value, qb50, expressed in cubic metres per hours for metre of envelope area3(17)Mindow infiltration rate(b) + (10) + (11) + (12) + (13) + (15) =3(19)Air permeability value, qb50, expressed in cubic metres per hours per square metre of envelope area3(17)Mindow of sides sheltered(20) = 1 - (0.075 x (19)) =(16)Number of sides sheltered(20) = 1 - (0.075 x (19)) =(16)Number of sides sheltered(20) = 1 - (0.075 x (19)) =(19)Number of sides sheltered(20) = 1 - (0.075 x (19)) =(19)Number of sides sheltered <td< td=""><td>Ground floor</td><td></td><td></td><td></td><td>· ·</td><td>(1a) x</td><td></td><td></td><td>(2a) =</td><td>. ,</td><td>-</td></td<>	Ground floor				· ·	(1a) x			(2a) =	. ,	-
2. Ventilation rate:main heatingsecondary heatingothertotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40$ $=$ 0 $(6a)$ Number of pansive vents 2 $x10$ $=$ 20 $(7a)$ Number of passive vents 0 $x40$ $=$ 0 $(7a)$ Number of flueless gas fires 0 $x40$ $=$ 0 $(7a)$ Number of storeys in the dwelling (ns) $Additional infiltration(9)(9)(9)Additional infiltration:0.55for steel or timber frame or 0.35 for masonry construction(9)(14)Ninder of storeys in the dwelling (ns)Additional infiltration:0.550.250.250.250.25If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 000110Percentage of windows and doors draught stripped0.510.250.250.220.220.23Air permeability value, qb50, expressed in cubic metres per hour per square metre of envelope area0.230.230.230.23Air permeability value square0.550.220.220.220.230.230.23If no draught lobby, enter 0.05, expressed in cubic metres per hour per square metre of envelope area0.230.230.230.230.23Air permeability value square0.550.220.220.230.230.230.230.23$	Total floor area TFA = (1a)+(1b)+(1c)+(1d)+	⊦(1e)+(1n	I) 6	1.27	(4)					
main heating heatingscondary heatingothertotalm³ per hourNumber of chimneys0+0=0x40 =0(6a)Number of open flues0+0=0x20 =0(6b)Number of intermittent fans2x10 =20(7a)Number of passive vents0x10 =07b)Number of flueless gas fires0x40 =07c)Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =20+ (5) =0.13(6)I' a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)(9)Additional infiltration0(9)(11)0(10)Structural infiltration to. 25 for steel or timber frame or 0.35 for masonry construction0(12)If suspended wooden floor, enter 0.20.25 - (0.2 x (14) + 100] =0(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - (0.2 x (14) + 100] =0(15)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3(17)If based on air permeability value, then (18) = (17) + 20)+(8), otherwise (18) = (16)0.28(19)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3(17)If based on air permeability value, then test base done or a degree air permeabilit	Dwelling volume			L		(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	153.18	(5)
heating 0teating 0teating 0teating 0teating 0teating 0Number of chimneys 0 0 $+$ 0 $=$ 0 $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $(7a)$ Number of intermittent fans 2 $x10$ 2 $(7a)$ Number of passive vents 0 $x40$ 0 $(7c)$ Number of flueless gas fires 0 $x40$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ 0 $+$ (5) 0.13 Number of storeys in the dwelling (ns) $x40$ 0 $(7c)$ (9) Additional infiltration $(9)-130.1$ 0 (9) Structural infiltration $(9)-130.1$ 0 (9) Structural infiltration $(9)-130.1$ 0 (11) t how preserves and are passed wall are	2. Ventilation rate:										
Number of chimneys 0 + 0 + 0 = 0 $x40$ 0 $(6a)$ Number of open flues 0 + 0 + 0 = 0 $x20$ 0 $(6b)$ Number of intermittent fans 2 $x10$ 2 $x10$ 2 2 $7a$ Number of passive vents 0 $x10$ 0 $7c$ 0 $x40$ 0 $7c$ Number of flueless gas fires 0 $x40$ 0 $7c$ 0 $x40$ 0 $7c$ Infitration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c)$ = 20 $+(6)$ 0 13 (6) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 10 0 10 Number of storeys in the dwelling (ns) 0 (9) 0 10 0 10 Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction 0 10 0 10 If out aught lobby, enter 0.05, else enter 0 0 0 12 0 13 Percentage of windows and doors draught stripped 0 0 0 14 Window infiltration $0.25 - [0.2 \times (14) + 100] =$ 0 16 Ar permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 0 17 If based on air permeability value, then $(18) = [177) + 20] + (8)$, otherwise $(18) = (16)$ 0.26 $(19) =$ 0.26 Ar permeability value,				у	other		total			m ³ per hour	
Number of intermittent fans 2 x10 = 20 (7a) Number of passive vents 0 x10 = 0 (7b) Number of flueless gas fires 0 x40 = 0 (7c) Air changes per hour Inflitration due to chinneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20 $+$ (5) = 0.13 (8) Number of storeys in the dwelling (ns) Additional infiltration (19) 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas or geneing); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (13) 0 (14) Window infiltration 0.25 [0.2 x (14) + 100] = 0 (14) Window infiltration 0.25 [0.2 x (14) + 100] = 0 (14) Window infiltration 0.25 [0.2 x (14) + 100] = 0 (15) Air permeability value, q50, expressed in cu	Number of chimneys			+ [0] = [0	X 4	40 =	0	(6a)
Number of passive vents 10^{-1} <th< td=""><td>Number of open flues</td><td>0 +</td><td>- 0</td><td></td><td>0</td><td>] = [</td><td>0</td><td>x</td><td>20 =</td><td>0</td><td>(6b)</td></th<>	Number of open flues	0 +	- 0		0] = [0	x	20 =	0	(6b)
Number of flueless gas fires $ \begin{array}{c} 0 \\ 0 \\ 0 \end{array} x 40 = \\ 0 \\ 0 \end{array} x 40 = \\ 0 \\ 0 \end{array} x 40 = \\ 0 \\ 0 \\ 0 \end{array} x 40 = \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	Number of intermittent far	IS IS	L				2	x '	10 =	20	(7a)
Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20$ + $(5) = 0.13$ (8)If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)Additional infiltration(9)-1]x0.1 = 0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - [0.2 x (14) + 100] =Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3 (17)Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredShelter factor(20) = 1 - [0.075 x (19)] =Infiltration rate modified for monthly wind speedInfiltration rate modified for monthly wind speed <t< td=""><td>Number of passive vents</td><td></td><td></td><td></td><td></td><td></td><td>0</td><td>x /</td><td>10 =</td><td>0</td><td> (7b)</td></t<>	Number of passive vents						0	x /	10 =	0	 (7b)
Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20+ (5) =0.13(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)(9)(10)Number of storeys in the dwelling (ns)(9)-1]x0.1 =0(10)Additional infiltration(9)-1]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(12)If no draught lobby, enter 0.05, else enter 00(12)(14)Percentage of windows and doors draught stripped0(15)Unifitration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3(17)Ar permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3(17)If based on air permeability value, then (18) = [(17) ± 20]+(8), otherwise (18) = (16)3(19)Ar permeability value applies if a pressurisation test has been done or a degree air permeability is being used3(19)Infiltration rate incorporating shelter factor(20) = 1 - [0.075 x (19)] =0.22(21)Infiltration rate modified for monthly wind speed3(16)0.28(22)Infiltration rate modified for monthly wind speed0.21 - [0.075 x (19)] = <t< td=""><td>Number of flueless gas fir</td><td>es</td><td></td><td></td><td></td><td></td><td>0</td><td> x 4</td><td>40 =</td><td>0</td><td>_](7c)</td></t<>	Number of flueless gas fir	es					0	x 4	40 =	0	_](7c)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)=$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9) to (16) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area if based on air permeability value, then (18) = $[(17) + 20]+(8)$, otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = $1 - [0.075 \times (19)] =$ Infiltration rate modified for monthly wind speed $\boxed{ Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}$ Monthly average wind speed from Table 7 (22)m <u>5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7</u> Wind Factor (22a)m = (22)m ÷ 4	-					L			Air ch	anges per be	
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9)-1)×0.1 = 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (14) Window infiltration ate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (18) = [(17) ÷ 20]+(6), otherwise (18) = (16) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = 0.78 (20) Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Monthly average wind speed from Table 7 (22)m 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m + 4						_				anges per no	-
Number of storeys in the dwelling (ns)0Additional infiltration $([9)-1]x0.1 =$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00Percentage of windows and doors draught stripped0Window infiltration rate0.25 - [0.2 x (14) + 100] =Infiltration rate(b) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used3Number of sides sheltered3(19)Shelter factor(20) = 1 - [0.075 x (19)] =Infiltration rate incorporating shelter factor(21) = (18) x (20) =Infiltration rate modified for monthly wind speed3Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov DecMonthly average wind speed from Table 7(22)me 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7Wind Factor (22a)m = (22)m ÷ 4	•					continue fro			÷ (5) =	0.13	(8)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If no draught lobby, enter 0.05, else enter 0Percentage of windows and doors draught strippedWindow infiltration0.25 - [0.2 x (14) ÷ 100] =01011111213141516161717181911111112131414151616171718191911111111121314151616171718191911111112131414151616171718191910111111121314141515161617				()/						0	(9)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration nate (3) + (10) + (11) + (12) + (13) + (15) = Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) + 20]+(8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $1nfiltration rate modified for monthly wind speed \boxed{1an Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}Monthly average wind speed from Table 7(22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7$	Additional infiltration							[(9)	-1]x0.1 =	0	(10)
deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration0.25 - [0.2 x (14) \div 100] =Infiltration rate(8) $+$ (10) $+$ (11) $+$ (12) $+$ (13) $+$ (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value qapiles if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredNumber of sides shelteredInfiltration rate incorporating shelter factorInfiltration rate modified for monthly wind speedInfiltration rate modified for monthly wind speedInfiltration rate modified for Table 7(22)m=5.154.94.44.33.83.744.34.34.34.54.7	Structural infiltration: 0.2	25 for steel or tim	ber frame or	0.35 for	masonr	y constr	uction			0	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.28Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used3Number of sides sheltered3(19)Shelter factor(20) = 1 - [0.075 \times (19)] =0.22Infiltration rate modified for monthly wind speed3(19)Monthly average wind speed from Table 70.22(21)(22)m=5.154.94.44.33.83.744.3Wind Factor (22a)m = (22)m ÷ 44.33.83.7	•• •		orresponding to	the greate	er wall are	a (after					
If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ Infiltration rate(B) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredShelter factorInfiltration rate modified for monthly wind speedInfiltration rate modified for monthly wind speedInfiltration rate wind speed from Table 7(22)m=5.154.94.44.33.83.744.34.54.7	•		sealed) or 0.	1 (seale	d), else	enter 0				0	(12)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 (17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.28 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 0.28 (18)Number of sides sheltered 3 (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed 0.22 (21)Infiltration rate modified for monthly wind speed $0.22 \times 14.4 \times 13$ Monthly average wind speed from Table 7 $(22)m =$ $(22)m =$ 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.4 4.3 3.8 3.7 4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.3 4.4 4.4 4.4 4.4 <t< td=""><td>·</td><td></td><td>,</td><td>,</td><td>,,</td><td></td><td></td><td></td><td></td><td></td><td>4</td></t<>	·		,	,	,,						4
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 (17) If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ 0.28 (18) Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used 0.28 (18) Number of sides sheltered 3 (19) 0.78 (20) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78 (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.22 (21) Infiltration rate modified for monthly wind speed 0.22 (21) $0.21 - [0.075 \times (19)] =$ 0.22 Monthly average wind speed from Table 7 $(22)m =$ 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$ 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7	Percentage of windows	and doors draugh	nt stripped							0	(14)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.28Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0.28Number of sides sheltered3Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed0.22Monthly average wind speed from Table 7(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.3 4.5 4.7	Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ <i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i> Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = (20) = (21) = (18) x (20) = (21) = (18) x (20) = (22) = (21) Infiltration rate incorporating shelter factor (21) = (18) x (20) = (22) = (21) = (22) = (21) Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4	Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered 3 Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78 Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.22 Infiltration rate modified for monthly wind speed 0.22 (21) Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4 Wind Factor (22a)m = (22)m ÷ 4 Image: Content of the second seco				•	•	•	etre of e	envelope	area	3	(17)
Number of sides sheltered3Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78 Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.22 Infiltration rate modified for monthly wind speed 0.22 (21) Infiltration rate modified for monthly wind speed 0.22 (21) Monthly average wind speed from Table 7 $(22)m =$ 5.1 5 $(22)m =$ 5.1 5 4.9 4.4 4.3 $(22)m =$ 5.1 5 4.9 4.4 4.3 $(22)m =$ $(22)m \div 4$ $(20) =$ $(21) \div (22)m \div 4$	•									0.28	(18)
Shelter factor $(20) = 1 - [0.075 \times (19)] =$ (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.22 (21) Infiltration rate modified for monthly wind speed 0.22 (21) Infiltration rate modified for monthly wind speed 0.22 (21) Monthly average wind speed from Table 7 0.22 0.22 $(22)m=$ 5.1 5 4.9 4.4 4.3 Wind Factor (22a)m = $(22)m \div 4$ 4.3 3.8 3.7 4 4.3			t has been don	e or a deg	gree air pei	rmeability i	is being us	sed		0	
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.22 (21) Infiltration rate modified for monthly wind speed $\boxed{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}$ Monthly average wind speed from Table 7 $(22)m=$ 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$ 4.4 4.3 4.4 4.3 4.5 4.7		1			(20) = 1 -	[0.075 x (1	9)] =				- · ·
Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7		ng shelter factor			(21) = (18)) x (20) =					4
JanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $\div 4$		-	beed							0.22	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			- i - i	Jul	Aug	Sep	Oct	Nov	Dec		
Wind Factor (22a)m = (22)m \div 4	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 1.0	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
.	0.28	0.27	0.27	0.24	0.23	0.21	0.21	0.2	0.22	0.23	0.24	0.26		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se		-				0	(220)
				endix N, (2	3b) = (23a	i) x Fmv (e	equation (N	N5)), othe	rwise (23b) = (23a)		l	0	(23a) (23b)
			0 11	iency in %	, (, (• •	<i>,,</i> .) (200)		l	0	(230) (23c)
			-	entilation	-					2h)m + (23h) 🗙 [ʻ	 _ (23c)	-	(200)
(24a)m=	r			0	0	0	0	0	0	0	0	0	. 100]	(24a)
		l d mech	i anical ve	ntilation	without	heat rec	L coverv (N	I //V) (24b))m = (22	I 2b)m + (;	23b)			
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	u ouse ex	r tract ver	ntilation of	or positiv	re input v	/entilatio	n from c	utside					
,				then (24d	•	•				5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous		•								
	<u>, ,</u>		r <u>, ,</u>	m = (22l	<i>.</i>	<u>`</u>	, 	<u> </u>	· · · · · · · · · · · · · · · · · · ·					
(24d)m=		0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53		(24d)
	r	i	î	nter (24a				1	i i i i i i i i i i i i i i i i i i i					
(25)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53		(25)
3. He	at losse	s and he	eat loss	paramete	er:									
ELEN	IENT	Gros		Openin m	•	Net Ar		U-valı W/m2		A X U (W/I		k-value kJ/m²∙ł		A X k kJ/K
Doors		area	(11-)	11	-	A ,r	л- Т х	1.4	.rx = [2.8		KJ/III∹r	`	(26)
Windo	ws					8.167	= .	/[1/(1.4)+	!	10.83				(20)
Floor	~~~												-,	
Walls ⁻						61.27		0.12		7.35288			\dashv	(28)
		44.8		8.17		36.63		0.15		5.5	╡┟		\dashv	(29)
Walls		27.5		2		25.53		0.14	=	3.66				(29)
		elements		footivowi	ndowilly	133.6		formula 1	/[/////////////////////////////////////	(a) . 0 041 a	a airean in	noroaronh		(31)
				effective wi nternal wal			aleo using	normula i	/[(1/ 0- vait	ie)+0.04j a	is given in	paragraph	3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				30.13	(33)
Heat c	apacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	7610.42	2 (34)
Therm	al mass	parame	eter (TMI	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Low	ĺ	100	(35)
	•	sments wh ad of a de		etails of the	constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
				culated u	usina An	nendix k	<					I	10.05	(36)
	•	•	,	nown (36) =	• •	•	•					l	10.05	(00)
	abric he			()		,			(33) +	(36) =			40.18	(37)
Ventila	tion hea	at loss ca	alculated	d monthly	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	27.22	27.14	27.07	26.72	26.66	26.35	26.35	26.3	26.47	26.66	26.79	26.93		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	67.4	67.33	67.25	66.91	66.84	66.54	66.54	66.48	66.66	66.84	66.97	67.11		
										Average =	Sum(39)1.	12 /12=	66.91	(39)

