Regulations Compliance Report

	ent L1A, 2013 Edition ober 2020 at 14:55:1	, England assessed by Stron 1	na FSAP 2012 program, Ver	sion: 1.0.5.9	
Project Informatio	in:				
Assessed By:	Zahid Ashraf (STR	O001082)	Building Type:	Flat	
Dwelling Details:					
NEW DWELLING	DESIGN STAGE		Total Floor Area: 7	3.82m ²	
Site Reference :	Hermitage Lane		Plot Reference:	Plot 8	
Address :	J				
Client Details:					
Name:					
Address :					
This report cover	s items included wi	thin the SAP calculations.			
-	te report of regulati				
1a TER and DER					
	ing system: Mains ga	as (c)			
Fuel factor: 1.00 (n	nains gas (c))				
-	xide Emission Rate	. ,	18.02 kg/m²		
	Dioxide Emission Rate	e (DER)	10.80 kg/m²		OK
1b TFEE and DF					
-	rgy Efficiency (TFEE) hergy Efficiency (DFE		49.4 kWh/m² 37.4 kWh/m²		
Dwelling Fablic En	ergy Enciency (DFE)	37.4 KVVII/III-		ок
2 Fabric U-value	S				
Element		Average	Highest		
External v	wall	0.14 (max. 0.30)	0.15 (max. 0.70)		ок
Floor		0.12 (max. 0.25)	0.12 (max. 0.70)		ок
Roof		(no roof)			
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)		ОК
2a Thermal bridg					
		om linear thermal transmittar	ces for each junction		
3 Air permeabilit				``````````````````````````````````````	
Air permeat Maximum	pility at 50 pascals		3.00 (design valı 10.0	le)	ок
			10.0		UN
4 Heating efficie					
Main Heatin	ig system:	Community heating scheme	es - mains gas		
Secondary I	heating system:	None			
	iedanig eyetetti				
5 Cylinder insula	ation				
Hot water S	torage:	No cylinder			
6 Controls					
Space heati	ng controls	Charging system linked to			• 16
Lat mater -	ontrolo	programmer and at least tw	o room thermostats		ок
Hot water co	JITUOIS.	No cylinder thermostat No cylinder			

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	1.02	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	11.2m ²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
External Walls U-value	0.13 W/m²K	
Floors U-value	0.12 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

			User De	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20 ⁷	12		Stroma Softwa					001082 n: 1.0.5.9	
		Pro	operty A	ddress:	Plot 8					
Address :										
1. Overall dwelling dime	nsions:									
Ground floor			Area	· ,	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³) 184.54) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	73	3.82	(4)			-		_
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	184.54	(5)
2. Ventilation rate:										
		econdary		other		total			m ³ per hou	r
Number of chimneys		0	+	0] = [0	X 4	40 =	0	(6a)
Number of open flues		0	+	0	1 = F	0	x	20 =	0	(6b)
Number of intermittent far	ר ביידע ביידע ווא ביידע					0	x ^	10 =	0	(7a)
Number of passive vents						0	x ·	10 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
						0			0	
								Air ch	anges per ho	ur
Infiltration due to chimney	vs, flues and fans = (6)	6a)+(6b)+(7a))+(7b)+(7	'C) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has be	een carried out or is intend	led, proceed	to (17), o	therwise c	ontinue fro	om (9) to ((16)			_
Number of storeys in th	e dwelling (ns)								0	(9)
Additional infiltration		() OF ([(9)·	-1]x0.1 =	0	(10)
Structural infiltration: 0. if both types of wall are pro- deducting areas of openin	esent, use the value corre				•	uction			0	(11)
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					0	(15)
Infiltration rate				(8) + (10) -					0	(16)
Air permeability value, o			•	•		etre of e	envelope	area	3	(17)
If based on air permeabili Air permeability value applies						ia haina w	and		0.15	(18)
Number of sides sheltere		is been done	or a degi	ree all per	meability	s being us	seu		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	P)m $\div 4$									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
· · · · · · · · · · · · · · · · · · ·								-	l	

Adjuste	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m			-		
	0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14		
			change i	rate for t	he appli	cable ca	se						· 	
		al ventila	using Appe	ondix N (2	2h) - (22a	$) \times Emv(c)$	austion (N	(5)) othou	nuico (22h)) - (220)			0.5	(23a)
) = (23a)			0.5	(23b)
			overy: effic		Ũ		,		, ,				79.05	(23c)
			I			i		, `	, , ,	, ,	· · ·	1 – (23c)	÷ 100] I	(24a)
(24a)m=		0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24a)
			anical ve			1			r i	, ,	· · · · · ·		I	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,			tract ven < (23b), t		•	-				5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or wh en (24d)		•	•				0.5]	•		1	
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t) or (24	c) or (24	d) in box	(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)
0.11						I	I	1	I		1	1	1	
			eat loss p			No. A.		11 -1		A \/ 11		1 - 1 -		× 1
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²∙ł		X k J/K
Doors						2	x	1.4	=	2.8				(26)
Windo	WS					11.20	5 <mark>x1</mark> /	/[1/(1.4)+	0.04] =	14.86				(27)
Floor						31.10	3 X	0.12	=	3.73236	6			(28)
Walls ⁻	Гуре1	36.6	61	11.2	2	25.41	x	0.15	=	3.81	ן ר			(29)
Walls -	Гуре2	36.1	15	2		34.15	5 X	0.14		4.83	ז ד		╡ ──	(29)
Walls ⁻	Гуре3	14.2	23	0		14.23	3 X	0.13	i	1.9	i F		i —	(29)
Total a	rea of e	lements		L		118.1		L	เ		L			(31)
* for win	dows and	roof wind				alue calcul		formula 1,	/[(1/U-valu	e)+0.04] a	as given in	paragraph	1 3.2	(-)
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				31.93	(33)
		Cm = S(,					((28)	.(30) + (32	2) + (32a).	(32e) =	3365.77	(34)
			ter (TMF		- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For desi	gn assess	sments wh	ere the de tailed calcu	tails of the				ecisely the	e indicative	values of	TMP in Ta	able 1f		
			x Y) cal		usina Ap	pendix ł	<						12.65	(36)
	-		are not kn		• •							I	12.00	(00)
	abric he			- ()	(.	/			(33) +	(36) =			44.59	(37)
Ventila	tion hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	15.41	15.23	15.05	14.17	13.99	13.1	13.1	12.93	13.46	13.99	14.34	14.7		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m		1	
(39)m=	59.99	59.81	59.64	58.75	58.58	57.69	57.69	57.51	58.04	58.58	58.93	59.28		
-									/	Average =	Sum(39)₁	12 /12=	58.71	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.81	0.81	0.81	0.8	0.79	0.78	0.78	0.78	0.79	0.79	0.8	0.8		
Numb	er of day	re in mor	nth (Tab	le 12)				Į	,	Average =	Sum(40)1.	12 /12=	0.8	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,							-							
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	349 x (TF	- A -13.9)2)] + 0.0)013 x (TFA -13		34		(42)
Reduce	the annua	al average	hot water		5% if the a	welling is	designed	(25 x N) to achieve		se target o		.38		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	103.82	100.04	96.26	92.49	88.71	84.94	84.94	88.71	92.49	96.26	100.04	103.82		
-						100					m(44) ₁₁₂ =		1132.53	(44)
			. <u> </u>	. <u> </u>	· ·			OTm / 3600		· ·			l	
(45)m=	153.95	134.65	138.95	121.14	116.23	100.3	92.94	106.65	107.93	125.78	137.3	149.1		(45)
lf instan	taneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		l otal = Su	m(45) ₁₁₂ =		1484.92	(45)
(46)m=	23.09	20.2	20.84	18.17	17.44	15.05	13.94	16	16.19	18.87	20.59	22.36		(46)
	storage			•										
-		. ,		• •			-	within sa	ame ves	sel		0		(47)
	•	-		ank in dw ar (this ir	-			ı (47) ombi boil	ers) ente	r '0' in <i>(</i>	47)			
	storage		not wate			notantai								
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				(48) x (49)) =		1	10		(50)
				cylinder l rom Tabl								00		(51)
		-	ee secti			1/1110/02	iy)				0.	02		(51)
	-	from Ta									1.	03		(52)
Tempe	erature 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	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contain:	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	50), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
	•	•		om Table								0		(58)
	•					,	. ,	65 × (41)			-1-1)			
		r			r	r		ng and a	-	1	· · ·	22.26		(59)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(33)

Combi	loss ca	alculated	for eac	ch i	month ((61)m =	(60)) ÷ 36	65 × (41)	m									
(61)m=	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	h month	(62)m	า =	0.85 × ((45)m	ı +	(46)m +	(57)	m +	(59)m + (61)m	
(62)m=	209.23	184.58	194.22	2	174.63	171.51	1:	53.79	148.22	161.9	93	161.42	181.	06	190.79	204	.37		(62)
Solar DI	-IW input	calculated	using Ap	ope	ndix G or	Appendix	н ((negativ	ve quantity) (ente	r '0'	if no sola	r contr	ibu	tion to wate	er hea	ting)		
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	ap	plies,	, see Ap	pendi	x G	6)							
(63)m=	0	0	0		0	0		0	0	0		0	0		0	()		(63)
Output	from w	ater hea	iter								-							-	
(64)m=	209.23	184.58	194.22	2	174.63	171.51	1:	53.79	148.22	161.9	93	161.42	181.	06	190.79	204	.37		
		•	•							С)utp	ut from wa	ater he	ate	er (annual)	12		2135.76	(64)
Heat g	ains fro	m water	heatin	g, l	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m] + 0.8 ×	× [(46)m	+ (57)m	+ (5	9)m]	
(65)m=	95.41	84.71	90.42	T	83.07	82.87	7	6.15	75.13	79.6	8	78.68	86.0)4	88.45	93	.8		(65)
inclu	ide (57)	m in calo	ulatior	<u>ו</u>	f (65)m	only if c	ylir	nder is	s in the c	dwellir	ng d	or hot w	ater i	s f	rom com	mun	ity h	eating	
		ains (see			. ,	•	,				U						5	0	
	Ŭ	ns (Table																	
Metab	Jan	Feb	Mar		Apr	May		Jun	Jul	Au	a	Sep	0	t	Nov	D	ec		
(66)m=	116.75	116.75	116.75	+	116.75	116.75		16.75	116.75	116.7	~ 	116.75	116.	-	116.75		6.75		(66)
		i (calcula					ion	190		lso se	L P T							1	
(67)m=	19.37	17.2	13.99	<u> </u>	10.59	7.92	i —	6.68	7.22	9.39	- 1	12.6	16	;	18.67	19.	91]	(67)
		ains (calc		_														I	
(68)m=	206.03	<u> </u>	202.79	-	191.32	176.84	r –	63.23	154.14	5a), a 152	<u> </u>	157.39	168.	86	183.34	106	6.94	1	(68)
				_											100.04	150		l	(00)
	34.68	s (calcula 34.68	34.68	-i-	34.68	L, equal	<u> </u>	1 L 15 4.68	34.68	, also 34.6	-	34.68	34.6	.0	34.68	24	.68	1	(69)
(69)m=						34.00	3	4.00	34.00	34.0	•	34.00	34.0	00	34.00	34.	.00		(03)
-	r	ins gains	r i	9 58 T	-		_											1	(70)
(70)m=	0	0	0		0	0		0	0	0		0	0		0	()		(70)
		vaporatic	<u> </u>	-		, `	<u> </u>	,					-					1	(= .)
(71)m=	-93.4	-93.4	-93.4		-93.4	-93.4	-	93.4	-93.4	-93.4	4	-93.4	-93.	4	-93.4	-93	3.4		(71)
Water		gains (T		<u> </u>														1	
(72)m=	128.24	126.06	121.53	3	115.38	111.38	1(05.76	100.97	107.	1	109.28	115.	65	122.84	126	6.07		(72)
Total i	nterna	l gains =	:					(66)	m + (67)m	+ (68)	m +	(69)m + ((70)m ·	+ (7	71)m + (72)	m			
(73)m=	411.67	1	396.34	ŧ	375.31	354.16	3	33.7	320.36	326.5	52	337.29	358.	53	382.88	400	.95		(73)
	lar gain																		
-			•	lar			and			tions to	o cor	nvert to th	ie appl	ica	ble orientat	ion.			
Orienta		Access F Table 6d			Area m²			Flu	x ole 6a			g_ able 6b		т	FF able 6c			Gains (W)	
								- 1 ai	Jie da		10		_	' -				(**)	-
	est <mark>0.9x</mark>	0.77		x	11	.2	x	3	6.79	ļĹ		0.63	×	F	0.7		=	126	(79)
	est <mark>0.9x</mark>	0.77		x	11	.2	x	6	2.67	ĹĹ		0.63	×	ļ	0.7		=	214.62	(79)
	est <mark>0.9x</mark>	0.77		x	11	.2	x	8	5.75			0.63	x	Ĺ	0.7		=	293.65	(79)
Southw	vest <mark>0.9x</mark>	0.77		x	11	.2	x	1(06.25			0.63	x		0.7		=	363.85	(79)
Southw	vest <mark>0.9x</mark>	0.77		x	11	.2	x	11	19.01			0.63	x		0.7		=	407.54	(79)

							,						_
Southwest _{0.9x}	0.77	x	11.	2	x	118.15		0.63	x	0.7	=	404.59	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	113.91		0.63	x	0.7	=	390.07	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	104.39		0.63	x	0.7	=	357.47	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	92.85		0.63	x	0.7	=	317.96	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	69.27		0.63	x	0.7	=	237.2	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	44.07		0.63	x	0.7	=	150.91	(79)
Southwest0.9x	0.77	x	11.	2	x	31.49		0.63	x	0.7	=	107.83	(79)
Solar <u>g</u> ains in	watts, cal	culated	for eacl	n month			(83)m = S	um(74)m .	(82)m				
(83)m= 126		293.65	363.85	407.54	404.59		357.47	317.96	237.2	150.91	107.83		(83)
Total gains –	internal an	d solar	(84)m =	: (73)m ·	+ (83)m	i, watts	i				i		
(84)m= 537.67	624.08	689.99	739.16	761.7	738.29	710.43	683.99	655.26	595.73	533.79	508.77		(84)
7. Mean inte	rnal tempe	erature	(heating	season)								
Temperature	during he	ating p	eriods ir	the livi	ng area	from Tal	ole 9, Th	n1 (°C)				21	(85)
Utilisation fac	ctor for gai	ins for li	iving are	a, h1,m	(see T	able 9a)							
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.94	0.9	0.85	0.75	0.63	0.47	0.35	0.38	0.56	0.78	0.9	0.94		(86)
Mean interna	al temperat	ture in l	iving are	ea T1 (fo	ollow st	eps 3 to 7	7 in Tabl	e 9c)		•			
(87)m= 19.63	<u> </u>	20.23	20.58	20.82	20.95	20.99	20.98	20.91	20.6	20.07	19.58		(87)
Tomporatura			oriode ir	roct of	dwollin	a from Tr		1					
Temperature	T T	20.25	20.26	20.26	20.27	20.27	20.27	20.27	20.26	20.25	20.25		(88)
								20.21	20.20	20.20	20.20		()
Utilisation fac	T T					T	r Ó	0.54	0.75				(90)
(89)m= 0.93	0.89	0.83	0.73	0.59	0.43	0.29	0.32	0.51	0.75	0.89	0.94		(89)
Mean interna	al temperat	ture in t	he rest	of dwelli	ng T2 (follow ste	eps 3 to	7 in Tabl	le 9c)				
(90)m= 18.41	18.78	19.25	19.74	20.05	20.22	20.26	20.26	20.17	19.78	19.04	18.34		(90)
								1	fLA = Livir	ig area ÷ (4	4) =	0.34	(91)
Mean interna	al temperat	ture (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1 – fl	_A) × T2					
(92)m= 18.82	19.16	19.58	20.02	20.31	20.47	20.51	20.5	20.42	20.05	19.39	18.76		(92)
Apply adjust	ment to the	e mean	internal	temper	ature fr	om Table	4e, whe	ere appro	opriate				
(93)m= 18.82	19.16	19.58	20.02	20.31	20.47	20.51	20.5	20.42	20.05	19.39	18.76		(93)
8. Space hea													
Set Ti to the			•		ed at s	tep 11 of	Table 9	b, so tha	ıt Ti,m=(76)m an	d re-calc	culate	
the utilisation	Feb	Mar			Jun	Jul	Δυα	Sep	Oct	Nov	Dec		
Utilisation fa			Apr	May	Jun	Jui	Aug	l Seb			Dec		
(94)m= 0.91	0.87	0.81	0.72	0.59	0.44	0.31	0.34	0.52	0.74	0.87	0.92		(94)
Useful gains				1)m									
(95)m= 489.23	T T	560.07	531.76	452.68	324.81	222.12	231.72	341.85	441.1	464.15	468.22		(95)
Monthly aver	rage exterr	nal tem	perature	from Ta	able 8			I	I			I	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for mear	n intern	al tempe	erature,	Lm , W	=[(39)m	x [(93)m	– (96)m]				
(97)m= 871.23	853.16	780.1	653.39	504.52	338.51	225.35	236.02	366.94	553.82	724.09	863.19		(97)
Space heatir	ng requirer	nent fo	r each m	nonth, k	/Vh/moi	h = 0.02	24 x [(97	')m <u>– (</u> 95)m] x (4	1)m		L	
(98)m= 284.21	208.56	163.71	87.58	38.57	0	0	0	0	83.86	187.15	293.86		

