Regulations Compliance Report

	ent L1A, 2013 Editior ober 2020 at 14:55:2	•	oma FSAP 2012 program, Vei	rsion: 1.0.5.9	
Project Information	on:	-			
Assessed By:	Zahid Ashraf (STR	20001082)	Building Type:	Flat	
Dwelling Details:					
NEW DWELLING	DESIGN STAGE		Total Floor Area: 5	5.72m ²	
Site Reference :	Hermitage Lane		Plot Reference:	Plot 3	
Address :	-				
Client Details:					
Name: Address :					
•	rs items included w ete report of regulat	ithin the SAP calculations ions compliance.	s.		
1a TER and DEF					
	ting system: Mains g	as (c)			
Fuel factor: 1.00 (• • • • •				
-	oxide Emission Rate		20.38 kg/m ²		
1b TFEE and DF	Dioxide Emission Rat	e (DER)	13.56 kg/m²	C	ОК
	rgy Efficiency (TFEE	١	54.2 kWh/m²		
-	nergy Efficiency (DFE		44.2 kWh/m²		
Dweining Fabric Er	lergy Enciency (Dr)	44.2 KW0/00	C	ж
2 Fabric U-value	es				
Element		Average	Highest		
External	wall	0.15 (max. 0.30)	0.15 (max. 0.70)		ЭK
Floor		0.12 (max. 0.25)	0.12 (max. 0.70)	C	ЭK
Roof	_	(no roof)	1 40 (******* 0 20)	,	
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)	(Ж
2a Thermal brid		11 AL 14 14	· · · ·		
		om linear thermal transmitt	ances for each junction		
3 Air permeabili			2.00 (decign vol		
Maximum	bility at 50 pascals		3.00 (design val 10.0		Ж
4 Heating efficie					
Main Heatir	ng system:	Community heating sche	mes - mains gas		
Secondary	heating system:	None			
	0.				
5 Cylinder insul	ation				
Hot water S	Storage:	No cylinder			
6 Controls					
_			.		
Space heat	ting controls	Charging system linked t programmer and at least	o use of community heating,		
Hot water c	controls.	No cylinder thermostat		L L	ЭK
not water t	ond 013.	No cylinder			

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7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.65m ²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Floors U-value	0.12 W/m²K	
Community heating, heat from boilers – mains gas		

Photovoltaic array

User Details:				
Assessor Name: Zahid Ashraf Stroma Numb	per:	STRO	001082	
Software Name: Stroma FSAP 2012 Software Vers	sion:	Versio	n: 1.0.5.9	
Property Address: Plot 3				
Address :				
1. Overall dwelling dimensions:				
Ground floor 55.72 (1a) x	Av. Height(m 2.5	1) (2a) =	Volume(m ³ 139.29) (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ (4)				
Dwelling volume (3a)+(3b)+	+(3c)+(3d)+(3e)+	(3n) =	139.29	(5)
2. Ventilation rate:				
main heatingsecondary heatingotherNumber of chimneys0+0=	total	x 40 =	m ³ per hou	r (6a)
Number of open flues $0 + 0 + 0 = 0$	0	x 20 =	0	(6b)
Number of intermittent fans	0	x 10 =	0	(7a)
Number of passive vents	0	x 10 =	0	(7b)
Number of flueless gas fires	0	x 40 =	0	(7c)
		A in ab		
			anges per ho	_
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	0 m (9) to (16)	÷ (5) =	0	(8)
Number of storeys in the dwelling (ns)			0	(9)
Additional infiltration		(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constru 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	iction		0	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0	(12)
If no draught lobby, enter 0.05, else enter 0			0	(13)
Percentage of windows and doors draught stripped			0	(14)
Window infiltration $0.25 - [0.2 \times (14) \div 10]$ (a)(a)	1		0	(15)
Infiltration rate $(8) + (10) + (11) + (12)$			0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square me If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$	etre of envelop	be area	3	(17)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is	s beina used		0.15	(18)
Number of sides sheltered	, sonig acca		2	(19)
Shelter factor (20) = 1 - [0.075 x (19	9)] =		0.85	(20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$			0.13	(21)
Infiltration rate modified for monthly wind speed				
Jan Feb Mar Apr May Jun Jul Aug Sep	Oct Nov	v Dec		
Monthly average wind speed from Table 7				
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4	4.3 4.5	4.7		
Wind Factor (22a)m = (22)m \div 4				
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1	1.08 1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m			-		
.	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
		<i>ctive air</i> al ventila	•	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N (2	(23a) = (23a	a) x Fmv (e	equation (I	N5)) , othe	rwise (23h) = (23a)			0.5	=
								n Table 4h) = (200)			0.5	(23b)
			-	-	-			HR) (24a		2b)m + ('	23h) v [[,]	1 _ (23c)	79.05 1001	(23c)
(24a)m=	r	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25	÷ 100j	(24a)
								MV) (24b				0.20		
(24b)m=				0					0	0	0	0		(24b)
								on from c		Ĵ		Ů		. ,
,					•	•		c) = (22t		5 × (23b)			
(24c)m=	, <i>,</i>	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	u ole hous	se positiv	/e input	ventilatio	on from l	oft			<u> </u>		
,								0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	k (25)					
(25)m=	0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3. He	at losse	s and he	eat loss i	paramet	er:									
	/IENT	Gros		Openin		Net Ar	ea	U-valı	Je	AXU		k-value	e A	Xk
		area	(m²)	'n	-	A ,r	m²	W/m2	K	(W/ł	<)	kJ/m²∙ł	K k	J/K
Doors						2	х	1.4	=	2.8				(26)
Windo	WS					8.651	ı x1	/[1/(1.4)+	0.04] =	11.47				(27)
Floor						55.71	5 <mark>x</mark>	0.12	=	6.6858				(28)
Walls	Type1	48.9	99	8.65	5	40.34	4 ×	0.15	=	6.05				(29)
Walls	Type2	4.4	Ļ	2		2.4	x	0.14	=	0.34	ן ר			(29)
Total a	area of e	elements	, m²			109.1	1							(31)
* for win	ndows and	l roof wind	ows, use e	effective wi	indow U-va	alue calcul	ated using	g formula 1	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	3.2	
		as on both			ls and par	titions		(22)	(22)			1		
		ss, W/K		U)				(26)(30)					27.35	(33)
		Cm = S	. ,							.(30) + (32	, , , ,	(32e) =	6727	(34)
		•				n kJ/m²K				tive Value:			100	(35)
	•	sments wh ad of a de			construct	ion are not	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
					using Ap	pendix I	K						9.32	(36)
	-	al bridging				-								
Total f	abric he	at loss							(33) +	(36) =			36.67	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.29	12.14	11.99	11.26	11.11	10.38	10.38	10.24	10.68	11.11	11.41	11.7		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	48.96	48.81	48.67	47.93	47.79	47.05	47.05	46.91	47.35	47.79	48.08	48.37		
										Average =	Sum(39)1	12 /12=	47.9	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.88	0.88	0.87	0.86	0.86	0.84	0.84	0.84	0.85	0.86	0.86	0.87		
Ni wala a			I						,	Average =	Sum(40)1.	.12 /12=	0.86	(40)
NUMDE	Jan	/s in moi Feb	Mar	, 	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	Apr 30	31	30	31	31 Aug	30	31	30	31		(41)
(,	01	20	01							01		01		()
4. Wa	iter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.(0013 x (⁻	TFA -13		86		(42)
Annua <i>Reduce</i>	l averag	e hot wa al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.46		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		1		ach month				r						
(44)m=	90.7	87.4	84.11	80.81	77.51	74.21	74.21	77.51	80.81	84.11	87.4	90.7	000.40	
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		989.48	(44)
(45)m=	134.51	117.64	121.4	105.84	101.55	87.63	81.2	93.18	94.3	109.89	119.96	130.27		
lf instan	'aneous w	vater heati	na at point	t of use (no	o hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	:	1297.37	(45)
(46)m=	20.18	17.65	18.21	15.88	15.23	13.14	12.18	13.98	14.14	16.48	17.99	19.54		(46)
· · ·	storage		_				_							
Storag	e volum	e (litres)	includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	-		ank in dw	-			. ,	ore) onto	or 'O' in ((47)			
	storage		not wate	er (uns n	iciuues i	nsianiai		ombi boil	ers) erne		(47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	rature f	actor fro	m Table	2b								C		(49)
			-	e, kWh/ye				(48) x (49)) =		1	10		(50)
				cylinder l rom Tabl							0.	02		(51)
		leating s				1,1110,00	xy)				0.	02		(01)
		from Ta									1.	03		(52)
Tempe	rature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		03		(54)
	. ,	(54) in (5	,	(((50)			1.	03		(55)
	-	r	1	for each	1	1			55) × (41) I	i				(50)
(56)m= If cylinde	32.01 er contains	28.92 s dedicate	32.01 d solar sto	30.98 rage. (57)	32.01 m = (56)m	30.98 x [(50) – (32.01 H11)] ÷ (5	32.01 0). else (5	30.98 7)m = (56)	32.01 m where (30.98 H11) is fro	32.01 m Append	ix H	(56)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
							02:01	02.01		02.01)		(58)
	•	•		om Table for each		59)m = ((58) ÷ 36	65 × (41)	m			J		(00)
	•						. ,	ng and a		r thermo	ostat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	ch	month ((61)m =	(60)) ÷ 36	65 × (41))m									
(61)m=	0	0	0		0	0		0	0	0		0	0		0	(C		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r eacl	n month	(62)r	n =	0.85 × ((45)m	+ (4	46)m +	(57)	m +	(59)m + (61)m	
(62)m=	189.79	167.57	176.67	7	159.33	156.83	1.	41.13	136.48	148.	46	147.79	165.1	7	173.45	185	5.54		(62)
Solar DH	W input	calculated	using A	ppe	ndix G or	Appendix	(H)	(negativ	ve quantity	/) (ente	er '0'	' if no sola	r contrib	outio	n to wate	er hea	ating)		
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	ap	plies,	, see Ap	pend	ix G	G)							
(63)m=	0	0	0		0	0		0	0	0		0	0		0	(C		(63)
Output	from w	ater hea	ter										-						
(64)m=	189.79	167.57	176.67	7	159.33	156.83	1.	41.13	136.48	148.	46	147.79	165.1	7	173.45	185	5.54		
			•				•			(Outp	out from wa	ater hea	ater	(annual)₁	12		1948.21	(64)
Heat g	ains fro	m water	heatin	g, I	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	(46) (m +	- (57)m	+ (5	i9)m]	
(65)m=	88.95	79.06	84.59		77.99	77.99	7	'1.93	71.22	75.	2	74.15	80.76	3	82.68	87.	.53		(65)
inclu	de (57)	m in calo	culation	יי ח ס	f (65)m	only if c	ylir	nder is	s in the c	dwelli	ng	or hot w	ater is	frc	m com	mun	ity h	eating	
5. Int	ernal a	ains (see	e Table	• 5	and 5a):	-				-						-	-	
	Ŭ	ns (Table																	
metab	Jan	Feb	Mai		Apr	May		Jun	Jul	Αι	ıa	Sep	Oct	t	Nov	D	ec		
(66)m=	92.91	92.91	92.91	-	92.91	92.91	-	92.91	92.91	92.9	-	92.91	92.91	-	92.91	92.			(66)
Liahtin	a aains	(calcula	ted in <i>i</i>	L Api	pendix	L. equat	ion	L9 oi	r L9a), a	lso se	ee T	Table 5	1						
(67)m=	15.16	13.47	10.95	<u> </u>	8.29	6.2	-	5.23	5.65	7.3		9.86	12.52	2	14.62	15.	.58		(67)
		ins (calc		_								see Ta							
(68)m=	162.03	163.71	159.47	-	150.45	139.06	r –	28.36	121.21	119.		123.77	132.7	9	144.18	154	.88	l	(68)
		calcula		_										Ů					()
(69)m=	32.29	32.29	32.29		32.29	2.29	<u> </u>	32.29	32.29	32.2		32.29	32.29	<u>, </u>	32.29	32.	29	l	(69)
						02.20		2.20	02.20	02.2	.0	02.20	02.20	<u></u>	02.20	02.	20		(00)
-		ns gains		3 58 T	a) 0	0	<u> </u>	0	0	0		0	0		0		`	l	(70)
(70)m=									0	0		0	0		0		J		(10)
		aporatic	<u> </u>			, `	—		74.00	74	22	74.00	74.0	<u> </u>	74.00	74	22	I	(71)
	-74.33				-74.33	-74.33		74.33	-74.33	-74.:	33	-74.33	-74.3	3	-74.33	-74	.33		(71)
		gains (T		ŕ	100.01	404.00			05.70			400.00	400 5		444.00			I	(70)
(72)m=	119.55	117.65	113.69	9	108.31	104.82	9	9.91	95.73	101.		102.98	108.5		114.83		7.65		(72)
		gains =						. ,	m + (67)m			. ,	· ·	<u> </u>				I	(70)
(73)m=	347.61	345.69	334.99	9	317.93	300.96	2	84.38	273.47	278.	84	287.49	304.7	4	324.5	338	3.99		(73)
	ar gain	s: calculated	uning of	lor	flux from	Table 6a	ond	00000	inted aqua	tiona t		nuart to th	o opplic	abl	o originator	ion			
0		Access F	0	nai	Area		anu	Flu	•		0.00		ie applic	abit	FF	.1011.		Gains	
Onenta		Table 6d			m²				x ble 6a		Т	g_ able 6b		Та	ble 6c			(W)	
Northea		0.77		~		<u>`</u>	~	1	1.00	_ [0.62	- ,		0.7		_	. ,	(75)
Northea	L	0.77		x	8.6		x		1.28	× v [0.63			0.7	\dashv	_	29.83	J
Northea	L	0.77		x	8.6		x		2.97	×		0.63			0.7	=	=	60.72	(75)
Northea	L	0.77		x	8.6		x		1.38	X		0.63		F	0.7	\dashv	=	109.4	(75)
	L	0.77		X	8.6		X		7.96	X		0.63	×	F	0.7	=	=	179.67	(75)
Northea	ιοι <mark>0.9</mark> χ	0.77		x	8.6	55	x	9	1.35	X		0.63	X		0.7		=	241.51	(75)