Heat Ic	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.1	1.1	1.1	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.1		
Numbe	er of dav	/s in mo	nth (Tab	le 1a)				-		Average =	Sum(40)1.	.12 /12=	1.09	(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)
I														
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x (⁻	TFA -13	2. .9)	02		(42)
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.44		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	95.08	91.62	88.16	84.71	81.25	77.79	77.79	81.25	84.71	88.16	91.62	95.08		_
Energy	content of	hot water	used - ca	culated m	onthly — A	100 v Vd r	n v nm v I	DTm / 3600			m(44) ₁₁₂ =		1037.23	(44)
	141	123.32	127.25	110.94	106.45	91.86	85.12	97.68	98.85	115.2	125.74	136.55	l	
(45)m=	141	123.32	127.25	110.94	106.45	91.00	60.12	97.00			m(45) ₁₁₂ =		1359.97	(45)
lf instant	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		rotar – Ou	III(40) 112 -		1000.01	
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage			•					•					
-		. ,		• •			-	within sa	ame ves	sei	()		(47)
	•	-			/elling, e ncludes i			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):				(0		(48)
Tempe	erature f	actor fro	m Table	2b							(0		(49)
•••			-	e, kWh/ye		or io not	known	(48) x (49)) =		(0		(50)
				•	loss fact le 2 (kWl)		(51)
		•	ee secti		,		.,					-		
		from Ta									(0		(52)
			m Table								(0		(53)
		m wateı (54) in (5	•	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		2		(54)
	. ,	. , .		for each	month			((56)m = (55) x (41)	m	(0		(55)
	0	0			0	0	0	0	0	0	0	0	l	(56)
(56)m= If cylinde	-	-	-	-	-	-	-	50), else (5	-	-	-	-	ix H	(00)
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•	•	,	om Table for each		59)m – 4	(58) <u>+</u> 20	65 × (41)	m		(0		(58)
	•					,	. ,	ing and a		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
	-	•	-	-	-	•	-	-	-	-	-		•	

Combi	loss ca	alculated	for eac	h 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	eat req	uired for	water h	neating c	alculated	d fo	or eacl	h month	(62)ı	m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	119.85	104.82	108.17	94.3	90.48	7	78.08	72.35	83.0	03	84.02	97.92	106.88	116.07]	(62)
Solar DI	-W input	calculated	using Ap	pendix G c	or Appendix	кН	(negativ	ve quantity	/) (ent	er '0'	if no sola	r contribu	tion to wat	er heating)	-	
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	S ap	oplies,	, see Ap	pend	lix G	S)					
(63)m=	0	0	0	0	0		0	0	0		0	0	0	0]	(63)
Output	from w	ater hea	ter	-	-			-				-	-		-	
(64)m=	119.85	104.82	108.17	94.3	90.48	7	78.08	72.35	83.0	03	84.02	97.92	106.88	116.07]	
										Outp	out from w	ater heate	er (annual)	112	1155.97	(64)
Heat g	ains fro	m water	heating	g, kWh/m	onth 0.2	5 ′	[0.85	× (45)m	ı + (6	1)m	n] + 0.8 x	k [(46)m	+ (57)m	n + (59)m	1]	
(65)m=	29.96	26.21	27.04	23.58	22.62	1	19.52	18.09	20.7	76	21	24.48	26.72	29.02]	(65)
inclu	ide (57)	m in calo	ulation	of (65)m	n only if c	yliı	nder is	s in the a	dwell	ing	or hot w	ater is f	rom com	nmunity h	neating	
5. In	ternal q	ains (see	e Table	5 and 5a	a):	-				-				-	_	
		ns (Table			/											
motab	Jan	Feb	Mar	Apr	May	Γ	Jun	Jul	A	рц	Sep	Oct	Nov	Dec]	
(66)m=	100.87	100.87	100.87	<u> </u>	100.87	-	00.87	100.87	100.	-	100.87	100.87	100.87	100.87		(66)
Lightin	g gains	(calcula	ted in A	Appendix	L, equat	ion	1 L9 01	r L9a), a	lso s	ee ⁻	Table 5				1	
(67)m=	17.03	15.13	12.3	9.31	6.96	1	5.88	6.35	8.2		11.08	14.07	16.42	17.5]	(67)
Applia	nces da	uns (calc	ulated i	n Appen	u dix Lea	ı uat	tion L	13 or I 1	1 3a) a	also	0.85 x (45)m + (46)m + (57)m + (59)m + (61)m 84.02 97.92 106.88 116.07 (62) if no solar contribution to water heating) 0 0 0 (63) 84.02 97.92 106.88 116.07 (64) 1 97.92 106.88 116.07 (64) 1 97.92 106.88 116.07 (64) 1 97.92 106.88 116.07 (64) 1 10.8 x [(46)m + (57)m + (59)m] (65) (65) 1 10.8 x [(46)m + (57)m + (59)m] (65) (66) 10.8 x [(40)m + (57)m + (59)m] (66) (66) 100.87 100.87 100.87 (66) 100.87 100.87 100.87 (66) 11.08 14.07 16.42 17.5 (67) see Table 5 (71) (71) (71) 33.09 33.09 33.09 (72) (74) (69)m + (70)m + (71)m + (72)m (72) (69)m + (70)m + (71)m + (72)m (73) 28.07 244.59 263.53 278.14 (73)					
(68)m=	176.15	177.98	173.37	<u> </u>	151.19	<u> </u>	39.55	131.78	129.			$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				
						_					e Table	ـــــــــــــــــــــــــــــــــــــ			1	
(69)m=	33.09	33.09	33.09	33.09	33.09	-	33.09	33.09	33.0				33.09	33.09	1	(69)
		ins gains													J	
(70)m=				0	0	Г	0	0	0		0	0	0	0	1	(70)
		vaporatic						Ů	Ů		•	Ů	Ů	Ů	J	(- /
(71)m=	-80.7	-80.7	-80.7	-80.7	-80.7	1	-80.7	-80.7	-80	7	-80.7	-80.7	-80.7	-80.7	1	(71)
					-00.7		-00.7	-00.7	-00	.1	-00.7	-00.7	-00.7	-00.7	J	()
(72)m=	40.27	gains (T 39	36.35	32.74	30.4		27.11	24.31	27.	0	20.17	22.0	27.11	20	1	(72)
				32.74	30.4	<u> </u>									J	(12)
	r	l gains =	r	050.00	044.04			i , ,	· ·		. ,	· · ·	1 .	1	1	(72)
(73)m=	286.71	285.36	275.28	258.88	241.81	2	225.8	215.7	219.	.37	228.07	244.59	263.53	278.14		(73)
	lar gain ains are		usina sol	ar flux fron	n Table 6a	and	lassoci	iated equa	itions t	0.00	nvert to th	e applica	ble orienta	tion		
		Access F	-	Area		ana	Flu			.0 00					Gains	
onona		Table 6d		m²	•			ole 6a		Т	able 6b	Т				
Northe	ast <mark>0.9x</mark>	0.77)	(8.	17	x	1	1.28	x		0.63	x	0.7	=	28.16	(75)
Northe	ast <mark>0.9x</mark>	0.77)	(8.	17	x	2	2.97	x		0.63	×	0.7	=	57.32	(75)
Northe	ast <mark>0.9x</mark>	0.77)	(8.	17	x	4	1.38	x		0.63	×	0.7	=	103.28	(75)
Northe	ast <mark>0.9x</mark>	0.77	,	(8.	17	x	6	57.96	x		0.63		0.7	=	169.61	(75)
Northe	ast <mark>0.9x</mark>	0.77)	(8.	17	x	9	1.35	x		0.63		0.7	=	227.99	(75)

