Regulations Compliance Report

Approved Document L1 Printed on 28 October 2		England assessed by Stro	oma FSAP 2012 program, Ve	rsion: 1.0.5.9	
Project Information:					
Assessed By: Zal	hid Ashraf (STRC	0001082)	Building Type:	Flat	
Dwelling Details:					
NEW DWELLING DES	IGN STAGE		Total Floor Area: 5	52.41m²	
Site Reference : He	rmitage Lane		Plot Reference:	Plot 9	
Address :					
Client Details:					
Name: Address :					
This report covers iter It is not a complete re		hin the SAP calculations ns compliance.			
1a TER and DER	-	- -			
Fuel for main heating s	/stem: Mains gas	(C)			
Fuel factor: 1.00 (mains	• • • • •				
Target Carbon Dioxide			22.4 kg/m²		
Dwelling Carbon Dioxid	e Emission Rate	(DER)	15.44 kg/m²		ок
1b TFEE and DFEE					
Target Fabric Energy E	• • •	-,	63.1 kWh/m ²		
Dwelling Fabric Energy	Efficiency (DFEE	=)	50.1 kWh/m ²		ок
2 Fabric U-values					UK
Element		Average	Highest		
External wall		0.14 (max. 0.30)	0.15 (max. 0.70)		ок
Floor		(no floor)	, , , , , , , , , , , , , , , , , , ,		
Roof		0.16 (max. 0.20)	0.24 (max. 0.35)		ОК
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)		ОК
2a Thermal bridging					
Thermal bridgi	ng calculated fro	m linear thermal transmitta	ances for each junction		
3 Air permeability					
Air permeability	at 50 pascals		3.00 (design val	ue)	
Maximum			10.0		ΟΚ
4 Heating efficiency					
Main Heating sys	stem:	Community heating scher	nes - mains gas		
0,		, ,	Ū		
Secondary heati	ng system:	None			
5 Cylinder insulation					
Hot water Storag		No cylinder			
6 Controls	, .				
Space heating co	ontrols	Charging eveter linked to	o use of community heating,		
opace nearing of	5111013	programmer and at least			ок
Hot water contro	ls:	No cylinder thermostat			
		No cylinder			

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	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: South West	8.65m ²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
External Walls U-value	0.13 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

Assessor Name:Zahid AshrafStroma Number:STR0001082Software Name:Stroma FSAP 2012Software Version:Version: 1.0.5.9Property Address: Plot 9Address :1. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Ground floor 52.41 $(1a) \times$ 2.5 $(2a) =$ 131.03 $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.41 $(1a) \times$ 2.5 $(2a) =$ 131.03 $(5a)$ Welling volume $(3a)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3b)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d$			l	Jser Det	tails:						
Address : A crea(m²) Av. Height(m) Volume(m³) Ground floor 52.41 (1a) \times 2.5 (2a) $=$ 131.03 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 52.41 (1a) \times 2.5 (2a) $=$ 131.03 (3a) Other (2a) $=$ <th< th=""><th></th><th></th><th>012</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th<>			012								
Area(m²) Av. Height(m)Volume(m³)Ground floor 52.41 $(1a) \times 2.5$ $(2a) = 131.03$ $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.41 (4) $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.03$ (5) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.03$ (5) $2.$ $main$ heating heating $main$ heating $heatingmainheatingm$			Pro	perty Ac	ddress:	Plot 9					
Area(m2) SolutionAv. Height(m) 2.5Volume(m3) 131.03Ground floor 52.41 (1a) x 2.5 (2a) = 131.03 (3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 52.41 (4)Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3c)+(3d)+(3e)+(3n) =$ 131.03 (5) 2. Ventilation rate: $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 131.03 (5)Number of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x20 =$ 0 (6b)Number of intermittent fans 0 $x10 =$ 0 $(7a)$ Number of flueless gas fires 0 $x10 =$ 0 $(7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $+$ 0 $(5) =$ 0 Infiltration due to chimneys, in the dwelling (ns) $Additional infiltration$ (9) (9) (9) Additional infiltration (9) (10) 0 (10)											