													_
Northeast 0.9x	0.77	×	8.6	65	x	97.38	x	0.63	x	0.7	=	257.47	(75)
Northeast 0.9x	0.77	x	8.6	65	x	91.1	x	0.63	×	0.7	=	240.86	(75)
Northeast 0.9x	0.77	x	8.6	65	x	72.63	x	0.63	x	0.7	=	192.02	(75)
Northeast 0.9x	0.77	x	8.6	65	x	50.42	x	0.63	x	0.7	=	133.31	(75)
Northeast 0.9x	0.77	x	8.6	65	x	28.07	x	0.63	x	0.7	=	74.21	(75)
Northeast 0.9x	0.77	x	8.6	65	x	14.2	x	0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	x	8.6	65	x	9.21	x	0.63	x	0.7	=	24.36	(75)
Solar <u>gains in</u>	watts, ca	alculated	for eac	h month			(83)m =	Sum(74)m	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.47		192.02	2 133.31	74.21	37.53	24.36		(83)
Total gains –	1	i	. ,	= (73)m ·	i , ,			_				1	
(84)m= 377.44	406.41	444.39	497.59	542.46	541.85	514.33	470.85	6 420.8	378.94	362.04	363.35		(84)
7. Mean inte	rnal temp	oerature	(heating	season)								
Temperature	e during h	eating p	eriods ir	n the livi	ng area	from Ta	ble 9, T	ĥ1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for l	iving are	ea, h1,m	(see T	able 9a)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.95	0.93	0.9	0.81	0.68	0.51	0.39	0.44	0.66	0.85	0.93	0.95		(86)
Mean interna	al temper	ature in	living are	ea T1 (fo	ollow st	eps 3 to	7 in Tal	ole 9c)		-	-		
(87)m= 19.37	19.56	19.91	20.38	20.73	20.92	20.98	20.96		20.38	19.82	19.34		(87)
Temperature			oriode ir	rest of	dwellin	a from Tr		 Th2 (°C)					
(88)m= 20.19	20.19	20.19	20.2	20.2	20.21	20.21	20.22		20.2	20.2	20.19		(88)
Utilisation fa	T		()		r Ì	T	T Ó		0.00	0.00	0.05	l	(89)
(89)m= 0.94	0.93	0.88	0.79	0.64	0.46	0.32	0.37	0.6	0.83	0.92	0.95		(03)
Mean interna	al temper	ature in		1	<u> </u>	`	eps 3 to	1	r			I	
(90)m= 18	18.27	18.77	19.43	19.9	20.14	20.2	20.19	20.03	19.44	18.65	17.96		(90)
									tLA = Livir	ig area ÷ (4) =	0.45	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1 –	fLA) × T2	_	_	-		
(92)m= 18.62	18.85	19.29	19.86	20.27	20.49	20.55	20.54	20.39	19.87	19.18	18.59		(92)
Apply adjust	r	i		· · · ·	1	T T	1		opriate			I	
(93)m= 18.62	18.85	19.29	19.86	20.27	20.49	20.55	20.54	20.39	19.87	19.18	18.59		(93)
8. Space he													
Set Ti to the the utilisation			•		ned at s	tep 11 of	Table	9b, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa				Indy			/////		000	1101	200		
(94)m= 0.93	0.91	0.87	0.78	0.64	0.48	0.35	0.4	0.62	0.82	0.9	0.93		(94)
Useful gains	, hmGm ,	, W = (94	4)m x (84	4)m		I	1						
(95)m= 349.84	369.11	385.16	387.75	349.75	260.31	181.18	187.36	6 259.78	308.86	326.13	339.02		(95)
Monthly ave	rage exte	rnal tem	perature	e from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	te for mea	an intern	al tempe	erature,	Lm,W	=[(39)m	x [(93)ı	m– (96)m]			L	
(97)m= 701.16		622.29	525.19	409.74	277.28		194.24		442.78	580.62	695.95		(97)
Space heati	1				1	-	1	<u> </u>	<u> </u>	r	1	I	
(98)m= 261.38	209.63	176.42	98.95	44.63	0	0	0	0	99.64	183.23	265.55		

	Total per year (kWh/y	rear) = Sum(98) _{15,912} =	1339.44	(98)
Space heating requirement in kWh/m²/year		[24.04	(99)
9b. Energy requirements – Community heating scheme				
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab		nmunity scheme.	0	(301)
Fraction of space heat from community system $1 - (301) =$		Γ	1	(302)
The community scheme may obtain heat from several sources. The procedure allow		our other heat sources; th	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See A Fraction of heat from Community boilers	Appenaix C.	Γ	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 community	heating system	Ī	1	(305)
Distribution loss factor (Table 12c) for community heating system		[1.05	(306)
Space heating		-	kWh/year	_
Annual space heating requirement			1339.44	
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	1406.41	(307a)
Efficiency of secondary/supplementary heating system in % (from T	able 4a or Appen	dix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 1	00 ÷ (308) =	0	(309)
Water heating				
Annual water heating requirement		[1948.21	
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2045.62	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e)] =	34.52	(313)
Cooling System Energy Efficiency Ratio		Γ	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 outs	side	-	193.3	(330a)
warm air heating system fans		ſ	0	(330b)
pump for solar water heating		Γ	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	193.3	(331)
Energy for lighting (calculated in Appendix L)		[267.75	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		Ī	-568.11	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ty)	[0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor E kg CO2/kWh	Emissions (g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	fuels repeat (363) to ((366) for the second fuel	94	(367a)
CO2 associated with heat source 1 [(307b)+(310	o)] x 100 ÷ (367b) x	0.22 =	793.23	(367)
Electrical energy for heat distribution [(313	i) x	0.52 =	17.92	(372)

Total CO2 associated with community s	ystems	(363)(366) + (368)(37	2)	=	811.15	(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) =			811.15	(376)
CO2 associated with electricity for pump	os and fans within dwe	lling (331)) x	0.52	=	100.32	(378)
CO2 associated with electricity for lightin	ng	(332))) x	0.52	=	138.96	(379)
Energy saving/generation technologies	(333) to (334) as appli		0.52 × 0.0	1 =	-294.85	(380)
Total CO2, kg/year	sum of (376)(382) =				755.58	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				13.56	(384)
El rating (section 14)					89.95	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 3

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):	None Indicative False	-			
Summer ventilation h Transmission heat lo Summer heat loss co	ss coeffi	cient:	ient:	183.86 36.7 220.53				(P1) (P2)
Overhangs:								
Orientation:	Ratio:		Z_overhangs:					
North East (NE)	0		1					
Solar shading:								
Orientation: North East (NE) Solar gains:	Z blinc 1	ls:	Solar access: 0.9	Ove 1	rhangs:	Z summer: 0.9		(P8)
Orientation		Area	Flux	g_	FF	Shading	Gains	
North East (NE)	0.9 x	8.65	98.85	0.63	0.7	0.9 Total	305.45 305.45	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer externa Thermal mass temperature	l tempera iture incre	ement		38 7* 3. 16 1. 20	3).56	July 375.95 681.41 3.09 17.9 1.3 22.29	August 383.03 632.93 2.87 17.8 1.3 21.97	
Likelihood of high int Assessment of likelih		-			l ight edium	Medium	Slight	

Assessor Name:Zahid AshrafStroma Number:STRO001082Software Name:Stroma FSAP 2012Software Version:Version: 1.0.5.9Property Address: Plot 3Address :1.0verall dwelling dimensions:Area(m?)Av. Height(m)Volume(m³)Gound floor55.72(1a) x2.5(2a) =139.29(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)55.72(1a) x2.5(2a) =139.29(5a)Outling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =139.29(5)Vertilation rate:Number of chimneys0+0=0x40 =0(6a)Number of open flues0+0=0x40 =0(6b)Number of passive vents0x10 =0(7b)Number of flueless gas fires0x40 =0(7c)Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =20 \div (5) =0.14(6)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(9)(40)Number of storeys in the dwelling (ns)0((9)-1)p.0.1 =0(10)
Address :1. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Ground floor 55.72 (1a) x 2.5 (2a) = 139.29 (3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 55.72 (1a) x 2.5 (2a) = 139.29 (3a)Outling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =139.29 (5)2. Ventilation rate:Mumber of chimneys0+0+0+0+0+0+0+0+0+0+0 0000000000000000000000000000000$
Area(m²)Av. Height(m)Volume(m³) Ground floor 55.72 $(1a) \times 2.5$ $(2a) = 139.29$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 55.72 $(1a) \times 2.5$ $(2a) = 139.29$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 55.72 $(1a) \times 2.5$ $(2a) = 139.29$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 55.72 $(1a) \times 2.5$ $(2a) = 139.29$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 55.72 $(1a) \times 2.5$ $(2a) = 139.29$ $(3a)$ Dowelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 139.29$ (5) 2. Ventilation rate: Number of chimneys 0 (4) Number of passive vents 0 $(6a)$ Number of passive vents $2a \times 10 = 2a$ $(7a)$ Number of flueless gas fires 0 $4b = 0$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) = 2a$ $2a$ $4b = 0$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c)= 2a$ $2a$ 4
Area(m²) Ground floorAv. Height(m) 2.5Volume(m³) 139.29Ground floor 55.72 (1a) x 2.5 (2a) = 139.29 (3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 55.72 (4)Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 139.29 (5) 2. Ventilation rate: (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 139.29 (5)Number of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x20 =$ 0 (6b)Number of passive vents 0 $x 10 =$ 20 (7a)Number of flueless gas fires 0 $x 40 =$ 0 (7c)Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 \div (5) = 0.14 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)
Ground floorGround floor 55.72 $(1a) \times 2.5$ $(2a) = 139.29$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 55.72 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 139.29$ (5) 2. Ventilation rate: $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 139.29$ (5) Number of chimneys 0 $+$ 0 $=$ 0 Number of open flues 0 $+$ 0 $=$ 0 $(40) = 0$ Number of intermittent fans $2 \times 10 = 20$ $(7a)$ Number of passive vents $0 \times 40 = 0$ $(7c)$ Number of flueless gas fires $0 \times 40 = 0$ $(7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20$ $+$ $(5) = 0.14$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)
Dwelling volume $(3a)+(3c)+(3d)+(3e)+(3n) =$ 139.29 (5) 2. Ventilation rate:main heatingsecondary heatingother totaltotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x 40 =$ 0 $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $x 20 =$ 0 $(6b)$ Number of intermittent fans 2 $x 10 =$ 20 $(7a)$ Number of passive vents 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 = $(6a)+(6b)+(7a)+(7c) =$ 20 \div $(5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div $(5) =$ 0.14 (6) Number of storeys in the dwelling (ns) 0 (9) 0 (9)
2. Ventilation rate:main heatingsecondary heatingothertotalm³ per hourNumber of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $x40 =$ 0 (6a)Number of open flues 0 $+$ 0 $+$ 0 $=$ 0 $x20 =$ 0 (6b)Number of intermittent fans 2 $x10 =$ 20 (7a)Number of passive vents 0 $x10 =$ 0 (7b)Number of flueless gas fires 0 $x40 =$ 0 (7c)Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div \div $(5) =$ 0.14 (8)Infiltration test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)
main heatingsecondary heatingothertotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x 40 =$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x 20 =$ 0 (6b)Number of intermittent fans 2 $x 10 =$ 20 (7a)Number of passive vents 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 = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 20 $\div (5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 20 $\div (5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 20 $\div (5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 20 $\div (5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 20 $\div (5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 20 $\div (5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 20 $\div (5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 20 $\div (5) =$ 0.14 Infiltration due to chimneys in the dwelling (ns)
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 2 $x 10 =$ 20 $(7a)$ Number of passive vents 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 = $(6a)+(6b)+(7a)+(7c) =$ 20 $+$ $(5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 $+$ $(5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 $+$ $(5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 $+$ $(5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 $+$ $(5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 $+$ $(5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 $+$ $(5) =$ 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 (6) 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 (6) Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ (6)
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 2 $x 10 =$ 20 $(7a)$ Number of passive vents 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 = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 \div (5) = 0.14 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)
Number of intermittent fans 2 $x 10 =$ 20 $(7a)$ Number of passive vents 0 $x 10 =$ 0 $(7b)$ Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per houri (5) = 0.14 (8)Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 0 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ Infiltration due to chimneys, flues an
Number of passive vents 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 = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div (5) =$ 0.14 (8) Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div (5) =$ 0.14 (8) Number of storeys in the dwelling (ns)
Number of flueless gas fires Number of flueless gas fires $ \begin{array}{c} 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ $
Air changes per hour Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)
Air changes per hour Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 \div (5) = 0.14 (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)
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) 0 (9)
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)
Number of storeys in the dwelling (ns)
Additional infiltration $[(9)-1]x0.1 = 0$ (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)
If no draught lobby, enter 0.05, else enter 0
Percentage of windows and doors draught stripped 0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered 2 (19)
Number of sides sheltered 2 (19) Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85 (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.25$ (21)
Infiltration rate modified for monthly wind speed
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7
Wind Factor $(22a)m = (22)m \div 4$
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18