													_	
Northeast 0.9x	0.77	x	8.1	7	x	97.38	x	0.6	63	x	0.7	=	243.07	(75)
Northeast 0.9x	0.77	x	8.1	7	x	91.1	x	0.6	63	x	0.7	=	227.38	(75)
Northeast 0.9x	0.77	x	8.1	7	x	72.63	x	0.6	63	x	0.7	=	181.27	(75)
Northeast 0.9x	0.77	x	8.1	7	x	50.42	x	0.6	63	x	0.7	=	125.85	(75)
Northeast 0.9x	0.77	x	8.1	7	x	28.07	x	0.6	63	x	0.7	=	70.05	(75)
Northeast 0.9x	0.77	x	8.1	7	x	14.2	x	0.6	63	x	0.7	=	35.43	(75)
Northeast 0.9x	rtheast 0.9x 0.77 X 8.17 X 9.21 X 0.63 X 0.7 =												23	(75)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = Sum(74)m(82)m 28.46														
(83)m= 28.16 57.32 103.28 169.61 227.99 243.07 227.38 181.27 125.85 70.05 35.43 23 Total gains – internal and solar (84)m = (73)m + (83)m , watts														(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts														
(84)m= 314.87 342.68 378.56 428.5 469.81 468.87 443.09 400.64 353.92 314.65 298.97 301.14														(84)
7. Mean inte	rnal temper	ature (heating	season)									
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C)													21	(85)
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) 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= 0.98	0.97	0.95	0.91	0.82	1	0.69 0.57	0.6	63 0	.82	0.93	0.97	0.98		(86)
Moon intern		uro in li				w steps 3 to	1		<u> </u>					
(87)m= 18.57	<u> </u>	9.17	19.75	20.3	<u> </u>	20.7 20.88	20.)).49	19.8	19.09	18.53		(87)
	<u> </u>											10100		
	т ^т т	<u> </u>		[elling from Ta	1		<u> </u>	00.04				(00)
(88)m= 20	20	20	20.01	20.01	2	0.01 20.01	20.	01 20	0.01	20.01	20.01	20		(88)
Utilisation fa	ctor for gain	is for r	est of d	welling,	h2,	m (see Table	9a)				1	r	I	
(89)m= 0.97	0.96	0.94	0.89	0.79		0.63 0.47	0.5	53 0	.77	0.92	0.96	0.98		(89)
Mean interna	al temperatu	ure in t	he rest	of dwelli	ing	T2 (follow ste	eps 3	to 7 in	Table	e 9c)				
(90)m= 17.77	17.96 1	8.37	18.93	19.46	1	9.82 19.95	19.	93 19	9.65	18.99	18.29	17.73		(90)
		-					-		fl	LA = Livin	ig area ÷ (4	4) =	0.4	(91)
Mean interna	al temperatu	ıre (for	the wh	ole dwe	llin	g) = fLA × T1	+ (1	– fLA) :	x T2					
(92)m= 18.09	1 1	8.69	19.26	19.79	-	0.17 20.32	20.	<u> </u>	9.98	19.32	18.61	18.05		(92)
	ment to the	mean	internal	temper	ı atu	re from Table	4e,	where a	appro	priate				
(93)m= 18.09	T T	8.69	19.26	19.79	r –	0.17 20.32	20.		9.98	19.32	18.61	18.05		(93)
8. Space he	ating require	ement			1	_								
Set Ti to the	mean interr	nal terr	nperatur	e obtair	ned	at step 11 of	⁻ Tabl	e 9b, s	o that	t Ti,m=(76)m an	d re-calo	ulate	
the utilisation	n factor for g	gains u	ising Ta	ble 9a									1	
Jan		Mar	Apr	May		Jun Jul	A	ug S	Sep	Oct	Nov	Dec		
Utilisation fa		- I			-		-						I	(2.1)
(94)m= 0.96		0.93	0.87	0.78	(0.64 0.5	0.5	6 0	.77	0.9	0.95	0.97		(94)
Useful gains	1 1	<u> </u>	, ,	,	_		1		1				l	
(95)m= 303.26		51.43	374.63	365.85		99.94 222.07	223	./3 27	1.18	284.06	284.26	291.17		(95)
Monthly average external temperature from Table 8												l	(06)	
(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 Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]													(96)	
Heat loss ra (97)m= 929.5		19.67	al tempe 692.92	540.96	-	, VV =[(39)m 70.62 247.69	x [(9)	`	2.21	582.72	770.91	929.14		(97)
												929.14		(37)
(98)m= 465.93	<u> </u>	48.37	229.17	10nth, K 130.28	vvn T	$\frac{\text{/month} = 0.02}{0}$		<u> </u>	- (95) 0	mj x (4) 222.2	350.38	474.66		
(30)11= 403.93	300.20 3	-U.J/	223.11	130.20		<u> </u>			0	<i>LLL.L</i>	550.56	474.00		

								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2607.25	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								42.55	(99)
8c. Sp	bace co	oling req	luiremer	nt										
Calcu	lated fo	r June, J	July and	August.	See Tal	ole 10b	-							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	e Lm (ca	lculated	using 2	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	625.46	492.39	505.27	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	oss hm											
(101)m=	0	0	0	0	0	0.73	0.79	0.76	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) =	(100)m x	(101)m									
(102)m=	0	0	0	0	0	456	390.69	382.23	0	0	0	0		(102)
Gains	(solar g	gains cal	lculated	for appli	cable we	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	623.66	592.12	543.84	0	0	0	0		(103)
						lwelling,	continu	ous (kW	h) = 0.02	24 x [(10)3)m – (*	102)m]:	x (41)m	
· · · ·	04)m to	zero if (104)m <	: 3 × (98)m								l .	
(104)m=	0	0	0	0	0	120.72	149.87	120.24	0	0	0	0		_
										= Sum(,	=	390.82	(104)
	fraction	-							f C =	cooled a	area ÷ (4	+) =	1	(105)
		actor (Ta		ŕ	r								I	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
-					<i>(i</i> = <i>i</i>)	(()	(Total	= Sum(104)	=	0	(106)
· ·		requirer		1		, <i>,</i>		r					l	
(107)m=	0	0	0	0	0	30.18	37.47	30.06	0	0	0	0		_
									Total	= Sum(107)	=	97.7	(107)
Space	cooling	requirer	nent in k	«Wh/m²/y	/ear				(107)	÷ (4) =			1.59	(108)
8f. Fab	ric Enei	rgy Effici	iency (ca	alculated	l only un	der spec	cial conc	litions, s	ee sectio	on 11)				
Fabric	Energ	y Efficier	псу						(99) -	+ (108) =	=		44.15	(109)

SAP Input

Property Details: Pl	ot 4							
Address: Located in: Region: UPRN: Date of assessm Date of certifica Assessment type Transaction type Tenure type: Related party di Thermal Mass Pa Water use <= 1. PCDF Version:	te: e: e: sclosure: arameter:	08 Ju 28 Oc New New Unkn No re Indica	ies valley ly 2020 ctober 2020 dwelling design sta dwelling	ge				
Property description	n:							
Dwelling type:		Flat						
Detachment: Year Completed:		2020						
Floor Location:		Floo	r area:					
Floor 0		61.27	/1 m2		Storey height 2.5 m	:		
Living area:			9 m ² (fraction 0.4)	2.5 11			
Front of dwelling f	aces:		West					
Opening types:								
Name: sw	Source: Manufacturer		Type: Solid	Glazing:		Argon:	Fram	ie:
NE	Manufacturer		Windows	double-glaze	ed	Yes		
Name:	Gap:		Frame Facto	or: g-value:	U-value:	Area:	No. a	f Openings:
SW NE	mm 16mm c	or more	0 0.7	0 0.63	1.4 1.4	2 8.167	1 1	
Name: SW	Type-Nam		Location: Corridor Wall	Orient: South West		Width: 0	Heig 0	nt:
NE			External Wall	North East		0	0	
Overshading:		Avera	ige or unknown					
Opaque Elements:								
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall	Kappa:
External Elements							Wall.	
External Wall Corridor Wall	44.801 27.529	8.17 2	36.63 25.53	0.15 0.15	0 0.31	False False		N/A N/A
Ground Floor	61.274			0.12				N/A
Internal Elements Party Elements								
Thermal bridges:								
			defined (individual		h = 0.0752			
Thermal bridges:			defined (individual		uc = 0.0752			
		Lenç	th Psi-valu	ie		other steel linte	els)	
, and the second s			th Psi-valu 0.291 0.048	E2 Othe E4 Jamb	r lintels (including o	other steel linte	els)	