	Total per year (kWh/y	vear) = Sum(98) _{15,912} =	1347.5	(98)
Space heating requirement in kWh/m²/year			18.25	(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 (Ta		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		our other heat sources;	the latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. Se Fraction of heat from Community boilers	e Appenaix C.		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			1347.5	
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	1414.87	(307a)
Efficiency of secondary/supplementary heating system in % (from	Table 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary system	m (98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating				
Annual water heating requirement			2135.76	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2242.55	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307	e) + (310a)(310e)] =	36.57	(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 or	utside		287.05	(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) =	287.05	(331)
Energy for lighting (calculated in Appendix L)			342.06	(332)
Electricity generated by PVs (Appendix M) (negative quantity)			-749.25	(333)
Electricity generated by wind turbine (Appendix M) (negative quar	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 the	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	= 840.43	(367)
Electrical energy for heat distribution [(3	13) x	0.52	= 18.98	(372)

Total CO2 associated with community s	ystems	(363)(366) + (368)(372	=	859.41	(373)	
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	ion heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wa	ater heating	(373) + (374) + (375) =			859.41	(376)
CO2 associated with electricity for pump	os and fans within dwe	lling (331)) x	0.52	=	148.98	(378)
CO2 associated with electricity for lightin	ng	(332))) x	0.52	=	177.53	(379)
Energy saving/generation technologies	(333) to (334) as appli	cable	0.52 × 0.0)1 =	-388.86	(380)
Total CO2, kg/year	sum of (376)(382) =				797.06	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				10.8	(384)
El rating (section 14)					91.01	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 8

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	es: eter: tters:	ather (a	ich):	Flat England Thames va No 1 North East Average or None Indicative V False 4 (Window	unknown			
Summer ventilation h Transmission heat lo			ient:	243.59 44.6				(P1)
Summer heat loss co				44.0 288.18				(P2)
Overhangs:								
Orientation:	Ratio:		Z_overhangs:					
South West (SW)	0 0		2_overnangs.					
Solar shading:	U		•					
Solar shading.								
Orientation:	Z blind	ls:	Solar access:	Over	hangs:	Z summer:		
South West (SW)	1		0.9	1		0.9		(P8)
Solar gains:								
Orientation		Area	Flux	g_	FF	Shading	Gains	
South West (SW)	0.9 x	11.2	119.92	9 0.63	0.7	0.9	479.99	
						Total	479.99	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer externa Thermal mass tempera Threshold temperature Likelihood of high internation	ement	-	968 3.3 16 1.3 20.	4.14 3.02 86	July 447.14 927.13 3.22 17.9 1.3 22.42 Medium	August 455.49 903.26 3.13 17.8 1.3 22.23 Medium	(P5) (P6) (P7)	

Assessor Name: Zahid Ashraf Stroma Number: STRO001082 Software Version: Version: 1.0.5.9 Property Address: Plot 8 Address : 1. Overall dwelling dimensions: Ground floor 73.82 (1a) X 2.5 (2a) = 184.54 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.82 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 184.54 (5)$ 2. Ventilation rate: Number of chimneys $0 + 0 = 0$ (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 184.54 (5) Number of open flues $0 + 0 = 0$ (40) Number of open flues $0 + 0 = 0$ (40) Number of intermittent fans $2 \times 10 = 0$ (7a) Number of passive vents $0 + 0 = 0$ (40) Number of flueless gas fires $0 + 0$ (5c) (7c) (7c) (7c) (7c) (7c) Number of storeys in the dwelling (ns) Additional infiltration (2.5 for steel or timber frame or 0.35 for masonry construction <i>i</i> both types of value present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	User Details:												
Address : 1. Overall dwelling dimensions: Area(m ²) Av. Height(m) Volume(m ³) Ground floor 73.82 (1a) x 2.5 (2a) = 184.54 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.82 (1a) x 2.5 (2a) = 184.54 (3a) Dot area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.82 (4) Dot area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.82 (4) Dot area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.82 (4) Dot area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.82 (4) Dot area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) Total floor area (TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) Total floor (1a) Total floor (1a) <th></th> <th></th> <th>2</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>			2										
Area(m ²) Av. Height(m) Volume(m ³) Ground floor 73.82 (1a) x 2.5 (2a) = 184.54 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.82 (4) Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 184.54 (5) 2. Ventilation rate: main heating other total main main heating * Colspan="2">total main main heating * Colspan="2">total main main heating * Colspan="2">total main main heating * Colspan="2">* Colspan="2" * Colspan="2" Number of chimneys o * X40 = o * Colspan="2" Number of chimneys secondary * Colspan="2" * Colspan="2" * Colspan="2" * Colspan="2" * Colspan="2"			Property	Address: Plo	ot 8								
Area(m²)Av. Height(m)Volume(m³)Ground floor 73.82 $(1a) \times 2.5$ $(2a) = 184.54$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 73.82 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 184.54$ (5) 2. Ventilation rate: $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 184.54$ (5) Number of chimneys 0 $+$ 0 $=$ 0 $x40 = 0$ $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $x40 = 0$ $(6a)$ Number of passive vents 0 $+$ 0 $=$ 0 $x40 = 0$ $(7a)$ Number of flueless gas fires 0 $x40 = 0$ $(7c)$ $At = 0$ $(7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 30$ $+$ $(5) = 0.16$ (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) $(9)-11x0.1 = 0$ (10) (11) (10) Additional infiltration $(9)-12x0.1 = 0$ (10) (11) (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 0.35 $(12)-12x0.1 = 0$ (11)													
Ground floor 73.82 $(1a) \times 2.5$ $(2a) =$ 184.54 $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 73.82 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 184.54 (5) 2. Ventilation rate: $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 184.54 (5) Number of chimneys 0 $+$ 0 $=$ 0 $(40) =$ Number of open flues 0 $+$ 0 $=$ 0 $(6a)$ Number of intermittent fans 3 $x10 =$ 30 $(7a)$ Number of passive vents 0 $x10 =$ 0 $(7c)$ Number of flueless gas fires 0 $x40 =$ 0 $(7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 30 $(4) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 30 (6) (6) Number of storeys in the dwelling (ns) (17) , otherwise continue from (9) to (16) (19) (10) Number of storeys in the dwelling (ns) (9) (10) (10) (10) Structural infiltration (9) (10) (11) (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 0.35 (11)	1. Overall dwelling dimen	isions:	<u>.</u>	(0)									
Dwelling volume $(3a)+(3c)+(3c)+(3c)+(3c)+(3c)+(3n) =$ 184.54(5)2. Ventilation rate:main heating heatingother heatingtotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 Number of open flues 0 $+$ 0 $=$ 0 $x20 =$ 0 Number of intermittent fans 3 $x10 =$ 30 $(7a)$ Number of passive vents 0 $x10 =$ 0 $(7c)$ Number of flueless gas fires 0 $x40 =$ 0 $(7c)$ Number of storeys in the dwelling (ns) a a a a Additional infiltration (9) (9) (10) (11) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (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 0.35 0	Ground floor			. ,		,	(2a) =	. ,	(3a)				
2. Ventilation rate:main heatingsecondary heatingother totaltotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x20 =$ 0 (6b)Number of intermittent fans 3 $x10 =$ 30 (7a)Number of passive vents 0 $x10 =$ 0 (7c)Number of flueless gas fires 0 $x40 =$ 0 (7c)Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 30 $+$ $(5) =$ 0.16 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)(9)Additional infiltration $(9)-1 x0.1 =$ 0 (1)(1)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (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 0.35 0.35	Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e))+(1n)	73.82 (4)									
main heatingsecondary heatingothertotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x20 =$ 0 (6b)Number of intermittent fans 3 $x10 =$ 30 (7a)Number of passive vents 0 $x10 =$ 0 (7b)Number of flueless gas fires 0 $x40 =$ 0 (7c)Number of flueless gas fires 0 $x40 =$ 0 (7c)Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) = 30 $+$ (5) = 0.16 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)Number of storeys in the dwelling (ns) 0 (9)(10)Additional infiltration $[(9)-1]x0.1 =$ 0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (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 0.35 0 0	Dwelling volume			(3a	a)+(3b)+(3c)+(3d	l)+(3e)+	(3n) =	184.54	(5)				
heatingheating \bullet </td <td>2. Ventilation rate:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	2. Ventilation rate:												
Number of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $x 40$ $=$ 0 $(6a)$ Number of open flues 0 $+$ 0 $+$ 0 $=$ 0 $x 20$ 0 $(6b)$ Number of intermittent fans 3 $x 10$ $=$ 0 $(7a)$ x 10 $=$ 0 $(7a)$ Number of passive vents 0 $x 10$ $=$ 0 $(7b)$ x 10 $=$ 0 $(7c)$ Number of flueless gas fires 0 $x 40$ $=$ 0 $(7c)$ x Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ $=$ 30 $+$ (5) 0.16 (8) Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c)$ $=$ 30 (16) (9) Number of storeys in the dwelling (ns) (9) (9) (9) (9) Additional infiltration (9) (10) (11) (11) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11) (11) <i>ib oth types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user $0.35$$(10)$</i>				other	total			m ³ per hour					
Number of intermittent fans3 $x 10 =$ 30(7a)Number of passive vents0 $x 10 =$ 0(7b)Number of flueless gas fires0 $x 40 =$ 0(7c)Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 30 $+ (5) =$ 0.16(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)0(9)Additional infiltration(9)(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(11)	Number of chimneys			0	= 0	x 4	0 =	0	(6a)				
Number of passive vents 3 30 $(1d)$ Number of flueless gas fires 0 $x 10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 30 $+ (5) =$ 0.16 If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) 0 (9) Number of storeys in the dwelling (ns) 0 (9) (10) Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction 0 (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 0.35 0 (11)	Number of open flues	0 +	0 +	0	= 0	x 2	0 =	0	(6b)				
Number of flueless gas fires Number of flueless gas fires 0 $x 40 = 0$ (7c) Air changes per hour Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 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 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	Number of intermittent fan	s			3	x 1	0 =	30] (7a)				
Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 30 $\div (5) =$ 0.16(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $\div (5) =$ 0.16(9)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 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(11)	Number of passive vents				0	x 1	0 =	0] (7b)				
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ <i>if a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i> Number of storeys in the dwelling (ns) Additional infiltration Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>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</i> (9)	Number of flueless gas fire	es			0	x 4	0 =	0] (7c)				
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ <i>if a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i> Number of storeys in the dwelling (ns) Additional infiltration Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction <i>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</i> (9)					L		L Air ch	anges per hou					
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 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								anges per not	-				
Number of storeys in the dwelling (ns) 0 (9)Additional infiltration 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 0	•						(5) =	0.16	(8)				
Additional infiltration $[(9)-1]x0.1 =$ 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 0.350(11)			-,			/	[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	Additional infiltration					[(9)-	1]x0.1 =						
deducting areas of openings); if equal user 0.35	Structural infiltration: 0.2	25 for steel or timber f	rame or 0.35 fo	r masonry c	onstruction		Ī	0	(11)				
			oonding to the grea	ter wall area (at	fter								
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)			ed) or 0.1 (seal	ed), else ent	er 0		[0	(12)				
If no draught lobby, enter 0.05, else enter 0	•		, ,	,.					4				
Percentage of windows and doors draught stripped 0 (14)	Percentage of windows	and doors draught str	ripped				Ī	0	(14)				
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)	Window infiltration			0.25 - [0.2 x (1	4) ÷ 100] =		ĺ	0	(15)				
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)	Infiltration rate			(8) + (10) + (1	1) + (12) + (13) +	+ (15) =	[0	(16)				
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 (17)			•	• •	re metre of e	nvelope	area	3	(17)				
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.31 (18)	•							0.31	(18)				
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered 3 (19)			been done or a de	gree air permea	ability is being us	sed	Г		7(10)				
Number of sides sheltered 3 (19) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.78 (20)				(20) = 1 - [0.07	75 x (19)] =				- · ·				
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.24$ (21)		ng shelter factor		(21) = (18) x (2	20) =		L [4				
Infiltration rate modified for monthly wind speed		-					L], ,				
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb M	Mar Apr May	Jun Jul	Aug	Sep Oct	Nov	Dec						
Monthly average wind speed from Table 7	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	(22)m= 5.1 5 4	.9 4.4 4.3	3.8 3.8	3.7	4 4.3	4.5	4.7						
Wind Factor $(22a)m = (22)m \div 4$	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	(22a)m= 1.27 1.25 1.	.23 1.1 1.08	0.95 0.95	0.92	1 1.08	1.12	1.18						

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.31	0.3	0.3	0.27	0.26	0.23	0.23	0.22	0.24	0.26	0.27	0.28			
	<i>ate effec</i> echanica		change i	rate for t	he appli	cable ca	se		-		-		- 		-)
			using Appe	ondix N (2	(2b) = (22c)		oquation (I	NE)) othou	nuico (22h)) = (22a)			0	(23a	
			0 11		, ,	, ,	• •	,, .) = (23a)			0	(23b	
			overy: effici	-	-) h) has i (1	00k) [4 (00 a)	0	(230	2)
a) If (24a)m=			anical ve					HR) (24a	m = (22)	20)m + (. 0	23D) × [0	1 – (23c) 0) ÷ 100]]	(24a	a)
		-	_	-	-	-			-	-	Ů	0	J	(240	,
,			anical ve		1	1	, <u>, ,</u>	r Ó	ŕ	, ,	, I		1	(0.4)	
(24b)m=		0	0	0	0	0	0	0	0	0	0	0	J	(24b	(כ
,			tract ven (23b), t		•	•				5 × (23b)		_		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c	2)
,			on or wh en (24d)							0.5]	-	-			
(24d)m=	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.53	0.54	0.54		(240	d)
Effe	ctive air	change	rate - er	iter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)						
(25)m=	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.53	0.53	0.54	0.54]	(25))
2 40	at losso	e and he	eat loss p	aramat	or:	•	•	•	•				,		
		Gros		Openin		Net Ar	222	U-valı		AXU		k-value	`	AXk	
		area		r		A,r		W/m2		(W/I	<)	kJ/m ² ·l		kJ/K	
Doors						2	x	1.4	=	2.8				(26))
Windo	WS					11.20	5 x1	/[1/(1.4)+	0.04] =	14.86				(27))
Floor						31.10	3 X	0.12] = [3.73236	3			(28))
Walls	Type1	36.6	51	11.2	2	25.41	x	0.15	 	3.81	i F		\exists	(29))
Walls	Type2	36.1	5	2		34.15	5 X	0.14		4.83			i F	(29))
Walls [·]	Туре3	14.2	23	0		14.23	3 X	0.13	i	1.9			\dashv	(29))
Total a	area of e	lements	, m²	L		118.1		L	เ		I			(31)	
				ffective wi	ndow U-va			r formula 1	/[(1/U-valu	ve)+0.04] a	ns given in	paragraph	1 3.2	()	
			sides of in				Ū			, -	0	, , ,			
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				31.9	3 (33))
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	3365.	77 (34))
Therm	al mass	parame	ter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35))
	-		ere the de tailed calcu		construct	ion are noi	t known pr	recisely the	e indicative	values of	TMP in T	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						12.6	5 (36))
			are not kn	own (36) =	= 0.05 x (3	1)									
Total f	abric he	at loss							(33) +	(36) =			44.5	9 (37))
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Į		
(38)m=	33.35	33.24	33.13	32.61	32.51	32.06	32.06	31.98	32.24	32.51	32.71	32.92	J	(38))
Heat t	ransfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_		
(39)m=	77.94	77.83	77.72	77.2	77.1	76.65	76.65	76.56	76.82	77.1	77.3	77.5			
									/	Average =	Sum(39)	12 /12=	77.2	2 (39))