Adjust	ed infiltr	ation rat	e (allow	ing for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m					
	0.32	0.31	0.31	0.27	0.27	0.24	0.24	0.23	0.25	0.27	0.28	0.29]	
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se	-	-	-	-		-	(23a)
				endix N, (2	(23a) = (23a	a) × Fmv (e	equation (1	N5)) . othe	rwise (23b) = (23a)			0	(23a)
			0 11	iency in %	, ,	, ,	• •	,, .	,	, (,			0	(230) (23c)
			-	entilation	-					2h)m + (23b) x [*	1 – (23c)	-	(200)
(24a)m=		0		0	0	0	0	0	0	0	0	0]	(24a)
b) If	balance	d mecha	ı anical ve	entilation	without	heat rec	L Covery (N	и ЛV) (24b	m = (22)	1 2b)m + (2	23b)	I	1	
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ver	tilation of	or positiv	/e input v	ventilatio	on from o	outside					
	if (22b)n	n < 0.5 ×	(23b), t	then (24	c) = (23b); other	wise (24	c) = (22k	o) m + 0.	.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				iole hous m = (22l		•				0.5]				
(24d)m=	0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.54		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in box	(25)			•		
(25)m=	0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.54		(25)
3 He	at losse	s and he	eat loss	paramet	er.									
	IENT	Gros	SS	Openin rr	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	()	k-value kJ/m²·l		A X k kJ/K
Doors		arca	(111)		•	2		1.4	=	2.8				(26)
Windo	ws					8.651	<u> </u>	/[1/(1.4)+	!	11.47				(27)
Floor						55.71		0.12		6.6858				(28)
Walls	Tvne1	48.9	20	8.65	:	40.34		0.12		6.05			\dashv	(20)
Walls		40.8		2	<u>, </u>	2.4	÷ ^	0.13		0.34			\dashv	(29)
		elements		2		109.1		0.14		0.54	L			(31)
				effective wi	ndow U-va			ı formula 1	/[(1/LJ-valı	ıe)+0.041 a	ns aiven in	paragraph	132	(31)
				nternal wal			alou aonig	, contrained a	/(// C + Cale		ie groon in	palagiapi		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				27.35	(33)
Heat c	apacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	6727	(34)
Therm	al mass	parame	eter (TMI	⁻ = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
	•	sments wh ad of a de		etails of the	construct	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
				culated	using Ap	pendix l	K						9.32	(36)
	•	•	,	10wn (36) =	• •	•								
Total f	abric he	at loss							(33) +	(36) =			36.67	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l	
(38)m=	25.31	25.22	25.13	24.71	24.64	24.27	24.27	24.21	24.41	24.64	24.79	24.96	J	(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m=	61.98	61.89	61.8	61.39	61.31	60.95	60.95	60.88	61.08	61.31	61.46	61.63		
										Average =	Sum(39)1	12 /12=	61.38	(39)

Heat lo	oss para	ımeter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.11	1.11	1.11	1.1	1.1	1.09	1.09	1.09	1.1	1.1	1.1	1.11		
Numbe	er of day	/s in mo	nth (Tab	le 1a)		1				Average =	Sum(40)1	.12 /12=	1.1	(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.	1.8 .9)	86		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o	62. f	.46		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for e	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	90.7	87.4	84.11	80.81	77.51	74.21	74.21	77.51	80.81	84.11	87.4	90.7		
-						100					m(44) ₁₁₂ =		989.48	(44)
				i	· ·	·	. <u> </u>	i		·	ables 1b, 10			
(45)m=	134.51	117.64	121.4	105.84	101.55	87.63	81.2	93.18	94.3	109.89	119.96	130.27		
lf instan	taneous w	vater heati	ng at poin	t of use (no	o hot water	^r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1297.37	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:									11			
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 ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	•		eclared I	loss facto	or is kno	wn (kWł	n/dav):)		(48)
,		actor fro				,	, , ,)		(49)
•				e, kWh/ye	ear			(48) x (49)) =)		(50)
			-	cylinder		or is not	known:				`	5		()
		-		rom Tabl	le 2 (kW	h/litre/da	ay)				()		(51)
	-	eating s from Ta		on 4.3										(52)
		actor fro		e 2b)		(52) (53)
				e, kWh/ye	ear			(47) x (51)) x (52) x (53) =)		(54)
		(54) in (5	-	,						,)		(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	l d solar sto	nage, (57)	i m = (56)m	x [(50) – (I [H11)] ÷ (5	i0), else (5	7)m = (56)	m where (H11) is froi	m Appendi	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) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wa	ter heati	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	alculated	for ea	ch	month ((61)m =	(60)) ÷ 36	65 × (41))m								
(61)m=	0	0	0		0	0		0	0	0	0		0	0	0)		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r each	n month	(62)m	= 0.85	× (45)m +	(46)m +	(57)ı	m +	(59)m + (61)m	
(62)m=	114.33	100	103.1	9	89.96	86.32	7	4.49	69.02	79.21	80.1	5	93.41	101.96	110	.73		(62)
Solar DH	-IW input	calculated	using A	ppe	endix G or	Appendix	Η ((negativ	ve quantity	/) (enter	'0' if no s	olar	· contribu	tion to wate	er hea	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=	114.33	100	103.1	9	89.96	86.32	7	4.49	69.02	79.21	80.1	5	93.41	101.96	110	.73		
										0	utput fron	n wa	ater heate	er (annual)	112		1102.76	(64)
Heat g	ains fro	m water	heatin	ıg,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m] + 0.	8 x	[(46)m	ı + (57)m	+ (5	9)m	1]	
(65)m=	28.58	25	25.8		22.49	21.58	1	8.62	17.26	19.8	20.0	4	23.35	25.49	27.	68		(65)
inclu	de (57)	m in calo	culatio	n o	f (65)m	only if c	ylir	nder is	s in the c	dwellin	g or ho	t wa	ater is f	rom com	muni	ity ł	eating	
5. Int	ernal a	ains (see	e Table	e 5	and 5a):	-				-						-	
		ns (Table																
metab	Jan	Feb	Ma		Apr	May		Jun	Jul	Aug	g Se	р	Oct	Nov	D	ес	1	
(66)m=	92.91	92.91	92.91	-	92.91	92.91	_	2.91	92.91	92.91		<u> </u>	92.91	92.91	92.			(66)
Liahtin	a aains	(calcula	ted in	L Api	pendix	L. equat	ion	L9 or	r L9a), a	lso se	e Table	5			1		1	
(67)m=	15.16	13.47	10.95	<u> </u>	8.29	6.2		5.23	5.65	7.35	9.86		12.52	14.62	15.	58	1	(67)
		ins (calc	L ulated	 in	Annend	l lixlea	Lat		13 or I 1	l 3a) al		 Tał	nle 5				1	
(68)m=	162.03	163.71	159.4	-	150.45	139.06		28.36	121.21	119.5			132.79	144.18	154	.88	1	(68)
		s (calcula		_													1	
(69)m=	32.29	32.29	32.29	-i	32.29	2.29	_	2.29	32.29	32.29		-	32.29	32.29	32.	29	1	(69)
						02.20		2.20	02.20	02.20	02.2	Ŭ	02.20	02.20	02	20	l	(00)
(70)m=		ins gains			a) 0	0		0	0	0	0		0	0	0	<u> </u>	1	(70)
			_						0	0	0		0	0	0	,	J	(10)
	<u> </u>	vaporatio		́-т		, `		,	74.00	74.00	740		74.00	74.00	74	00	1	(71)
(71)m=			-74.3	_	-74.33	-74.33	- /	74.33	-74.33	-74.3	3 -74.3	33	-74.33	-74.33	-74.	.33	J	(71)
) gains (T		ŕ													1	(70)
(72)m=	38.42	37.2	34.67	<u> </u>	31.24	29.01	2	5.86	23.19	26.61			31.39	35.4	37.:	21	J	(72)
		l gains =							. ,	· ,				71)m + (72)	<u> </u>		1	
(73)m=	266.48	265.25	255.9	7	240.85	225.14	2	10.33	200.94	204.3	7 212.3	34	227.58	245.07	258	.54		(73)
	lar gain				0	Table Oa								hla anda atau				
			Ũ	blar			and			tions to		o th	e applica	ble orientat	tion.		Coine	
Orienta		Access F Table 6d			Area m ²			Flu Tab	x ble 6a		g_ Table (6b	г	FF able 6c			Gains (W)	
Northor																		
Northea		0.77		x	8.6		x		1.28		0.63			0.7		=	29.83	(75)
Northea	-	0.77		X	8.6		X		2.97		0.63		╡ [╵] ┝	0.7		=	60.72	(75)
Northea	1	0.77		x	8.6		x		1.38		0.63		₋ı × Ŀ	0.7		=	109.4	(75)
Northea		0.77		x	8.6	65	x	6	7.96	×	0.63			0.7		=	179.67	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	8.6	5	x	9	1.35	x	0.63		x	0.7		=	241.51	(75)

Northeast $0.9x$ 0.77 x 8.65 x 91.1 x 0.63 x 0.7 = 240.86 Northeast $0.9x$ 0.77 x 8.65 x 72.63 x 0.63 x 0.7 = 192.02 Northeast $0.9x$ 0.77 x 8.65 x 50.42 x 0.63 x 0.7 = 133.31 Northeast $0.9x$ 0.77 x 8.65 x 28.07 x 0.63 x 0.7 = 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 = 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 = 24.36 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (82)m (84	 75) 75) 75) 75) 75) 75) 75) 83) 84) 85) 											
Northeast $0.9x$ 0.77 x 8.65 x 72.63 x 0.63 x 0.7 = 192.02 Northeast $0.9x$ 0.77 x 8.65 x 50.42 x 0.63 x 0.7 = 133.31 Northeast $0.9x$ 0.77 x 8.65 x 28.07 x 0.63 x 0.7 = 133.31 Northeast $0.9x$ 0.77 x 8.65 x 28.07 x 0.63 x 0.7 = 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 = 37.53 Northeast $0.9x$ 0.77 x 8.65 x 9.21 x 0.63 x 0.7 = 24.36 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 9.21 x 0.63 x 0.7 $=$ 24.36 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 29	 (75) (75) (75) (75) (75) (83) (84) (85) 											
Northeast $0.9x$ 0.77 × 8.65 × 50.42 × 0.63 × 0.77 = 133.31 Northeast $0.9x$ 0.77 × 8.65 × 28.07 × 0.63 × 0.77 = 133.31 Northeast $0.9x$ 0.77 × 8.65 × 28.07 × 0.63 × 0.77 = 74.21 Northeast $0.9x$ 0.77 × 8.65 × 14.2 × 0.63 × 0.77 = 74.21 Northeast $0.9x$ 0.77 × 8.65 × 14.2 × 0.63 × 0.77 = 37.53 Northeast $0.9x$ 0.77 × 8.65 × 9.21 × 0.63 × 0.77 = 24.36 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	 (75) (75) (75) (75) (83) (84) (85) 											
Northeast $0.9x$ 0.77 x 8.65 x 28.07 x 0.63 x 0.7 = 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 = 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 = 37.53 Northeast $0.9x$ 0.77 x 8.65 x 9.21 x 0.63 x 0.7 = 37.53 Northeast $0.9x$ 0.77 x 8.65 9.21 x 0.63 x 0.7 = 24.36 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (82)m (82	 (75) (75) (83) (84) (85) 											
Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 = 37.53 Northeast $0.9x$ 0.77 x 8.65 x 9.21 x 0.63 x 0.7 = 24.36 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (82)m (83)m = 29.83 60.72 109.4 179.67 241.51 257.47 240.86 192.02 133.31 74.21 37.53 24.36 Total gains – internal and solar (84)m = (73)m + (83)m, watts (84)m= 296.31 325.97 365.37 420.52 466.65 467.8 441.79 396.39 345.64 301.78 282.61 282.9 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 21 Utilisation factor for gains for living area, h1,m (see Table 9a) 345.64 30.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) $(86)m =$ 0.97 0.94 0.89 $0.2.35$ 20.73	 (75) (75) (83) (84) (85) 											
Northeast $0.9x$ 0.77 x 8.65 x 9.21 x 0.63 x 0.7 $=$ 24.36 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 29.83 60.72 109.4 179.67 241.51 257.47 240.86 192.02 133.31 74.21 37.53 24.36 Total gains – internal and solar (84)m = (73)m + (83)m, watts (84)m = 296.31 325.97 365.37 420.52 466.65 467.8 441.79 396.39 345.64 301.78 282.61 282.9 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 Utilisation factor for gains for living area, h1,m (see Table 9a) $[366]m =$ 0.97 0.94 0.89 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) $(87)m =$ 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.52 19.83 19.1 18.53 Temperature du	 (75) (83) (84) (85) 											
Solar gains in watts, calculated for each month (B3)m = Sum(74)m(82)m (B3)m= 29.83 60.72 109.4 179.67 241.51 257.47 240.86 192.02 133.31 74.21 37.53 24.36 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 296.31 325.97 365.37 420.52 466.65 467.8 441.79 396.39 345.64 301.78 282.61 282.9 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 Utilisation factor for gains for living area, h1,m (see Table 9a) [B6)m= 0.97 0.97 0.94 0.89 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) [Chemating from Table 9, Th2 (°C) [Chemating from Table 9, Th2 (°C)	83) 84) 85)											
(83)m= 29.83 60.72 109.4 179.67 241.51 257.47 240.86 192.02 133.31 74.21 37.53 24.36 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 296.31 325.97 365.37 420.52 466.65 467.8 441.79 396.39 345.64 301.78 282.61 282.9 Comportation of the second second	84)											
(83)m= 29.83 60.72 109.4 179.67 241.51 257.47 240.86 192.02 133.31 74.21 37.53 24.36 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 296.31 325.97 365.37 420.52 466.65 467.8 441.79 396.39 345.64 301.78 282.61 282.9 Comportation of the second second	84)											
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 296.31 325.97 365.37 420.52 466.65 467.8 441.79 396.39 345.64 301.78 282.61 282.9 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 0.97 0.97 0.94 0.89 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	84)											
(84)m= 296.31 325.97 365.37 420.52 466.65 467.8 441.79 396.39 345.64 301.78 282.61 282.9 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.94 0.89 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	85)											
7. Mean internal temperature (heating season)Temperature during heating periods in the living area from Table 9, Th1 (°C)21Utilisation factor for gains for living area, h1,m (see Table 9a)Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec(86)m= 0.97 0.97 0.94 0.89 0.8 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) $(87)m=$ 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	85)											
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.97 0.94 0.89 0.8 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)												
Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.97 0.94 0.89 0.8 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.97 0.97 0.94 0.89 0.8 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	00)											
(86)m= 0.97 0.94 0.89 0.8 0.66 0.53 0.59 0.8 0.92 0.96 0.98 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	00)											
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	00											
(87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	86)											
(87)m= 18.58 18.78 19.21 19.8 20.35 20.73 20.89 20.85 20.52 19.83 19.1 18.53 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)												
	87)											
	88)											
	,											
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	200											
(89)m= 0.97 0.96 0.93 0.87 0.76 0.59 0.44 0.5 0.74 0.91 0.96 0.97	89)											
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)												
	90)											
$fLA = Living area \div (4) = 0.45$	91)											
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$												
(92)m= 18.13 18.34 18.76 19.35 19.88 20.24 20.38 20.35 20.05 19.38 18.66 18.09	92)											
Apply adjustment to the mean internal temperature from Table 4e, where appropriate												
	93)											
8. Space heating requirement												
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a	Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
Utilisation factor for gains, hm:												
Useful gains, hmGm , W = (94)m x (84)m	94)											
	94)											
	(94) (95)											
Monthly average external temperature from Table 8												
	(95)											
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	(95)											
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m]	95) 96)											