SAP Input

17.526	0.064	E7	Party floor between dwellings (in blocks of flats)
5.9	0.083	E16	Corner (normal)
5.9	0.056	E18	Party wall between dwellings
6.992	0.158	E21	Exposed floor (inverted)
6.992	0.16	P1	Ground floor
6.992	0	P3	Intermediate floor between dwellings (in blocks of flats)

Ventilation:	
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 0 0 3 3
Main heating system:	
Main heating system:	Community heating schemes Heat source: Community boilers heat from boilers – mains gas, heat fraction 1, efficiency 94 Piping>=1991, pre-insulated, low temp, variable flow Central heating pump : 2013 or later Design flow temperature: Unknown Boiler interlock: Yes
Main heating Control:	
Main heating Control:	Charging system linked to use of community heating, programmer and at least two room thermostats Control code: 2312
Secondary heating system:	
Secondary heating system:	None
Water heating:	
Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False
Others:	
Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics:	Standard Tariff Unknown No conservatory 100% Low rise urban / suburban English No <u>Photovoltaic 1</u> Installed Peak power: 0.75 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West
Assess Zero Carbon Home:	No

			User De	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20 ²	12								
		Pro	operty A	ddress:	Plot 4					
Address :										
1. Overall dwelling dimer	isions:									
Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.9 Property Address: Plot 4 Address: Plot 4 Address: Plot 4 Address: Plot 4 Adverse: Volume(m ²) Ground floor Volume(m ²) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 6:1:::::::::::::::::::::::::::::::::::		(3a)								
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	61	.27	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	153.18	(5)
2. Ventilation rate:										
				other		total			m ³ per hou	•
Number of chimneys			+	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				Ē	2	x ′	10 =	20	(7a)
Number of passive vents					Γ	0	x ′	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans = (6a)+(6b)+(7a	ı)+(7b)+(7	c) =	Г	20	<u> </u>	÷ (5) =	0.13	(8)
					ontinue fro				0.10	
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration							[(9)	1]x0.1 =	0	(10)
if both types of wall are pre	sent, use the value corres				•	uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	led) or 0.1	(sealed	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
U U	and doors draught s	tripped							0	(14)
				•	· · /	- C			0	(15)
									0	(16)
			•	•	•	etre of e	nvelope	area		=
	-					is boing u	ood		0.38	(18)
		is been done	or a degr	ee all per	ineability i	s being ut	360		3	(19)
			(20) = 1 - [0.075 x (1	9)] =				(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	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7						_			
(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									
(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 infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				_	
	0.38	0.37	0.36	0.32	0.32	0.28	0.28	0.27	0.29	0.32	0.33	0.35		
		c <i>tive air</i> al ventila	-	rate for t	he appli	cable ca	se							(220)
				endix N (2	3h) - (23a	a) x Emv (e	equation (I	N5)) , othe	rwise (23h) – (23a)			0	(23a)
			0 11		, (, ,		n Table 4h) = (200)			0	(23b)
			-	-	-			HR) (24a		2b)m + ('	23h) v [·	1 _ (23c)	0	(23c)
(24a)m=	r				0					0	0	1 - (230)		(24a)
	-	-		_		-		I MV) (24b	-	-		Ŭ	l	
(24b)m=					0			0	0	0	0	0		(24b)
								n from c	_		•	Ŭ	l	
,					-			c) = (22b		5 × (23b)			
(24c)m=	<u> </u>	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	n or wh	ole hous	e positiv	/e input	ventilatio	on from l	oft				1	
,	if (22b)n	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(25)
3. He	at losse	s and he	eat loss	paramet	er:									
	/IENT	Gros		Openin		Net Ar	ea	U-valu	ue	AXU		k-value	9	AXk
		area	(m²)	'n	2	A ,r	n²	W/m2	:Κ	(W/ł	<)	kJ/m²∙ł	K	kJ/K
Doors						2	X	1	=	2				(26)
Windo	WS					8.167	7 x1	/[1/(1.4)+	0.04] =	10.83				(27)
Floor						61.27	4 X	0.13	=	7.96562	2			(28)
Walls	Type1	44.	8	8.17	,	36.63	3 X	0.18	=	6.59				(29)
Walls ⁻	Type2	27.5	53	2		25.53	3 X	0.18	=	4.6				(29)
Total a	area of e	elements	, m²			133.6	3							(31)
							ated using	g formula 1	/[(1/U-valu	e)+0.04] a	is given in	paragraph	n 3.2	
				nternal wal	ls and par	titions		(00) (00)	(22)				r	
		ss, W/K :		U)				(26)(30)		(0.0) (0.0		(00.)	31.98	(33)
		Cm = S(. ,							.(30) + (32		(32e) =	7610.42	
		•	•	⊃ = Cm ÷	,					tive Value:			250	(35)
	-	ad of a de			construct	ion are noi	t known pi	recisely the	emaicative	values of		adie II		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						9.95	(36)
if details	s of therma	al bridging	are not kr	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			41.93	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	28.85	28.71	28.57	27.94	27.82	27.26	27.26	27.16	27.47	27.82	28.06	28.31		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	70.78	70.64	70.5	69.86	69.74	69.19	69.19	69.08	69.4	69.74	69.99	70.24		
										Average =	Sum(39)1	12 /12=	69.86	(39)

Heat lo	oss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.16	1.15	1.15	1.14	1.14	1.13	1.13	1.13	1.13	1.14	1.14	1.15		
Numb			nth (Tab							Average =	Sum(40)1	.12 /12=	1.14	(40)
NULLIO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(+1)	01	20						01	00			01		()
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF if TF	A > 13. A £ 13.	9, N = 1	+ 1.76 ×					9)2)] + 0.0		TFA -13.	9) 2.(02		(42)
Reduce	the annua	al average	hot water		5% if the c	welling is	designed	(25 x N) to achieve		se target o	82. f	.11		(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=	90.33	87.04	83.76	80.47	77.19	73.9	73.9	77.19	80.47	83.76	87.04	90.33		
Francis	contont of	botwator	upped op	la data dim	onthly 1	100 v Vd v		DTm / 2600			$m(44)_{112} =$		985.36	(44)
			. <u> </u>	. <u> </u>	· ·		. <u> </u>	DTm / 3600						
(45)m=	133.95	117.15	120.89	105.4	101.13	87.27	80.87	92.8	93.9	109.44	119.46	129.72	1001.07	(45)
lf instan	taneous w	vater heati	ng at poin	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		10tal = Su	m(45) ₁₁₂ =		1291.97	(43)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:				1		I	1					
Storag	e volum	e (litres)) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel	1	150		(47)
	•	-		ank in dw	-			. ,		or (0) in (47)			
	storage		not wate		iciuues i	nstantai	ieous co	ombi boil	ers) erne		47)			
	•		eclared I	oss fact	or is kno	wn (kWł	n/day):				(0		(48)
Tempe	erature f	actor fro	m Table	2b))		(49)
Energy	/ lost fro	m watei	· storage	e, kWh/y	ear			(48) x (49)) =		()		(50)
,				cylinder										()
		-	ee secti	rom Tab on 4.3	ie 2 (kvv	n/litre/da	ay)				()		(51)
	-	from Ta		011 1.0							(C		(52)
Tempe	erature f	actor fro	m Table	2b							(C		(53)
Energy	/ lost fro	m watei	· storage	e, kWh/y	ear			(47) x (51)) x (52) x (53) =	(0		(54)
Enter	(50) or ((54) in (5	55)								(0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – ((H11)] ÷ (5	50), else (5	7)m = (56)	m where (H11) is froi	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						(0		(58)
	-						. ,	65 × (41)						
		1	I	i	i	· · · · · ·	r	ng and a	· ·	r	<u> </u>			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for ea	ch	month ((61)m =	(60)) ÷ 36	65 × (41)	m						
(61)m=	0	0	0		0	0		0	0	0	0	0	0	0]	(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r eacl	n month	(62)m :	= 0.85 ×	(45)m +	- (46)m +	(57)m	+ (59)m + (61)m	
(62)m=	113.86	99.58	102.7	6	89.59	85.96	7	'4.18	68.74	78.88	79.82	93.02	101.54	110.26	- -	(62)
Solar DH	-IW input	calculated	using A	ppe	ndix G or	Appendix	(H)	(negati	ve quantity) (enter '	0' if no sola	r contribu	ution to wate	er heating	 g)	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	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=	113.86	99.58	102.7	6	89.59	85.96	7	'4.18	68.74	78.88	79.82	93.02	101.54	110.26	، آ	
										Out	put from w	ater heat	er (annual)	112	1098.17	(64)
Heat g	ains fro	m water	heatin	g,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)n	n + (57)m	+ (59)	m]	
(65)m=	28.46	24.9	25.69	,	22.4	21.49	1	8.54	17.18	19.72	19.95	23.26	25.38	27.57	7	(65)
inclu	de (57)	m in calo	culation	n o	f (65)m	only if c	ylir	nder i	s in the c	welling	or hot w	vater is	from com	munity	heating	
5. Int	ernal a	ains (see	e Table	e 5	and 5a):	-			-				-	-	
		ns (Table) -										
metab	Jan	Feb	 Ma		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	7	
(66)m=	100.87	100.87	100.8	-	100.87	100.87	-	00.87	100.87	100.87	100.87	100.87	-	100.87		(66)
	n dains	(calcula								so see				1		
(67)m=	17.03	15.13	12.3		9.31	6.96	-	5.88	6.35	8.25	11.08	14.07	16.42	17.5	7	(67)
				 in							o see Ta					. ,
(68)m=	176.15	177.98	173.3	-	163.56	151.19		39.55	131.78	129.95	134.56	144.36	156.74	168.38	, , , , , , , , , , , , , , , , , , , ,	(68)
													130.74	100.50		(00)
	<u> </u>	<u> </u>		-i		· · ·	<u> </u>				ee Table		22.00	22.00	7	(60)
(69)m=	33.09	33.09	33.09		33.09	33.09	3	33.09	33.09	33.09	33.09	33.09	33.09	33.09		(69)
-		ns gains	r i	€ 5a	-		—				1				-	(70)
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0		(70)
Losses		vaporatic	<u> </u>			, , 	—				· · · · · ·				-	
(71)m=	-80.7	-80.7	-80.7		-80.7	-80.7	-	80.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7		(71)
Water	heating	gains (T	able 5	5)			_						-	-	_	
(72)m=	38.26	37.05	34.53	3	31.11	28.88	2	25.76	23.1	26.5	27.71	31.26	35.26	37.05		(72)
Total i	nterna	gains =						(66)	m + (67)m	+ (68)m	+ (69)m +	(70)m + (71)m + (72)m	_	
(73)m=	284.7	283.41	273.4	6	257.24	240.29	2	24.45	214.49	217.97	226.61	242.95	261.68	276.19)	(73)
6. So	lar gain	s:														
			Ũ	olar	flux from	Table 6a	and			tions to c	onvert to th	ne applica	able orienta	tion.		
Orienta		Access F			Area			Flu		-	g_ Table Ch	-	FF		Gains	
		Table 6d			m²			1 ar	ole 6a		Table 6b		Table 6c		(W)	_
Northea		0.77		x	8.1	7	x	1	1.28	x	0.63	x	0.7	=	28.16	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	8.1	7	x	2	2.97	x	0.63	×	0.7	=	57.32	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.1	7	x	4	1.38	x	0.63	×	0.7	=	103.28	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.1	7	x	6	7.96	x	0.63	x	0.7	=	169.61	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.1	7	x	9	1.35	x	0.63	x	0.7	=	227.99	(75)