Ground floor 52.41 $(1a) \times 2.5$ $(2a) =$ 131.03 $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.41 (4) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 131.03 (5) 2. Ventilation rate: $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 131.03 (5) Number of chimneys $0 +$ $0 +$ $0 =$ $0 (6a)$ Number of open flues $0 +$ $0 +$ $0 =$ $0 (6a)$ Number of intermittent fans $0 x 10 =$ $0 (7a)$ Number of passive vents $0 x 10 =$ $0 (7b)$ Number of flueless gas fires $0 x 40 =$ $0 (7c)$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0 x (6) =$ $0 -$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0 (5) =$ $0 -$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0 (6)$ (6) Number of storeys in the dwelling (ns) $Additional infiltration$ $[(9)-1]x0.1 =$ $0 -$ Additional infiltration $[(9)-1]x0.1 =$ $0 (10)$	1. Overall dwelling dimer	isions:								N I (2)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 131.03 (5) 2. Ventilation rate: main heatingsecondary heatingothertotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x40 =$ 0 (6a)Number of intermittent fans 0 $x10 =$ 0 (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 = $(6a)+(6b)+(7a)+(7b) =$ 0 \div (5) = 0 (8)In a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) (9) (9)Additional infiltration $(9)-1)x0.1 =$ 0 (10)	Ground floor			· · ·	-			,	(2a) =		_
2. Ventilation rate:Number of chimneysmain heating 0 secondary heating 0 othertotalm³ per hourNumber of open flues 0 $+$ 0 $=$ 0 $x 40 =$ 0 (6a)Number of open flues 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)Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 0 $x 10 =$ 0 (7c)Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c) =$ 0 $x 10 =$ 0 (7c)Number of storeys in the dwelling (ns) $Additional infiltration$ $[(9) - 1]x 0.1 =$ 0 (9)Additional infiltration $[(9) - 1]x 0.1 =$ 0 (10)	Total floor area TFA = (1a)+(1b)+(1c)+(1d)+	(1e)+(1n)	52.4	41 (4)					
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 0 $+$ 0 $=$ 0 $x 10 =$ 0 (7a)Number of passive vents 0 $x 10 =$ 0 (7b)Number of flueless gas fires 0 $x 40 =$ 0 (7c)Air changes per hour 0 $x 40 =$ 0 (7c)Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 (9) (9) Number of storeys in the dwelling (ns) 0 (9) (9) Additional infiltration $[(9)-1]x0.1 =$ 0 (10)	Dwelling volume					(3a)+(3b)	+(3c)+(3d))+(3e)+	.(3n) =	131.03	(5)
heatingheatingNumber of chimneys 0 $+$ 0 $+$ 0 $=$ 0 $x 40 =$ 0 $(6a)$ Number of open flues 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 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 \div $(5) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 \div $(5) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 \div $(5) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $(-7c)$ $(-7c)$ Number of storeys in the dwelling (ns) $Additional infiltration$ (9) (10) Additional infiltration (9) (10) (10)	2. Ventilation rate:				_						
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 = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ 0 Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ 0 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns) 0 (9) Additional infiltration $[(9)-1]x0.1 =$ 0 (10)	-	heating 0 +	heating 0		0		0		l	0	(6a)
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 = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ 0 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) \circ (9) Number of storeys in the dwelling (ns) 0 (9) (10)	Number of intermittent far	IS IS					0	x 1	10 =	0	(7a)
Number of flueless gas fires 0 $x 40 =$ 0 $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 $\div (5) =$ 0 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) 0 (9) Number of storeys in the dwelling (ns) 0 (9) (10)	Number of passive vents						0	x 1	10 =		
Air changes per hour Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 0 \div (5) = 0 (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) \bigcirc (9) (9) Number of storeys in the dwelling (ns) 0 (9) (10)	·	25					-	x 4	40 =	-	
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0$ <i>If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)</i> Number of storeys in the dwelling (ns) Additional infiltration [(9)-1]x0.1 = 0 (8)	Number of fideless gas fill	55					0	~		0	(70)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration [(9)-1]x0.1 = 0 (10)									Air ch	anges per ho	ur
Additional infiltration $[(9)-1] \times 0.1 = 0$ (10)	If a pressurisation test has be	en carried out or is inte				ontinue fro	-		÷ (5) =		-