	Total per year (kWh/year) = Sum(98) _{15,912} =												2356.44	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								42.29	(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	572.89	450.99	462.67	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	oss hm											
(101)m=	0	0	0	0	0	0.76	0.82	0.78	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	vatts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	432.79	367.94	360.27	0	0	0	0		(102)
Gains	(solar g	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	616.64	584.94	533	0	0	0	0		(103)
						lwelling,	continue	ous (kW	(h) = 0.0	24 x [(10)3)m – (102)m] x	x (41)m	
set (1	04)m to	zero if ((104)m <	: 3 × (98)m									
(104)m=	0	0	0	0	0	132.37	161.45	128.51	0	0	0	0		
										= Sum(,	=	422.34	(104)
	I fractior								f C =	cooled a	area ÷ (4	4) =	1	(105)
	ttency fa	actor (Ta	able 10b)									1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
									Total	l = Sum((104)	=	0	(106)
· ·		-	r	month =			r <u>í</u>	I			1		l	
(107)m=	0	0	0	0	0	33.09	40.36	32.13	0	0	0	0		_
									Total	= Sum(107)	=	105.58	(107)
Space	cooling	requirer	ment in k	kWh/m²/y	/ear				(107)) ÷ (4) =			1.9	(108)
8f. Fab	ric Ener	gy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric	Energy	/ Efficier	псу						(99) ·	+ (108) =	=		44.19	(109)

SAP Input

Property Details: Pl	ot 3								
Address: Located in: Region: UPRN: Date of assessm Date of certificat Assessment type Transaction type Tenure type: Related party dis Thermal Mass Pa Water use <= 12 PCDF Version:	te: e: e: sclosure: arameter:	New dv New dv Unknov No rela Indicati	s valley 2020 ber 2020 velling design sta velling	ge					
Property description	า:								
Dwelling type: Detachment:		Flat							
Year Completed:		2020							
Floor Location:		Floor	area:						
Floor 0		55.715	m²	5	torey height 2.5 m				
Living area:			m ² (fraction 0.4	53)					
Front of dwelling factors of the opening types:	aces:	South V	vest						
Name:	Source:	Τv	vpe:	Glazing:		Argon:	Fram	e.	
SW	Manufacturer	So	lid	-		-	Train	0.	
NE	Manufacturer	W	ndows	double-glaze	d	Yes			
Name:	Gap:		Frame Facto	-	U-value:	Area:		f Openings:	
SW NE	mm 16mm or r	nore	0 0.7	0 0.63	1.4 1.4	2 1 8.651 1			
Name: SW NE	Type-Name:	Сс	ocation: rridor Wall ternal Wall	Orient: South West North East		Width: 0 0	Heigl 0 0	nt:	
Overshading: Opaque Elements:		Average	e or unknown						
51	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain	wall:	Карра:	
External Elements External Wall	48.992	8.65	40.34	0.15	0	False		N/A	
Corridor Wall	4.398	2	2.4	0.15	0.31	False		N/A	
Ground Floor <u>Internal Elements</u> <u>Party Elements</u>	55.715			0.12				N/A	
Thermal bridges:									
Thermal bridges:		User-de Lengt l		PSI-values) Y-Valu I e	e = 0.0854				
		4.795 13.2	0.291 0.048	E2 Other E4 Jamb	er lintels (including other steel lintels) b				
		13.2 18.099	0.048	= ·	nd floor (normal)				

SAP Input

[Approved]	18.099	0.069	E7	Party floor between dwellings (in blocks of flats)
	1.757	0.098	E24	Eaves (insulation at ceiling level - inverted)
	2.95	0.09	E16	Corner (normal)
	8.85	0.057	E18	Party wall between dwellings
	2.95	0.096	E25	Staggered party wall between dwellings
	12.241	0.16	P1	Ground floor
	10.383	0	P3	Intermediate floor between dwellings (in blocks of flats)

Ventilation:	
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 0 0 2 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: Water heating:	None
Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False
Others:	
Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics:	Standard Tariff Unknown No conservatory 100% Low rise urban / suburban English No <u>Photovoltaic 1</u> Installed Peak power: 0.69 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West
Assess Zero Carbon Home:	No

			User D	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20	-	:	Softwa	a Num are Ver				001082 n: 1.0.5.9	
		Pr	operty A	Address:	Plot 3					
Address :										
1. Overall dwelling dimer	ISIONS:		•	(0)			• • • • • •		N I (0)	
Ground floor			Area	· ·	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³) 139.29	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	1e)+(1n) 55	5.72	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	139.29	(5)
2. Ventilation rate:										
	main heating	secondary heating	y (other		total			m ³ per hou	•
Number of chimneys	0 +	0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	x2	20 =	0	(6b)
Number of intermittent far	IS					2	x ´	10 =	20	(7a)
Number of passive vents					Γ	0	x	10 =	0	(7b)
Number of flueless gas fir	es				Γ	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	s. flues and fans =	(6a)+(6b)+(7a	a)+(7b)+(7	′c) =	Г	20	<u> </u>	÷ (5) =	0.14	(8)
If a pressurisation test has be					continue fro				0.11	
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	esent, use the value corr				•	uction			0	(11)
If suspended wooden fle	oor, enter 0.2 (unse	aled) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0)							0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration				•	x (14) ÷ 1	· ·	(4.5)		0	(15)
Infiltration rate	50	1.			+ (11) + (1				0	(16)
Air permeability value, o If based on air permeabilit			•	•	•	etre of e	nvelope	area	5	(17)
Air permeability value applies	-					is heina u	sed		0.39	(18)
Number of sides sheltered	•		o or a acg	lee all per		o sonig u			2	(19)
Shelter factor				(20) = 1 - [[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)) x (20) =				0.33	(21)
Infiltration rate modified for	r monthly wind spee	ed								_
Jan Feb I	Mar Apr May	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7					_	-	-		
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allow	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m	-		_		
	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39		
		<i>ctive air</i> al ventila	•	rate for t	he appli	cable ca	se							
				andix N (2	(23a) – (23a) x Fmv (e	equation (I	N5)) , othei	rwise (23h) – (23a)			0	(23a)
		• •	0 11		, ,	, (• •	n Table 4h	,) = (200)			0	(23b)
			-	-	-			HR) (24a		2b)m + ('	23h) v [*	1 _ (23c)	0 · 1001	(23c)
a) II (24a)m=									0 $11 = (22)$	0	23D) X [0	- 100j	(24a)
		_		-		-		_	-	-	÷	Ŭ		(,
(24b)m=								VV) (24b	0 = (22)	0	230)	0		(24b)
	-									0	0	0		(210)
					•	-		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		0.51				
(24d)m=	<u> </u>	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(24d)
								d) in box						
(25)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
()								1						~ /
				paramet										
ELEN	IENT	Gros area		Openin rr		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-valu∉ kJ/m²∙ł		A X k kJ/K
Doors						2	x	1	=	2				(26)
Windo	WS					8.651	x1	/[1/(1.4)+	0.04] =	11.47				(27)
Floor						55.71	5 X	0.13] = [7.24295	5			(28)
Walls	Type1	48.9	99	8.65	;	40.34	4 X	0.18		7.26			\exists	(29)
Walls [·]	Type2	4.4		2		2.4	x	0.18		0.43	5		$\exists \vdash$	(29)
Total a	area of e	elements	, m²			109.1	1		L					(31)
* for win	ndows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcul	lated using	g formula 1,	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	3.2	
				nternal wal	ls and par	titions								
		ss, W/K :	•	U)				(26)(30)	+ (32) =				28.41	(33)
		Cm = S(. ,						((28)	.(30) + (32	2) + (32a).	(32e) =	6727	(34)
Therm	al mass	parame	ter (TM	P = Cm -	- TFA) ir	∩ kJ/m²K			Indica	tive Value:	Medium		250	(35)
	-	sments wh ad of a de			construct	ion are noi	t known pi	recisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix I	K						7.44	(36)
if details	s of therma	al bridging	are not kr	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			35.84	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			i	(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	27.16	27	26.84	26.09	25.96	25.3	25.3	25.18	25.55	25.96	26.24	26.53		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	63.01	62.84	62.68	61.94	61.8	61.15	61.15	61.03	61.4	61.8	62.08	62.38		
									/	Average =	Sum(39)1	12 /12=	61.94	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.13	1.13	1.13	1.11	1.11	1.1	1.1	1.1	1.1	1.11	1.11	1.12		
Numbe	er of day	/s in mo	nth (Tab	le 1a)	•		•	-	/	Average =	Sum(40)1.	.12 /12=	1.11	(40)
- turnov	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			1						
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF if TF	A > 13.9 A £ 13.9	9, N = 1	+ 1.76 x)2)] + 0.(TFA -13.		86		(42)
Reduce	the annua	al average	hot water		5% if the a	welling is	designed	(25 x N) to achieve		se target o		.33		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	86.17	83.03	79.9	76.77	73.63	70.5	70.5	73.63	76.77	79.9	83.03	86.17		
_											m(44) ₁₁₂ =		940.01	(44)
					-			OTm / 3600		-		-		
(45)m=	127.78	111.76	115.33	100.54	96.48	83.25	77.14	88.52	89.58	104.4	113.96	123.75		
lf instan	taneous w	vater heati	ng at point	t of use (no	o hot water	^r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1232.5	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
· · ·	storage	loss:												
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	-		ank in dw	-			. ,	`	(0) : ((-)			
	vise if no storage		hot wate	er (this ir	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)
		actor fro				,)		(49)
Energy	/ lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)) =)		(50)
,				cylinder										
		age loss leating s		rom Tabl	le 2 (kW	h/litre/da	ay)				(0		(51)
	•	from Ta		011 4.5)		(52)
		actor fro		2b))		(52)
Energy	/ lost fro	m water	· storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =)		(54)
		(54) in (5	•)		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	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	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (ar	nual) fro	om Table		•		-		•)		(58)
	•	•	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for eac	h month	(61)m =	(60	0) ÷ 36	65 × (41))m							
(61)m=	0	0	0	0	0		0	0	0		0	0	0	0]	(61)
Total h	eat req	uired for	water I	neating	calculate	d fo	or eacl	n month	(62)n	า =	0.85 × (45)m -	+ (46)m +	(57)m +	(59)m + (61)m	
(62)m=	108.62	95	98.03	85.46	82		70.76	65.57	75.2	5	76.14	88.74	96.86	105.19]	(62)
Solar DH	W input	calculated	using Ap	pendix G	or Appendi	хH	(negati	ve quantity	/) (ente	r '0'	if no sola	r contrib	ution to wate	er heating)	-	
(add a	dditiona	al lines if	FGHR	S and/or	WWHR	Sa	pplies	, see Ap	pendi	x G	i)				_	
(63)m=	0	0	0	0	0		0	0	0		0	0	0	0		(63)
Output	from w	ater hea	ter													
(64)m=	108.62	95	98.03	85.46	82		70.76	65.57	75.2	5	76.14	88.74	96.86	105.19]	
									C	Outpu	ut from wa	ater heat	er (annual)	112	1047.62	(64)
Heat g	ains fro	m water	heating	g, kWh/r	nonth 0.2	25 ´	[0.85	× (45)m	+ (61)m]] + 0.8 x	: [(46)n	n + (57)m	+ (59)m	n]	
(65)m=	27.15	23.75	24.51	21.37	20.5		17.69	16.39	18.8	1	19.04	22.18	24.22	26.3]	(65)
inclu	de (57)	m in calo	culation	of (65)r	n only if	cyli	nder i	s in the c	dwellir	ng c	or hot w	ater is	from com	munity I	neating	
5. Int	ernal q	ains (see	Table	5 and 5	a):	-				-					-	
	Ŭ	ns (Table														
motab	Jan	Feb	Mar		May		Jun	Jul	Au	a	Sep	Oct	Nov	Dec]	
(66)m=	92.91	92.91	92.91	92.91	92.91		92.91	92.91	92.9		92.91	92.91	92.91	92.91		(66)
Liahtin	a aains	(calcula	ted in A	Appendix	L. equa	tior	ו L9 ס	r L9a), a	lso se	e T	able 5			L	1	
(67)m=	15.16	13.47	10.95	8.29	6.2	-	5.23	5.65	7.35	- 1	9.86	12.52	14.62	15.58	1	(67)
		ins (calc		in Anner	udix Leo	_L_ nua	tion L	13 or I 1			see Tal			ļ	J	
(68)m=	162.03	163.71	159.47				28.36	121.21	119.5	- T	123.77	132.79	144.18	154.88	1	(68)
		s (calcula]	. ,
(69)m=	32.29	32.29	32.29	32.29	32.29	-	32.29	32.29	32.2	_	32.29	32.29	32.29	32.29	1	(69)
					02.20		02.20	02.20	02.2	Ŭ	02.20	02.20	02.20	02.20	1	(00)
(70)m=		ns gains		5a)	0		0	0	0		0	0	0	0	1	(70)
								0	0		0	0	0	0	J	(10)
		vaporatic	<u> </u>		<u> </u>	-	,	74.00	740		74.00	74.00	74.00	74.00	1	(71)
(71)m=		-74.33	-74.33		-74.33	-	74.33	-74.33	-74.3	3	-74.33	-74.33	-74.33	-74.33]	(71)
		gains (T	,	-		-							1	1	1	(70)
(72)m=	36.5	35.34	32.94	29.67	27.56		24.57	22.03	25.2		26.44	29.82		35.35		(72)
	-	l gains =	r			-		. ,				-	(71)m + (72)	1	7	
(73)m=	264.56	263.39	254.24	239.29	223.69	2	209.04	199.78	203.0)4	210.95	226.01	243.3	256.68		(73)
	lar gain				T 1 1 0											
-			-			and			tions to			e applic	able orienta	tion.	Caina	
Orienta		Access F Table 6d		Are m²			Flu Tat	x ble 6a			g_ able 6b		FF Table 6c		Gains (W)	
Northor	-								1Г			-			. ,	
Northea	L	0.77			.65	x		1.28			0.63	_ ×	0.7	=	29.83	(75)
Northea	l	0.77			.65	x		2.97			0.63	_ ×	0.7	=	60.72	(75)
Northea		0.77			.65	x		1.38			0.63	_ ×	0.7	=	109.4	(75)
Northea	L	0.77		× 8	.65	x	6	7.96			0.63	×	0.7	=	179.67	(75)
Northea	ast <mark>0.9x</mark>	0.77	3	K 8	.65	x	9	1.35	x		0.63	x	0.7	=	241.51	(75)