Northeast 0.9x	0.77	x	8.1	7	x	97.38	×		0.63	×	0.7	=	243.07	(75)	
Northeast 0.9x	0.77	x	8.1	7	x	91.1	x		0.63	x	0.7	=	227.38	(75)	
Northeast 0.9x	0.77	x	8.1	7	x	72.63	×		0.63	x	0.7	=	181.27	(75)	
Northeast 0.9x	0.77	x	8.1	7	x	50.42	×		0.63	x	0.7	=	125.85	(75)	
Northeast 0.9x	0.77	×	8.1	7	x	28.07	x		0.63	×	0.7	=	70.05	(75)	
Northeast 0.9x	0.77	x	8.1	7	x	14.2	×		0.63	x	0.7	=	35.43	(75)	
Northeast 0.9x	ortheast 0.9x 0.77 X 8.17 X 9.21 X 0.63 X 0.7 =												23	(75)	
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m= 28.16 57.32 103.28 169.61 227.99 243.07 227.38 181.27 125.85 70.05 35.43 23															
$\begin{array}{c c c c c c c c c c c c c c c c c c c $														(83)	
														(84)	
7. Mean inter	rnal temper	ature (heating	season)										
7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21														(85)	
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) 21 (85)															
Jan															
(86)m= 1	1	1	0.98	0.94	(0.81 0.65	0.	73	0.93	0.99	1	1		(86)	
Mean interna	al temperati	ure in li	iving are	ea T1 (fe	ollo	w steps 3 to	7 in ⁻	Table			•				
(87)m= 19.67	<u> </u>	20.01	20.35	20.68	<u> </u>	20.9 20.98	-	.96	20.77	20.36	19.96	19.65		(87)	
Temperature			oriode ir	roct of	L dw	uolling from T			<u> </u>				1		
(88)m= 19.96	т <u>т</u> т	19.96	19.97	19.97	_	9.98 19.98	-	9, 111 .98	2 (C) 19.97	19.97	19.97	19.96		(88)	
					I				10.07	10.01	10.01	10.00		()	
Utilisation fac	<u>т т</u>				T		<u> </u>				1		1	(80)	
(89)m= 1	1	0.99	0.98	0.91		0.73 0.52	0	.6	0.89	0.99	1	1		(89)	
Mean interna	al temperati	ure in t	he rest	of dwell	ing	T2 (follow s	teps 3	3 to 7	in Table	e 9c)		r	1		
(90)m= 18.74	18.85 ´	19.08	19.42	19.74	1	9.93 19.97	19	.97	19.83	19.44	19.04	18.72		(90)	
									fl	LA = Livir	ng area ÷ (4	4) =	0.4	(91)	
Mean interna	al temperati	ure (for	r the wh	ole dwe	llin	$g) = fLA \times T^{-1}$	1 + (1	– fLA	A) × T2						
(92)m= 19.11	19.22 [·]	19.45	19.79	20.11	2	0.32 20.37	20	.36	20.21	19.81	19.41	19.09		(92)	
Apply adjustr	ment to the	mean	internal	temper	atu	re from Tab	le 4e,	wher	e appro	priate	-				
(93)m= 19.11	19.22 ⁻	19.45	19.79	20.11	2	0.32 20.37	20	.36	20.21	19.81	19.41	19.09		(93)	
8. Space hea															
Set Ti to the					ned	at step 11 c	of Tab	le 9b,	, so that	t Ti,m=((76)m an	d re-calo	culate		
the utilisation	Feb	<u> </u>			<u> </u>	Jun Jul			Son	Oct	Nov	Dee	1		
Jan Utilisation fac		Mar	Apr	May		Jun Jul		ug	Sep	001	Nov	Dec			
(94)m= 1	<u> </u>	0.99	0.98	0.91		0.76 0.57	0.	65	0.9	0.99	1	1		(94)	
Useful gains,					I								l		
(95)m= 312.34	T T	374.14	416.49	427.85	3	54.99 253.4	259	9.82	318	308.75	296.21	298.8		(95)	
Monthly aver	age extern	al temp	perature	e from T	abl	e 8			I				1		
(96)m= 4.3	4.9	6.5	8.9	11.7	<u> </u>	14.6 16.6	16	6.4	14.1	10.6	7.1	4.2		(96)	
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]															
(97)m= 1048.2 1011.61 913.06 760.91 586.8 395.62 260.99 273.73 423.74 642.29 861.4 1046.09													(97)		
Space heatir	ng requirem	nent for	each m	nonth, k	Wh	/month = 0.0)24 x	[(97)r	n – (95))m] x (4	1)m		-		
(98)m= 547.48	451.47 4	00.96	247.98	118.26		0 0	(C	0	248.16	406.93	555.98			

								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2977.22	(98)
Space	e heatir	ng require	ement in	kWh/m²	²/year								48.59	(99)
8c. Sr	bace co	oling rec	uiremer	nt										
		or June, J			See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	loss rat	e Lm (ca	lculated	using 2	5°C inter	nal temp	berature			nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	650.37	511.99	525.04	0	0	0	0		(100)
Utilisa	ation fac	ctor for lo	ss hm											
(101)m=	0	0	0	0	0	0.82	0.89	0.85	0	0	0	0		(101)
Usefu	I loss, l	nmLm (V	/atts) = ((100)m x	(101)m		•	•				•		
(102)m=	0	0	0	0	0	531.41	455.52	446.05	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)			•		
(103)m=	0	0	0	0	0	622.31	590.9	542.45	0	0	0	0		(103)
		<i>g require</i> zero if (lwelling,	continu	ous (kW	(h) = 0.0	24 x [(10)3)m – (102)m]:	x (41)m	
(104)m=	,	0	0	0	0	65.45	100.72	71.72	0	0	0	0		
		1	1	1	1	1	1	1	Total	= Sum(104)	=	237.88	(104)
Cooled	l fractio	n								cooled	,	4) =	1	(105)
Intermi	ttency f	factor (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	requirer	nent for	month =	: (104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	16.36	25.18	17.93	0	0	0	0		
									Total	= Sum(107)	=	59.47	(107)
Space	cooling	requirer	nent in k	(Wh/m²/y	year				(107)	÷ (4) =			0.97	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only un	der spec	cial conc	litions, se	ee sectio	on 11)				
Fabrio	c Energ	y Efficier	псу						(99) ·	+ (108) =	=		49.56	(109)
Targe	et Fabri	ic Energ	y Efficie	ency (TF	EE)								56.99	(109)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 20	12		Softwa	are Ver	sion:		Versio	n: 1.0.5.9	
		P	roperty A	Address:	Plot 4					
Address :										
1. Overall dwelling dimer	isions:									
Ground floor			Area 6	. ,	(1a) x	Av. He i	ight(m)	(2a) =	Volume(m ³) 153.18	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n	I) 6	1.27	(4)			. .		
Dwelling volume		, ,	, <u> </u>			+(3c)+(3d)+(3e)+	.(3n) =	153.18	(5)
2. Ventilation rate:										
		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	<u> </u> + [0	i = [0	× 2	20 =	0	(6b)
Number of intermittent fan	s				- 	0	x 1	10 =	0	(7a)
Number of passive vents						0	x 1	10 =	0	(7b)
Number of flueless gas fire	es				Γ	0	x 4	40 =	0	(7c)
								Air ob	anges per he	
					_				anges per ho	ur ¬
Infiltration due to chimneys If a pressurisation test has be					continue fro	0 0 (9) to (÷ (5) =	0	(8)
Number of storeys in the		iou, procee				5111 (0) 10 (10)		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or timber	frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening		sponding to	the greate	er wall area	a (after					_
If suspended wooden flo		aled) 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 draught s	stripped						·	0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) -	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, c	· ·		•	•	•	etre of e	nvelope	area	3	(17)
If based on air permeabilit	•								0.15	(18)
Air permeability value applies		as been don	e or a deg	iree air pei	rmeability i	is being us	sed			٦
Number of sides sheltered Shelter factor	1			(20) = 1 - [0.075 x (1	9)] =			3	(19)
Infiltration rate incorporatir	na shelter factor			(21) = (18)		-/]			0.78	(20) (21)
Infiltration rate modified fo	0	Ч		(21) = (10)	, x (2 0) -				0.12	(21)
rii	Mar Apr May	1 1	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe					·				I	
	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	I	<u> </u>							I	
Wind Factor $(22a)m = (22)$ (22a)m 1.27 1.25 1)m ÷ 4 .23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
		0.00	0.00	0.02					l	