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)				
(40)m=	1.06	1.05	1.05	1.05	1.04	1.04	1.04	1.04	1.04	1.04	1.05	1.05			
Numbe	er of dav	vs in mo	nth (Tab	le 1a)				-		Average =	Sum(40)1.	12 /12=	1.05	(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)	
			1	1				l							
4. Wa	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:		
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x (⁻	TFA -13		34		(42)	
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.38		(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Hot wate	er usage il	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	· · · · ·						
(44)m=	103.82	100.04	96.26	92.49	88.71	84.94	84.94	88.71	92.49	96.26	100.04	103.82			
Enorm	contant of	hot water	unad an	loulotod m	onthly - 1	100 v Vd r		Tm / 2600			$m(44)_{112} =$		1132.53	(44)	
			. <u> </u>	. <u> </u>	· ·	i		DTm / 3600		· ·					
(45)m=	153.95	134.65	138.95	121.14	116.23	100.3	92.94	106.65	107.93	125.78	137.3	149.1	1484.92	(45)	
lf instant	Total = Sum(45) ₁₁₂ = f instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)														
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)	
	storage								1		·				
-		. ,		• •			-	within sa	ame ves	sel		0		(47)	
	•	-			velling, e			n (47) ombi boil	ars) ante	ar '∩' in <i>(</i>	(17)				
	storage		not wate	51 (1113 11	iciuues i	nstantai			ers) erite						
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)	
Tempe	erature fa	actor fro	m Table	2b								0		(49)	
			-	e, kWh/ye				(48) x (49)) =			0		(50)	
				•	loss fact le 2 (kW							-		(54)	
		•	ee secti			1/11110/02	iy)					0		(51)	
		from Ta										0		(52)	
Tempe	erature fa	actor fro	m Table	2b								0		(53)	
0.			•	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)	
		(54) in (5										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 fro	m Append	ix H		
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)	
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)	
	•				,	,	. ,	65 × (41)							
				I	· · · · ·	1	· · · · · ·	ng and a	· ·	· · · · · ·	, 	0	l	(59)	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(39)	

Combi	loss ca	alculated	for ea	ch	month ((61)m =	(60	D) ÷ 36	65 × (41))m							
(61)m=	0	0	0		0	0		0	0	0		0	0	0	0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	or eacl	h month	(62)	m =	0.85 × ((45)m +	- (46)m +	(57)m	+ (59)m + (61)n	า
(62)m=	130.86	114.45	118.1		102.97	98.8	8	35.26	79	90.	66	91.74	106.91	116.7	126.73	3	(62)
Solar DH	- IW input	calculated	using A	ppe	ndix G or	Appendix	(H)	(negati	ve quantity	/) (ent	er '0'	' if no sola	r contribu	ution to wat	er heatin	ıg)	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	a p	oplies	, see Ap	pend	lix G	G)					
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0		(63)
Output	from w	ater hea	iter									-	-	-	-		
(64)m=	130.86	114.45	118.1		102.97	98.8	8	35.26	79	90.	66	91.74	106.91	116.7	126.73	3	
									•		Outp	out from w	ater heat	er (annual)	112	1262.19	(64)
Heat g	ains fro	m water	heatin	ıg,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	k [(46)n	n + (57)m	n + (59)	im]	
(65)m=	32.72	28.61	29.53	3	25.74	24.7	2	21.31	19.75	22.	66	22.93	26.73	29.18	31.68	3	(65)
inclu	de (57)	m in cal	culatio	n o	f (65)m	only if c	: ylir	nder i	s in the o	dwell	ing	or hot w	ater is	from corr	munity	/ heating	
5. Int	ernal g	ains (see	e Table	e 5	and 5a):											
Metab	olic dai	ns (Table	e 5). W	att	s												
	Jan	Feb	Ma		Apr	May		Jun	Jul	A	Jg	Sep	Oct	Nov	Dec	2	
(66)m=	116.75	116.75	116.7	5	116.75	116.75	1	16.75	116.75	116	.75	116.75	116.75	116.75	116.75	5	(66)
Lightin	g gains	(calcula	ted in	Ap	pendix l	L, equat	ion	1 L9 oi	r L9a), a	lso s	ee ⁻	Table 5	•	-	•		
(67)m=	19.37	17.2	13.99	,	10.59	7.92	(6.68	7.22	9.3	9	12.6	16	18.67	19.91		(67)
Applia	nces ga	ains (calc	ulated	in	Append	dix L, eq	uat	tion L	13 or L1	3a), a	also	see Ta	ble 5	I			
(68)m=	206.03	208.17	202.7	- T	191.32	176.84	r –	63.23	154.14	15		157.39	168.86	183.34	196.94	4	(68)
Cookir	ig gains	s (calcula	ated in	Ap	pendix	L, equat	tior	ר L15	or L15a	, als	 0 SE	e Table	5				
(69)m=	34.68	34.68	34.68	-i	34.68	34.68	<u> </u>	34.68	34.68	34.0		34.68	34.68	34.68	34.68	3	(69)
Pumps	and fa	ins gains	(Table		a)		I		1								
(70)m=	0	0	0		0	0		0	0	0		0	0	0	0		(70)
Losses	se.a. e	vaporatio	n (nec	nati	ve valu	es) (Tab	le	5)						<u> </u>			
(71)m=	-93.4	-93.4	-93.4	- -	-93.4	-93.4	—	·93.4	-93.4	-93	.4	-93.4	-93.4	-93.4	-93.4		(71)
	heating	i gains (1	I Table 5				I							_			
(72)m=	43.97	42.58	39.69	ŕ	35.75	33.2		29.6	26.55	30.4	46	31.85	35.92	40.52	42.58	3	(72)
		l gains =	I				I	(66)	l m + (67)m	l 1 + (68	3)m +	L + (69)m + I		 71)m + (72	!)m		
(73)m=	327.4	325.98	314.4	9	295.69	275.98	2	57.54	245.93	249	·	259.87	278.81		317.46	6	(73)
. ,	lar gain	s:	ļ										<u> </u>		<u> </u>		
			using so	olar	flux from	Table 6a	and	lassoci	iated equa	tions	to co	onvert to th	ne applica	able orienta	tion.		
Orienta	ation:	Access F	actor		Area			Flu	х			g_		FF		Gains	
		Table 6d			m²			Tal	ble 6a		Т	able 6b	-	Table 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77		x	11.	.2	x	3	86.79			0.63	x	0.7	=	= 126	(79)
Southw	est <mark>0.9x</mark>	0.77		x	11.	.2	x	6	62.67	Ì		0.63	× [0.7	=	= 214.62	(79)
Southw	est <mark>0.9x</mark>	0.77		x	11.	.2	x	8	35.75			0.63	× [0.7	= =	= 293.65	(79)
Southw	est <mark>0.9</mark> x	0.77		x	11.	.2	x	1	06.25			0.63	× [0.7	=	= 363.85	(79)
Southw	est <mark>0.9x</mark>	0.77		x	11.	.2	x	1	19.01	Ì		0.63	× [0.7	-	407.54	(79)

Southwest _{0.9x}	0.77	×	11.	2	x	11	18.15		0.63	×	0.7	=	404.59	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	11	13.91		0.63	x	0.7	=	390.07	(79)
Southwest0.9x	0.77	x	11.	2	x	1(04.39		0.63	x	0.7	=	357.47	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	9	2.85		0.63	x	0.7	=	317.96	(79)
Southwest0.9x	0.77	x	11.	2	x	6	9.27		0.63	x	0.7	=	237.2	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	4	4.07		0.63	x	0.7	=	150.91	(79)
Southwest0.9x	0.77	x	11.	2	x	3	1.49		0.63	x	0.7	=	107.83	(79)
					-									
Solar <u>g</u> ains in	watts, calc	ulated	for eacl	n month				(83)m = S	um(74)m .	(82)m	-			
(83)m= 126	214.62 2	293.65	363.85	407.54	40	04.59	390.07	357.47	317.96	237.2	150.91	107.83		(83)
Total gains –	internal and	d solar	(84)m =	= (73)m ·	+ (8	33)m	, watts							
(84)m= 453.4	540.6 6	608.14	659.53	683.52	66	62.13	636	607.35	577.83	516.01	451.47	425.29		(84)
7. Mean inte	rnal temper	rature ((heating	season)									
Temperature	e during hea	ating pe	eriods ir	n the livii	ng a	area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisation fa	ctor for gair	ns for li	iving are	a, h1,m	(se	ee Ta	ble 9a)							
Jan	Feb	Mar	Apr	May	<u>`</u>	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.96	0.94	0.91	0.85	0.75	().62	0.48	0.52	0.7	0.87	0.95	0.97		(86)
Mean interna		uro in li	iving or			w cto	nc 2 to 7	l 7 in Tabl			1			
(87)m= 18.84	T T	19.56	20.06	20.49		20.8	20.92	20.91	20.69	20.11	19.37	18.77		(87)
	I I									20.11	10.07	10.11		
Temperature	<u> </u>	T			r								l	(00)
(88)m= 20.04	20.04 2	20.04	20.05	20.05	2	0.05	20.05	20.05	20.05	20.05	20.04	20.04		(88)
Utilisation fa	ctor for gair	ns for r	est of d	welling,	h2,	m (se	e Table	9a)					L	
(89)m= 0.96	0.93	0.89	0.82	0.71	().55	0.39	0.43	0.64	0.85	0.94	0.96		(89)
Mean interna	al temperati	ure in t	he rest	of dwelli	ng	T2 (fo	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m= 18.06	18.35 [·]	18.76	19.25	19.65	1	9.92	20.02	20.01	19.84	19.31	18.59	17.99		(90)
									f	LA = Livir	ng area ÷ (4	4) =	0.34	(91)
Mean interna	al temperati	ure (foi	r the wh	ole dwe	lline	a) = fl	_A x T1	+ (1 – fL	A) × T2					
(92)m= 18.32	<u> </u>	19.03	19.52	19.94		0.22	20.33	20.31	20.13	19.59	18.86	18.26		(92)
Apply adjust	ment to the	mean	internal	temper	atu	re fro	m Table	4e, whe	ere appro	priate	1			
(93)m= 18.32		19.03	19.52	19.94	-	0.22	20.33	20.31	20.13	19.59	18.86	18.26		(93)
8. Space he	ating require	ement												
Set Ti to the	mean inter	nal ten	nperatur	e obtair	ed	at ste	ep 11 of	Table 9	b, so tha	t Ti,m=((76)m an	d re-calo	culate	
the utilisation	1 1	<u> </u>	using Ta	ble 9a									1	
Jan	Feb	Mar	Apr	Мау		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	<u> </u>	· · · ·											l	(0.4)
(94)m= 0.95		0.88	0.81	0.71	().56	0.42	0.46	0.65	0.83	0.92	0.95		(94)
Useful gains	T T	<u> </u>	, ,	,		74.05	007.74	070 70	075 00	400.04	440.04	405 45	l	(95)
(95)m= 428.97		533.09	533.52	483.54		74.05	267.74	276.78	375.33	429.31	416.21	405.45		(93)
Monthly ave (96)m= 4.3	4.9	6.5	8.9	11.7		9 8 4.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat											'.'	7.2	l	(00)
(97)m= 1092.8		74.17	820.1	635.14		, vv = 30.62	285.54	299.54	462.94] 692.79	908.96	1089.38		(97)
Space heating													l	. /
(98)m= 493.89	т і т	328.16	206.34	112.79		0	0.02	0		196.03	354.78	508.84		
, ,		-					-	-	-				l	

								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2584.82	(98)	
Space	e heatin	g require	ement in	kWh/m²	²/year								35.02	(99)	
8c. Sp	bace co	oling req	quiremer	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	720.49	567.19	581.89	0	0	0	0		(100)	
Utilisa	ation fac	tor for lo	oss hm												
(101)m=	0	0	0	0	0	0.8	0.86	0.84	0	0	0	0		(101)	
Usefu	l loss, h	mLm (V	Vatts) =	(100)m x	(101)m										
(102)m=															
(102)m= 0 0 0 574.43 485.4 487.87 0 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) Gains Gains															
(103)m=															
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] x (41)m															
· · ·	04)m to	zero if ((104)m <	: 3 × (98)m										
(104)m=	0	0	0	0	0	206.25	255.37	229.75	0	0	0	0		_	
										= Sum(,	=	691.36	(104)	
	I fractior								f C =	cooled a	area ÷ (4	+) =	1	(105)	
		actor (Ta	r	ŕ	-				-	-	-				
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		-	
0					(404)		(400)		Total	l = Sum(104)	=	0	(106)	
•		· ·	r	month =	r`´´	· · · /	<u>`</u>								
(107)m=	0	0	0	0	0	51.56	63.84	57.44	0	0	0	0		-	
									Total	= Sum(107)	=	172.84	(107)	
Space	cooling	requirer	ment in k	«Wh/m²/y	/ear				(107)) ÷ (4) =			2.34	(108)	
8f. Fab	ric Enei	gy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)					
Fabric	Energy	/ Efficier	псу						(99) ·	+ (108) =	=		37.36	(109)	

SAP Input

Property Details: Pl	ot 8							
Address: Located in: Region: UPRN: Date of assessm Date of certificat Assessment type Transaction type Tenure type: Related party dis Thermal Mass Pa Water use <= 12 PCDF Version:	te: e: sclosure: arameter:	08 July 28 Oct New d New d Unkno No rela Indicat	s valley / 2020 ober 2020 welling design stag welling	ge				
Property description	ו:							
Dwelling type:		Flat						
Detachment: Year Completed:		2020						
Floor Location:		Floor	area:		.			
Floor 0		73.816	0 m ²		Storey height 2.5 m			
Living area:		25.101	m ² (fraction 0.3	4)	210 111			
Front of dwelling fa	aces:	North	East					
Opening types:	<u></u>	-				•	-	
Name: NE	Source: Manufacturer		ype: olid	Glazing:		Argon:	Fram	e:
SW	Manufacturer		/indows	double-glaz	zed	Yes		
Name:	Gap:		Frame Facto	or: g-value:	U-value:	Area:	No. o	f Openings:
NE SW	mm 16mm c	or more	0 0.7	0 0.63	1.4 1.4	2 11.205	1 1	
							11.1.1.1.1	- 4
Name: NE	Type-Nam		ocation: orridor Wall	Orient: North East		Width: 0	Heigl 0	11:
SW		E	xternal Wall	South Wes	t	0	0	
Overshading:		Averag	je or unknown					
Opaque Elements:								
Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall:	Карра:
External Elements External Wall	36.613	11.2	25.41	0.15	0	False		N/A
Corridor Wall	36.15	2	34.15	0.15	0.4	False		N/A
Stairwell Wall Exposed Floor	14.231 31.103	0	14.23	0.15 0.12	0.82	False		N/A N/A
Internal Elements	51.105			0.12				N/A
Party Elements								
Thermal bridges:								
Thermal bridges:			efined (individual		lue = 0.1071			
		Leng 5.93	h Psi-valu 0.291		er lintels (including o	other steel linte	ls)	
		17.7	0.048	E4 Jam	b			

SAP Input

	39.118	0.063	E7	Party floor between dwellings (in blocks of flats)
	10.9	0.078	E16	Corner (normal)
[Approved]	2.725	-0.09	E17	Corner (inverted internal area greater than external are
	2.725	0.096	E25	Staggered party wall between dwellings
[Approved]	2.725	0.06	E18	Party wall between dwellings
	10.488	0.287	E20	Exposed floor (normal)
	13.449	0.125	E21	Exposed floor (inverted)
	9.451	0.109	E24	Eaves (insulation at ceiling level - inverted)
	5.393	0	P3	Intermediate floor between dwellings (in blocks of flats)
	5.393	0.16	P7	Exposed floor (normal)

Ventilation:	
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of fans: Number of sides sheltered: Pressure test:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 2 Ductwork: Insulation, rigid Approved Installation Scheme: True 0 0 0 3 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: 0.91 Tilt of collector: 30° Overshading: None or very little

SAP Input

Collector Orientation: South West No

Assess Zero Carbon Home:

User Details: Assessor Name: Zahid Ashraf Stroma Number: STRO001082														
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 207			Softwa	re Ver				001082 n: 1.0.5.9					
		Pro	operty A	ddress:	Plot 8									
Address :														
1. Overall dwelling dimen	isions:		_											
Ground floor			Area		(1a) x		ight(m) 2.5	(2a) =	Volume(m ³) 184.54	(3a)				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	73	3.82	(4)									
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	184.54	(5)				
2. Ventilation rate:														
		econdary heating		other		total			m ³ per hou	•				
Number of chimneys		0	+	0] = [0	x 4	40 =	0	(6a)				
Number of open flues	0 +	0	+ [0] = [0	× 2	20 =	0	(6b)				
Number of intermittent fan	s					3	x ′	10 =	30	(7a)				
Number of passive vents					Γ	0	x	10 =	0	(7b)				
Number of flueless gas fire	es				Γ	0	× 4	40 =	0	(7c)				
Number of flueless gas fires 0 x 40 = 0 (7 Air changes per hour														
Infiltration due to chimney	s, flues and fans = (6)	6a)+(6b)+(7a)+(7b)+(7	c) =	Г	30	<u> </u>	÷ (5) =	0.16	(8)				
If a pressurisation test has be					ontinue fro			. (0)	0.10					
Number of storeys in the	e dwelling (ns)								0	(9)				
Additional infiltration							[(9)	-1]x0.1 =	0	(10)				
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	sent, use the value 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)				
Percentage of windows	and doors draught s	tripped							0	(14)				
Window infiltration				•	x (14) ÷ 1	- C			0	(15)				
Infiltration rate					+ (11) + (1				0	(16)				
Air permeability value, o			•	•	•	etre of e	nvelope	area	5	(17)				
If based on air permeabilit Air permeability value applies	-					ia haina u	and		0.41	(18)				
Number of sides sheltered		is been done	or a degr	ee all per	ineability i	s being ut	360		3	(19)				
Shelter factor			(20) = 1 - [0.075 x (1	9)] =			0.78	(20)				
Infiltration rate incorporation	ng shelter factor		(21) = (18)	x (20) =				0.32	(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 infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.41	0.4	0.39	0.35	0.34	0.3	0.3	0.3	0.32	0.34	0.36	0.38			
	late effec		-	rate for t	he appli	cable ca	se						-		
	echanica			andix NL (2	(26) - (22c)	$ \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{$	acuation (N	N5)), othe	nuice (22h) - (220)			0		(23a)
			0 11		, ,	, ,	• •	,, .	,) = (23a)			0		(23b)
			-	-	-			n Table 4h					0		(23c)
			i		i	· · · · · ·	<u> </u>	<u>1 </u>	ŕ	, <u>,</u>	r <u>, -</u>	1 – (23c)) ÷ 100]]		(24a)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0	J		(24a)
			i		1	· · · · · ·	<u> </u>	MV) (24b 1	,	, ,	· · · · · · · · · · · · · · · · · · ·	1	1		(2.41.)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
,					•	•		on from c c) = (22t		5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,								on from l 0.5 + [(2		0.5]			-		
(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(24d)
Effe	ctive air	change	rate - er	iter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)			•			
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(25)
3 Ho	at losse	e and he	at loss r	aramot	or:	•	•	•				•	•		
		Gros		Openin		Net Ar	·ea	U-valı		AXU		k-value	<u> </u>	АX	(k
		area		m		A,r		W/m2		(W/I	<)	kJ/m²·l		kJ/l	
Doors						2	x	1	=	2					(26)
Windo	WS					11.20	5 x1	/[1/(1.4)+	0.04] =	14.86					(27)
Floor						31.10	3 X	0.13] = [4.0433	 }				(28)
Walls	Type1	36.6	51	11.2	2	25.41	x	0.18		4.57	i F		- -		(29)
Walls	Type2	36.1	5	2		34.15	5 X	0.18		6.15					(29)
Walls ⁻	ТуреЗ	14.2	23	0		14.23	3 X	0.18		2.56	i F				(29)
Total a	area of e	lements	, m²			118.1	1								(31)
	ndows and de the area						lated using	g formula 1	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	n 3.2		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				34.	18	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	3365	5.77	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		25	0	(35)
	ign assess used instea				construct	ion are noi	t known pr	recisely the	e indicative	values of	TMP in T	able 1f			_
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	K						15.	77	(36)
	s of therma		are not kn	own (36) =	= 0.05 x (3	1)									
Total f	abric he	at loss							(33) +	(36) =			49.9	95	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	35.51	35.31	35.12	34.22	34.05	33.26	33.26	33.11	33.56	34.05	34.39	34.75]		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	85.46	85.27	85.07	84.17	84	83.21	83.21	83.07	83.52	84	84.34	84.7			_
									/	Average =	Sum(39)	12 /12=	84.	17	(39)

Heat lo	oss para	ımeter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.16	1.16	1.15	1.14	1.14	1.13	1.13	1.13	1.13	1.14	1.14	1.15		
Numbe	er of day	/s in mo	nth (Tab	le 1a)		1		1		Average =	Sum(40)1	.12 /12=	1.14	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	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.		34		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.66		(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=	98.62	95.04	91.45	87.87	84.28	80.69	80.69	84.28	87.87	91.45	95.04	98.62		
_											m(44) ₁₁₂ =		1075.9	(44)
Energy o			used - cai	· · · · ·	· ·	i		DTm / 3600		·		c, 1d)		
(45)m=	146.26	127.92	132	115.08	110.42	95.29	88.3	101.32	102.53	119.49	130.43	141.64		
lf instant	taneous w	/ater heati	ng at poin	t of use (no	o hot water	^r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1410.68	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		1					I			··			
-		. ,		• •			-	within sa	ame ves	sel		150		(47)
		•		ank in dw	•			· ,	ara) ant	or (0) in (47)			
	storage		not wate	er (unis ir	iciudes i	nstantar	ieous co	ombi boil	ers) ente	er u in (47)			
	•		eclared I	loss facto	or is kno	wn (kWł	n/day):				(0		(48)
Tempe	erature f	actor fro	m Table	e 2b							()		(49)
Energy	/ lost fro	m water	- storage	e, kWh/ye	ear			(48) x (49)) =		())		(50)
•				cylinder										
		age loss neating s		rom Tabl	le 2 (kW	h/litre/da	ay)				(0		(51)
	-	from Ta		011 4.5							(C		(52)
		actor fro		e 2b								у С		(53)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =))		(54)
Enter	(50) or	(54) in (5	55))		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	50), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3						()		(58)
	•					59)m = ((58) ÷ 30	65 × (41)	m					
•	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat		ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for eac	h mor	th (61)m :	= (6	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 I	neating	g calculate	ed f	or eacl	h month	(62)m =	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	124.32	108.73	112.2	97.8	32 93.86		80.99	75.05	86.12	87.15	101.57	110.87	120.4		(62)
Solar DH	- W input	calculated	using Ap	pendix	G or Append	dix H	I (negati	ve quantity	/) (enter '()' if no sola	r contribu	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHR	S and/	or WWHR	RS a	applies	, 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=	124.32	108.73	112.2	97.8	32 93.86		80.99	75.05	86.12	87.15	101.57	110.87	120.4		
									Out	put from w	ater heate	er (annual)	12	1199.08	(64)
Heat g	ains fro	m water	heating	g, kWł	/month 0.	25	´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	31.08	27.18	28.05	24.4	15 23.46		20.25	18.76	21.53	21.79	25.39	27.72	30.1		(65)
inclu	de (57)	m in calo	ulation	of (65	5)m only if	cy	linder is	s in the a	dwelling	or hot w	vater is f	rom com	munity h	neating	
5. Int	ernal g	ains (see	Table	5 and	5a):										
		ns (Table			,										
motab	Jan	Feb	Mar		or May	/	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	116.75	116.75	116.75	116.	75 116.75	5	116.75	116.75	116.75	116.75	116.75	116.75	116.75		(66)
Lightin	g gains	(calcula	ted in A	ppen	dix L, equa	atio	n L9 oi	r L9a), a	lso see	Table 5				1	
(67)m=	19.37	17.2	13.99	10.			6.68	7.22	9.39	12.6	16	18.67	19.91]	(67)
Appliar	nces aa	uins (calc	ulated	in App	endix L, e	au	ation L	13 or L1	3a), also	see Ta	ble 5	1	I	1	
(68)m=	206.03	208.17	202.79			<u> </u>	163.23	154.14	152	157.39	168.86	183.34	196.94]	(68)
	u dains	s (calcula	ited in <i>l</i>	L Appen	dix L, equ	atio	on I 15	or I 15a'	also s	ı ee Table	1 9.5	1		1	
(69)m=	34.68	34.68	34.68	34.6		_	34.68	34.68	34.68	34.68	34.68	34.68	34.68]	(69)
	and fa	ns gains	(Table	- 5a)	I	_						1		1	
(70)m=					0		0	0	0	0	0	0	0	1	(70)
					alues) (Ta							-		1	. ,
(71)m=		-93.4	-93.4	-93		-	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4	1	(71)
		gains (T		_			00.1					00.1	00.1	J	()
(72)m=	41.77	40.45	37.7	33.9	96 31.54		28.12	25.22	28.94	30.26	34.13	38.5	40.46	1	(72)
		gains =		00.	0 01.04							71)m + (72)]	()
(73)m=	325.2	323.85	312.5	293	.9 274.32	2	256.06	244.61	248.35	258.28	277.01	298.53	315.33	1	(73)
	ar gain		012.0	200	.5 214.52	-	230.00	244.01	240.00	230.20	211.01	200.00	010.00		(10)
			using sol	ar flux f	rom Table 6	a ar	nd associ	iated equa	tions to c	onvert to th	ne applica	ble orientat	ion.		
•		Access F	•		rea		Flu			g_		FF		Gains	
		Table 6d		I	m²			ole 6a	٦	able 6b	Т	able 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77		< 🗌	11.2	x	3	6.79		0.63	x	0.7	=	126	(79)
Southw	est <mark>0.9x</mark>	0.77	;	،	11.2	×	6	2.67		0.63		0.7	=	214.62	(79)
Southw	est <mark>0.9x</mark>	0.77	;	، 	11.2	x		5.75		0.63		0.7	=	293.65	(79)
Southw	est <mark>0.9x</mark>	0.77	 ;	, <u> </u>	11.2	 x		06.25		0.63		0.7		363.85](79)
Southw	est <mark>0.9x</mark>	0.77		، [11.2	x		19.01		0.63		0.7	=	407.54	(79)

Southwesto by 0.77 x 14.2 x 149.45 0.62 x 0.7 - 104.50 (70)														
Southwest _{0.9x}	0.77	x	11.	.2	x	1	18.15		0.63	×	0.7	=	404.59	(79)
Southwest _{0.9x}	0.77	x	11.	.2	x	1	13.91		0.63	x	0.7	=	390.07	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	10	04.39		0.63	x	0.7	=	357.47	(79)
Southwest _{0.9x}	0.77	x	11.	.2	x	9	2.85		0.63	x	0.7	=	317.96	(79)
Southwest _{0.9x}	0.77	x	11.	.2	x	6	9.27		0.63	×	0.7	=	237.2	(79)
Southwest _{0.9x}	0.77	x	11.	.2	x	4	4.07		0.63	x	0.7	=	150.91	(79)
Southwest0.9x	0.77	x	11.	.2	x	3	31.49		0.63	x	0.7	=	107.83	(79)
Solar <u>g</u> ains in	watts, calc	ulated	for eac	n month				(83)m =	Sum(74)m .	(82)m		-	_	
(83)m= 126		293.65	363.85	407.54		04.59	390.07	357.47	317.96	237.2	150.91	107.83		(83)
Total gains –	internal and	d solar	(84)m =	= (73)m ·	+ (8	33)m	, watts						•	
(84)m= 451.2	538.47 6	606.15	657.75	681.86	66	60.65	634.68	605.83	576.24	514.21	449.45	423.16		(84)
7. Mean inte	rnal tempei	rature (heating	season)									
Temperature	e during hea	ating pe	eriods ir	n the livii	ng	area f	from Tab	ole 9, T	h1 (°C)				21	(85)
Utilisation fa	ctor for gair	ns for li	ving are	ea, h1,m	(s	ее Та	ble 9a)							
Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.96	0.89	().74	0.56	0.61	0.84	0.97	1	1		(86)
Mean interna	al temperati	ure in li	iving are	a T1 (fr	مالد	w ste	ns 3 to 7	' in Tał						
(87)m= 19.76	<u> </u>	20.19	20.51	20.77		0.94	20.99	20.98	20.88	20.52	20.08	19.73]	(87)
							(1	
Temperature	<u> </u>	ating pe 19.96	erioas ir 19.97	19.97		eiiing 9.98	19.98	19.98		19.97	19.97	19.96	1	(88)
(88)m= 19.95	19.96	19.90	19.97	19.97		9.96	19.96	19.96	19.98	19.97	19.97	19.90	J	(00)
Utilisation fa						,		,	- <u> </u>	1	1	1	1	
(89)m= 1	0.99	0.98	0.94	0.84	().64	0.44	0.48	0.76	0.96	0.99	1		(89)
Mean interna	al temperat	ure in t	he rest	of dwelli	ng	T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)		-	_	
(90)m= 18.83	19	19.26	19.57	19.82	1	9.95	19.98	19.98	19.91	19.59	19.15	18.8		(90)
									1	iLA = Liv	ing area ÷ (4	4) =	0.34	(91)
Mean interna	al temperat	ure (for	r the wh	ole dwe	lling	g) = fl	LA × T1	+ (1 –	fLA) × T2					
(92)m= 19.14		19.58	19.89	20.14	_	0.29	20.32	20.32	20.24	19.91	19.47	19.12]	(92)
Apply adjust	ment to the	mean	internal	temper	atu	re fro	m Table	4e, wł	nere appro	opriate	1		1	
(93)m= 19.14	19.32	19.58	19.89	20.14	2	0.29	20.32	20.32	20.24	19.91	19.47	19.12		(93)
8. Space hea	ating requir	ement												
Set Ti to the			•		ed	at ste	ep 11 of	Table	9b, so tha	t Ti,m=	₌(76)m an	d re-cale	culate	
the utilisation	1 1	<u> </u>											1	
Jan	Feb	Mar	Apr	Мау		Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	
Utilisation fa		ns, nm: 0.98	0.94	0.85		0.67	0.48	0.53	0.78	0.96	0.99	1	1	(94)
						0.07	0.40	0.55	0.78	0.90	0.99	I	J	(34)
Useful gains (95)m= 449.54	T T	v = (94 592.69	618.98	580.38	4/	45.15	305.42	318.99	451.47	491.38	445.79	422.02	1	(95)
Monthly ave							000.42	010.00	-01.47	401.00	, 410.110	422.02]	()
(96)m= 4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	14.1	10.6	7.1	4.2]	(96)
Heat loss rat											1		1	
(97)m= 1268.54			· ·	709.18		, 73.24	309.52	325.41		782	1043.03	1263.34]	(97)
Space heatir	ng requirem	nent for	each m	honth, k	Nh	/mont	th = 0.02	24 x [(9	7)m – (95)m] x (41)m	ļ	1	
(98)m= 609.33		386.63	220.27	95.83		0	0	0	0	216.22	T	625.94]	
L	· ·	I										1	1	

		8)15,912 =	3051.95	(98)										
Space	e heatir	ng require	ement in	kWh/m²	²/year								41.35	(99)
8c. Sp	bace co	oling rec	uiremer	nt										
Calcu	lated fo	or June, J	July and	August.	See Tal	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rat	e Lm (ca	lculated	using 2	5°C inter	nal temp	berature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	782.2	615.77	631.31	0	0	0	0		(100)
Utilisa	ation fac	ctor for lo	ss hm											
(101)m=	0	0	0	0	0	0.87	0.93	0.92	0	0	0	0		(101)
Usefu	l loss, l	nmLm (V	/atts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	682.82	574.05	578.44	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)			•		
(103)m=	0	0	0	0	0	859.41	827.31	795.15	0	0	0	0		(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m – (102)m] > set (104)m to zero if (104)m < 3 x (98)m													x (41)m	
(104)m=	04)11110		0		0	127.15	188.42	161.23	0	0	0	0		
(104)11-	Ū	Ů	Ű	Ŭ	Ŭ	127.10	100.42	101.20	-	= Sum(=	476.8	(104)
Cooled	l fractio	n								cooled a	,		470.0	(104)
		actor (Ta	able 10b)						coolou	. (.,		(100)
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	' = Sum(104)	=	0	(106)
Space	cooling	requirer	nent for	month =	: (104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	31.79	47.11	40.31	0	0	0	0		
									Total	= Sum(107)	=	119.2	(107)
Space	cooling	requirer	ment in k	(Wh/m²/y	/ear				(107)	÷ (4) =			1.61	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculat <u>ec</u>	l only <u>un</u>	der spec	cial co <u>nc</u>	litions <u>, s</u> e	ee sec <u>tic</u>	on 11)				
Fabric	Energ	y Efficier	псу						(99) -	+ (108) =	=		42.96	(109)
Targe	et Fabri	c Energ	y Efficie	ency (TF	EE)								49.4	(109)

		Use	r Details:						
Assessor Name:	Zahid Ashraf		Stroma	a Numl	ber:		STRO	001082	
Software Name:	Stroma FSAP 207	12	Softwa	re Ver	sion:		Versio	n: 1.0.5.9	
		Proper	ty Address:	Plot 8					
Address :									
1. Overall dwelling dime	nsions:	_							
Ground floor		A	rea(m²) 73.82	(1a) x	Av. He	ight(m) 2.5	(2a) =	Volume(m ³ 184.54	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	73.82	(4)					
Dwelling volume				(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	184.54	(5)
2. Ventilation rate:			-		_				
		econdary heating	other		total			m ³ per hou	r
Number of chimneys	0 +	0 +	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			' L	0	x ′	0 =	0	(7a)
Number of passive vents					0	x ^	0 =	0	(7b)
Number of flueless gas fi	res				0	x 4	40 =	0	(7c)
				L			ا Air ch	anges per ho	
) . (7 .)	_				anges per no	_
Infiltration due to chimney If a pressurisation test has b				ontinue fra	$\frac{0}{0}$		÷ (5) =	0	(8)
Number of storeys in th), ошног шоо о		, 10/ 10/	10)	[0	(9)
Additional infiltration						[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.	.25 for steel or timber	frame or 0.35	for masonr	y constru	uction		İ	0	(11)
if both types of wall are pr deducting areas of openir	resent, use the value corres	sponding to the gr	eater wall area	a (after					
If suspended wooden f		led) or 0.1 (se	aled), else	enter 0			I	0	(12)
If no draught lobby, ent		, (,.					0	(13)
Percentage of windows	s and doors draught s	tripped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 10	= [00		ĺ	0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,		•	•	•	etre of e	nvelope	area	3	(17)
If based on air permeabil	•							0.15	(18)
Air permeability value applie. Number of sides sheltere	•	s been done or a	degree air per	meability i	s being us	sed	1		
Shelter factor	u		(20) = 1 - [0.075 x (1	9)] =			3 0.78	(19) (20)
Infiltration rate incorporat	ing shelter factor		(21) = (18)	x (20) =			l	0.12	(21)
Infiltration rate modified for	0	d					I	0.12	
	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22a)m$	2)m ÷ 4								
	1.23 1.1 1.08	0.95 0.95	5 0.92	1	1.08	1.12	1.18		
	I	• •		I		Į			