	•	e aweiling (ns)						[(0).	11v0 1 –		
		25 for steel or timb	er frame or 0	.35 for n	masonrv	constru	uction	[(0)	1,0.1 -		=
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 both types of wall are pre deducting areas of opening	esent, use the value con gs); if equal user 0.35	responding to th	he greater	wall area	(after			l	0	_()
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	-			(sealed)), else e	enter 0				0	=
If no draught lobby, enter 0.05, else enter 0	0 1	·								0	=
Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0(15)	U U	and doors draugh	stripped	0	25 - [0.2]	$(14) \pm 10$	- 100				=
								- (15) =			=
		150 expressed in a	ubic metres						area		=
Air permeability value, q50, expressed in cubic metres per nour per square metre of envelope area 3 (17) If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.15 (18)				•	•			nvelope	arca		=
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	•						s being us	ed	l	0.15	
Number of sides sheltered 2 (19)	Number of sides sheltered	ł							[2	(19)
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.85$ (20)	Shelter factor			(2	20) = 1 - [0).075 x (1	9)] =			0.85	(20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.13$ (21)	Infiltration rate incorporation	ng shelter factor		(2	21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified for monthly wind speed	Infiltration rate modified for	r monthly wind spe	ed								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	Jan Feb I	Mar Apr Ma	iy Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind speed from Table 7	Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7	(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22)m \div 4	Wind Factor (22a)m = (22)m ÷ 4									
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
<u> </u>	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	
				ndix N (2	3h) - (23a) x Fmv (e	equation (N	N5)), other	wise (23h) – (23a)			0.5	(23a)
		• •	0 11		, (, ,	• •	n Table 4h)	,) = (200)			0.5	(23b)
			-	-	-					2b)m i (f	226) v [1 (22a)	79.05	(23c)
a) II (24a)m=		0.26	0.26	0.25	0.24	0.23	0.23	HR) (24a 0.22	0.23	0.24	23D) x [0.25	0.25	- 100j	(24a)
												0.20		(2.00)
0) II (24b)m=								۷V) (24b 0	0 = (22)	0	230)	0		(24b)
		-	-	÷	-	Ţ	-		-	Ū	0	0		(=)
,					•	•		on from c c) = (22b		5 × (23b)	-		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,						•		on from l 0.5 + [(2:		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in box	(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 Ho	at losso	s and he	at loss r	aramet	or:			•						
ELEN		Gros		Openin		Net Ar	ea	U-valı	le	AXU		k-value	e A	Xk
		area		m		A ,r		W/m2		(W/ł	<)	kJ/m²·l		I/K
Doors						2	x	1.4	=	2.8				(26)
Windo	WS					8.651	x1.	/[1/(1.4)+	0.04] =	11.47				(27)
Walls ⁻	Type1	37.6	4	8.65		28.99) X	0.15	=	4.35				(29)
Walls ⁻	Type2	20.6	7	2		18.67	' X	0.14	=	2.64	ו ר			(29)
Walls ⁻	ТуреЗ	15.0	1	0		15.01	x	0.13		2.01	ז ר		\neg	(29)
Roof T	Type1	38.8	3	0		38.83	3 X	0.15	= [5.82	i F		\neg	(30)
Roof 7	Type2	7.02	2	0		7.02	x	0.24		1.69	i F		\exists	(30)
Total a	area of e	lements	, m²			119.1	8		เ		L			(31)
* for win	ndows and		ows, use e			alue calcul		formula 1,	/[(1/U-valu	ie)+0.04] a	s given in	paragraph	3.2	
Fabric	heat los	s, W/K =	= S (A x	U)	,			(26)(30)	+ (32) =				30.77	(33)
Heat c	apacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	1290.11	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
	-	sments wh ad of a dei			construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						15.5	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			46.27	(37)
Ventila	ation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5))		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	11.56	11.42	11.28	10.59	10.46	9.77	9.77	9.63	10.04	10.46	10.73	11.01		(38)
Heat tr	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	57.83	57.7	57.56	56.87	56.73	56.04	56.04	55.9	56.32	56.73	57.01	57.28		_
										Average =	Sum(39)1	12 /12=	56.83	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.1	1.1	1.1	1.09	1.08	1.07	1.07	1.07	1.07	1.08	1.09	1.09		
Numbr	or of day		nth (Tab			<u> </u>		!	,	Average =	Sum(40)1.	12 /12=	1.08	(40)
NULLIDE	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)