Northeast 0.9x 0.77 x 8.65 x 97.38 x 0.63 x 0.7 = 257.47 (75)																
Northeast 0.9x	0.77	x	8.6	5	x	9	7.38	x	(0.63	×	0.7	=	-	257.47	(75)
Northeast 0.9x	0.77	x	8.6	5	x	9	91.1	x	(0.63	x	0.7	=	-	240.86	(75)
Northeast 0.9x	0.77	x	8.6	5	x	72	2.63	x	(0.63	x	0.7	=	-	192.02	(75)
Northeast 0.9x	0.77	x	8.6	5	x	50	0.42	x	(0.63	x	0.7	=	-	133.31	(75)
Northeast 0.9x	0.77	x	8.6	5	x	28	8.07	x	(0.63	_ x [0.7	=	-	74.21	(75)
Northeast 0.9x	0.77	x	8.6	5	x	1	4.2	x	(0.63	x	0.7	=	-	37.53	(75)
Northeast 0.9x	0.77	x	8.6	5	x	9).21	x	(0.63	_ x [0.7	=	-	24.36	(75)
_																
Solar gains in	watts, calcul	lated	for eacl	n month				(83)m	= Sun	n(74)m	.(82)m	-	-			
(83)m= 29.83	60.72 10	9.4	179.67	241.51	2	57.47	240.86	192.	.02 ^	133.31	74.21	37.53	24.36			(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m ·	+ (8	83)m ,	watts							_		
(84)m= 294.39	324.11 363	3.63	418.96	465.2	4	66.51	440.63	395.	.06 3	344.25	300.21	280.84	281.04	4		(84)
7. Mean inter	nal tempera	ture ((heating	season)											
Temperature	during heati	ing pe	eriods ir	n the livi	ng	area f	rom Tab	ole 9,	Th1	(°C)					21	(85)
Utilisation fac	ctor for gains	s for li	iving are	a, h1,m	(s	ee Tal	ble 9a)									
Jan	Feb N	Лar	Apr	May	Ĺ	Jun	Jul	Au	Jg	Sep	Oct	Nov	Dec	;		
(86)m= 1	1 0.	.99	0.98	0.91	(0.76	0.59	0.6	7	0.91	0.99	1	1	-		(86)
Mean interna	l temperatur	in l	iving are	a T1 (fr	مالد	w stor	ns 3 to 7	in T	ahle	9c)		I				
(87)m= 19.72	r <u>'</u> r	0.07	20.42	20.74	<u> </u>	0.94	20.99	20.9		20.81	20.41	20.01	19.7	٦		(87)
					L											
Temperature	т <u>т</u> т	<u> </u>	eriods in 19.99	19.99	dw I	<u> </u>				<u>, í</u>	19.99	10.00	10.00	7		(88)
(88)m= 19.98	19.98 19	9.98	19.99	19.99		20	20	20	,	20	19.99	19.99	19.98			(00)
Utilisation fac	ctor for gains	s for r			h2,	m (se		,				1	r	_		
(89)m= 1	1 0.	.99	0.97	0.88	(0.67	0.47	0.5	4	0.86	0.98	1	1			(89)
Mean interna	l temperatur	e in t	he rest	of dwelli	ng	T2 (fc	ollow ste	ps 3	to 7 i	in Table	e 9c)		-			
(90)m= 18.8	18.92 19	9.16	19.51	19.81	1	9.97	20	20)	19.89	19.51	19.11	18.79			(90)
										fl	_A = Livi	ng area ÷ (4	4) =		0.45	(91)
Mean interna	l temperatur	e (foi	r the wh	ole dwe	llin	g) = fL	.A × T1	+ (1	– fLA) × T2						
(92)m= 19.22	i <u>i</u>	.57	19.93	20.24	<u> </u>	20.41	20.45	20.4		20.31	19.92	19.52	19.2	٦		(92)
Apply adjustr	nent to the n	nean	internal	temper	atu	ire froi	m Table	4e, v	where	e appro	priate	<u>.</u>				
(93)m= 19.22	19.34 19	9.57	19.93	20.24	2	.0.41	20.45	20.4	44	20.31	19.92	19.52	19.2			(93)
8. Space hea	ting requirer	ment														
Set Ti to the			•		ned	at ste	ep 11 of	Tabl	e 9b,	so that	: Ti,m=	(76)m an	d re-ca	alculate	9	
the utilisation					<u> </u>	. 1						I		-		
	I I I	/ar	Apr	May		Jun	Jul	Aı	Jg	Sep	Oct	Nov	Dec	;		
Utilisation fac (94)m= 1	<u> </u>	s, nm: .99	0.97	0.89		0.71	0.52	0.6		0.88	0.98	1	1	7		(94)
Useful gains,						5.71	0.32	0.0	<u>'</u>	0.00	0.90		1			(04)
(95)m= 293.84	г I	= (94 0.44	405.3	412.08	3	30.15	230.95	238.	18	302.3	295.18	279.85	280.6	3		(95)
Monthly aver							200.00	200		002.0	200.10	210.00	200.00			
(96)m= 4.3	<u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>	5.5	8.9	11.7	<u> </u>	14.6	16.6	16.	4	14.1	10.6	7.1	4.2	٦		(96)
Heat loss rat												I	I			
(97)m= 939.86	· · · · ·	9.54	682.9	527.51	<u> </u>	55.18	235.18	246	<u> </u>	381.05	575.87	770.82	935.8	3		(97)
Space heatin	g requireme	ent for	r each m	nonth, k	Nh	/mont	h = 0.02	24 x [(97)m	n – (95)		1)m		1		
(98)m= 480.64	r i	1.57	199.87	85.89		0	0	0	<u> </u>	0	208.83	353.5	487.4	7		
L	• •				-											

								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2550.32	(98)
Space	e heatir	ng require	ement in	kWh/m²	²/year								45.77	(99)
8c. Sp	bace co	oling rec	uiremer	nt										
		or June, J			See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	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	574.77	452.48	463.79	0	0	0	0		(100)
Utilisa	tion fac	ctor for lo	ss hm											
(101)m=	0	0	0	0	0	0.87	0.93	0.89	0	0	0	0		(101)
Usefu	l loss, l	nmLm (V	/atts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	497.98	418.61	413.17	0	0	0	0		(102)
Gains	(solar	, gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	615.35	583.78	531.67	0	0	0	0		(103)
		ig require				lwelling,	continu	ous (kW	h) = 0.02	24 x [(10)3)m – (102)m]:	x (41)m	
ì	04)m to	o zero if (104)m <	: 3 × (98)m								1	
(104)m=	0	0	0	0	0	84.51	122.89	88.17	0	0	0	0		_
										= Sum(,	=	295.57	(104)
Cooled									fC=	cooled	area ÷ (4	4) =	1	(105)
		actor (Ta		Í					-	-		-		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		—
C	ممانمه		n ant far		(101)	(105)	(100)-		lotal	= Sum(104)	=	0	(106)
· .		requirer		$\frac{1}{0}$	(104)m	× (105) 21.13	× (106)r 30.72	n 22.04	0	0	0	0		
(107)m=	0	0	0	0	0	21.13	30.72	22.04	-	-				
										= Sum(1.0.7)	=	73.89	(107)
Space	cooling	requirer	nent in k	(Wh/m²/y	year				(107)	÷ (4) =			1.33	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only un	der spec	cial conc	litions, se	ee sectio	on 11)				
Fabric	: Energ	y Efficier	псу						(99) ·	+ (108) =	=		47.1	(109)
Targe	t Fabri	ic Energ	y Efficie	ency (TF	EE)								54.17	(109)

		User	Details:						
Assessor Name:	Zahid Ashraf		Stroma	Numb	ber:		STRO	001082	
Software Name:	Stroma FSAP 201	2	Softwa	re Ver	sion:		Versio	n: 1.0.5.9	
		Propert	y Address:	Plot 3					
Address :									
1. Overall dwelling dimer	nsions:								
Ground floor		Ar	ea(m²) 55.72 (1a) x		ight(m) 2.5	(2a) =	Volume(m ³) 139.29) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	55.72 (4	4)			-		
Dwelling volume				(3a)+(3b)-	+(3c)+(3d)+(3e)+	.(3n) =	139.29	(5)
2. Ventilation rate:									
		econdary leating	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 far	าร				0	x 1	10 =	0	(7a)
Number of passive vents					0	x 1	10 =	0	(7b)
Number of flueless gas fir	es				0	x 4	40 =	0	(7c)
							Air ch	anges per ho	
		-) - (0)) - (7 -) - (7)	. (7.)	_				anges per no	_
Infiltration due to chimney If a pressurisation test has be				ntinue fro	0 m (9) to (÷ (5) =	0	(8)
Number of storeys in th		, proced to (11)	, ourier wide de		111 (0) 10 (10)		0	(9)
Additional infiltration	0 ()					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber	frame or 0.35 f	for masonry	constru	uction			0	(11)
	esent, use the value corres	ponding to the gre	eater wall area	(after					_
deducting areas of openin If suspended wooden fl		ed) or 0.1 (sea	aled). else e	nter 0				0	(12)
If no draught lobby, ent			,,					0	(13)
Percentage of windows	and doors draught st	ripped						0	(14)
Window infiltration			0.25 - [0.2 ×	(14) ÷ 10	= [00			0	(15)
Infiltration rate			(8) + (10) +	(11) + (12	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expressed in cub	oic metres per l	hour per sq	uare me	etre of e	nvelope	area	3	(17)
If based on air permeabili	•							0.15	(18)
Air permeability value applies		s been done or a c	legree air pern	neability is	s being us	sed			
Number of sides sheltered Shelter factor			(20) = 1 - [0	.075 x (19	9)] =			2 0.85	(19) (20)
Infiltration rate incorporati	ng shelter factor		(21) = (18) 2		/-			0.85	(21)
Infiltration rate modified for	0	1	. , . ,					0.15	
	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 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	p)m $\div 4$								
	1.23 1.1 1.08	0.95 0.95	0.92	1	1.08	1.12	1.18		
	I	I	_ !					I	