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	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		
	ate effec echanica		change i	rate for t	he appli	cable ca	se	-	-		-			
				ondix N (2	(22) = (22)		oquation (I	N5)) , othei	nuico (22h)) = (22a)			0.5	(23a)
		• •	0 11		, ,	, ,	• •	,, -) = (23a)			0.5	(23b)
			-	-	-			n Table 4h)			006)	4 (00 -)	79.05	(23c)
			I	1	· · · · · ·	· · · · · ·	<u> </u>	1				1 - (23c)	÷100]	(24a)
(24a)m=		0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(24d)
,				1			, <u>, ,</u>	MV) (24b	ŕ	<i>,</i> ,	,		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=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24		(25)
3 He	at losse	s and he	eat loss p	naramet	۵r.									
	/IENT	Gros		Openin		Net Ar	ea	U-valı	IE	AXU		k-value	ż	AXk
		area		n		A ,r		W/m2		(W/I	<)	kJ/m²·l		kJ/K
Doors						2	x	1.4	=	2.8				(26)
Windo	WS					11.20	5 <mark>x1</mark>	/[1/(1.4)+	0.04] =	14.86				(27)
Floor						31.10	3 X	0.12	=	3.73236	3			(28)
Walls ⁻	Type1	36.6	61	11.2	2	25.41	ı x	0.15		3.81	īĒ		\exists	(29)
Walls ⁻	Type2	36.1	5	2		34.15	5 X	0.14	 	4.83	i F			(29)
Walls ⁻	ТуреЗ	14.2	23	0		14.23	3 X	0.13		1.9			\exists	(29)
Total a	area of e	lements	, m²			118.1			L		L			(31)
				effective wi	indow U-va	L		g formula 1,	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	1 3.2	
** incluc	le the area	ns on both	sides of in	nternal wal	lls and par	titions								
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				31.93	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	3365.77	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
	-		ere the de tailed calci		construct	ion are no	t known pr	recisely the	e indicative	values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	K						12.65	(36)
			are not kn	own (36) =	= 0.05 x (3	1)			(2.2.)	(2.2)				
	abric he								(33) +				44.59	(37)
ventila			alculated							= 0.33 × (1	l	
(00) -	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	15.41	15.23	15.05	14.17	13.99	13.1	13.1	12.93	13.46	13.99	14.34	14.7		(38)
	ransfer o									= (37) + (3	· · · · ·	1	I	
(39)m=	59.99	59.81	59.64	58.75	58.58	57.69	57.69	57.51	58.04	58.58	58.93	59.28		
									/	Average =	Sum(39)1	12 /12=	58.71	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.81	0.81	0.81	0.8	0.79	0.78	0.78	0.78	0.79	0.79	0.8	0.8		
Numbe	er of day	us in mo	nth (Tab	le 1a)	I			!		Average =	Sum(40)1	.12 /12=	0.8	(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)
						ļ	I	I		<u> </u>				
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		34		(42)
Annua <i>Reduce</i>	l averag	e hot wa al average	hot water		5% if the a	welling is	designed	(25 x N) to achieve		se target o		.38		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-		-			
(44)m=	103.82	100.04	96.26	92.49	88.71	84.94	84.94	88.71	92.49	96.26	100.04	103.82		_
Energy	content of	hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 10		1132.53	(44)
(45)m=	153.95	134.65	138.95	121.14	116.23	100.3	92.94	106.65	107.93	125.78	137.3	149.1		
lf instan	taneous w	ator hoati	na at noint	t of use (no	hot water	r storage)	enter () in	boxes (46		Total = Su	m(45) ₁₁₂ =	:	1484.92	(45)
			· ·					· ·	i	18.87	20.50	22.26	l	(46)
(46)m= Water	23.09 storage	20.2 loss:	20.84	18.17	17.44	15.05	13.94	16	16.19	10.07	20.59	22.36		(40)
Storag	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel	()		(47)
	•	•		ank in dw	•			· · ·						
	vise if no storage		hot wate	er (this in	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):)		(48)
Tempe	erature f	actor fro	m Table	2b)		(49)
Energy	/ lost fro	m water	[.] storage	e, kWh/ye	ear			(48) x (49)) =		1	10		(50)
,				cylinder l										(54)
		-	ee secti	rom Tabl on 4.3	e z (kvv	n/nue/ua	iy)				0.	02		(51)
	-	from Ta									1.	03		(52)
Tempe	erature 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	storage	loss cal	culated t	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	5-11	(56)
-				- · ·		1		r	· · ·		H11) is fro			()
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
	-	•		om Table			(=0) -				(D		(58)
	-				•		. ,	65 × (41) ng and a		r thermo	stat)			
(1100 (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)
(L	L	L_00	L_00	L	L_00				

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating c	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	209.23	184.58	194.22	174.63	171.51	153.79	148.22	161.93	161.42	181.06	190.79	204.37		(62)
Solar D	HW input	calculated	using App	pendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	applies	, 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=	209.23	184.58	194.22	174.63	171.51	153.79	148.22	161.93	161.42	181.06	190.79	204.37		_
								Outp	out from w	ater heate	r (annual)₁	12	2135.76	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	95.41	84.71	90.42	83.07	82.87	76.15	75.13	79.68	78.68	86.04	88.45	93.8		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	rom com	munity h	eating	
5. In	ternal g	ains (see	Table :	5 and 5a):									
Metab	olic gaiı	ns (Table	5), Wa	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	140.11	140.11	140.11	140.11	140.11	140.11	140.11	140.11	140.11	140.11	140.11	140.11		(66)
Lightir	g gains	(calcula	ted in A	ppendix	L, equati	on L9 o	r L9a), a	lso see [·]	Table 5					
(67)m=	48.42	43.01	34.98	26.48	19.79	16.71	18.06	23.47	31.5	40	46.68	49.77		(67)
Applia	nces ga	ins (calc	ulated i	n Appen	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	•			
(68)m=	307.51	310.71	302.66	285.55	263.94	243.63	230.06	226.87	234.91	252.03	273.64	293.95		(68)
Cookir	ng gains	s (calcula	ted in A	ppendix	L, equat	ion L15	or L15a)), also se	e Table	5				
(69)m=	51.35	51.35	51.35	51.35	51.35	51.35	51.35	51.35	51.35	51.35	51.35	51.35		(69)
Pumps	s and fa	ns gains	(Table	5a)						•				
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. e	vaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4	-93.4		(71)
Water	heating	, gains (T	able 5)											
(72)m=	128.24	126.06	121.53	115.38	111.38	105.76	100.97	107.1	109.28	115.65	122.84	126.07		(72)
Total	interna	l gains =				(66)	m + (67)m	ı + (68)m -	+ (69)m +	(70)m + (7	'1)m + (72)	m		
(73)m=	582.23	577.82	557.22	525.45	493.16	464.14	447.14	455.49	473.74	505.72	541.21	567.83		(73)
6. So	lar gain	s:		1					1	1				
Solar (gains are	calculated	using sola	ar flux from	Table 6a a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	ion.		
Orient		Access F		Area		Flu		_	g_	_	FF		Gains	
		Table 6d		m²		la	ole 6a	T	able 6b	T	able 6c		(W)	_
Southw	/est <mark>0.9x</mark>	0.77	х	11	.2	х 3	6.79		0.63	x	0.7	=	126	(79)
	/est <mark>0.9x</mark>	0.77	x	11	.2	x 6	2.67		0.63	x	0.7	=	214.62	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	11	.2	х <u></u> 8	5.75		0.63	x	0.7	=	293.65	(79)
Southw	/est <mark>0.9x</mark>	0.77	X	11	.2	x 1	06.25		0.63	x	0.7	=	363.85	(79)
Southw	/est <mark>0.9x</mark>	0.77	x	11	.2	x 1	19.01		0.63	x	0.7	=	407.54	(79)