Adjust	ed infiltr	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		
		c <i>tive air</i> al ventila	-	rate for t	he appli	cable ca	se							
				andix N (2	(23a) – (23a) v Emv (e	auation (N	N5)) , othei	rwise (23h) – (23a)			0.5	(23a)
			0 11		, (, ,	• •	n Table 4h)	,) – (200)			0.5	(23b)
			-	-	-					26)m i (*	00h) [/	(22-2)	79.05	(23c)
a) II (24a)m=	0.25	0.25	0.25	0.23	0.23	0.22		HR) (24a 0.21	0.22	20)m + (. 0.23	23D) × [* 0.24	- (23C) 0.24	÷100]	(24a)
												0.24		(244)
	r	· · · · · ·	r		i		<u> </u>	MV) (24b	í i		,	0	l	(24b)
(24b)m=		0	0	0	0	0	0	0	0	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=	r í	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b) or (24	L 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)
A 11							1	1						
				oaramete		No. A.		11 -1		A \/ 11				X I
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·ł		∖Xk J/K
Doors			· · ·			2	x	1.4		2.8	<i>,</i>			(26)
Windo	ws					8.167	7 x1	/[1/(1.4)+	0.04] =	10.83				(27)
Floor						61.27	4 X	0.12	= [7.35288				(28)
Walls	Tvne1	44.	•	8.17	,]	36.63	_	0.12		5.5			\dashv	(29)
Walls		27.5		2		25.53	_	0.13		3.66	╡┟			(29)
		elements		2		133.6	_	0.14		3.00	L			(31)
				effective wi	ndow U-va			g formula 1.	/[(1/U-valu	ie)+0.041 a	s aiven in	paragraph	132	(01)
				nternal wal			atoa aonig	, ionnaid in		<i>ie)</i> : ere ij a	e gronni	paragraph	0.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				30.13	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	7610.42	(34)
Therm	al mass	parame	ter (TMF	- Cm -	- TFA) in	n kJ/m²K			Indica	tive Value:	Low		100	(35)
	-	sments wh ad of a de			constructi	ion are not	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						10.05	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			40.18	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			,	(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.79	12.64	12.49	11.76	11.61	10.88	10.88	10.73	11.17	11.61	11.91	12.2		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	52.97	52.83	52.68	51.94	51.8	51.06	51.06	50.92	51.36	51.8	52.09	52.38		
									/	Average =	Sum(39)1		51.91	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.86	0.86	0.86	0.85	0.85	0.83	0.83	0.83	0.84	0.85	0.85	0.85		
Numb			L					I	,	Average =	Sum(40)1.	12 /12=	0.85	(40)
NUMBE	Jan	Feb	nth (Tab 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)
(,	01	20	01							01				(,
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		02		(42)
Annua <i>Reduce</i>	l averag	je hot wa al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.44		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate			-	ach month I		r		· ,						
(44)m=	95.08	91.62	88.16	84.71	81.25	77.79	77.79	81.25	84.71	88.16	91.62	95.08	1007.00	
Energy o	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	m x nm x [OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1037.23	(44)
(45)m=	141	123.32	127.25	110.94	106.45	91.86	85.12	97.68	98.85	115.2	125.74	136.55		
lf instan	taneous w	vater heati	na at point	t of use (no	o hot water	r storage)	enter () in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1359.97	(45)
(46)m=	21.15	18.5	19.09	16.64	15.97	13.78	12.77	14.65	14.83	17.28	18.86	20.48		(46)
· · ·	storage													
Storag	e volum	e (litres)	includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	-		ank in dw ar (this ir	-			ı (47) ombi boil	ore) onto	or 'O' in ((17)			
	storage		not wate	51 (1113 11	iciuues i	nstantai			ers) erite		<i>(11)</i>			
a) If m	anufact	urer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
			-	, kWh/ye				(48) x (49)) =		1	10		(50)
,				cylinder l rom Tabl							0	02		(51)
		-	ee secti		- (.,,				0.	02		()
		from Ta									1.	03		(52)
			m Table								0	.6		(53)
•••		om wateı (54) in (5	-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		03		(54)
	. ,	. , .	,	for each	month			((56)m – (55) × (41)ı	m	1.	03		(55)
		28.92	32.01	30.98	32.01	20.00	22.01		· · ·	i	20.09	32.01		(56)
(56)m= If cylinde	32.01 er contains					30.98 x [(50) – (32.01 H11)] ÷ (5	32.01 60), else (5	30.98 7)m = (56)	32.01 m where (30.98 H11) is fro		ix H	(50)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	 Э З	,	•			•		0		(58)
Primar	y circuit	loss cal	culated	for each	month (. ,	65 × (41)						
	-		· · · · · ·	r	i	1	i	ng and a		1	, 		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	alculated	for each	month	(61)m =	(60)	÷ 365	5 × (41)	m						
(61)m=	0	0	0	0	0		0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	eating ca	alculated	l for	each	month	(62)m =	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	196.28	173.25	182.53	164.44	161.73	14	5.35	140.4	152.96	152.34	170.47	179.24	191.83]	(62)
Solar DI	-IW input	calculated	using App	endix G o	r Appendix	H (n	egative	e quantity	r) (enter 'C	' if no sola	r contribu	tion to wate	er heating)	•	
(add a	dditiona	al lines if	FGHRS	and/or \	WWHRS	app	olies, s	see Ap	pendix (G)					
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	from w	vater hea	ter												
(64)m=	196.28	173.25	182.53	164.44	161.73	14	5.35	140.4	152.96	152.34	170.47	179.24	191.83]	
		-		-					Out	out from w	ater heat	er (annual)	12	2010.81	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [(0.85 ×	(45)m	+ (61)n	n] + 0.8 x	k [(46)m	n + (57)m	+ (59)m	1]	
(65)m=	91.1	80.95	86.53	79.68	79.62	73	.34	72.52	76.7	75.66	82.52	84.6	89.62]	(65)
inclu	ide (57))m in calo	culation	of (65)m	only if c	ylino	der is	in the c	dwelling	or hot w	ater is t	from com	munity ł	heating	
5. Int	ternal q	ains (see	e Table 5	5 and 5a):	•			-				-	-	
		ns (Table			/										
metab	Jan	Feb	Mar	Apr	May	J	un	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	121.05	121.05	121.05	121.05	121.05			121.05	121.05	121.05	121.05	121.05	121.05		(66)
Liahtin	a aains	(calcula	ted in Ai	ppendix	L. equati	ion l	 _9 or l	L9a). a	lso see	Table 5		1		1	
(67)m=	42.57	37.81	30.75	23.28	17.4	-	.69	15.88	20.64	27.7	35.17	41.05	43.76]	(67)
Applia	nces da	ains (calc	ulated ir	I Append	lix Lea	uatio	on I 13	3 or I 1:	3a) also) see Ta	l ble 5	1		1	
(68)m=	262.91	265.64	258.76	244.13	225.65			196.69	193.96	200.83	215.47	233.94	251.31	1	(68)
		s (calcula												1	
(69)m=	49.12	49.12	49.12	49.12	49.12		.12	49.12	49.12	49.12	49.12	49.12	49.12	1	(69)
		I Ins gains	I (Table /	I 5a)										1	
(70)m=				0	0		0	0	0	0	0	0	0	1	(70)
		vaporatio						0			, in the second se]	
(71)m=		-80.7	-80.7	-80.7	-80.7) 0.7	-80.7	-80.7	-80.7	-80.7	-80.7	-80.7	1	(71)
				00.7	00.7		0.7	00.1	00.7	00.7	00.7	00.7	00.7	1	(***
(72)m=	122.45	gains (1 120.45	116.31	110.67	107.01	10	1.86	97.48	103.09	105.08	110.92	117.51	120.46	1	(72)
				110.07	107.01	10						71)m + (72)]	()
(73)m=	517.4	l gains = 513.37	495.29	467.55	439.54	11		399.51	407.16	423.09	451.03	1	505	1	(73)
. ,		1	495.29	407.55	439.54	414	+.31	399.51	407.10	423.09	451.05	401.97	505	1	(13)
	lar gain ains are		using sola	ar flux from	Table 6a a	and a	associat	ted equa	tions to co	onvert to th	e applica	ble orientat	tion		
		Access F	U	Area			Flux	•		g_		FF		Gains	
Onona		Table 6d		m²			Tabl		Г	able 6b	٦	Table 6c		(W)	
Northea	ast <u>0.9x</u>	0.77	x	8.	17	×Г	11	.28	x	0.63	_ × [0.7	=	28.16	(75)
Northea		0.77	^ x			γΓ ×Γ		.20	x	0.63		0.7		57.32	(75)
	ast 0.9x	0.77	^ x			ΛL ×Γ		.38	x	0.63		0.7	=	103.28	(75)
	ast 0.9x	0.77	^			ΛL ×Γ		.30		0.63		0.7		169.61	(75) (75)
Northea		0.77	^			^ L × [.90		0.63		0.7		227.99	(75)
		0.77	^	0.	17	^ L	91.	.55	^	0.05	^	0.7	_	227.99	(13)

																_
Northeast 0.9x	0.77	x	8.1	7	x	9	7.38	×	0.63		×	0.7		=	243.07	(75)
Northeast 0.9x	0.77	x	8.1	7	x	9	1.1	×	0.63		x	0.7		= [227.38	(75)
Northeast 0.9x	0.77	x	8.1	7	x	72	2.63	x	0.63		x [0.7		= [181.27	(75)
Northeast 0.9x	0.77	x	8.1	7	x	50	0.42	x	0.63) x [0.7		= [125.85	(75)
Northeast 0.9x	0.77	x	8.1	7	x	28	8.07	x	0.63		x	0.7		= [70.05	(75)
Northeast 0.9x	0.77	x	8.1	7	x	1	4.2	x	0.63) x [0.7		= [35.43	(75)
Northeast 0.9x	0.77	x	8.1	7	x	9	.21	x	0.63		×	0.7		= [23	(75)
														-		_
Solar gains in	watts, calc	culated	for each	n month				(83)m	= Sum(74)r	m((82)m					
(83)m= 28.16	57.32 1	103.28	169.61	227.99	24	43.07	227.38	181.2	27 125.8	5	70.05	35.43	23			(83)
Total gains –	internal and	d solar	(84)m =	= (73)m ·	+ (8	33)m ,	watts									
(84)m= 545.57	570.7 5	598.57	637.16	667.53	65	57.37	626.89	588.4	43 548.9	3 !	521.08	517.4	528			(84)
7. Mean inte	rnal tempei	rature (heating	season)											
Temperature	e during hea	ating pe	eriods ir	n the livi	ng a	area f	rom Tab	ole 9,	Th1 (°C)					[21	(85)
Utilisation fa	ctor for gair	ns for li	ving are	a, h1,m	(se	ee Tal	ble 9a)							L		
Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ig Sep	p	Oct	Nov	De	с		
(86)m= 0.9	0.88	0.84	0.76	0.63	().47	0.35	0.39	9 0.58		0.77	0.87	0.91			(86)
Mean interna	al temperat	ure in li	iving are	a T1 (fr	- Mo	w ster		' in Ta	able 9c)							
(87)m= 19.73		20.16	20.52	20.79		0.94	20.98	20.9		3	20.56	20.11	19.7	,		(87)
				reat of			from To			_						
Temperature		20.2	20.21	20.21		0.22	20.22	20.2		·	20.21	20.21	20.2	1		(88)
									.5 20.22	-	20.21	20.21	20.2	'		(00)
Utilisation fa		r			r –	<u> </u>		, í								(00)
(89)m= 0.89	0.87	0.82	0.73	0.59	(0.42	0.29	0.32	2 0.53		0.74	0.85	0.9			(89)
Mean interna	al temperat	ure in t	he rest	of dwelli	ng	T2 (fc	ollow ste	ps 3	to 7 in Ta	able	9c)					
(90)m= 18.51	18.72	19.12	19.63	19.98	2	0.17	20.21	20.2	1 20.1		19.69	19.06	18.4	8		(90)
										fL/	A = Livin	g area ÷ (4	4) =		0.4	(91)
Mean interna	al temperat	ure (for	the wh	ole dwe	lling	g) = fL	.A × T1	+ (1 -	- fLA) × T	2						
(92)m= 19	19.19	19.53	19.98	20.31	2	0.48	20.52	20.5	2 20.41	1	20.04	19.48	18.9	7		(92)
Apply adjust	ment to the	mean	internal	temper	atu	re froi	m Table	4e, v	vhere app	prop	oriate		•			
(93)m= 19	19.19	19.53	19.98	20.31	2	0.48	20.52	20.5	2 20.41	1	20.04	19.48	18.9	7		(93)
8. Space he	ating requir	ement														
Set Ti to the			•		ed	at ste	ep 11 of	Table	e 9b, so tl	hat -	Ti,m=(76)m an	d re-c	alc	ulate	
the utilisation	1 1	<u> </u>	I		<u> </u>	1	ll				0	Nau		_		
Jan Utilisation fa	Feb	Mar Mar	Apr	May		Jun	Jul	Au	ig Ser	þ	Oct	Nov	De	C		
(94)m= 0.87	т <u>т</u>	0.81	0.72	0.59).44	0.31	0.3	5 0.54		0.74	0.84	0.88	3		(94)
Useful gains																
(95)m= 476.3	T T	483.99	459.48	395.75	28	86.58	196.7	204.	66 296.7	2	383.74	432.97	465.1	8		(95)
Monthly ave		al temp		from Ta	able	e 8		I					I			
(96)m= 4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	4 14.1		10.6	7.1	4.2			(96)
Heat loss rat	te for mean	interna	al tempe	erature,	Lm	, W =	:[(39)m :	x [(93)m– (96)	m]						
(97)m= 778.7	754.69 6	686.65	575.74	445.81	30	00.11	200.17	209.	54 324.2	2	488.73	644.87	773.5	56		(97)
Space heati	ng requirem	nent for	each m	nonth, k\	Nh	/mont	h = 0.02	24 x [(97)m – (9	95)n	n] x (4′	1)m				
(98)m= 224.99	180.17 1	150.78	83.71	37.25		0	0	0	0		78.11	152.57	229.4	14		