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m	-				
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
		<i>ctive air</i> al ventila	0	rate for t	he appli	cable ca	se							
				andix N (2	(23a) – (23a) v Emv (e	auation (N	N5)) , othei	rwise (23h) – (23a)			0.5	(23a)
			0 11		, (, ,	• •	n Table 4h)	,) = (200)			0.5	(23b)
			-	-	-					2b)m i (f	00h) v [/	(220)	79.05	(23c)
(24a)m=		0.26	0.26	0.25	0.24	0.23	0.23	HR) (24a 0.22	0.23	20)m + (. 0.24	23D) × [0.25	0.25	- 100]]	(24a)
												0.25		(244)
								MV) (24b	0)m = (22)	20)m + (2 0	,	0	1	(24b)
(24b)m=			_				_	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		0.51				
(24d)m=	<u> </u>	0	0	0	0	0	0	0	0	0	0	0		(24d)
		L change	rate - er	L hter (24a) or (24b) or (24	L c) or (24	d) in boy	(25)				I	
(25)m=	0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
	L	I	I	1			I						l	
				paramet									-	
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·ł		A X k J/K
Doors						2	x	1.4	=	2.8				(26)
Windo	WS					8.651	x1.	/[1/(1.4)+	0.04] =	11.47				(27)
Floor						55.71	5 X	0.12		6.6858	Ξ r			(28)
Walls ⁻	Type1	48.9	99	8.65	;	40.34	1 x	0.15	i	6.05	= i		\dashv	(29)
Walls ⁻		4.4		2		2.4	x	0.14		0.34	╡┟		\dashv	(29)
		elements				109.1			L	0.01	L			(31)
* for win	ndows and	l roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	g formula 1,	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	1 3.2	
** incluc	le the area	as on both	sides of ir	nternal wal	ls and part	titions								
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				27.35	(33)
Heat c	apacity	Cm = S((A x k)						((28)	.(30) + (32	2) + (32a).	(32e) =	6727	(34)
Therm	al mass	parame	ter (TMF	⁻ = Cm -	- TFA) in	∩ kJ/m²K			Indica	tive Value:	Low		100	(35)
	-	sments wh ad of a de			constructi	ion are not	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						9.32	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			36.67	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			1	(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	12.29	12.14	11.99	11.26	11.11	10.38	10.38	10.24	10.68	11.11	11.41	11.7		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m		_	
(39)m=	48.96	48.81	48.67	47.93	47.79	47.05	47.05	46.91	47.35	47.79	48.08	48.37		
									/	Average =	Sum(39)1		47.9	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.88	0.88	0.87	0.86	0.86	0.84	0.84	0.84	0.85	0.86	0.86	0.87		
Nhumb			I					1	,	Average =	Sum(40)1.	12 /12=	0.86	(40)
NUMDE	Jan	/s in mo 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)
(,=	01	20			01	00				01		01		()
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	- A -13.9)2)] + 0.(0013 x (⁻	TFA -13		86		(42)
Annua <i>Reduce</i>	l averag	e hot wa al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.46		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate		1		,	Vd,m = fa			1		r	1		I	
(44)m=	90.7	87.4	84.11	80.81	77.51	74.21	74.21	77.51	80.81	84.11	87.4	90.7	000.40	
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		989.48	(44)
(45)m=	134.51	117.64	121.4	105.84	101.55	87.63	81.2	93.18	94.3	109.89	119.96	130.27		
lf instan	taneous w	vater heati	na at poini	t of use (no	o hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	-	1297.37	(45)
(46)m=	20.18	17.65	18.21	15.88	15.23	13.14	12.18	13.98	14.14	16.48	17.99	19.54		(46)
· · ·	storage													. ,
Storag	e volum	e (litres)	includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	-			velling, e			. ,	ora) onto	or (0' in ((17)			
	storage		not wate	er (uns n	iciuues i	nsianiai		ombi boil			(47)			
	-		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)
,					loss fact le 2 (kWl							00		(51)
		leating s				1,1110,00	xy)				0.	02		(01)
		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	for each	month	i	i	((56)m = (55) × (41)ı	m	1		I	
(56)m=	32.01	28.92 s dedicate	32.01 d solar sto	30.98	32.01 m = (56)m	30.98 x [(50) – (32.01 H11)] ∸ (5	32.01	30.98	32.01 m where (30.98 H11) is fro	32.01 m Append	ix H	(56)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
						50.50	52.01	52.01	50.50	52.01				
	-	•		om Table for each		59)m = ((58) ÷ 36	65 × (41)	m			0		(58)
	-						. ,	ng and a		r thermo	ostat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eacl	n month	(61)m =	(60)) ÷ 36	5 × (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	d for	⁻ each	n month	(62)m	= 0.85 ×	(45)m	+ (4	16)m +	(57)m	n + (59)m + (6	1)m
(62)m=	189.79	167.57	176.67	159.33	156.83	14	1.13	136.48	148.4	6 147.79	165.1	17	173.45	185.5	54	(62)
Solar DI	-IW input	calculated	using Ap	pendix G o	r Appendix	κΗ (r	negativ	e quantity	/) (ente	'0' if no sol	ar contri	butio	n to wate	er heatir	ng)	
(add a	dditiona	al lines if	FGHRS	and/or	WWHRS	s ap	plies,	see Ap	pendi	(G)						
(63)m=	0	0	0	0	0		0	0	0	0	0		0	0		(63)
Output	t from w	ater hea	ter													
(64)m=	189.79	167.57	176.67	159.33	156.83	14	1.13	136.48	148.4	6 147.79	165.1	17	173.45	185.5	54	
		-			-				C	utput from v	vater he	ater (annual) ₁	12	1948.21	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8	x [(46))m +	(57)m	+ (59))m]	
(65)m=	88.95	79.06	84.59	77.99	77.99	71	1.93	71.22	75.2	74.15	80.7	6	82.68	87.53	3	(65)
inclu	de (57))m in calo	culation	of (65)m	only if c	ylin:	der is	s in the c	dwellir	g or hot v	vater is	s fro	m com	munity	y heating	
5. Int	ternal q	ains (see	e Table :	5 and 5a):	-				-				-	-	
	Ŭ	ns (Table														
metab	Jan	Feb	Mar	Apr	May	Γ.	Jun	Jul	Au	g Sep	Oc	rt 🗌	Nov	De	с	
(66)m=	111.5	111.5	111.5	111.5	111.5		11.5	111.5	111.		111.		111.5	111.	-	(66)
Lightin	a dains	(calcula	ı ted in A	n Dendix	L. equat	ion	L9 or	L9a), a	lso se	e Table 5	_ I]	
(67)m=	37.9	33.66	27.38	20.73	15.49	1	3.08	14.13	18.3		31.3	1	36.54	38.96	6	(67)
		l ains (calc	l ulated i	I Annen	l divled	L Liati	on I 1	3 or 1 1	3a) a	so see Ta	able 5					
(68)m=	241.83	<u> </u>	238.02	224.55	207.56	r –	1.59	180.92	178.4			10	215.19	231.1	6	(68)
											_	10	210.10	201.1	0	(00)
	48.01	48.01	48.01	48.01	L, equa	-	3.01	48.01	, also 48.0'	see Table	48.0	1	48.01	48.0	4	(69)
(69)m=					40.01	40	5.01	40.01	40.0	40.01	40.0	1	40.01	40.0	1	(03)
-		ins gains	i i i i i i i i i i i i i i i i i i i	1		<u> </u>									_	(70)
(70)m=	0	0	0	0	0		0	0	0	0	0		0	0		(70)
	<u> </u>	vaporatic	<u> </u>	1	T Ó Ì	r	<u></u>				-			r	_	
(71)m=	-74.33	-74.33	-74.33	-74.33	-74.33	-7	4.33	-74.33	-74.3	3 -74.33	-74.3	33	-74.33	-74.3	3	(71)
Water		gains (T	Table 5)												_	
(72)m=	119.55	117.65	113.69	108.31	104.82	99	9.91	95.73	101.0	8 102.98	108.5	55	114.83	117.6	65	(72)
Total i	nterna	I gains =	:				(66)	m + (67)m	ı <mark>+ (6</mark> 8)	n + (69)m +	· (70)m +	+ (71)	m + (72))m		
(73)m=	484.46	480.82	464.26	438.77	413.05	38	9.75	375.95	383.0	3 397.55	423.2	23	451.74	472.9	94	(73)
6. So	lar gain	s:														
-			•	ar flux from	Table 6a	and		•	tions to	convert to t	he appli	cable		tion.		
Orienta		Access F		Area	l		Flux	x ole 6a		g_ Table 6b		Tal	FF		Gains	
		Table 6d		m²		_	Tab	ne oa	. –	Table of) 	Tai	ble 6c		(W)	
	ast <mark>0.9x</mark>	0.77	x	8.	65	×	1	1.28	x	0.63	x		0.7		= 29.83	(75)
Northea	ast <mark>0.9x</mark>	0.77	×	8.	65	×	22	2.97	×	0.63	x		0.7		= 60.72	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	8.	65	x	4	1.38	x	0.63	x		0.7	:	= 109.4	(75)
Northea	ast <mark>0.9x</mark>	0.77	×	8.	65	x	6	7.96	×	0.63	x		0.7		= 179.67	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	8.	65	x [9	1.35	x	0.63	x		0.7		= 241.51	(75)

Northeast $0.9x$ 0.77 x 8.65 x 97.38 x 0.63 x 0.7 $=$ 257.4 Northeast $0.9x$ 0.77 x 8.65 x 91.1 x 0.63 x 0.7 $=$ 240.8 Northeast $0.9x$ 0.77 x 8.65 x 72.63 x 0.63 x 0.7 $=$ 192.0 Northeast $0.9x$ 0.77 x 8.65 x 50.42 x 0.63 x 0.7 $=$ 133.3 Northeast $0.9x$ 0.77 x 8.65 x 28.07 x 0.63 x 0.7 $=$ 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 $=$ 37.53 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 $=$ 37.53	6 (75) 2 (75)
Northeast $0.9x$ 0.77 x 8.65 x 72.63 x 0.63 x 0.7 $=$ 192.02 Northeast $0.9x$ 0.77 x 8.65 x 50.42 x 0.63 x 0.7 $=$ 192.02 Northeast $0.9x$ 0.77 x 8.65 x 50.42 x 0.63 x 0.7 $=$ 133.3 Northeast $0.9x$ 0.77 x 8.65 x 28.07 x 0.63 x 0.7 $=$ 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 $=$ 37.53	2 (75)
Northeast $0.9x$ 0.77 x 8.65 x 50.42 x 0.63 x 0.7 $=$ 133.3 Northeast $0.9x$ 0.77 x 8.65 x 28.07 x 0.63 x 0.7 $=$ 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 $=$ 74.21 Northeast $0.9x$ 0.77 x 8.65 x 14.2 x 0.63 x 0.7 $=$ 37.53	
Northeast 0.9x 0.77 x 8.65 x 28.07 x 0.63 x 0.7 = 74.21 Northeast 0.9x 0.77 x 8.65 x 14.2 x 0.63 x 0.7 = 37.53	(75)
Northeast 0.9x 0.77 X 8.65 X 14.2 X 0.63 X 0.7 = 37.53	1 (75)
	(75)
	(75)
Northeast 0.9x 0.77 X 8.65 X 9.21 X 0.63 X 0.7 = 24.36	(75)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m	
(83)m= 29.83 60.72 109.4 179.67 241.51 257.47 240.86 192.02 133.31 74.21 37.53 24.36	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts	
(84)m= 514.29 541.54 573.66 618.43 654.55 647.22 616.81 575.05 530.85 497.43 489.27 497.3	(84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21	(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(86)m= 0.9 0.88 0.83 0.73 0.6 0.44 0.33 0.36 0.56 0.76 0.86 0.9	(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)	
(87)m= 19.74 19.9 20.18 20.55 20.81 20.95 20.98 20.98 20.89 20.57 20.12 19.71	(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	
(88)m= 20.19 20.19 20.2 20.2 20.21 20.21 20.22 20.21 20.22 20.21	(88)
	()
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	(90)
(89)m= 0.89 0.86 0.81 0.71 0.56 0.39 0.27 0.31 0.51 0.73 0.84 0.89	(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m= 18.51 18.74 19.15 19.66 20 20.17 20.2 20.2 20.1 19.7 19.07 18.48	(90)
$fLA = Living area \div (4) = 0.45$	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$	
(92)m= 19.07 19.26 19.62 20.06 20.37 20.52 20.56 20.55 20.46 20.1 19.55 19.04	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	
(93)m= 19.07 19.26 19.62 20.06 20.37 20.52 20.56 20.55 20.46 20.1 19.55 19.04	(93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation factor for gains, hm:	
(94)m= 0.87 0.84 0.8 0.7 0.57 0.41 0.3 0.33 0.52 0.72 0.83 0.88	(94)
Useful gains, hmGm , W = (94)m x (84)m	
(95)m= 445.9 457.25 456.68 433.91 372.04 267.51 183.37 190.75 277.37 359.93 405.6 435.31	(95)
Monthly average external temperature from Table 8	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m]	
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 723.06 701.06 638.29 534.98 414.13 278.58 186.23 194.83 301.05 453.73 598.4 717.71	(97)
	(97)

	Тс	tal per year (kWh/year) = Sum(98) _{15,912} =	1027.98	(98)
Space heating requirement in kWh/m²/year			18.45	(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	. The procedure allows for	r CHP and up to four other heat sources; ti	he latter	
includes boilers, heat pumps, geothermal and waste heat from Fraction of heat from Community boilers	power stations. See App	pendix C.	1	(303a)
Fraction of total space heat from Community boile	rs	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community he	eating system	1	(305)
Distribution loss factor (Table 12c) for community	heating system		1.05	(306)
Space heating			kWh/yea	
Annual space heating requirement			1027.98	
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	1079.38	(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			1948.21	7
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	2045.62	(310a)
Electricity used for heat distribution	0.0	01 × [(307a)(307e) + (310a)(310e)] =	31.25	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, it	² not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Tab mechanical ventilation - balanced, extract or posit	,	e	193.3	(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) =	193.3	(331)
Energy for lighting (calculated in Appendix L)			267.75	(332)
Electricity generated by PVs (Appendix M) (negati	ve quantity)		-568.11	(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 =	45.77	(340a)
Water heating from CHP	(310a) x	4.24 x 0.01 =	86.73	(342a)

			Fuel Price			
Pumps and fans	(331)		13.19	x 0.01 =	25.5	(349)
Energy for lighting	(332)		13.19	x 0.01 =	35.32	(350)
Additional standing charges (Table 12)				[120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (345	i)(354) =		[313.31	(355)
11b. SAP rating - Community heating s	scheme					
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 4	5.0] =		Г	1.31	(357)
SAP rating (section12)				Ĺ	81.77	(358)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emissior kg CO2/k		Emissions kg CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)		P) using two fuels repeat (36	63) to (366) for the s	second fuel	94	(367a)
CO2 associated with heat source 1	[(307	7b)+(310b)] x 100 ÷ (367h	o) x 0.22	=	718.08	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	16.22	(372)
Total CO2 associated with community s	ystems	(363)(366) + (368)	(372)	=	734.3	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instant	aneous heater (312	2) x 0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375)	=		734.3	(376)
CO2 associated with electricity for pump	os and fans within dw	velling (331)) x	0.52	=	100.32	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	138.96	(379)
Energy saving/generation technologies Item 1	(333) to (334) as app	blicable	0.52	x 0.01 =	-294.85	(380)
Total CO2, kg/year	sum of (376)(382) =			Γ	678.73	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			Ī	12.18	(384)
El rating (section 14)				[90.97	(385)
13b. Primary Energy – Community heat	ing scheme					
		Energy kWh/year	Primary factor		P.Energy (Wh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		CHP) using two fuels repeat (36	63) to (366) for the s	second fuel	94	(367a)
Energy associated with heat source 1	[(307	7b)+(310b)] x 100 ÷ (367b	o) x 1.22	=	4055.84	(367)
Electrical energy for heat distribution		[(313) x		=	95.94	(372)
Total Energy associated with community	y systems	(363)(366) + (368)	(372)	=	4151.78	(373)
if it is negative set (373) to zero (unle	ss specified otherwis	e, see C7 in Append	dix C)		4151.78	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)

Total Primary Energy, kWh/year sum of (37)	6)(382) =			3823.08	(383)
Energy saving/generation technologies Item 1		3.07	x 0.01 =	-1744.1	(380)
Energy associated with electricity for lighting	(332))) x	3.07	=	821.98	(379)
Energy associated with electricity for pumps and fans within o	dwelling (331))	x 3.07	=	593.42	(378)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Total Energy associated with space and water heating	(373) + (374) + (375) =			4151.78	(376)
Energy associated with water from immersion heater or insta	ntaneous heater(312) x	1.22	=	0	(375)

Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.9 Property Address: Property Address: Property Address: Address: Council dwolling dimensions: Area(m ²) Av. Height(m) Volume(m ²) (3a) Ground floor 57.72 (1a) × 2.5 (2a) + (3b)+(3b)+(3c)+(3c)+(3c)+(-ac)*) = (3a) (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 56.72 (a) × 40.9 (a) (a) (a) × 40.9 (a)				User D	etails:							
Property Address: Plot 3 Address : 1. Overall dwelling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Ground floor Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 5.5.72 (1a) × 2.5 Volume(m ²) Overhild into rate: main meaning secondary heating other total m ³ per hour Number of chimneys o $x40 =$ 0 (a) Number of passive vents Air changes per hour Number of flueless gas fires 0 $x40 =$ 0 (a) Number of flueless gas fires 0 $x40 =$ 0 (a) Number of storeys in the dwelling (ns) $x40 =$ 0 $x40 =$ 0 (a) Number of storeys in the dwelling (ns) $x40 =$ 0 (a) <th col<="" th=""><th>Assessor Name:</th><th>Zahid Ashr</th><th>af</th><th></th><th>Strom</th><th>a Num</th><th>ber:</th><th></th><th>STRO</th><th>001082</th><th></th></th>	<th>Assessor Name:</th> <th>Zahid Ashr</th> <th>af</th> <th></th> <th>Strom</th> <th>a Num</th> <th>ber:</th> <th></th> <th>STRO</th> <th>001082</th> <th></th>	Assessor Name:	Zahid Ashr	af		Strom	a Num	ber:		STRO	001082	
Aldress : 1. Overall dwelling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Ground floor Solution (1a) (1b)+(1a)+(1a)+(1a)+(1a)+(1a)+(1a)+(1a)+(1a	Software Name:	Stroma FS	AP 2012		Softwa	are Ver	sion:		Versic	on: 1.0.5.9		
I. Overall dwelling dimensions: Area(m ²) Av. Height(m) Volume(m ²) Ground floor 55.72 (1a) x 2.5 (2a) = (33.29) (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 55.72 (4) (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = (139.29) (5) Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = (139.29) (5) Vumber of chinneys 0 + 0 = 0 x40 = 0 (6b) Number of open flues 0 + 0 + 0 2 (10) (6b) Number of open flues 0 + 0 + 0 - 0 (6c) Number of passive vents 0 x10 0 (7a) (7a) (7b) (7b) (7c)			Р	roperty ,	Address:	Plot 3						
Area(m²)Av. Height(m)Volume(m²)Ground floor 55.72 $(1a) \times 2.5$ $(2a) = 139.29$ $(3a) \times 2.5$ Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 55.72 (4) $(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+(3a)+$	Address :											
Ground floor 55.72 (ia) x 2.5 (2a) = 138.29 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 55.72 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 132.23$ (5) 2. Ventilation rate: and nearing testing total area (ab) total area (ab) total area (ab) total area (ab) total 	1. Overall dwelling dimer	isions:		_	(A)							
Duelling volume $(3a)+(3b)+(3c)+(3d)+(3a)+(,(3n)) =$ (5) 2. Ventilation rate: main heating 0 secondary heating 0 other total m ³ per hour Number of chimneys 0 + 0 = 0 x40 = 0 (6a) Number of open flues 0 + 0 = 0 x40 = 0 (6b) Number of passive vents 0 x10 = 0 (7c) 0 x40 = 0 (7c) Number of flueless gas fires 0 x40 = 0 (7c) 0 x40 = 0 (7c) Number of storeys in the dwelling (n) Additional infiltration (0) (0) (0) (0) (0) Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction (0) (11) (11) (12) (13) Additional infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = (16) (16) (16) If buspended wooden floor, enter 0.25, espressed in cubic metres per hour 0 (12) (14) (16) (16) (11) (11) (11) (12)	Ground floor				· ·	(1a) x			(2a) =		_	
2. Ventilation rate: main heating secondary heating other total m³ per hour Number of ohmeys 0 + 0 = 0 x40 = 0 (6a) Number of open flues 0 + 0 = 0 x20 = 0 (6b) Number of open flues 0 + 0 = 0 x20 = 0 (6b) Number of intermittent fans 2 x10 = 20 (7a) (7b)	Total floor area TFA = (1a)+(1b)+(1c)+((1d)+(1e)+(1r	n) 5	5.72	(4)						
main heating heatingscendary heating heatingothertotalma*per hourNumber of ohmneys0+0=0x40 =0(6a)Number of open flues0+0=0x20 =0(6a)Number of intermittent fans2x10 =20(7a)Number of passive vents0x40 =0(7c)Number of flueless gas fires0x40 =0(7c)Number of flueless gas fires0x40 =0(7c)Number of storeys in the dwelling (ns)x40 =0(9)Additional infiltration0(17). otherwise continue from (9) to (16)Number of storeys in the dwelling (ns)0(9)Additional infiltration0(10)If but paes of wall are parsent, use the value corresponding to the greater wall area (after deducting areas of agenings); if equal user 0.350If suspended wooden floor, enter 0.20.1 (sealed), else enter 00If ho draught lobby, enter 0.05, else enter 00(12)Parcentage of windows and doors draught stripped0(14)Window infiltration rate0.25 - [0.2 x (14) + 100] =0Air permeability value, etco, expressed in cubic metres per hour per square metre of envelope area5Air permeability value, etco, expressed in cubic metres per hour per square metre of envelope area5Air permeability value applies if a pressurisation test has been dore or a degree air permeability is being used0Air permeability v	Dwelling volume					(3a)+(3b))+(3c)+(3c	l)+(3e)+	.(3n) =	139.29	(5)	
Number of chimneys 0 1 0 0 1 0 1 0 <t< td=""><td>2. Ventilation rate:</td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td><u> </u></td><td></td></t<>	2. Ventilation rate:		-							<u> </u>		
Number of open flues 0 + 0 + 0 = 0 × 20 = 0 (6b) Number of intermittent fans 2 × 10 = 20 (7a) Number of passive vents 0 × 10 = 0 (7c) Number of flueless gas fires 0 × 40 = 0 (7c) Number of flueless gas fires 0 × 40 = 0 (7c) Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) = 20 + (5) = 0.14 (6) If <i>a pressurisation test has been carried out or is intended, proceed to</i> (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9)-1)×0.1 = 0 (10) Structural infiltration 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 opening); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (13) Percentage of windows and doors draught stripped Window infiltration $0.25 \cdot (0.2 \times (14) + 100) =$ (16) Air permeability value, g50, expressed in cubic metres per hour per square metre of envelope area 5 (17) If based on air permeability value, then (18) = (17) + 20]+(8), otherwise (18) = (16) Air permeability value, g50, expressed in cubic metres per hour per square metre of envelope area 5 (17) Air permeability value, applies <i>I a presurisation test has been done or a degree air permeability is being used</i> Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.33 (21) Infiltration rate modified for monthly wind speed Monthly average wind speed from Table 7 (22)m $5.1 5$ 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m $+ 4$</i>				У	other		total			m ³ per hour	•	
Number of intermittent fans2 $x 10 =$ 00(rs)Number of intermittent fans2 $x 10 =$ 20(rs)Number of passive vents0 $x 10 =$ 0(rb)Number of flueless gas fires0 $x 40 =$ 0(rc)Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =20+ (6) =0.14(8)Air changes per hourIf a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns)Additional infiltration(9)Additional infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If is uspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If is uspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If is uspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If is uspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If is uspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If is uspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If is uspended wooden floor, enter 0.2 (unsealed)If is uspen	Number of chimneys			+	0	=	0	X 4	40 =	0	(6a)	
Number of passive vents Number of passive vents Number of flueless gas fires 0 x $10 = 0$ (7b) 0 x $40 = 0$ (7c) Additional infiltration test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 1^{\prime} 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 (9) to (16) 1^{\prime} 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 (0.25 for steel or timber frame or 0.35 for masonry construction if both paps of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0.2 If or draught lobby, enter 0.05, else enter 0.2 $0 = 10^{-1} (12) + (13) + (15) = 0$ (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 5 = (17) 1^{\prime} the part of sides sheltered Number of sides sheltered Number of sides sheltered 1^{\prime} per entability value, q50, expressed in cubic metres per hour per square metre of envelope area 5 = (17) 0 = 0.33 = (21) Infiltration rate incorporating shelter factor $(20) = 1 - [0.075 \times (19)] = 0.33 = (21)$ Infiltration rate modified for monthly wind speed 1^{\prime} a Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m = 5.1 = 5 = 4.9 = 4.4 = 4.3 = 3.8 = 3.8 = 3.7 = 4 = 4.3 = 4.5 = 4.7 Wind Factor (22a)m = (22)m $\div 4$	Number of open flues	0	+ 0	+	0] = [0	x	20 =	0	(6b)	
Number of flueless gas fires $ \begin{array}{c c} 0 & x 40 = & 0 & (7c) \\ \hline Air changes per hour \\ \hline If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue (from (9) to (16) \\ \hline Wumber of storeys in the dwelling (ns) & 0 & (9) \\ \hline Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction (9) to (16) \\ \hline Structural infiltration 0.25 for steel or timber frame or 0.35 for masonry construction (9) to (16) \\ \hline If a pressurisation test value corresponding to the greater wall area (after deducting areas of opening); if equal user 0.35 \\ \hline If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 & 0 & (12) \\ \hline If no draught lobby, enter 0.05, else enter 0 & 0 & (14) \\ \hline Window infiltration rate & (6) + (10) + (11) + (12) + (13) + (15) = & 0 & (16) \\ \hline Air premeability value, q50, expressed in cubic metres per hour per square metre of envelope area (5 & (17) \\ \hline Air premeability value, q50, expressed in cubic metres per hour per square metre of envelope area (5 & (17) \\ \hline Air premeability value, q50, expressed in cubic metres per air premeability is being used \\ Number of sides sheltered \\ Number of sides sheltered \\ \hline Monther or sides sheltered \\ \hline Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec \\ Monthly average wind speed from Table 7 (22)m 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 \\ \hline Wind Factor (22a)m = (22)m ÷ 4 \end{array}$	Number of intermittent fan	s				- <u> </u>	2	x	10 =	20	(7a)	
Inductor of Nucleon graph with the index of the ind	Number of passive vents						0	x '	10 =	0	_ (7b)	
Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) =20+ (6) =0.14(6)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)(9)(10)Number of storeys in the dwelling (ns)(9)-1]x0.1 =0(10)Additional infiltration(9)-1]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(12)If no draught lobby, enter 0.05, else enter 00(12)(14)Percentage of windows and doors draught stripped0(15)Unifitration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area5(17)Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used2(19)Number of sides sheltered20) = 1 - [0.075 x (19)] =0.33(21)Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.33(21)Infiltration rate modified for monthly wind speed20.33(21)Infiltration rate modified for monthly wind speed20.33(21)Infiltration rate modified for monthly wind speed20.33(21)Infiltration rate modified for monthly wind speed1 <td>Number of flueless gas fire</td> <td>es</td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td> x 4</td> <td>40 =</td> <td>0</td> <td>_](7c)</td>	Number of flueless gas fire	es					0	x 4	40 =	0	_](7c)	
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if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration $0.25 - [0.2 \times (14) \pm 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \pm 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Monthly average wind speed from Table 7 (22)m = 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor $(22a)m = (22)m \div 4$		25 for steel or	timber frame or	0.35 fo	masonr	v constr	uction	[(9)	-1]XU.1 =			
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Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area5If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.39Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0Number of sides sheltered2(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.33Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.33Infiltration rate modified for monthly wind speed $\overline{21} = (18) \times (20) =$ 0.33Monthly average wind speed from Table 7 $(22)m =$ $\overline{5.1}$ $\overline{5}$ 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 Wind Factor (22a)m = (22)m $\div 4$ 4.4 4.3 3.8 3.7 4 4.3 4.5	•		,	1 (seale	ed), else	enter 0				0	(12)	
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International of the second s					_			+ (15) =			=	
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ <i>Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used</i> Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = (20		150 expresse	d in cubic metre						area		=	
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	· ·			•	•	•		, no olopo	area		=	
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Infiltration rate incorporating shelter factor (21) = (18) × (20) = 0.33 (21) Infiltration rate modified for monthly wind speed $\overline{0.33}$ (21) Infiltration rate modified for monthly wind speed $\overline{0.33}$ (21) Monthly average wind speed from Table 7 $\overline{0.31}$ $\overline{0.33}$ (21) Wind Factor (22a)m = (22)m ÷ 4 $\overline{0.33}$ $\overline{0.33}$ $\overline{0.33}$ (21)		ł								2	(19)	
Infiltration rate modified for monthly wind speed $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							9)] =			0.85	=	
JanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m ÷ 4		-			(21) = (18)) x (20) =				0.33	(21)	
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				Jul	Aug	Sep	Oct	Nov	Dec			
Wind Factor (22a)m = (22)m \div 4				0.0	0.7		4.0	4.5	4 7			
	(22)m= 0.1 5 2	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	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 infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.38	0.39		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se	-	-	-	-		0	(23a)
				endix N, (2	3b) = (23a	a) x Fmv (e	equation (N5)) . othe	rwise (23b) = (23a)			0	(23a) (23b)
		• •	0 11	iency in %	, (, ,	• •	,, .	``) (200)			0	(230) (23c)
			-	-	-					2h)m + (23h) x ['	1 – (23c)	-	(200)
(24a)m=				0	0	0			0	0	0	0	. 100]	(24a)
		d mech	ı anical ve	ntilation	without	i heat rec	L coverv (N	I ЛV) (24b	m = (22)	1 2b)m + ()	1 23b)			
(24b)m=	r	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	ract ver	ntilation of	n positiv	i ve input v	r ventilatio	n from c	utside					
,				hen (24	•	•				.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
				ole hous m = (221						0.5]				
(24d)m=		0.59	0.58	0.57	0.56	0.55	, 0.55	0.55	, 0.56	0.56	0.57	0.58		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	b) or (24	c) or (24	d) in box	(25)					
(25)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
2 40	at locco	e and he		paramete	or:		•					•		
		Gros		Openin		Net Ar	ea	U-valı	IP	AXU		k-value	2	AXk
		area		m	•	A ,r		W/m2		(W/I		kJ/m²·ł		kJ/K
Doors						2	x	1	=	2				(26)
Windo	WS					8.651	x1.	/[1/(1.4)+	0.04] =	11.47				(27)
Floor						55.71	5 X	0.13	=	7.2429	5			(28)
Walls ⁻	Type1	48.9	99	8.65	;	40.34	ı x	0.18	=	7.26			\neg	(29)
Walls	Type2	4.4	Ļ	2		2.4	x	0.18	=	0.43			$\neg \square$	(29)
Total a	area of e	lements	, m²			109.1	1							(31)
* for win	dows and	roof wind	ows, use e	effective wi	ndow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
				nternal wal	ls and par	titions		(0.0) (0.0)	(00)					
			= S (A x	U)				(26)(30)					28.41	(33)
		Cm = S(,							(30) + (32	· · · ·	(32e) =	6727	(34)
				⊃ = Cm ÷						tive Value		-61- 15	250	(35)
	•		ere the de tailed calc	tails of the ulation.	construct	ion are not	r known pr	ecisely the	e indicative	e values of	IMP IN T	adie 11		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						7.44	(36)
if details	of therma	al bridging	are not kn	nown (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			35.84	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5)		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	27.16	27	26.84	26.09	25.96	25.3	25.3	25.18	25.55	25.96	26.24	26.53		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	63.01	62.84	62.68	61.94	61.8	61.15	61.15	61.03	61.4	61.8	62.08	62.38		
										Average =	Sum(39)1	12 /12=	61.94	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.13	1.13	1.13	1.11	1.11	1.1	1.1	1.1	1.1	1.11	1.11	1.12		
Numb	er of day	rs in mo	nth (Tab	le 12)		1	1	1		Average =	Sum(40)1.	.12 /12=	1.11	(40)
Numb	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,														
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	ed occu A > 13.9 A £ 13.9	9, N = 1		: [1 - exp	(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x (⁻	TFA -13	1. .9)	86		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.33		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ii	n litres pei	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•					
(44)m=	86.17	83.03	79.9	76.77	73.63	70.5	70.5	73.63	76.77	79.9	83.03	86.17		
Energy	content of	hot water	used - cal	culated me	onthly $= 4$.	190 x Vd,r	m x nm x L	DTm / 3600			m(44) ₁₁₂ = ables 1b, 1		940.01	(44)
(45)m=	127.78	111.76	115.33	100.54	96.48	83.25	77.14	88.52	89.58	104.4	113.96	123.75		
16 :	()		I		I		I	L		Total = Su	m(45) ₁₁₂ =	:	1232.5	(45)
	i			· ·		·		boxes (46	1				l	(10)
(46)m= Water	19.17 storage	16.76 loss:	17.3	15.08	14.47	12.49	11.57	13.28	13.44	15.66	17.09	18.56		(46)
	-		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	-		ank in dw	-			. ,			· ·			
	vise if no storage		hot wate	er (this ir	icludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	0		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Tempe	erature fa	actor fro	m Table	2b		,						54		(49)
Energy	y lost fro	m water	storage	e, kWh/ye	ear			(48) x (49)) =		0.	75		(50)
,				cylinder l										
		-	factor fi ee secti	rom Tabl	le 2 (kW	h/litre/da	ay)					0		(51)
	e factor	-		011 4.5)		(52)
Tempe	erature fa	actor fro	m Table	2b								с С		(53)
Energy	y lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =)		(54)
Enter	(50) or ((54) in (5	55)								0.	75		(55)
Water	storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m				
(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylind	er 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=	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							C		(58)
	•						. ,	65 × (41)			-1-1			
			· · · · · ·		r	i	1	ing and a	· ·	1	· ·	22.22		(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	h month	(61)m =	(60)) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0		0	0	0	0	0	0	0]	(61)
Total h	neat req	uired for	water h	neating c	alculated	d fo	r eacl	h month	(62)m	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	174.38	153.85	161.92	145.64	143.07	1:	28.34	123.74	135.12	134.67	150.99	159.05	170.35		(62)
Solar DI	-IW input	calculated	using Ap	pendix G d	or Appendix	(H)	(negati	ve quantity	/) (enter	0' if no sola	r contribu	tion to wate	er heating)		
(add a	dditiona	al lines if	FGHR	S and/or	WWHRS	S ap	plies	, see Ap	pendix	G)					
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0]	(63)
Output	t from w	ater hea	iter	-	-					-	-		-	-	
(64)m=	174.38	153.85	161.92	145.64	143.07	1:	28.34	123.74	135.12	134.67	150.99	159.05	170.35		
Output from water heater (annual)1781.12(6)													(64)		
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]															
(65)m=	79.76	70.83	75.62	69.5	69.35	6	3.75	62.93	66.71	65.86	71.99	73.96	78.42		(65)
inclu	ude (57)	m in calo	ulation	of (65)n	n only if c	ylir	nder i	s in the c	dwelling	g or hot w	vater is t	from com	munity h	heating	
5. In	ternal a	ains (see	e Table	5 and 5a	a):				-	-			-	-	
		ns (Table													
Mictab	Jan	Feb	Mar		May		Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	92.91	92.91	92.91	92.91	92.91	-	2.91	92.91	92.91	92.91	92.91	92.91	92.91		(66)
Liahtin	a aains	(calcula	ted in A	vppendix	L. equat	ion	L9 o	r L9a), a	lso see	Table 5	I	1	I	1	
(67)m=	15.16	13.47	10.95	8.29	6.2	1	5.23	5.65	7.35	9.86	12.52	14.62	15.58]	(67)
		1								o see Ta				1	
(68)m=	162.03	<u> </u>	159.47	<u> </u>	· · · · ·	1	28.36	121.21	119.53	T	132.79	144.18	154.88	1	(68)
										see Table				J	()
(69)m=	32.29	32.29	32.29	32.29	32.29	-	2.29	32.29	32.29	32.29	32.29	32.29	32.29	1	(69)
					02.20		2.25	02.20	02.20	02.20	02.20	02.20	52.25	J	(00)
-		ins gains	r`	<u> </u>		<u> </u>	2	2	2					1	(70)
(70)m=	3	3	3	3	3	Ļ	3	3	3	3	3	3	3	J	(70)
	<u> </u>	vaporatio	<u> </u>		T	1		- /						1	(74)
(71)m=					-74.33	- 1	74.33	-74.33	-74.33	-74.33	-74.33	-74.33	-74.33	J	(71)
		ı gains (T	·		· · · ·	-		r			·	-	r	1	()
(72)m=	107.21	105.4	101.64	96.53	93.22	8	8.55	84.58	89.66	91.47	96.76	102.73	105.41	J	(72)
		l gains =	1		· · · · ·		. ,	· · ·	· · ·	+ (69)m +		1	, 	1	
(73)m=	338.27	336.45	325.94	309.15	292.35	2	76.02	265.32	270.42	278.98	295.95	315.4	329.74		(73)
	lar gain				_										
			•			and			tions to a	convert to th	ne applica		tion.		
Orient		Access F Table 6d		Area m ²			Flu Tał	x ole 6a		g_ Table 6b	-	FF Fable 6c		Gains (W)	
Northo									ı —					. ,	٦
	ast <mark>0.9x</mark>	0.77			65	x		1.28		0.63		0.7	=	29.83	(75)
	ast <mark>0.9x</mark>	0.77			65	x		2.97		0.63		0.7	=	60.72	(75)
	ast <mark>0.9x</mark>	0.77			65	x		1.38		0.63		0.7	=	109.4	(75)
	ast <mark>0.9x</mark>	0.77	,	< 8.	65	x	6	57.96	×	0.63		0.7	=	179.67	(75)
Northe	ast <mark>0.9x</mark>	0.77	2	K 8.	65	x	9	1.35	×	0.63	×	0.7	=	241.51	(75)