(,=	01	20			01	00				01		01		()
4. Wa	iter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		76		(42)
Reduce	the annua	al average	hot water		5% if the a	lwelling is	designed	(25 x N) to achieve		se target o		.03		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	88.03	84.83	81.63	78.43	75.23	72.03	72.03	75.23	78.43	81.63	84.83	88.03		-
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x [OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		960.38	(44)
(45)m=	130.55	114.18	117.83	102.72	98.57	85.05	78.82	90.44	91.52	106.66	116.43	126.43		
					· · · ·	· · · ·				Total = Su	m(45) ₁₁₂ =		1259.2	(45)
			· ·					boxes (46)	, , , 		1			(10)
(46)m= Water	19.58 storage	17.13 loss:	17.67	15.41	14.78	12.76	11.82	13.57	13.73	16	17.46	18.96		(46)
	-) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If comr	nunity h	eating a	and no ta	ank in dw	velling, e	nter 110	litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage		eclared I	oss facto	or is kno	wn (kWł	n/dav).					0		(48)
,			m Table				"day).					0		(40)
•				, kWh/ye	ear			(48) x (49)) =			10		(50)
			-	cylinder		or is not		(-/ (-)	, ,		L '	10		(00)
		-		rom Tabl	le 2 (kW	h/litre/da	ay)				0.	02		(51)
		leating s from Ta	ee secti	on 4.3								00		(52)
			m Table	2b								03 .6		(52) (53)
				e, kWh/ye	ear			(47) x (51)) x (52) x (53) =				(54)
		(54) in (5	-	,	Jul			() (0	, ~ (0_) ~ (,		03 03		(54)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (L H11)] ÷ (5	i0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3			-				0		(58)
Primar	y circuit	loss cal	culated	for each	month (. ,	65 × (41)						
•	-	1	r	r	i	1	i	ng and a	· ·	i	, 			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for ea	ch	month ((61)m =	(60	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	he	ating ca	alculated	d fo	r eacl	h month	(62)m	= 0.85	× ((45)m +	(46)m +	(57)m -	- (59)m + (61)m	
(62)m=	185.83	164.11	173.1		156.22	153.84	1:	38.55	134.09	145.7	2 145.	02	161.94	169.92	181.71]	(62)
Solar DH	W input	calculated	using A	ppe	ndix G or	Appendi	(H)	(negati	ve quantity	/) (entei	'0' if no s	sola	r contribu	tion to wate	er heating)	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	S 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=	185.83	164.11	173.1		156.22	153.84	1:	38.55	134.09	145.7	2 145.	02	161.94	169.92	181.71]	
			•							0	utput from	n wa	ater heate	er (annual)	12	1910.04	(64)
Heat g	ains fro	m water	heatin	g,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)m] + 0.	.8 x	(46)m	ı + (57)m	+ (59)n	n]	
(65)m=	87.63	77.91	83.4		76.95	76.99	7	1.08	70.43	74.29	73.2	23	79.69	81.51	86.26]	(65)
inclu	de (57)	m in calo	culation	n o	f (65)m	only if c	vlir	nder i	s in the c	dwellir	g or ho	t w	ater is f	rom com	munity	_ heating	
	. ,	ains (see			. ,	-	,				0				,	5	
	Ŭ																
Metabo	Jine gair Jan	ns (Table Feb	Ma		s Apr	May	Γ	Jun	Jul	Au	g Se	'n	Oct	Nov	Dec	1	
(66)m=	88.06	88.06	88.06	-	88.06	88.06	-	88.06	88.06	88.06	_		88.06	88.06	88.06	_	(66)
		(calcula]	
(67)m=	9 9 4115 14.19	12.6	10.25	<u> </u>	7.76	5.8	1	4.9	5.29	6.88	9.2		11.72	13.68	14.59	1	(67)
														13.00	14.55]	(0.)
		ins (calc	· · · · ·	-			1		r	,		-		400.50	4 40 70	1	(69)
(68)m=	153.5	155.09	151.0	_	142.53	131.74		21.61	114.83	113.2			125.8	136.59	146.72		(68)
	<u> </u>	s (calcula		-i		· ·	-		· · · · · ·						ı —	-	(22)
(69)m=	31.81	31.81	31.81		31.81	31.81	3	81.81	31.81	31.81	31.8	31	31.81	31.81	31.81		(69)
Pumps	and fa	ns gains	(Table	e 5	a)		-									7	
(70)m=	0	0	0		0	0		0	0	0	0		0	0	0		(70)
Losses	s e.g. ev	/aporatic	n (neg	jati	ve valu	es) (Tab	le	5)	-				-		-	_	
(71)m=	-70.45	-70.45	-70.4	5	-70.45	-70.45	-7	70.45	-70.45	-70.4	5 -70.4	45	-70.45	-70.45	-70.45		(71)
Water	heating	gains (T	able 5	5)									-		-	_	
(72)m=	117.78	115.93	112.0	9	106.88	103.49	g	8.72	94.66	99.86	101.	.7	107.1	113.2	115.94		(72)
Total i	nterna	gains =	:					(66)	m + (67)m	ı + (68)ı	n + (69)m	n + ((70)m + (71)m + (72))m		
(73)m=	334.89	333.05	322.8	4	306.59	290.45	2	74.64	264.21	269.3	9 277.	61	294.05	312.89	326.67]	(73)
6. Sol	lar gain	s:	-										-				
Solar g	ains are	calculated	using so	olar	flux from	Table 6a	and	assoc	iated equa	tions to	convert t	o th	e applica	ble orientat	tion.		