Southwesto.9x													
00000.00	0.77	x	11.	2	×	118.15		0.63	x	0.7	=	404.59	(79)
Southwest0.9x	0.77	x	11.	2	x	113.91		0.63	x	0.7	=	390.07	(79)
Southwest _{0.9x}	0.77	x	11.	2	×	104.39		0.63	x	0.7	=	357.47	(79)
Southwest0.9x	0.77	x	11.	2	×	92.85		0.63	x	0.7	=	317.96	(79)
Southwest0.9x	0.77	x	11.	2	×	69.27		0.63	_ x [0.7	=	237.2	(79)
Southwest0.9x	0.77	x	11.	2	×	44.07		0.63	x	0.7	=	150.91	(79)
Southwest0.9x	0.77	x	11.	2	×	31.49		0.63	x	0.7	=	107.83	(79)
Solar <u>g</u> ains ir	n watts, ca	alculated	for each	n month			(83)m = S	um(74)m .	(82)m	-			
(83)m= 126	214.62	293.65	363.85	407.54	404	4.59 390.07	357.47	317.96	237.2	150.91	107.83		(83)
Total gains –	internal a	nd solar	(84)m =	- (73)m -	+ (83	3)m, watts							
(84)m= 708.22	2 792.44	850.87	889.3	900.7	868	8.73 837.21	812.96	791.7	742.92	692.13	675.66		(84)
7. Mean inte	ernal temp	erature	(heating	season)								
Temperatur	e during h	eating p	eriods ir	n the livir	ng a	rea from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisation fa	actor for g	ains for I	iving are	a, h1,m	(se	e Table 9a)							
Jan	Feb	Mar	Apr	May	J	un Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.88	0.84	0.77	0.68	0.55	0.	41 0.3	0.32	0.48	0.69	0.83	0.89		(86)
Mean intern	al temper	ature in l	iving are	ea T1 (fo	ollow	v steps 3 to 7	7 in Tabl						
(87)m= 19.96		20.43	20.7	20.87		.97 20.99	20.99	20.94	20.73	20.32	19.91		(87)
			I	root of	<u> </u>	lling from To							
(88)m= 20.24		20.25	20.26	20.26		elling from Ta	20.27	n2 (°C) 20.27	20.26	20.25	20.25		(88)
								20.27	20.20	20.23	20.25		(00)
		г т	I			n (see Table	<u> </u>					l	(00)
(89)m= 0.87	0.82	0.75	0.65	0.52	0.3	37 0.25	0.27	0.43	0.66	0.81	0.88		(89)
		ļļ											
Mean intern	al temper	ature in t		of dwelli	ng T	Γ2 (follow ste	eps 3 to 3	7 in Tabl	e 9c)				
Mean intern (90)m= 18.87	- <u> </u>	ature in 1 19.52		of dwelli 20.12	<u> </u>	Γ2 (follow ste .24 20.26	eps 3 to 20.26	20.21	19.94	19.39	18.81		(90)
	- <u> </u>		he rest		<u> </u>		ri — — —	20.21	19.94	19.39 g area ÷ (4		0.34	
(90)m= 18.87	19.17	19.52	he rest 19.89	20.12	20		20.26	20.21 f	19.94			0.34	(90)
(90)m= 18.87	19.17 al temper	19.52	he rest 19.89	20.12	20 Iling	.24 20.26	20.26	20.21 f	19.94			0.34	(90)
(90)m= 18.87 Mean intern (92)m= 19.24	19.17 al temper 19.51	19.52 ature (fo 19.83	he rest 19.89 r the wh 20.17	20.12 ole dwe 20.38	20 Iling 20	.24 20.26) = fLA × T1	20.26 + (1 – fL 20.51	20.21 f .A) × T2 20.46	19.94 LA = Livir 20.21	g area ÷ (4	4) =	0.34	(90) (91)
(90)m= 18.87 Mean intern (92)m= 19.24	19.17 al temper 19.51 tment to t	19.52 ature (fo 19.83	he rest 19.89 r the wh 20.17	20.12 ole dwe 20.38	20 Iling 20 ature	.24 20.26) = fLA × T1 .49 20.51	20.26 + (1 – fL 20.51	20.21 f .A) × T2 20.46	19.94 LA = Livir 20.21	g area ÷ (4	4) =	0.34	(90) (91)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus	19.17 al temper 19.51 tment to ti 19.51	19.52 ature (fo 19.83 he mean 19.83	he rest 19.89 r the wh 20.17 internal	20.12 ole dwe 20.38 tempera	20 Iling 20 ature	.24 20.26) = fLA × T1 .49 20.51 e from Table	20.26 + (1 – fL 20.51 24e, whe	20.21 f .A) × T2 20.46 ere appro	19.94 LA = Livir 20.21 opriate	g area ÷ (4 19.71	4) = 19.19	0.34	(90) (91) (92)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the	19.17 al temper 19.51 tment to th 19.51 ating require mean int	19.52 ature (fo 19.83 he mean 19.83 Jirement ernal ten	he rest of 19.89 r the who 20.17 internal 20.17	20.12 ole dwel 20.38 tempera 20.38 re obtain	20 20 20 aturo 20	.24 20.26) = fLA × T1 .49 20.51 e from Table	20.26 + (1 – fL 20.51 20.51 20.51	20.21 f A) × T2 20.46 ere appro 20.46	19.94 LA = Livir 20.21 ppriate 20.21	g area ÷ (4 19.71 19.71	4) = 19.19 19.19		(90) (91) (92)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisatio	19.17 al temper 19.51 tment to ti 19.51 ating requ mean int n factor fo	19.52 ature (fo 19.83 he mean 19.83 uirement ernal ten or gains u	he rest 19.89 r the wh 20.17 internal 20.17 nperatur using Ta	20.12 ole dwe 20.38 tempera 20.38 re obtain ble 9a	20 20 20 20 ature 20	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51 at step 11 of	20.26 + (1 – fL 20.51 • 4e, whe 20.51 Table 9	20.21 f A) × T2 20.46 ere appro 20.46 o, so tha	19.94 LA = Livir 20.21 ppriate 20.21 t Ti,m=(g area ÷ (4 19.71 19.71 76)m an	⁴⁾ = 19.19 19.19 d re-calc		(90) (91) (92)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisatio Jan	19.17 al temper 19.51 tment to th 19.51 ating require mean int n factor fo Feb	19.52 ature (fo 19.83 he mean 19.83 Jirement ernal ten or gains to Mar	he rest 19.89 r the wh 20.17 internal 20.17 nperatur using Ta Apr	20.12 ole dwel 20.38 tempera 20.38 re obtain	20 20 20 20 ature 20	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51	20.26 + (1 – fL 20.51 20.51 20.51	20.21 f A) × T2 20.46 ere appro 20.46	19.94 LA = Livir 20.21 ppriate 20.21	g area ÷ (4 19.71 19.71	4) = 19.19 19.19		(90) (91) (92)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation Jan Utilisation fa	19.17 al temper 19.51 tment to ti 19.51 ating require mean int n factor for Feb actor for g	19.52 ature (fo 19.83 he mean 19.83 uirement ernal ten or gains u Mar ains, hm	he rest of 19.89 r the wh 20.17 internal 20.17 nperatur using Ta Apr	20.12 ole dwe 20.38 tempera 20.38 re obtain ble 9a May	20 Illing 20 ature 20 ature 20	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51 at step 11 of un Jul	+ (1 – fL 20.26 + (1 – fL 20.51 • 4e, whe 20.51 Table 9l Aug	20.21 f A) × T2 20.46 ere appro 20.46 o, so tha Sep	19.94 LA = Livir 20.21 ppriate 20.21 t Ti,m=(Oct	g area ÷ (4 19.71 19.71 76)m an Nov	⁴⁾ = 19.19 19.19 d re-calc Dec		(90) (91) (92) (93)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation Jan Utilisation fa (94)m= 0.85	19.17 al temper 19.51 tment to th 19.51 ating require mean int n factor for ctor for g 0.8	19.52 ature (fo 19.83 he mean 19.83 Jirement ernal ten or gains to Mar ains, hm 0.74	he rest 19.89 r the wh 20.17 internal 20.17 nperatur using Ta Apr 0.65	20.12 ole dwel 20.38 tempera 20.38 re obtain ble 9a May 0.52	20 Illing 20 ature 20 ature 20	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51 at step 11 of	20.26 + (1 – fL 20.51 • 4e, whe 20.51 Table 9	20.21 f A) × T2 20.46 ere appro 20.46 o, so tha	19.94 LA = Livir 20.21 ppriate 20.21 t Ti,m=(g area ÷ (4 19.71 19.71 76)m an	⁴⁾ = 19.19 19.19 d re-calc		(90) (91) (92)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation Jan Utilisation fa (94)m= 0.85 Useful gains	19.17 al temper 19.51 tment to ti 19.51 ating require mean int n factor for Corr for g 0.8 s, hmGm	19.52 ature (fo 19.83 he mean 19.83 Jirement ernal ten or gains to Mar ains, hm 0.74	he rest 19.89 r the wh 20.17 internal 20.17 nperatur using Ta Apr 0.65	20.12 ole dwel 20.38 tempera 20.38 re obtain ble 9a May 0.52	lling 20 20 20 20 ature 20 20 20 20 20 20 20 20 20 20 20 20 20	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51 at step 11 of un Jul	+ (1 – fL 20.26 + (1 – fL 20.51 • 4e, whe 20.51 Table 9l Aug	20.21 f A) × T2 20.46 ere appro 20.46 o, so tha Sep	19.94 LA = Livir 20.21 ppriate 20.21 t Ti,m=(Oct	g area ÷ (4 19.71 19.71 76)m an Nov	⁴⁾ = 19.19 19.19 d re-calc Dec		(90) (91) (92) (93)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation Jan Utilisation fa (94)m= 0.85 Useful gains	19.17 al temper 19.51 tment to th 19.51 ating require mean int n factor for ctor for g 0.8 s, hmGm 636.03	19.52 ature (fo 19.83 he mean 19.83 uirement or gains to Mar ains, hm 0.74 , W = (94 629.99	he rest 19.89 r the wh 20.17 internal 20.17 internal 20.17	20.12 ole dwel 20.38 tempera 20.38 re obtain ble 9a May 0.52 4)m 472.37	20 20 20 20 20 20 20 20 20 20 20 20 20 2	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51 at step 11 of un Jul 38 0.27 0.67 223.62	20.26 + (1 – fL 20.51 • 4e, whe 20.51 Table 9 Aug 0.29	20.21 f A) × T2 20.46 ere appro 20.46 o, so tha Sep 0.45	19.94 LA = Livir 20.21 ppriate 20.21 t Ti,m=(Oct 0.65	g area ÷ (4 19.71 19.71 76)m an Nov 0.79	⁴⁾ = 19.19 19.19 d re-calc Dec 0.86		(90) (91) (92) (93) (93)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation Jan Utilisation fa (94)m= 0.85 Useful gains (95)m= 600.04	19.17 al temper 19.51 tment to th 19.51 ating require mean int n factor for ctor for g 0.8 s, hmGm 636.03	19.52 ature (fo 19.83 he mean 19.83 uirement or gains to Mar ains, hm 0.74 , W = (94 629.99	he rest 19.89 r the wh 20.17 internal 20.17 internal 20.17	20.12 ole dwel 20.38 tempera 20.38 re obtain ble 9a May 0.52 4)m 472.37	lling 20 20 20 20 ature 20 20 20 20 20 20 20 20 20 20 20 20 20	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51 at step 11 of un Jul 38 0.27 0.67 223.62	20.26 + (1 – fL 20.51 • 4e, whe 20.51 Table 9 Aug 0.29	20.21 f A) × T2 20.46 ere appro 20.46 o, so tha Sep 0.45	19.94 LA = Livir 20.21 ppriate 20.21 t Ti,m=(Oct 0.65	g area ÷ (4 19.71 19.71 76)m an Nov 0.79	⁴⁾ = 19.19 19.19 d re-calc Dec 0.86		(90) (91) (92) (93) (93)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation Jan Utilisation fa (94)m= 0.85 Useful gains (95)m= 600.04 Monthly ave (96)m= 4.3	19.17 al temper 19.51 tment to th 19.51 ating require mean int n factor for 0.8 s, hmGm 4 636.03 prage exter 4.9	19.52 ature (fo 19.83 he mean 19.83 uirement ernal ten or gains (Mar ains, hm 0.74 , W = (94 629.99 ernal tem 6.5	he rest 19.89 r the wh 20.17 internal 20.17 internal 20.17 internal 20.17 0.65 0.74 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	20.12 ole dwe 20.38 tempera 20.38 re obtain ble 9a May 0.52 4)m 472.37 e from Ta 11.7	20 20 20 20 20 20 20 20 20 20 20 20 20 2	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51 at step 11 of un Jul 38 0.27 0.67 223.62 8	20.26 + (1 – fL 20.51 4e, whe 20.51 Table 9 Aug 0.29 233.77 16.4	20.21 f A) × T2 20.46 ere appro 20.46 c, so tha 0, so tha 0.45 353.23	19.94 LA = Livir 20.21 opriate 20.21 t Ti,m=(Oct 0.65 485.57 10.6	g area ÷ (4 19.71 19.71 76)m an Nov 0.79 550.18	 +) = 19.19 19.19 d re-calc Dec 0.86 581.1 		(90) (91) (92) (93) (93) (94) (95)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation Jan Utilisation fa (94)m= 0.85 Useful gains (95)m= 600.04 Monthly ave (96)m= 4.3	19.17 al temper 19.51 tment to ti 19.51 ating require ating require mean int n factor for actor for g 0.8 636.03 arage exter 4.9 te for mean	19.52 ature (fo 19.83 he mean 19.83 uirement ernal ten or gains (Mar ains, hm 0.74 , W = (94 629.99 ernal tem 6.5	he rest 19.89 r the wh 20.17 internal 20.17 internal 20.17 internal 20.17 0.65 0.74 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	20.12 ole dwe 20.38 tempera 20.38 re obtain ble 9a May 0.52 4)m 472.37 e from Ta 11.7	20 20 20 ature 3300 3300 3300 ature 14 Lm ,	.24 20.26) = fLA × T1 .49 20.51 e from Table .49 20.51 at step 11 of un Jul 38 0.27 0.67 223.62 8 4.6 16.6	20.26 + (1 – fL 20.51 4e, whe 20.51 Table 9 Aug 0.29 233.77 16.4	20.21 f A) × T2 20.46 ere appro 20.46 c, so tha 0, so tha 0.45 353.23	19.94 LA = Livir 20.21 opriate 20.21 t Ti,m=(Oct 0.65 485.57 10.6	g area ÷ (4 19.71 19.71 76)m an Nov 0.79 550.18	 +) = 19.19 19.19 d re-calc Dec 0.86 581.1 		(90) (91) (92) (93) (93) (94) (95)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation [Jan Utilisation fa (94)m= 0.85 Useful gains (95)m= 600.04 Monthly ave (96)m= 4.3 Heat loss ra (97)m= 896.17	19.17 al temper 19.51 tment to th 19.51 ating require mean int n factor for 0.8 s, hmGm 4 636.03 prage exter 4.9 te for mean 873.81	19.52 ature (fo 19.83 he mean 19.83 uirement ernal ten or gains (Mar ains, hm 0.74 629.99 ernal tem 6.5 an intern 795.16	he rest 19.89 r the wh 20.17 internal 20.17 internal 20.17 onperatur using Ta Apr 0.65 0.6	20.12 ole dwe 20.38 tempera 20.38 re obtain ble 9a May 0.52 4)m 472.37 e from Ta 11.7 erature, 508.26	20 20 20 ature 330 able 14 Lm , 338	.24 20.26) = fLA × T1 .49 .49 20.51 e from Table .49 .49 20.51 at step 11 of un Jul 38 0.27 0.67 223.62 8 16.6 .46 16.6 .W =[(39)m	20.26 + (1 – fL 20.51 4e, whe 20.51 Table 9 Aug 0.29 233.77 16.4 x [(93)m 236.37	20.21 f A) × T2 20.46 ere appro 20.46 c, so tha 0, so tha 353.23 14.1 - (96)m 369.01	19.94 19.94 LA = Livir 20.21 ppriate 20.21 t Ti,m=(Oct 0.65 485.57 10.6] 562.87	g area ÷ (4 19.71 19.71 76)m an Nov 0.79 550.18 7.1 742.88	 +) = 19.19 19.19 d re-calc Dec 0.86 581.1 4.2 		(90) (91) (92) (93) (93) (94) (95) (96)
(90)m= 18.87 Mean intern (92)m= 19.24 Apply adjus (93)m= 19.24 8. Space he Set Ti to the the utilisation [Jan Utilisation fa (94)m= 0.85 Useful gains (95)m= 600.04 Monthly ave (96)m= 4.3 Heat loss ra (97)m= 896.17	19.17 al temper 19.51 tment to ti 19.51 ating required e mean int n factor for actor for g 0.8 s, hmGm 636.03 erage exter 4.9 te for mea 873.81 ng required	19.52 ature (fo 19.83 he mean 19.83 uirement ernal ten or gains (Mar ains, hm 0.74 629.99 ernal tem 6.5 an intern 795.16	he rest 19.89 r the wh 20.17 internal 20.17 internal 20.17 onperatur using Ta Apr 0.65 0.75 0.65 0.75 0.75 0.75 0.75 0.7	20.12 ole dwe 20.38 tempera 20.38 re obtain ble 9a May 0.52 4)m 472.37 e from Ta 11.7 erature, 508.26	20 20 20 ature 330 able 14 Lm , 339 Wh/r	.24 20.26) = fLA × T1 .49 .49 20.51 e from Table .49 .49 20.51 at step 11 of un Jul .38 0.27 0.67 223.62 8 .46 4.6 16.6 .9W =[(39)m 9.55 225.61	20.26 + (1 – fL 20.51 4e, whe 20.51 Table 9 Aug 0.29 233.77 16.4 x [(93)m 236.37	20.21 f A) × T2 20.46 ere appro 20.46 c, so tha 0, so tha 353.23 14.1 - (96)m 369.01	19.94 19.94 LA = Livir 20.21 ppriate 20.21 t Ti,m=(Oct 0.65 485.57 10.6] 562.87	g area ÷ (4 19.71 19.71 76)m an Nov 0.79 550.18 7.1 742.88	 +) = 19.19 19.19 d re-calc Dec 0.86 581.1 4.2 		(90) (91) (92) (93) (93) (94) (95) (96)

	Тс	tal per year (kWh/year) = Sum(98) _{15,912} =	1017.77	(98)
Space heating requirement in kWh/m²/year			13.79	(99)
9b. Energy requirements – Community heating sc	heme			
This part is used for space heating, space cooling Fraction of space heat from secondary/supplemer			0	(301)
Fraction of space heat from community system 1 -			1	(302)
The community scheme may obtain heat from several sources	. ,	ا or CHP and up to four other heat sources; tl	he latter	
includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community boilers			1	(303a)
Fraction of total space heat from Community boile	rs	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(eating system	1	(305)
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)
Space heating		·	kWh/year]
Annual space heating requirement			1017.77	
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	1068.66	(307a)
Efficiency of secondary/supplementary heating sy	stem in % (from Tab	le 4a or Appendix E)	0	(308
Space heating requirement from secondary/supple	ementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2135.76	7
If DHW from community scheme:			2100.10	
Water heat from Community boilers		(64) x (303a) x (305) x (306) =	2242.55	(310a)
Electricity used for heat distribution	0.0	01 × [(307a)(307e) + (310a)(310e)] =	33.11	(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 (Tab mechanical ventilation - balanced, extract or positi	,	e	287.05	(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) =	287.05	(331)
Energy for lighting (calculated in Appendix L)			342.06	(332)
Electricity generated by PVs (Appendix M) (negati	ve quantity)		-749.25	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heating scheme				
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0.01 =	45.31	(340a)
Water heating from CHP	(310a) x	4.24 × 0.01 =	95.08	(342a)

			Fuel Prie	се			
Pumps and fans	(331)		13.19	x 0.01 =		37.86	(349)
Energy for lighting	(332)		13.19	x 0.01 =		45.12	(350)
Additional standing charges (Table 12)						120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (3	345)(354) =				343.37	(355)
11b. SAP rating - Community heating	scheme						
Energy cost deflator (Table 12)						0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) -	+ 45.0] =				1.21	(357)
SAP rating (section12)						83.07	(358)
12b. CO2 Emissions – Community heat	ing scheme						-
		Energy kWh/yea		ission factor CO2/kWh		nissions CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		CHP) IP using two fuels repeat	(363) to (366) f	or the second fue	el [94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (3	67b) x	0.22	- [760.87	(367)
Electrical energy for heat distribution		[(313) x		0.52	= [17.19	(372)
Total CO2 associated with community s	systems	(363)(366) + (3	68)(372)	-	= [778.06	(373)
CO2 associated with space heating (se	condary)	(309) x		0	- [0	(374)
CO2 associated with water from immers	sion heater or insta	antaneous heater	312) x	0.22	- [0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (3	75) =		[778.06	(376)
CO2 associated with electricity for pum	ps and fans within	dwelling (331)) x		0.52	- [148.98	(378)
CO2 associated with electricity for lighti	ng	(332))) x		0.52	- [177.53	(379)
Energy saving/generation technologies Item 1	(333) to (334) as a	applicable	0.52	x 0.01 =		-388.86	(380)
Total CO2, kg/year	sum of (376)(382) :	=				715.71	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =					9.7	(384)
El rating (section 14)						91.93	(385)
13b. Primary Energy – Community heat	ing scheme						
		Energy kWh/yea		nary or		Energy Vh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		ot CHP) IP using two fuels repeat	(363) to (366) f	or the second fue	el	94	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100 ÷ (3	67b) x	1.22	= [4297.53	(367)
Electrical energy for heat distribution		[(313) x			= [101.65	(372)
Total Energy associated with communit	y systems	(363)(366) + (3	68)(372)		= [4399.18	(373)
if it is negative set (373) to zero (unle	ss specified otherv	vise, see C7 in Appe	əndix C)		[4399.18	(373)
Energy associated with space heating (secondary)	(309) x		0	= [0	(374)

Total Primary Energy, kWh/year sum of (376	ö)(382) =			4030.36	(383)
Energy saving/generation technologies Item 1		3.07 × 0.0	01 =	-2300.19	(380)
Energy associated with electricity for lighting	(332))) x	3.07	=	1050.12	(379)
Energy associated with electricity for pumps and fans within c	lwelling (331)) x	3.07	=	881.25	(378)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Total Energy associated with space and water heating	(373) + (374) + (375) =			4399.18	(376)
Energy associated with water from immersion heater or instar	ntaneous heater(312) x	1.22	=	0	(375)

			User D	etails:						
Assessor Name:	Zahid Ashr	af		Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.9	
		Р	roperty <i>i</i>	Address	Plot 8					
Address :										
1. Overall dwelling dime	nsions:		•	- (2)		A 11.	·) / - L (2)	
Ground floor			_	a(m²) '3.82	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³) 184.54) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+((1d)+(1e)+(1r	1) 7	3.82	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	184.54	(5)
2. Ventilation rate:	_									
	main heating	secondar heating	у	other		total			m ³ per hour	•
Number of chimneys	0	+ 0	+	0] = [0	× ·	40 =	0	(6a)
Number of open flues	0	+ 0	+	0] = [0	x	20 =	0	(6b)
Number of intermittent far	าร				- F	3	x	10 =	30	(7a)
Number of passive vents					Γ	0	x	10 =	0	(7b)
Number of flueless gas fir	es				Γ	0	x	40 =	0	(7c)
								Air ch	anges per ho	_ ur
Infiltration due to chimne	a fluce and f		(7b) (7b) (7	70) -	Γ					-
Infiltration due to chimney If a pressurisation test has be					continue fr	30 om (9) to (÷ (5) =	0.16	(8)
Number of storeys in th			()						0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.						uction			0	(11)
if both types of wall are pro deducting areas of openin			o the great	er wall are	a (after					
If suspended wooden fl	- · ·		.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else e	enter 0							0	(13)
Percentage of windows	and doors dr	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value, o			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabili	-						1		0.41	(18)
Air permeability value applies Number of sides sheltered		on test has been dor	ie or a deg	gree air pei	rmeability	is being u	sea		2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			3 0.78	(13)
Infiltration rate incorporati	ng shelter fac	tor		(21) = (18)) x (20) =				0.32	(21)
Infiltration rate modified for	•								0.02	
r	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Tabl	e 7		-				-		
	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (22	2)m ÷ 4								-	
	.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	