		Total per year (kWh/year) = $Sum(98)_{15912}$ =	1137	(98)
Space heating requirement in kWh/m²/year			18.56	(99)
9b. Energy requirements – Community heatir	ng scheme			
This part is used for space heating, space co Fraction of space heat from secondary/supple			0	(301)
Fraction of space heat from community syste			1	(302)
The community scheme may obtain heat from several so		s for CHP and up to four other heat sources: t		
includes boilers, heat pumps, geothermal and waste heat Fraction of heat from Community boilers			1	(303a)
Fraction of total space heat from Community	boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table	e 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for commu	unity heating system		1.05	(306)
Space heating			kWh/year	
Annual space heating requirement			1137	
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	1193.85	(307a)
Efficiency of secondary/supplementary heating	ng system in % (from Ta	able 4a or Appendix E)	0	(308
Space heating requirement from secondary/s	upplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2010.81	7
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	2111.35	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307e) + (310a)(310e)] =	33.05	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling syste	em, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling mechanical ventilation - balanced, extract or	, ,	side	212.58	(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) =	212.58	(331)
Energy for lighting (calculated in Appendix L)			300.75	(332)
Electricity generated by PVs (Appendix M) (n	egative quantity)		-617.51	(333)
Electricity generated by wind turbine (Append	lix M) (negative quantit	у)	0	(334)
10b. Fuel costs – Community heating schen	ne			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0.01 =	50.62	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	89.52	(342a)

			Fuel Price			
Pumps and fans	(331)		13.19	x 0.01 =	28.04	(349)
Energy for lighting	(332)		13.19	x 0.01 =	39.67	(350)
Additional standing charges (Table 12)				[120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (3	45)(354) =		[327.85	(355)
11b. SAP rating - Community heating	scheme					
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) +	45.0] =		Γ	1.3	(357)
SAP rating (section12)				Ī	81.93	(358)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emissio kg CO2/		Emissions (g CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)		CHP) P using two fuels repeat(363) to (366) for the	second fuel	94	(367a)
CO2 associated with heat source 1	[(3	807b)+(310b)] x 100 ÷ (36	7b) x 0.22	=	759.49	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	17.15	(372)
Total CO2 associated with community s	systems	(363)(366) + (368	8)(372)	=	776.65	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or insta	ntaneous heater (3	12) x 0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (37	5) =		776.65	(376)
CO2 associated with electricity for pum	ps and fans within o	dwelling (331)) x	0.52	=	110.33	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	156.09	(379)
Energy saving/generation technologies Item 1	(333) to (334) as a	pplicable	0.52	x 0.01 =	-320.49	(380)
Total CO2, kg/year	sum of (376)(382) =	:		Г	722.58	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			Ī	11.79	(384)
El rating (section 14)				Γ	90.89	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		P.Energy (Wh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		t CHP) P using two fuels repeat(363) to (366) for the	second fuel	94	(367a)
Energy associated with heat source 1	[(3	307b)+(310b)] x 100 ÷ (36	7b) x 1.22	=	4289.73	(367)
Electrical energy for heat distribution		[(313) x		=	101.47	(372)
Total Energy associated with communit	y systems	(363)(366) + (366	8)(372)	=	4391.2	(373)
if it is negative set (373) to zero (unle	ss specified otherw	vise, see C7 in Appe	ndix C)		4391.2	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)

Total Primary Energy, kWh/year sum of (37	76)(382) =			4071.36	(383)
Energy saving/generation technologies Item 1		3.07 × 0.0	01 =	-1895.76	(380)
Energy associated with electricity for lighting	(332))) x	3.07	=	923.3	(379)
Energy associated with electricity for pumps and fans within	dwelling (331)) x	3.07	=	652.63	(378)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Total Energy associated with space and water heating	(373) + (374) + (375) =			4391.2	(376)
Energy associated with water from immersion heater or insta	antaneous heater(312) x	1.22	=	0	(375)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP 20 ⁻	12		Softwa				Versio	n: 1.0.5.9	
		Pro	operty A	Address:	Plot 4					
Address :										
1. Overall dwelling dime	nsions:									
			Area			Av. He	ight(m)	-	Volume(m ³)	_
Ground floor			6	1.27	(1a) x	2	2.5	(2a) =	153.18	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1n)	6	1.27	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	153.18	(5)
2. Ventilation rate:	_									
		econdary heating		other		total			m ³ per hou	
Number of chimneys	0 +	0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0	x	20 =	0	(6b)
Number of intermittent far	าร				' F	2	x ′	10 =	20	(7a)
Number of passive vents					Ē	0	x ′	10 =	0	 (7b)
Number of flueless gas fir	res					0	x 4	40 =	0	 (7c)
C C					L	-				
								Air ch	anges per ho	ur
Infiltration due to chimney						20		÷ (5) =	0.13	(8)
If a pressurisation test has be		led, proceed	to (17), o	otherwise c	ontinue fro	om (9) to ((16)			
Number of storeys in th Additional infiltration	e dweining (ns)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	25 for steel or timber	frame or ().35 for	masonr	v constr	uction	[(0)		0	(11)
if both types of wall are pro deducting areas of openin	esent, use the value corre				•					_, ,
If suspended wooden fl	oor, enter 0.2 (unsea	led) or 0.1	(seale	d), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2		-	(45)		0	(15)
Infiltration rate				(8) + (10) ·					0	(16)
Air permeability value, of If based on air permeabili			•	•	•	etre of e	envelope	area	5	(17)
Air permeability value applies						is beina u	sed		0.38	(18)
Number of sides sheltered									3	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporati	ng shelter factor			(21) = (18)	x (20) =				0.29	(21)
Infiltration rate modified for	or monthly wind spee	d				_	-	-		
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7						-	-		
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	?)m ÷ 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
	I								I	

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
	0.38	0.37	0.36	0.32	0.32	0.28	0.28	0.27	0.29	0.32	0.33	0.35		
		c <i>tive air</i> al ventila	•	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	•) (200)			0	
			-	-	-			HR) (24a		2h)m + (23h) v [[,]	1 – (23c)	0 ÷ 1001	(23c)
(24a)m=	r			0	0				0	0	0		÷ 100]	(24a)
								I MV) (24b			-	Ŭ		(
(24b)m=	r				0			0	0	0	0	0		(24b)
								n from c				Ŭ		
,					•	•		c) = (22k		5 × (23b))			
(24c)m=	<u> </u>	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) lf	natural	ventilatio	on or wh	ole hous	se positiv	/e input	ventilatio	on from l	oft					
	if (22b)n	∩ = 1, th	en (24d)	m = (22l	o)m othe	erwise (2	24d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	ld) in boy	(25)					
(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.56	0.56		(25)
3. He	at losse	s and he	eat loss	paramet	er:									
	/IENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²·ł		A X k kJ/K
Doors		area	(11)		1	2	x	1		2		KU/111 -1	`	(26)
Windo	ws					8.167	=	/[1/(1.4)+	י	10.83	=			(27)
Floor						61.27		0.13	= [7.96562			-	(28)
Walls	Tvne1	44.		8.17	,]			0.13	=	6.59			\dashv	(29)
Walls						36.63					╡╏		\dashv	
		27.5 elements		2		25.53		0.18	= [4.6				(29)
			-	offective wi	ndow H-va	133.6 alue calcul		g formula 1	/[(1/Ll-valu	ie)⊥0 041 a	is aiven in	naragraph	32	(31)
				nternal wal				g ioinnaia i	/[(// 0 / Valu	0/10.04/0	o givoir in	paragraph	0.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)) + (32) =				31.98	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	7610.42	2 (34)
Therm	al mass	parame	ter (TM	- Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(35)
	-				construct	ion are noi	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
			tailed calc		uning An	nondiv l	/							
	-	•	,	culated own (36) =	• •		N						9.95	(36)
	abric he		are not ki	0001 (30) -	= 0.03 X (3	1)			(33) +	(36) =			41.93	(37)
Ventila	ation hea	at loss ca	alculated	monthly	V				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	28.85	28.71	28.57	27.94	27.82	27.26	27.26	27.16	27.47	27.82	28.06	28.31		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m		I	
(39)m=	70.78	70.64	70.5	69.86	69.74	69.19	69.19	69.08	69.4	69.74	69.99	70.24		
	L	I	I	I		I	I	I	·/	Average =			69.86	(39)