Orienta		Access F			Area			Flu			_ g_		_	FF		Gains	
		Table 6d			m²			Tat	ble 6a		Table	6b		able 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	3	86.79		0.63		x	0.7	=	97.28	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	6	62.67		0.63		x	0.7	=	165.7	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	8	35.75	Ī	0.63		×	0.7	=	226.72	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	55	x	1	06.25	Ī	0.63		_ x [0.7	=	280.91	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	5	x	1	19.01		0.63		× [0.7	=	314.65	(79)

												_
Southwest _{0.9x}	0.77 ×	8.6	65	x 1	18.15		0.63	x	0.7	=	312.37	(79)
Southwest _{0.9x}	0.77 ×	8.6	65	x 1	13.91		0.63	x	0.7	=	301.16	(79)
Southwest _{0.9x}	0.77 ×	8.6	65	x 1	04.39		0.63	x	0.7	=	275.99	(79)
Southwest _{0.9x}	0.77 ×	8.6	65	x g	92.85		0.63	x	0.7	=	245.49	(79)
Southwest _{0.9x}	0.77 ×	8.6	65	× e	69.27		0.63	x	0.7	=	183.13	(79)
Southwest _{0.9x}	0.77 ×	8.6	65	x	44.07		0.63	x	0.7	=	116.52	(79)
Southwest _{0.9x}	0.77 ×	8.6	65	x;	31.49		0.63	x	0.7	=	83.25	(79)
Solar <u>gains in wa</u>	tts, calculate	d for eac	h month			(83)m = S	um(74)m .	(82)m	-	-		
	65.7 226.72	280.91	314.65	312.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains – inte	i	1 /	i ,	· ,	, watts						I	
(84)m= 432.17 49	98.75 549.56	587.5	605.1	587.01	565.36	545.39	523.1	477.18	429.41	409.92		(84)
7. Mean internal	temperature	(heating	season)								
Temperature du	ring heating	periods in	n the livi	ng area	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisation factor	for gains for	living are	ea, h1,m	(see Ta	able 9a)	_						
Jan	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.93	0.9 0.86	0.79	0.68	0.54	0.41	0.44	0.62	0.8	0.9	0.94		(86)
Mean internal te	mperature in	living ar	ea T1 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)			-		
	9.34 19.74	20.21	20.59	20.85	20.95	20.94	20.77	20.28	19.59	18.99		(87)
Temperature du	rina heatina i	- Deriods in	n rest of	dwelling	i from Ta		h2 (°C)					
(88)m= 20	20 20	20.01	20.02	20.03	20.03	20.03	20.02	20.02	20.01	20.01		(88)
				L	L	0>						
Utilisation factor	0.89 0.84	0.76	0.63	n2,m (Se 0.47		9a) 0.36	0.55	0.77	0.89	0.93		(89)
									0.03	0.95		(00)
Mean internal te		1	r	r ě (r	ri — — —	l I	,				(00)
(90)m= 17.42 1	7.83 18.4	19.05	19.57	19.89	19.99	19.98	19.8	19.16	18.2	17.34	0.44	(90)
							'	iLA = Livin	y area ÷ (•	+) =	0.44	(91)
Mean internal te	`	or the wh	i	lling) = f	LA x T1	+ (1 – fL	A) × T2				1	
	8.49 18.98	19.56	20.01	20.31	20.41	20.4	20.22	19.65	18.81	18.06		(92)
Apply adjustmer	1	1	<u> </u>	1	r	1	· · ·	r –			l	(00)
	8.49 18.98	19.56	20.01	20.31	20.41	20.4	20.22	19.65	18.81	18.06		(93)
8. Space heating Set Ti to the me			ro obtoir	ad at at	on 11 of	Toble 0	h ao tha	+ Ti m_(76)m.on	d ro oolo	vulata	
the utilisation fac		•		ieu al si	ертто	Table 9	o, so ina	u 11,m=(70)m an	u re-caic	ulate	
	Feb Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor	for gains, hn	n:										
(94)m= 0.9 (0.87 0.82	0.74	0.63	0.49	0.36	0.39	0.57	0.76	0.87	0.91		(94)
Useful gains, hn	nGm , W = (9	4)m x (8	4)m				-					
	32.23 449.37	435.62	383.89	288.93	203.87	211.6	296.81	361.05	371.6	373.34		(95)
Monthly average		ri	1	i	i			i	i		I	
. ,	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 fo			1	1	1 /	· · · ·	r í í	ŕ – – –	007.00	700.00		
	33.98 718.5	606.08	471.62	319.85	213.4	223.51	344.69	513.36	667.29	793.96		(97)
Space heating r	· I	T	1		1		í í		r –	212.04		
(98)m= 305.18 23	36.38 200.24	122.73	65.27	0	0	0	0	113.32	212.9	312.94		

	Total per year (kWh/y	ear) = Sum(98) _{15,912} =	1568.95	(98)
Space heating requirement in kWh/m²/year		[29.93	(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 $1 - (301) =$		Ĩ	1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See		ur other heat sources; th	ie latter	_
Fraction of heat from Community boilers			1	(303a)
Fraction of total space heat from Community boilers		(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	heating system		1	(305)
Distribution loss factor (Table 12c) for community heating system		[1.05	(306)
Space heating Annual space heating requirement		[kWh/year 1568.95	7
Space heat from Community boilers	(98) x (304a) x	(305) x (306) =	1647.4	(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		L		-
Annual water heating requirement		[1910.04]
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x	(305) x (306) =	2005.55	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e)] =	36.53	(313)
Cooling System Energy Efficiency Ratio		Ī	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 out	side	-	181.84	(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) =	181.84	(331)