-							_							_
Northeast 0.9x	0.77	x	8.6	5	x	97.38	×		0.63	x	0.7	=	257.47	(75)
Northeast 0.9x	0.77	x	8.6	5	x	91.1	x		0.63	x	0.7	=	240.86	(75)
Northeast 0.9x	0.77	x	8.6	5	x	72.63	x		0.63	x	0.7	=	192.02	(75)
Northeast 0.9x	0.77	x	8.6	5	x [50.42	×		0.63	x	0.7	=	133.31	(75)
Northeast 0.9x	0.77	x	8.6	5	x [28.07	x		0.63	x	0.7	=	74.21	(75)
Northeast 0.9x	0.77	x	8.6	5	x [14.2	×		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	x	8.6	5	x [9.21	x		0.63	×	0.7	=	24.36	(75)
Solar <u>gains in</u>	watts, calc	ulated	for each	n month			(83))m = S	um(74)m .	(82)m				
(83)m= 29.83		109.4	179.67	241.51		57.47 240.8		92.02	133.31	74.21	37.53	24.36		(83)
Total gains – i	nternal and	d solar	(84)m =	: (73)m ·	+ (8	33)m, watts	; 							
(84)m= 368.1	397.17 4	35.34	488.82	533.86	53	33.49 506.1	8 46	62.44	412.28	370.15	352.93	354.1		(84)
7. Mean inter	rnal temper	rature (heating	season)									
Temperature	during hea	ating pe	eriods ir	the livi	ng a	area from T	able	9, Th	1 (°C)				21	(85)
Utilisation fac	ctor for gair	ns for li	ving are	a, h1,m	(se	ee Table 9a	ı)							
Jan	Feb	Mar	Apr	Мау	,	Jun Jul		Aug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.96	0.87	C	0.69 0.52	0).59	0.85	0.97	0.99	1		(86)
Mean interna	l temperati	ure in li	iving are	ea T1 (fo	ollo	w steps 3 to	7 in	Table	e 9c)					
(87)m= 19.84	<u> </u>	20.19	20.52	20.81	<u> </u>	0.96 20.99	-	0.99	20.88	20.52	20.13	19.82		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)														
(88)m= 19.98		19.98	19.99	19.99	r –	20 20		20	20	19.99	19.99	19.98		(88)
											()			
Utilisation fac	T T	T				<u> </u>		,	0.70	0.00		4	l	(80)
(89)m= 1	0.99	0.98	0.94	0.82		0.6 0.41).47	0.78	0.96	0.99	1		(89)
Mean interna	<u> </u>				r –	<u> </u>	steps	3 to 7		,			I	
(90)m= 18.44	18.61	18.95	19.43	19.81	1	9.98 20		20	19.9	19.44	18.87	18.42		(90)
									f	LA = Livi	ng area ÷ (4	1) =	0.45	(91)
Mean interna	l temperati	ure (for	the wh	ole dwe	lling	g) = fLA × T	1 + (1 – fL	A) × T2					
(92)m= 19.07	19.22 ⁻	19.51	19.93	20.26	2	0.42 20.45	5 2	0.45	20.34	19.93	19.44	19.05		(92)
Apply adjustr	nent to the	mean		temper	r	i i	le 4e	, whe	ere appro	opriate			1	
(93)m= 19.07	I I	19.51	19.93	20.26	2	0.42 20.45	5 2	0.45	20.34	19.93	19.44	19.05		(93)
8. Space hea							_							
Set Ti to the the utilisation			•		ed	at step 11	of Ta	ble 9t	o, so tha	t Ti,m=	(76)m an	d re-calo	culate	
Jan	Feb	Mar	Apr	May		Jun Jul		Aug	Sep	Oct	Nov	Dec		
Utilisation fac				way				nug	000	001	1101	000		
(94)m= 0.99	<u> </u>	0.98	0.94	0.83	C	0.64 0.46).52	0.81	0.96	0.99	1		(94)
Useful gains,	hmGm , V	V = (94)m x (84	1)m										
(95)m= 366.12	393.73 4	26.97	460.5	445.38	34	0.35 233.0	4 24	42.48	332.52	355.83	349.4	352.53		(95)
Monthly aver	age extern	al temp	perature	from Ta	able	€ 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	1	4.6 16.6	1	6.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for mean	interna	al tempe	erature,	Lm	, W =[(39)r	n x [(93)m	– (96)m]			L	
(97)m= 930.79		815.49	682.87	529.12		55.94 235.3		46.9	383.17	576.41	766.18	926.51		(97)
Space heatin	r i r	r			/Vh/		024 >				1		I	
(98)m= 420.12	340.09 2	289.06	160.11	62.3		0 0		0	0	164.11	300.08	427.04		

								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	2162.9	(98)
Space	e heatir	g require	ement ir	n kWh/m²	?/year								38.82	(99)
9a. En	ergy reo	quiremer	nts – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heati	•			la ser la								0	
	Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) =													(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 Efficiency of secondary/supplementary heating system, %													93.5	(206)
Efficie	ency of			lementar	y heating	g systen		r		1	1	r	0	(208)
•	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	e heatin 420.12	g require 340.09	ement (0 289.06	calculate	d above)	0	0	0	164.11	300.08	427.04		
(044)				1		0	0	0	0	104.11	300.08	427.04	1	
(211)n	$1 = \{[(98)]$	363.73	309.15	100 ÷ (20 171.24	66.63	0	0	0	0	175.52	320.94	456.72		(211)
	440.02	000.10	000.10	171.24	00.00	0	0				211) _{15,1012}		2313.26	(211)
Space	e heatin	a fuel (s	econdar	ry), kWh/	month					, ,	× 13, 1012		2010.20	
•		D1)] } x 1		• •	monun									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
		-				-	-	Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	I.	0	(215)
	heating													
Output	from w	ater hea 153.85	ter (calc 161.92	ulated a	bove) 143.07	128.34	123.74	135.12	134.67	150.99	159.05	170.35		
Efficie		ater hea		143.04	143.07	120.34	123.74	155.12	134.07	130.33	109.00	170.55	79.8	(216)
	87.08	86.87	86.34	85.07	82.77	79.8	79.8	79.8	79.8	85.04	86.48	87.17	70.0	(217)
		I heating,	kWh/m	onth									1	
(219)n	<u>) = (64</u>)	<u>m x 100</u>) ÷ (217))m									1	
(219)m=	200.26	177.1	187.53	171.2	172.86	160.83	155.06	169.32	168.76	177.56	183.91	195.43	 	-
A								Tota	I = Sum(2		All- 4		2119.82	(219)
	I totals heating		ed. main	system	1					K	Wh/year		kWh/year 2313.26	٦
•		fuel use		-)									2119.82	Ę
	0			alactria	kaan ha	4							2113.02	
				electric	кеер-по	ι							1	
		ng pump										30		(230c)
boiler with a fan-assisted flue 45									45		(230e)			
Total electricity for the above, kWh/year sum of (230a)(230g) =										75	(231)			
Electri	city for I	ighting											267.75	(232)
12a. (CO2 en	nissions ·	– Individ	lual heat	ing syste	ems inclu	uding mi	cro-CHP)					
EnergyEmission factorkWh/yearkg CO2/kWh										tor	Emissions kg CO2/yea			
Space	heating	ı (main s	ystem 1)		(21	1) x			0.2	16	=	499.66	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	457.88	(264)
Space and water heating	(261) + (262) + (263) + (264) =			957.55	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	138.96	(268)
Total CO2, kg/year	sum	of (265)(271) =		1135.43	(272)
					_

TER =

20.38 (273)