3. Heat losses and heat loss parameter:ELEMENT Gross Openings m²Net Area A,m^2 U-value M/m^2K A X U (W/K) k-value $KJ/m^2 \cdot K$ A X k KJ/K Doors2x1=2(26)Windows11.205x1/[1/(1.4)+0.04] =14.86(27)	Adjust	ed infiltra	ation rat	e (allowi	ng for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m		-		_		
If mechanical ventilation. 0 (2a) If exhaucts if hear pump using Appendix N, (23a) = (23a) × Frw (equation (N5i), otherwise (23b) = (23a) 0 (2a) a) If balanced mechanical ventilation with heat recovery (MV/HR) (24a) m = (22b) m + (23b) × [1 - (23c) + 100] (2a) 0 <			-						0.3	0.32	0.34	0.36	0.38			
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 0				-	rate for t	he appli	cable ca	se	-	-	-		-	- 		
If balanced with heat recover; efficiency in % allowing for in-use factor (from Table 4h) = 0 <td></td> <td></td> <td></td> <td></td> <td>ondix N (2</td> <td>(26) = (22)</td> <td>$) \times Emv(c)$</td> <td>ocuption (I</td> <td>N5)) otho</td> <td>nuico (22h</td> <td>) = (22a)</td> <td></td> <td></td> <td></td> <td></td> <td>=</td>					ondix N (2	(26) = (22)	$) \times Emv(c)$	ocuption (I	N5)) otho	nuico (22h) = (22a)					=
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] (24a)m 0 0 0 0 0 0 0 0 0 0				0		, ,	, ,	• •	,, .	,) – (238)					=
$ \begin{array}{c} (24a)m \hline 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0$				-	-	-					⊃h.)	00k) [4 (22.5))	(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				i i		i	i	1	1	1	<u> </u>	1	1) ÷ 100]]		(24a)
		-	-	-						ů	÷	Ů	0	J		(240)
a) I whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)				1		1		r	1	1	1	· ·		1		(24b)
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)						-				-	0	0	0	J		(240)
a) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + ((22b)m ² x 0.5) (24d)m 0.58 0.58 0.56 0.55 0.55 0.56 0.57 (24d) (25)m = 0.58 0.58 0.56 0.55 0.55 0.56 0.57 (24d) (25)m = 0.58 0.58 0.56 0.55 0.54 0.55 0.56 0.57 (24d) (25)m = 0.58 0.58 0.56 0.55 0.54 0.55 0.56 0.57 (24d) (25)m = 0.58 0.58 0.56 0.55 0.56 0.56 0.57 (24d) (25)m = 0.58 0.58 0.56 0.55 0.56 0.56 0.57 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross 2 1 = 2 (26) Windows 11.205 x11/1/(1.4)+0.04] = 14.86 (27) (29) (28) Walls Type 1 36.61 11.2 25.41 x 0.18 = 6.55 (2	,					•	•				5 × (23b))	-	_		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
Less Less <thless< th=""> Less Less <tr< td=""><td>,</td><td></td><td></td><td></td><td></td><td></td><td>•</td><td></td><td></td><td></td><td>0.5]</td><td></td><td></td><td></td><td></td><td></td></tr<></thless<>	,						•				0.5]					
$\begin{array}{c c} (25)m = & 0.58 & 0.58 & 0.58 & 0.56 & 0.56 & 0.55 & 0.54 & 0.55 & 0.56 & 0.56 & 0.57 \end{array} (25) \\ \hline \textbf{3. Heat losses and heat loss parameter:} \\ \hline \textbf{ELEMENT} & Gross \\ area (m2) & Openings \\ area (m2) & Openings \\ m2 & A, m2 & U-value \\ A, m2 & V/m2K & A X U \\ W/m2K & A X U \\ W/m2K & K/M2 & K \\ W/m2K & M2 & M2 & M2 & M2 \\ Openings & U-value \\ W/m2K & A X U \\ W/m2K & K/M2 & K \\ W/m2K & M2 & M2 & M2 & K \\ W/m2K & M2 & M2 & M2 & K \\ W/m2K & M2 & M2 & M2 & M2 \\ W/m2K & M2 & M2 & M2 & M2 \\ Wolds Type1 & 36.61 & 11.2 & 25.41 & X \\ 0.18 & = & 4.57 & (29) \\ Walls Type2 & 36.61 & 11.2 & 25.41 & X \\ 0.18 & = & 4.57 & (29) \\ Walls Type2 & 36.61 & 11.2 & 25.41 & X \\ 0.18 & = & 4.57 & (29) \\ Walls Type2 & 36.61 & 11.2 & 25.41 & X \\ 0.18 & = & 4.57 & (29) \\ Walls Type3 & 14.23 & 0 & 14.23 & X \\ 0.18 & = & 2.56 & (29) \\ Valla Type3 & 14.23 & 0 & 14.23 & X \\ 0.18 & = & 2.56 & (29) \\ Valla Tope3 & 14.23 & X \\ 0.18 & = & 2.56 & (29) \\ Valla Tope3 & adverse and noot windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 \\ ``nclude the areas on both sides of internal walls and partitions \\ Fabric heat loss, W/K = S (A × U) & (26)(30) + (32) = & 34.18 & (33) \\ Heat capacity Cm = S(A × K) & (28)(30) + (32) = & 34.18 & (33) \\ Heat capacity Cm = S(A × K) & (28)(30) + (32) = & 34.18 & (33) \\ Thermal mass parameter (TMP = Cm ÷ TFA) in K/m2K & indicative values of TMP in Table 11 \\ can be used instead of a detailed calculation. \\ Thermal bridges : S (L × Y) calculated using Appendix K & (15.77 & (36) & (38)m = 0.33 \times (25)m \times (5) \\ \hline Math table is the advelue dist of the construction are not known precisely the indicative values of TMP in Table 11 \\ can be used instead of a $	(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(24d)
3. Heat loss parameter: ELEMENT Gross area (m²) Openings Net Area A, m² W/m²K (W/K) k-value kJ/K Doors 2 1 = 2 (W/K) k-value kJ/K A X k kJ/K Doors 2 x 1 = 2 (W/K) k-value kJ/K A X k kJ/K Doors 2 x 1 = 2 (W/K) k-value kJ/K A X k kJ/K Doors 2 x 1 = 2 (W/K) k-value kJ/K A X k kJ/K Didors 2 x 1 = 2 (W/K) k-value kJ/K A X k kJ/K Pior 31.103 x 0.13 = 4.04339 (Z2) (Z2) Walls Type1 36.61 11.2 25.41 x 0.18 = 6.15 (Z2) (Z2) Walls Type2 36.15 2 34.15 x 0.18 = 2.56 (Z2) (Z2) Walls Type3 14.23 0 14.23 x 0.18 = 2.56 (Z2) (Z3) Tot	Effe	ctive air	change	rate - en	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	x (25)				-		
ELEMENT Gross area (m ²) Openings m ² Net Area A,m ² U-value W/m2K A X U (W/K) k-value kJ/m ² -K A X k kJ/K Doors 2 x 1 2 (26) Windows 11.205 x1(1/(1.4)+0.04) = 14.86 (27) Floor 31.103 x 0.13 = 4.04339 (28) Walls Type1 36.61 11.2 25.41 x 0.18 = 4.57 (29) Walls Type2 36.15 2 34.15 x 0.18 = 6.15 (29) Walls Type3 14.23 0 14.23 x 0.18 = 2.56 (29) Walls Type3 14.23 0 14.23 x 0.18 = 2.56 (29) Value the areas on both sides of internal walks and partitions ************************************	(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57			(25)
ELEMENT Gross area (m ²) Openings m ² Net Area A,m ² U-value W/m2K A X U (W/K) k-value kJ/m ² -K A X k kJ/K Doors 2 x 1 2 (26) Windows 11.205 x1(1/(1.4)+0.04) = 14.86 (27) Floor 31.103 x 0.13 = 4.04339 (28) Walls Type1 36.61 11.2 25.41 x 0.18 = 4.57 (29) Walls Type2 36.15 2 34.15 x 0.18 = 6.15 (29) Walls Type3 14.23 0 14.23 x 0.18 = 2.56 (29) Walls Type3 14.23 0 14.23 x 0.18 = 2.56 (29) Value the areas on both sides of internal walks and partitions ************************************	3 He	at losse	s and he	at loss r	haramet	≏r.								-		
area (m²) $m²$ A, $m²$ W/m2K (W/K) kJ/m²-K kJ/K Doors 2 × 1 = 2 (26) Windows 11.205 x1/[1/(1.4) + 0.04] = 14.86 (27) Floor 31.103 × 0.13 = 4.04339 (28) Walls Type1 36.61 11.2 25.41 × 0.18 = 6.15 (29) Walls Type2 36.15 2 34.15 × 0.18 = 6.15 (29) Walls Type3 14.23 0 14.23 × 0.18 = 2.56 (29) Total area of elements, m² 118.1 (31) * (31) * (31) * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 34.18 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) = 34.18 (33) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 250 (35) For design assessments where the detaia							Net Ar	ea	U-valı	le	AXU		k-value	<u>م</u>	A >	< k
Windows 11.205 $x1/[1/(1.4) + 0.04] =$ 14.86 (27) Floor 31.103 x 0.13 $=$ 4.04339 (28) Walls Type1 36.61 11.2 25.41 x 0.18 $=$ 4.57 (29) Walls Type2 36.15 2 34.15 x 0.18 $=$ 6.15 (29) Walls Type3 14.23 0 14.23 x 0.18 $=$ 2.56 (29) Walls Type3 14.23 0 14.23 x 0.18 $=$ 2.56 (29) Total area of elements, m ² 118.1 (31) * (31) * (31) * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 34.18 (33) Heat capacity Cm = S(A x k) (28)(30) + (32) = 34.18 (33) (34) 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 250 (35) For design assessments where the details of the construction are not known precisely the i												K)				
Floor 31.103 X 0.13 = 4.04339 (28) Walls Type1 36.61 11.2 25.41 X 0.18 = 4.57 (29) Walls Type2 36.15 2 34.15 X 0.18 = 6.15 (29) Walls Type3 14.23 0 14.23 X 0.18 = 6.15 (29) Walls Type3 14.23 0 14.23 X 0.18 = 6.15 (29) Total area of elements, m ² 118.1 (31) * (31) * (31) * include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 34.18 (33) Heat capacity Cm = S(A x k) (26)(30) + (32) = 34.18 (33) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11 (31) * (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (32) + (33) + (36) = (49.95 <td< td=""><td>Doors</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>x</td><td>1</td><td>=</td><td>2</td><td></td><td></td><td></td><td></td><td>(26)</td></td<>	Doors						2	x	1	=	2					(26)
Walls Type136.6111.225.41 \times 0.18=4.57(29)Walls Type236.15234.15 \times 0.18=6.15(29)Walls Type314.23014.23 \times 0.18=2.56(29)Total area of elements, m2118.1(31)*(31)*(31)* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2**** include the areas on both sides of internal walls and partitions(26)(30) + (32) =34.18(33)Heat capacity Cm = S(A x k)(26)(30) + (32) =34.18(33)Heat capacity Cm = S(A x k)((28)(30) + (32) + (32a)(32e) =3365.77(34)Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²KIndicative Value: Medium250(35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 11(31)can be used instead of a detailed calculation.15.77(36)Thermal bridges : S (L x Y) calculated using Appendix K15.77(36)if details of thermal bridging are not known (36) = 0.05 x (31)(33) + (36) =49.95(37)Total fabric heat loss calculated monthly(38)m = 0.33 x (25)m x (5)(38)(38)m=35.5135.3135.1234.2234.0533.2633.1133.5634.3934.75(38)Heat transfer coefficient, W/K(39)m = (37) + (38)m(39)m = (37) + (38)m(38)m(37	Windo	WS					11.20	5 x1	/[1/(1.4)+	0.04] =	14.86					(27)
Walls Type236.15234.15x0.18=6.15(29)Walls Type314.23014.23x0.18=2.56(29)Total area of elements, m2118.1(31)* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2** include the areas on both sides of internal walls and partitionsFabric heat loss, W/K = S (A x U)(26)(30) + (32) =34.18(33)Heat capacity Cm = S(A x k)((28)(30) + (32) + (32a)(32e) =3365.77(34)Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m2KIndicative Value: Medium250(35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f(31)can be used instead of a detailed calculation.15.77(36)Thermal bridges : S (L x Y) calculated using Appendix K(33) + (36) =49.95(37)Ventilation heat loss calculated monthly(38)m = $0.33 \times (25)m \times (5)$ (38)m =(38)m=35.5135.1134.2234.0533.2633.1133.5634.0534.3934.75Heat transfer coefficient, W/K(39)m = (37) + (38)m(39)m =85.4685.2785.0784.178483.2183.0783.528484.3484.7	Floor						31.10	3 X	0.13	=	4.0433	9				(28)
Walls Type314.23014.23 \times 0.18=2.56(29)Total area of elements, m2118.1(31)* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2(31)** include the areas on both sides of internal walls and partitions(26)(30) + (32) =(34.18)Fabric heat loss, W/K = S (A x U)(26)(30) + (32) =(34.18)Heat capacity Cm = S(A x k)((28)(30) + (32) + (32a)(32e) =(3365.77)Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²KIndicative Value: Medium250For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f(35)can be used instead of a detailed calculation.15.77(36)Thermal bridges : S (L x Y) calculated using Appendix K(15.77)(36)if details of thermal bridging are not known (36) = 0.05 x (31)(33) + (36) =49.95(37)Total fabric heat loss(33) + (36) =49.95(37)Ventilation heat loss calculated monthly(38) m = 0.33 x (25) m x (5)(38)(38) m=35.5135.3135.1234.2234.0533.2633.2633.1133.5634.0534.3934.75(38) m=85.4685.2785.0784.178483.2183.0783.528484.3484.7	Walls -	Type1	36.6	51	11.2	2	25.41	x	0.18	i	4.57	- i		ΞĒ		(29)
Total area of elements, m ² 118.1 (31) * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 (31) ** include the areas on both sides of internal walls and partitions (26)(30) + (32) = (34.18) Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (34.18) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = (34.18) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f (31) (32) (33) + (36) = (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f (36) (37) can be used instead of a detailed calculation. 15.77 (36) if details of thermal bridging are not known (36) = 0.05 x (31) (33) + (36) = (49.95) (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38)m = (39)m = (37) + (38)m (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (38) (38) (39)m = (37) + (38)m (38)	Walls ⁻	Type2	36.1	5	2		34.15	5 X	0.18	= [6.15	= 1		Ξ F		(29)
Total area of elements, m²118.1(31)* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2(31)** include the areas on both sides of internal walls and partitions(26)(30) + (32) =(34.18)Fabric heat loss, W/K = S (A x U)(26)(30) + (32) =(34.18)Heat capacity Cm = S(A x k)((28)(30) + (32) + (32a)(32e) =(365.77)Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²KIndicative Value: Medium250For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f(35)can be used instead of a detailed calculation.15.77(36)Thermal bridges : S (L x Y) calculated using Appendix K(15.77)(36)if details of thermal bridging are not known (36) = 0.05 x (31)(33) + (36) =(49.95)Total fabric heat loss(33) + (36) =(49.95)(37)Ventilation heat loss calculated monthly(38)m = 0.33 x (25)m x (5)(38)(38)m=35.5135.1135.1234.2234.0533.2633.1133.5634.0534.3934.75(38)Heat transfer coefficient, W/K(39)m = (37) + (38)m(39)m =(37) + (38)m(38)	Walls -	ТуреЗ	14.2	23	0		14.23	3 X	0.18		2.56			- -		 (29)
* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 34.18 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 3365.77 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K (15.77 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss $(33) + (36) = 49.95$ (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38)m = 35.51 35.31 35.12 34.22 34.05 33.26 33.26 33.11 33.56 34.05 34.39 34.75 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 85.46 85.27 85.07 84.17 84 83.21 83.21 83.07 83.52 84 84.34 84.7		•••								เ						
Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 34.18 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 3365.77 (34) Thermal mass parameter (TMP = Cm + TFA) in kJ/m²K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f 250 (36) an be used instead of a detailed calculated using Appendix K 15.77 (36) if details of thermal bridging are not known (36) = 0.05 x (31) 15.77 (36) Total fabric heat loss (33) + (36) = 49.95 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38) (38)m = 35.51 35.12 34.22 34.05 33.26 33.11 33.56 34.93 34.75 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (38) (38) (39)m = (37) + (38)m (38)					ffective wi	ndow U-va	L		g formula 1	/[(1/U-valu	ie)+0.04] a	as given ir	n paragraph	n 3.2		
Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 3365.77 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K Indicative Value: Medium 250 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 15.77 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (31) + (36) = 49.95 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) (38)m = 35.51 35.31 35.12 34.22 34.05 33.26 33.26 33.21 33.11 33.56 34.05 34.39 34.75 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 85.46 85.27 85.07 84.17 84 83.21 83.21 83.07 83.52 84 84.34 84.7	** inclua	le the area	as on both	sides of in	ternal wal	ls and par	titions									_
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²KIndicative Value: Medium250(35)For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.(35)Thermal bridges : S (L x Y) calculated using Appendix K15.77(36)if details of thermal bridging are not known (36) = 0.05 x (31)Total fabric heat loss(33) + (36) =49.95(37) Ventilation heat loss calculated monthly(38)m = 0.33 x (25)m x (5)(38)m=35.5135.5135.2133.2633.2183.0783.2183.0783.2183.0783.5284(33) m = 0.33 x (25)m x (5)(38) m = 0.33 x (25)m x (5)(38) m = (37) + (38)m </td <td></td> <td></td> <td></td> <td>•</td> <td>U)</td> <td></td> <td></td> <td></td> <td>(26)(30)</td> <td>+ (32) =</td> <td></td> <td></td> <td></td> <td>34.</td> <td>18</td> <td>(33)</td>				•	U)				(26)(30)	+ (32) =				34.	18	(33)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 15.77 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss $(33) + (36) = 49.95$ (37) Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$ (38)m= 35.51 35.31 35.12 34.22 34.05 33.26 33.26 33.11 33.56 34.05 34.39 34.75 (38) Heat transfer coefficient, W/K $(39)m = (37) + (38)m$ (39)m= 85.46 85.27 85.07 84.17 84 83.21 83.21 83.07 83.52 84 84.34 84.7	Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	336	5.77	(34)
can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 15.77 (36) if details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) = (33) + (36) = (49.95 (37) Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$ (38)m = $(37) + (38)m$ (39)m = $(37) + (38)m$ (39)m = $(37) + (38)m$ (39)m = $85.46 \times 85.27 \times 85.07 \times 84.17 \times 84 \times 83.21 \times 83.21 \times 83.07 \times 83.52 \times 84 \times 84.34 \times 84.7$			•			,								25	0	(35)
if details of thermal bridging are not known $(36) = 0.05 \times (31)$ Total fabric heat loss (33) + (36) = (33) + (36) = (49.95 (37) Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$ (38)m = $0.33 \times (25)m \times (5)$ (38)m = 35.51 35.51 35.12 34.22 34.05 33.26 33.11 33.56 34.05 34.39 34.75 (38) Heat transfer coefficient, W/K (39)m = $(37) + (38)m$ (39)m = 85.46 85.27 85.07 84.17 84 83.21 83.07 83.52 84 84.34 84.7		-				construct	ion are noi	t known pr	recisely the	e indicative	values of	TMP in T	able 1f			
(33) + (36) = 49.95 (37) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= 35.51 35.12 34.22 34.05 33.26 33.11 33.56 34.05 34.39 34.75 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (37) + (38)m	Therm	al bridge	es : S (L	x Y) cale	culated	using Ap	pendix l	<						15.	77	(36)
Note Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)m \times (5)$ Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= 35.51 35.12 34.22 34.05 33.26 33.11 33.56 34.05 34.39 34.75 (38) Heat transfer coefficient, W/K (39)m = $(37) + (38)m$ (39)m= 85.46 85.27 85.07 84.17 84 83.21 83.07 83.52 84 84.34 84.7				are not kn	own (36) =	= 0.05 x (3	1)			(00)	(00)					
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= 35.51 35.31 35.12 34.22 34.05 33.26 33.26 33.11 33.56 34.05 34.39 34.75 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 85.46 85.27 85.07 84.17 84 83.21 83.07 83.52 84 84.34 84.7												(OF) (T	`	49.	95	(37)
(38)m= 35.51 35.31 35.12 34.22 34.05 33.26 33.26 33.11 33.56 34.05 34.39 34.75 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (37) 85.46 85.27 85.07 84.17 84 83.21 83.07 83.52 84 84.34 84.7	ventila	i		1						. ,			1	1		
Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 85.46 85.27 85.07 84.17 84 83.21 83.07 83.52 84 84.34 84.7	(20)									· · ·						(28)
(39)m= 85.46 85.27 85.07 84.17 84 83.21 83.21 83.07 83.52 84 84.34 84.7					34.22	34.05	33.26	33.20	33.11				34.75	J		(00)
						r			L .	· · ·	1	r -		1		
	(39)m=	85.46	85.27	85.07	84.17	84	83.21	83.21	83.07						47	