Energy for lighting (calculated in Appendix L)		Ī	250.62	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		[-526.94	(333)
Electricity generated by wind turbine (Appendix M) (negative quanti	ty)	[0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor I kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	fuels repeat (363) to (366) for the second fuel	94	(367a)
CO2 associated with heat source 1 [(307b)+(310	b)] x 100 ÷ (367b) x	0.22 =	839.4	(367)
Electrical energy for heat distribution [(313	3) x	0.52 =	18.96	(372)

Total CO2 associated with community s	ystems	(363)(366) + (368)(37	2)	=	858.36	(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) =			858.36	(376)
CO2 associated with electricity for pump	os and fans within dwe	lling (331)) x	0.52	=	94.38	(378)
CO2 associated with electricity for lightin	ng	(332))) x	0.52	=	130.07	(379)
Energy saving/generation technologies (Item 1	(333) to (334) as appli	cable	0.52 × 0.0	1 =	-273.48	(380)
Total CO2, kg/year	sum of (376)(382) =				809.32	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				15.44	(384)
El rating (section 14)					88.87	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 9

Dwelling type: Located in: Region: Cross ventilation poss Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass param Night ventilation: Blinds, curtains, shut Ventilation rate durin Overheating Details:	es: eter: tters:	ather (a	ich):	Flat England Thames val No 1 North East Average or None Indicative V False 4 (Window	unknown			
Summer ventilation h Transmission heat lo Summer heat loss co	ss coeffic	cient:	ient:	172.96 46.3 219.24				(P1) (P2)
Overhangs:								
Orientation:	Ratio:		Z_overhangs:					
South West (SW)	0		1					
Solar shading:								
Orientation: South West (SW)	Z blind 1	s:	Solar access: 0.9	Over 1	hangs:	Z summer: 0.9		(P8)
Solar gains:								
Orientation South West (SW)	0.9 x	Area 8.65	Flux 119.92	g_ 0.63	FF 0.7	Shading 0.9 Total	Gains 370.59 370.59	(P3/P4)
Internal gains:								
Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass tempera Threshold temperature Likelihood of high int	temperat	ement	5.		5.02 1.04 8 78	July 361.84 732.42 3.34 17.9 1.3 22.54 Medium	August 368.62 714.33 3.26 17.8 1.3 22.36 Medium	(P5) (P6) (P7)
Assessment of likelih	ood of h	igh inte	ernal temperatur	'e: <u>Me</u>	<u>dium</u>			

Assessor Name: Zahid Ashraf Stroma Number: STR0001082 Software Name: Stroma FSAP 2012 Software Version: Version: 1.0.5.9 Property Address: Plot 9 Address : 1. Overall dwelling dimensions: Area(m ²) Av. Height(m) Volume(m ³) Ground floor S2.41 (1a) x 2.5 (2a) = (31.03) (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) S2.41 (4) Dwelling volume (3a)+(3b)+(3c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d
Address : Area(m?) Av. Height(m)Volume(m?)Ground floor 52.41 $(1a) \times 2.5$ $(2a) =$ 131.03 $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.41 (4) 2.5 $(2a) =$ 131.03 $(3a)$ Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 131.03 (5) 2.5 2.5 $(2a) =$ $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$ 131.03 (5) 2. Ventilation rate: Number of chimneys 0 $+$ 0 $=$ 0 $x40 =$ 0 $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $x40 =$ 0 $(6b)$ Number of intermittent fans 2 $x10 =$ 0 $7c_0$ Number of passive vents 0 $x10 =$ 0 $7c_0$ Number of flueless gas fires 0 $x40 =$ 0 $7c_0$ Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c)=$ 20 $+$ 0 0 If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) 0 0 0 Structural infiltration 25 for steel or timber frame or 0.35 for masonry construction 0 0 0 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 0 0 If no draught lobby, enter 0.05 , else enter 0 0 0 0 0 If suspended wooden floor,
Area(m²)Av. Height(m)Volume(m³) Ground floorState (na)+(1b)+(1c)+(1d)+(1e)+(1n)State (na)Volume(m3)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)State (na)State (na)Volume(m3)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)State (na)Volume(m3)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)State (na)Volume(m3)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)State (na)Volume(m3)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1a)+(1c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d