Heat l	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.16	1.15	1.15	1.14	1.14	1.13	1.13	1.13	1.13	1.14	1.14	1.15		
Niccords								I	,	Average =	Sum(40)1.	12 /12=	1.14	(40)
UNUTID	er of day Jan	Feb	Mar	, 1	May	Jun	Jul	Δυα	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	Apr 30	31	30	31	Aug 31	30	31	30	31		(41)
(+1)11-	01	20	01	00	01	00			00	01	00	01		()
4. Wa	ater heat	ing ene	rgy requ	irement:								kWh/ye	ar:	
if TF	ned occu FA > 13.9 FA £ 13.9	9, N = 1		:[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		02		(42)
Annua Reduce	l averag	e hot wa al average	hot water	usage by	5% if the a	welling is	designed	(25 x N) to achieve		se target o		.11		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ii		day for ea	ach month I	Vd,m = fa	ctor from 7	Table 1c x	(43)						
(44)m=	90.33	87.04	83.76	80.47	77.19	73.9	73.9	77.19	80.47	83.76	87.04	90.33		
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x [OTm / 3600			m(44) ₁₁₂ = ables 1b, 1	L	985.36	(44)
(45)m=	133.95	117.15	120.89	105.4	101.13	87.27	80.87	92.8	93.9	109.44	119.46	129.72		
If in star								haven (40		Total = Su	m(45) ₁₁₂ =	-	1291.97	(45)
			- ·					boxes (46		10.10	47.00			(46)
(46)m= Water	20.09 storage	17.57 IOSS:	18.13	15.81	15.17	13.09	12.13	13.92	14.09	16.42	17.92	19.46		(46)
	-		includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If com	munity h	eating a	ind no ta	nk in dw	velling, e	nter 110) litres in	(47)						
	vise if no storage		hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	nanufact		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
	erature fa										0.	54		(49)
-	y lost fro		-					(48) x (49)) =		0.	75		(50)
,	nanufact			•										(54)
	ater stora munity h	-			e z (kvv	n/ntre/ua	iy)					0		(51)
	e factor	-										0		(52)
Temp	erature fa	actor fro	m Table	2b								0		(53)
•	y lost fro		•	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	(50) or (0.	75		(55)
	storage	loss cal	r	1	month			((56)m = (, , ,	r	1			
(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 m Appendi	v Ll	(56)
-			r			1		 I			-		×11	(57)
(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)
	ry circuit					E0)		25 (44)	~			0		(58)
	•				•		. ,	65 × (41) 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 month	(61)m =	(60) -	- 365 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(61)
Total h	neat req	uired for	water h	neating c	alculated	l for e	ach month	(62)m =	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	180.54	159.24	167.49	150.49	147.72	132.	36 127.46	139.39	139	156.03	164.55	176.32		(62)
Solar D	HW input	calculated	using Ap	pendix G c	r Appendix	H (ne	gative quantit	y) (enter '()' if no sola	r contribu	tion to wate	er heating)	-	
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	appl	es, see Ap	pendix	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(64)m=	180.54	159.24	167.49	150.49	147.72	132.	36 127.46	139.39	139	156.03	164.55	176.32		
			-					Out	put from w	ater heate	er (annual)	112	1840.58	(64)
Heat g	jains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.	85 × (45)m	n + (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	81.81	72.62	77.47	71.12	70.9	65.0	9 64.16	68.13	67.3	73.66	75.79	80.41		(65)
inclu	ude (57)	m in calo	ulation	of (65)m	n only if c	ylinde	er is in the	dwelling	or hot w	/ater is f	rom com	munity h	neating	
5. In	ternal g	ains (see	Table	5 and 5a):									
		ns (Table			/									
motab	Jan	Feb	Mar	Apr	May	Ju	n Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	100.87	100.87	100.87		100.87	100.	37 100.87	100.87	100.87	100.87	100.87	100.87		(66)
Lightir	ig gains	(calcula	ted in A	ppendix	L, equat	ion L) or L9a), a	lso see	Table 5				1	
(67)m=	17.03	15.13	12.3	9.31	6.96	5.8		8.25	11.08	14.07	16.42	17.5]	(67)
Applia	nces da	ins (calc	ulated i	n Appen	L dix L. ea	uatio	1 L13 or L1	i 3a), also	i o see Ta	ble 5	Į	<u> </u>	1	
(68)m=	176.15	177.98	173.37		151.19	139.	- T	129.95	134.56	144.36	156.74	168.38]	(68)
							 15 or L15a				I	<u> </u>	1	
(69)m=	33.09	33.09	33.09	33.09	33.09	33.0		33.09	33.09	33.09	33.09	33.09	1	(69)
		ns gains											1	
(70)m=			3	3	3	3	3	3	3	3	3	3	1	(70)
				ative valu						Ů		<u> </u>	J	
(71)m=	-80.7	-80.7	-80.7	-80.7	-80.7	-80.	7 -80.7	-80.7	-80.7	-80.7	-80.7	-80.7	1	(71)
					-00.7	-00.	1 00.1	-00.7	00.7	-00.7	-00.7	-00.7]	()
(72)m=	109.97	gains (T 108.07	104.13		95.3	90.4	4 86.24	91.57	93.47	99.01	105.27	108.08	1	(72)
				90.77	95.5		(66)m + (67)n						J	(12)
(73)m=	359.4	gains =	346.06	327.91	309.71	292.		286.04	295.37	313.7	334.69	350.22	1	(73)
. ,	lar gain		340.00	527.91	309.71	292.	280.03	200.04	295.57	515.7	334.09	300.22		(10)
	Ŭ		usina sol	ar flux from	Table 6a	and as	sociated equa	ations to c	onvert to th	ne applical	ble orientat	tion		
	-	Access F	Ū	Area			Flux		g_		FF		Gains	
Choine		Table 6d		m²			Table 6a	7	9_ Fable 6b	Т	able 6c		(W)	
Northe	ast <u>0.9x</u>	0.77	,	(8.	17	×	11.28] x [0.63	□ × [0.7		28.16	(75)
	ast 0.9x	0.77			17	×	22.97		0.63		0.7		57.32	(75)
	ast <u>0.9</u> x	0.77			17	× Г	41.38] ^ [] x [0.63		0.7	=	103.28	(75)
	ast 0.9x	0.77			17	× Г	67.96] ^ [] x [0.63		0.7		169.61](75)](75)
	ast 0.9x	0.77			17	× Г	91.35] ^ [] x [0.63		0.7		227.99	(75)
	0.07	0.77	′	`°.	17	^	91.00		0.05	^ L	0.7		221.99	_(, , ,

Northeast 0.9x 0.77 X 8.17 X 97.38 X 0.63 X 0.7	= 243.07 (75)										
Northeast 0.9x 0.77 x 8.17 x 91.1 x 0.63 x 0.7	= 227.38 (75)										
Northeast 0.9x 0.77 X 8.17 X 72.63 X 0.63 X 0.7	= 181.27 (75)										
Northeast 0.9x 0.77 x 8.17 x 50.42 x 0.63 x 0.7	= 125.85 (75)										
Northeast 0.9x 0.77 x 8.17 x 28.07 x 0.63 x 0.7	= 70.05 (75)										
Northeast 0.9x 0.77 x 8.17 x 14.2 x 0.63 x 0.7	= 35.43 (75)										
Northeast 0.9x 0.77 x 8.17 x 9.21 x 0.63 x 0.7	= 23 (75)										
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m											
(83)m= 28.16 57.32 103.28 169.61 227.99 243.07 227.38 181.27 125.85 70.05 35.43 23	3 (83)										
Total gains – internal and solar (84)m = (73)m + (83)m , watts											
(84)m= 387.57 414.75 449.34 497.53 537.7 535.16 508.02 467.31 421.21 383.76 370.12 373.	.21 (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 De	ec										
(86)m= 1 1 0.99 0.97 0.9 0.75 0.58 0.65 0.88 0.98 1 1	(86)										
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)											
(87)m= 19.78 19.89 20.12 20.44 20.75 20.93 20.99 20.98 20.84 20.46 20.07 19.7	76 (87)										
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)											
(88)m = 19.96 19.96 19.96 19.97 19.97 19.98 19.98 19.98 19.98 19.97 19.	96 (88)										
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	(89)										
(89)m= 1 0.99 0.99 0.96 0.86 0.66 0.46 0.52 0.82 0.97 0.99 1											
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)											
(90)m= 18.34 18.5 18.83 19.3 19.72 19.93 19.97 19.97 19.84 19.34 18.77 18.3											
$fLA = Living area \div (4) =$	0.4 (91)										
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$											
(92)m= 18.91 19.05 19.34 19.76 20.13 20.33 20.38 20.37 20.24 19.79 19.29 18.8	89 (92)										
Apply adjustment to the mean internal temperature from Table 4e, where appropriate											
(93)m= 18.91 19.05 19.34 19.76 20.13 20.33 20.38 20.37 20.24 19.79 19.29 18.8	89 (93)										
8. Space heating requirement											
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a											
	ec										
Utilisation factor for gains, hm:	60										
(94)m= 1 0.99 0.98 0.96 0.87 0.69 0.51 0.57 0.84 0.97 0.99 1	(94)										
Useful gains, hmGm , W = (94)m x (84)m											
(95)m= 385.79 411.8 442.54 475.57 467.84 370.09 256.96 266.56 353.92 371.77 367.02 371.	.79 (95)										
Monthly average external temperature from Table 8											
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	2 (96)										
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]											
(97)m= 1034.39 999.81 905.35 758.6 587.88 396.64 261.31 274.33 425.83 640.81 853.11 103	1.9 (97)										
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m											
(98)m= 482.56 395.15 344.33 203.78 89.31 0 0 0 0 200.17 349.98 491.	.12										

								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2556.4	(98)
Space	heating	g require	ement ir	n kWh/m²	/year								41.72	(99)
9a. Enei	rgy req	uiremer	nts – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space		•			, .									-
Fraction of space heat from secondary/supplementary system										0	(201)			
Fraction of space heat from main system(s) $(202) = 1 - (201) =$ The state of the 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)			
Efficien	ncy of s			lementar	y heating	g systen		r		1			0	(208)
Ĺ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
· –	heating 482.56	g require 395.15	ament (0 344.33	203.78	d above) 89.31) 0	0	0	0	200.17	349.98	491.12		
L						0	0	0	0	200.17	349.90	491.12		(014)
	= {[(98) 516.11)m x (20 422.62	4)] } X 368.27	100 ÷ (20 217.95	95.52	0	0	0	0	214.08	374.31	525.26		(211)
Ľ	010.11	122.02	000.27	211.00	00.02	Ů	Ů			ar) =Sum(2			2734.12	(211)
Space	heating	a fuel (s	econdar	ry), kWh/	month									
= {[(98)n				• ·										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0	(215)
Water h	-													
	<u>rom wa</u> 180.54	ater hea 159.24	ter (calc 167.49	ulated al	bove) 147.72	132.36	127.46	139.39	139	156.03	164.55	176.32		
L Efficienc					=								79.8	(216)
(217)m=	·	87.14	86.7	85.62	83.52	79.8	79.8	79.8	79.8	85.48	86.78	87.4		(217)
∟ Fuel for	water	heating,	kWh/m	onth										
(219)m =													l	
(219)m= 2	206.78	182.73	193.19	175.76	176.87	165.86	159.73	174.67	174.18 I = Sum(2 ⁻	182.54	189.62	201.73		
ممرمه	totala							TOLA	i = 3um(2		Nhhaar		2183.65 kWh/yea i	(219)
Annual totals kWh/year Space heating fuel used, main system 1									2734.12	٦				
Water heating fuel used									2183.65	f				
	-			electric	keep-ho	t						I		
						-						30		(230c)
central heating pump: boiler with a fan-assisted flue									(230e)					
Total electricity for the above, kWh/year sum of (230a)(230g) =								45	75	_				
Electricity for lighting							Sum	01 (230a).	(2309) =			75	(231)	
	•												300.75	(232)
-12a. C(02 em	issions -	- Individ	lual heati	ing syste	ems incli	uding mi	cro-CHP						
							ergy /h/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/ye	
Space h	eating	(main s	ystem 1)		(21	1) x			0.2	16	=	590.57	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	471.67	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1062.24	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	156.09	(268)
Total CO2, kg/year	sum	of (265)(271) =		1257.25	(272)

TER =

20.52 (273)