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.16	1.16	1.15	1.14	1.14	1.13	1.13	1.13	1.13	1.14	1.14	1.15		
Numb	er of day	l vs in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1.	12 /12=	1.14	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,														~ ,
4. Wa	ater hea	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		34		(42)
Reduce	the annua	al average	hot water		5% if the c	welling is	designed	(25 x N) to achieve		se target o		.66		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	98.62	95.04	91.45	87.87	84.28	80.69	80.69	84.28	87.87	91.45	95.04	98.62		-
Energy	content of	hot water	used - ca	culated m	onthly $= 4$.	190 x Vd,r	n x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1075.9	(44)
(45)m=	146.26	127.92	132	115.08	110.42	95.29	88.3	101.32	102.53	119.49	130.43	141.64		
16 :						(L		Total = Su	m(45) ₁₁₂ =		1410.68	(45)
	r	i	-			, ,	i	boxes (46						(40)
(46)m= Water	21.94 storage	19.19 loss:	19.8	17.26	16.56	14.29	13.24	15.2	15.38	17.92	19.57	21.25		(46)
	-) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If com	munity ł	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage		eclared I	oss facto	or is kno	wn (k\//ł	n/dav).				4	20		(48)
			m Table				vuay).					39 54		(40)
				. ∠S e, kWh/ye	ear			(48) x (49)) =			75		(50)
			-	cylinder		or is not		(10) / (10)	,		0.	75		(00)
		-		rom Tabl	le 2 (kW	h/litre/da	ay)					0		(51)
	•	leating s	ee secti	on 4.3								0		(50)
			m Table	2b								0 0		(52) (53)
•				, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
		(54) in (5	-	,,,,						,	0.	-		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (,	• •	65 × (41)						
•		1	r	r	· · · · · ·	1		ng and a	-	i	, 	00.0-		(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for 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	h month	(62)m	= 0.85 ×	(45)m	+	(46)m +	(57)r	n +	(59)m + (61)m	
(62)m=	192.85	170	178.5	9	160.17	157.02	14	40.38	134.89	147.9	2 147.62	166.0)9	175.53	188.	.24		(62)
Solar DH	-IW input	calculated	using A	ppe	ndix G or	Appendix	н ((negativ	ve quantity	v) (enter	'0' if no sola	ar contri	but	ion to wate	er heat	ting)	•	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	ap	plies,	, see Ap	pendix	G)							
(63)m=	0	0	0		0	0		0	0	0	0	0		0	0]	(63)
Output	from w	ater hea	ter															
(64)m=	192.85	170	178.5	9	160.17	157.02	14	40.38	134.89	147.9	2 147.62	166.0)9	175.53	188.	.24		
			•							0	utput from v	vater he	ate	r (annual)₁	12		1959.29	(64)
Heat g	ains fro	m water	heatin	ıg,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8	x [(46)	m	+ (57)m	+ (59	9)m	1]	
(65)m=	85.91	76.2	81.17	,	74.34	73.99	6	57.76	66.63	70.97	70.17	77.0	1	79.44	84.3	37		(65)
inclu	ide (57)	m in calo	culatio	n o	f (65)m	only if c	ylir	nder is	s in the c	dwellin	g or hot v	vater is	s fr	om com	muni	ty h	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	Oc	t	Nov	D	ec]	
(66)m=	116.75	116.75	116.7	-	116.75	116.75		16.75	116.75	116.7		116.7		116.75	116.		-	(66)
Liahtin	n dains	ı (calcula	L ted in	 Ani	pendix	equat	ion	190	ri9a)a	lso sei	Table 5				I		1	
(67)m=	19.37	17.2	13.99	<u> </u>	10.59	7.92	i —	6.68	7.22	9.39	12.6	16		18.67	19.9	91	1	(67)
				_							so see Ta						1	
(68)m=	206.03	208.17	202.7	-	191.32	176.84	r –	63.23	154.14	5a), ai 152	157.39	168.8	36	183.34	196.	0/	1	(68)
				_										105.54	130.	.94]	(00)
(69)m=	<u> </u>	<u> </u>		-i	34.68		<u> </u>				see Table			24.69	24/	20	1	(69)
	34.68	34.68	34.68			34.68	3	4.68	34.68	34.68	34.68	34.6	0	34.68	34.6	00]	(03)
-		ns gains	r i	ə 5a	-		—										1	(70)
(70)m=	3	3	3		3	3		3	3	3	3	3		3	3		J	(70)
		aporatic	<u> </u>	- T			r –			-		-					1	
(71)m=	-93.4	-93.4	-93.4		-93.4	-93.4	-	93.4	-93.4	-93.4	-93.4	-93.	4	-93.4	-93	.4]	(71)
Water		gains (T	Table 5	5)													1	
(72)m=	115.47	113.39	109.0	9	103.25	99.45	9	4.11	89.56	95.38	97.45	103.	5	110.34	113	8.4	J	(72)
Total i	nternal	gains =						(66)	m + (67)m	+ (68)r	n + (69)m +	(70)m +	- (7	1)m + (72)	m		-	
(73)m=	401.9	399.8	386.9)	366.18	345.23	32	25.05	311.95	317.8	328.47	349.3	39	373.37	391.	.28		(73)
6. So	lar gain	s:																
-			•	olar	flux from	Table 6a	and			tions to	convert to t	he appli	cat		ion.			
Orienta		Access F			Area			Flu			g_ Table Ch		т	FF			Gains	
	-	Table 6d			m²				ole 6a		Table 6b)	-	able 6c			(W)	_
Southw	est <mark>0.9x</mark>	0.77		x	11	.2	x	3	6.79		0.63	x		0.7		=	126	(79)
Southw	est <mark>0.9x</mark>	0.77		x	11.2		x	62.67			0.63	x		0.7		=	214.62	(79)
Southw	est <mark>0.9x</mark>	0.77		× 11.2		.2	x	8	5.75		0.63	x		0.7		=	293.65	(79)
Southw	est <mark>0.9x</mark>	0.77		x	11	.2	x	1(06.25		0.63	x		0.7		=	363.85	(79)
Southw	est <mark>0.9x</mark>	0.77		x	11	.2	x	1	19.01		0.63	x		0.7		=	407.54	(79)

														_
Southwest _{0.9x}	0.77	X	11.	.2	x	1	18.15		0.63	×	0.7	=	404.59	(79)
Southwest _{0.9x}	0.77	x	11.	2	x	1	13.91		0.63	x	0.7	=	390.07	(79)
Southwest0.9x	0.77	x	11.	.2	x	1	04.39		0.63	x	0.7	=	357.47	(79)
Southwest0.9x	0.77	x	11.	.2	x	g	92.85		0.63	x	0.7	=	317.96	(79)
Southwest0.9x	0.77	x	11.	.2	x	6	9.27		0.63	×	0.7	=	237.2	(79)
Southwest _{0.9x}	0.77	x	11.	.2	x	4	4.07		0.63	x	0.7	=	150.91	(79)
Southwest0.9x	0.77	x	11.	.2	x	3	81.49		0.63	x	0.7	=	107.83	(79)
Solar <u>g</u> ains in	watts, calo	culated	for eac	n month				(83)m = S	um(74)m .	(82)m				
(83)m= 126		293.65	363.85	407.54		04.59	390.07	357.47	317.96	237.2	150.91	107.83		(83)
Total gains –	internal and	d solar	(84)m =	= (73)m ·	+ (8	33)m	, watts				i		1	
(84)m= 527.89	614.42 6	680.55	730.03	752.77	72	29.64	702.02	675.27	646.43	586.59	524.29	499.11		(84)
7. Mean inte	rnal tempe	rature ((heating	season)									
Temperature	e during hea	ating pe	eriods ir	the livi	ng	area	from Tab	ole 9, Th	n1 (°C)				21	(85)
Utilisation fa	ctor for gai	ns for li	iving are	ea, h1,m	ı (s	ee Ta	ıble 9a)							
Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.98	0.94	0.85	(0.68	0.51	0.55	0.78	0.95	0.99	1		(86)
Mean interna	al temperat	ture in l	iving are	ea T1 (fo	ollo	w ste	ns 3 to 7	' in Tabl	e 9c)					
(87)m= 19.85		20.28	20.58	20.82	1	0.96	20.99	20.99	20.91	20.6	20.17	19.82		(87)
Tomporature			oriodo ir	root of		alling					1		1	
Temperature	<u> </u>	19.96	19.97	19.97	1	9.98	19.98	19.98	19.98	19.97	19.97	19.96		(88)
									19.90	13.57	13.37	19.90		(00)
Utilisation fa		r			—		r	,			1		1	(22)
(89)m= 0.99	0.99	0.97	0.92	0.8	(0.59	0.4	0.44	0.7	0.93	0.99	1		(89)
Mean interna	al temperat	ture in t	he rest	of dwell	ing	T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m= 18.44	18.69	19.05	19.48	19.8	1	9.95	19.98	19.98	19.91	19.52	18.91	18.4		(90)
									f	LA = Livir	ng area ÷ (4	4) =	0.34	(91)
Mean interna	al temperat	ture (foi	r the wh	ole dwe	llin	g) = fl	LA x T1	+ (1 – fl	_A) × T2					
(92)m= 18.92	19.15	19.47	19.85	20.15	2	0.29	20.32	20.32	20.25	19.89	19.34	18.88		(92)
Apply adjust	ment to the	e mean	internal	temper	atu	re fro	m Table	4e, whe	ere appro	opriate				
(93)m= 18.92	19.15	19.47	19.85	20.15	2	0.29	20.32	20.32	20.25	19.89	19.34	18.88		(93)
8. Space he	ating requir	rement												
Set Ti to the					ned	at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calo	culate	
the utilisation	1 1	<u> </u>			-	<u> </u>				0.1		Du	1	
Jan	Feb	Mar Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa		0.96	0.92	0.81		0.62	0.44	0.48	0.73	0.93	0.98	0.99		(94)
Useful gains	<u> </u>					5.02	0.44	0.40	0.75	0.00	0.00	0.00		(0.)
(95)m= 523.76		656.12	668.4	609.34	4	53.99	306.98	321.51	470.19	544.89	515.72	496.08		(95)
Monthly ave											1		1	
(96)m= 4.3	4.9	6.5	8.9	11.7	-	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	te for mean									1	1	l	I	
(97)m= 1249.62		103.37	921.92	709.38	1	, 73.71	309.65	325.61	513.59	780.08	1031.98	1243.68		(97)
Space heati	ng requirem	nent for	each m	honth, k	Wh	/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		I	
(98)m= 540.04	T T	332.75	182.53	74.43		0	0	0	0	174.98	371.71	556.22		
	•				•				•		•			

								Tota	l per year	(kWh/year	⁻) = Sum(9	8)15,912 =	2643.02	(98)
Space	e heating	require	ement in	ı kWh/m²	/year								35.81	(99)
9a. En	ergy requ	iremen	ıts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	HP)					_
	e heating													-
	on of spa					mentary							0	(201)
Fraction of space heat from main system(s) $(202) = 1 - (201) =$												1	(202)	
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$												1	(204)	
Efficiency of main space heating system 1												93.5	(206)	
Efficiency of secondary/supplementary heating system, %											-	0	(208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heating	· ·	· · ·	1	,				-				1	
		410.36	332.75	182.53	74.43	0	0	0	0	174.98	371.71	556.22		
(211)m	$n = \{[(98)n \\ 1 = 1 \}$			· · · ·				0	0	407.45	007.55	504.00		(211)
	577.58	438.89	355.88	195.22	79.61	0	0	0 Tota		187.15 ar) =Sum(2	397.55	594.88	0000 70	7(214)
Snoo	- hooting	fuel (e	ooondor	n.) L\\/⊨/	month			Tota	i (kwii) you				2826.76	(211)
•	e heating)m x (201	•		• /	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water	heating													-
Output	from wat					4 4 9 9 9	404.00	4 47 00	4 47 00	400.00	475 50	400.04		
Efficier	192.85	170	178.59	160.17	157.02	140.38	134.89	147.92	147.62	166.09	175.53	188.24	70.0	(216)
(217)m=	ncy of wat	87.08	86.45	85.16	82.95	79.8	79.8	79.8	79.8	84.95	86.77	87.53	79.8	(217)
· · ·	r water he				02.00	10.0	10.0	10.0	10.0	04.00	00.11	07.00		()
	n = (64)m	-												
(219)m=	220.61 [·]	195.23	206.58	188.08	189.28	175.91	169.04	185.36	184.99	195.5	202.29	215.05		-
_								Tota	I = Sum(2				2327.93	(219)
	I totals heating fu	يما يروم	d main	evetom	1					k	Wh/year	•	kWh/year 2826.76	1
•	C			System										
	heating fu												2327.93	
Electric	city for pu	mps, fa	ans and	electric	keep-ho	t								
centra	al heating	pump:										30		(230c)
boiler	with a far	n-assis	ted flue									45		(230e)
Total electricity for the above, kWh/year sum of (230a)(230g) =									75	(231)				
Electric	city for lig	hting											342.06	(232)
12a. (CO2 emis	sions -	- Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHP)					-4
Energy Emission factor kWh/year kg CO2/kWh											Emissions kg CO2/yea	ır		
Space	heating (I	main s	ystem 1)			1) x			0.2		=	610.58	(261)
	- ·													

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	502.83	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1113.41	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	177.53	(268)
Total CO2, kg/year	sum	of (265)(271) =	-	1329.87	(272)

TER =

18.02 (273)