Area(m?)Av. Height(m)Volume(m?)Ground floor 52.41 $(1a) \times 2.5$ $(2a) = 131.03$ $(3a)$ Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 52.41 (4) $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.03$ (5) Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.03$ (5) (5) (5) 2. Ventilation rate: $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 131.03$ (6) Number of chimneys 0 $+$ 0 $=$ 0 Number of open flues 0 $+$ 0 $=$ 0 Number of open flues 0 $+$ 0 $=$ 0 Number of passive vents 2 $x10 =$ 20 $(7e)$ Number of flueless gas fires 0 $x10 =$ 0 $(7c)$ Number of storeys in the dwelling (ns) $x40 =$ 0 (9) Additional infiltration $(25 for steel or timber frame or 0.35 for masonry construction0(11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.3500(12)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)0(13)Percentage of windows and doors draught stripped00(14)0(15)Infiltration0.25 \cdot [0.2 \times (14) + 100] =0(15)Infiltration rate(8) + (10) + (11) + (12) + (15) + (15) =0(16)$
Ground floor 52.41 $(1a) \times 2.5$ $(2a) =$ (131.03) $(3a)$ Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.41 (4) Dwelling volume $(3a)+(2b)+(3c)+(3d)+(3e)+(3n) =$ (131.03) (5) 2. Ventilation rate:main heatingsecondary heating $(a) +$ $(a) =$ $(a) +$ Number of chimneys $0 +$ $0 +$ $0 =$ $0 (6a)$ Number of open flues $0 +$ $0 +$ $0 =$ $2 0$ $2 \times 10 =$ $2 0 (6b)$ Number of passive vents $0 10 =$ $0 (7c)$ Number of flueless gas fires $0 x10 =$ $0 (7c)$ Number of storeys in the dwelling (ns) $x 40 =$ $0 (10)$ Additional infiltration 0.25 for steel or timber frame or 0.35 for masonry construction $(9) - 1 x0.1 =$ $0 -$ If suppended 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 $0.25 - [0.2 \times (14) + 100] =$ $0 -$ Infiltration $0.25 - [0.2 \times (14) + 100] =$ $0 (14)$ Window infiltration $0.25 - [0.2 \times (14) + 100] =$ $0 (15)$ Infiltration rate $(8) + (10) + (11) + (12) + (15) + (15) =$ $0 (14)$
Dwelling volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =131.03 (5) 2. Ventilation rate: main heatingothertotalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x40$ 2 0 (6a)Number of passive vents 2 $x10$ 2 20 (7a) 0 $x10$ 0 $x10$ 0 $(7a)$ $(7$
2. Ventilation rate:main heating heatingsecondary heating heatingothertotalm³ per hourNumber of chimneys 0 0 $+$ 0 $=$ 0 $x40$ 0 $(6a)$ Number of open flues 0 $+$ 0 $=$ 0 $x20$ 0 $(6b)$ Number of intermittent fans 2 $x10$ 2 20 $(7a)$ Number of passive vents 0 $x10$ 0 $(7c)$ Number of flueless gas fires 0 $x40$ 0 $(7c)$ Number of flueless gas fires 0 $x40$ 0 $(7c)$ Number of storeys in the dwelling (ns) $Additional infiltration(9)(6b)+(7a)+(7b)+(7c)(6)Additional infiltration0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (afterdeducting areas of openings); if equal user 0.350(12)If no draught lobby, enter 0.05, else enter 00.25 - [0.2 \times (14) + 100] =0(13)Percentage of windows and doors draught stripped0(14)0(14)Window infiltration0.25 - [0.2 \times (14) + 100] =0(15)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)$
Mumber of chimneysmain heating 0 secondary heating 0 other 0 totalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x20$ 0 (6b)Number of intermittent fans 2 $x10$ 20 (7a)Number of passive vents 0 $x10$ 0 (7c)Number of flueless gas fires 0 $x40$ 0 (7c)Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20 $+$ (5) 0.15 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (10) 0 (10)Number of storeys in the dwelling (ns) 0 (10) (11) 0 (10)Additional infiltration (9) (10) (11) 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 (12) 0 (12)If no draught lobby, enter 0.05, else enter 0 $0.25 - [0.2 \times (14) \div 100] =$ 0 (13)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 (15)
Mumber of chimneysmain heating 0 secondary heating 0 other 0 totalm³ per hourNumber of chimneys 0 $+$ 0 $=$ 0 $x40$ 0 (6a)Number of open flues 0 $+$ 0 $=$ 0 $x20$ 0 (6b)Number of intermittent fans 2 $x10$ 20 (7a)Number of passive vents 0 $x10$ 0 (7c)Number of flueless gas fires 0 $x40$ 0 (7c)Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 20 $+$ (5) 0.15 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (10) 0 (10)Number of storeys in the dwelling (ns) 0 (10) (11) 0 (10)Additional infiltration (9) (10) (11) 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 (12) 0 (12)If no draught lobby, enter 0.05, else enter 0 $0.25 - [0.2 \times (14) \div 100] =$ 0 (13)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 (15)
Number of chimneys 0 + 0 + 0 = 0 × 40 = 0 (6a)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 (7b)Number of flueless gas fires 0 × 40 = 0 (7c)Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $+(5) =$ 0.15 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 (9)Number of storeys in the dwelling (ns) 0 (10) 0 (11)Additional infiltration $(9)-1]\times 0.1 =$ 0 (10)Structural infiltration:0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 0 (13) 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 (15)
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 $+(5) =$ 0.15 (8) If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) 0 (9) Number of storeys in the dwelling (ns) 0 (10) 0 (11) Additional infiltration $(9)-1]x0.1 =$ 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (12) If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) Percentage of windows and doors draught stripped 0 (14) Window infiltration $0.25 - [0.2 x (14) + 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0
Number of passive vents 10
Number of flueless gas fires 0 $x 40 =$ 0 (10) 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 $\div (5) =$ 0.15 If a pressurisation test has been carried out or is intended, proceed to (17) , otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) 0 (9) Additional infiltration $(9)-1]x0.1 =$ 0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 0 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 $0.25 - [0.2 x (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0
Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) =$ 20 $\div (5) =$ 0.15(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) $\div (5) =$ 0.15(8)Number of storeys in the dwelling (ns)0(9)(10)Additional infiltration[(9)-1]x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry 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 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) + 100] =0Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 \div (5) =0.15(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) 0 0 (9) Number of storeys in the dwelling (ns) 0 0 0 (9) Additional infiltration $(9)-1]x0.1 =$ 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35$0$$(12)$If no draught lobby, enter 0.05, else enter 0$0$$(13)$Percentage of windows and doors draught stripped$0$$(14)$Window infiltration$0.25 - [0.2 \times (14) \div 100] =$$0$Infiltration rate$(8) + (10) + (11) + (12) + (13) + (15) =$$0$</i>
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)Number of storeys in the dwelling (ns) 0 (9)Additional infiltration 0 (9)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11) <i>if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35</i> 0 (12)If no draught lobby, enter 0.05, else enter 0 0 (13)Percentage of windows and doors draught stripped $0.25 - [0.2 \times (14) \div 100] =$ Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0(16)
Number of storeys in the dwelling (ns) 0 0 (9) Additional infiltration $[(9)-1]\times 0.1 =$ 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 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 $0.25 - [0.2 \times (14) \div 100] =$ 0 Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0 Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0
Additional infiltration $[(9)-1]x0.1 =$ 0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(11)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) ÷ 100] =0Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)
It is the state of the state
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0(16)
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 $0.25 - [0.2 \times (14) \div 100] =$ Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0(16)
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)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0(15)Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0(16)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ 0.3 (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)
Shelter factor (20) = 1 - $[0.075 \times (19)] =$ 0.85 (20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.26$ (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 infiltra	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.33	0.32	0.32	0.28	0.28	0.24	0.24	0.24	0.26	0.28	0.29	0.3		
	<i>ate effec</i> echanica		-	rate for t	he appli	cable ca	se							
				endix N, (2	3h) - (23a	a) v Emv (e	auation (N	(5)) othe	rwise (23h) - (23a)			0	(23a)
			• • • •	iency in %	, ,	, ,) – (20a)			0	(23b)
			-	-	-					2b)m i (22h) v [/	1 – (23c)	0	(23c)
a) II (24a)m=								1K) (242				0	÷ 100]	(24a)
		-	-	entilation	-	-	-	÷	-	_		Ū		(,
(24b)m=	r								0 = (22)		230)	0		(24b)
		÷	-	tilation c	-				•	0	0	Ū		()
,				hen (240	•	•				.5 × (23b	b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (22t		•				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	0.55		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in bo>	(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	0.55		(25)
2 40	at locco	e and he		paramete	or:		•		•	•		•		
	IENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/		k-value kJ/m²·ł		A X k kJ/K
Doors						2	x	1.4	=	2.8				(26)
Windo	WS					8.651	x1/	/[1/(1.4)+	0.04] =	11.47	=			(27)
Walls ⁻	Type1	37.6	64	8.65	;	28.99) x	0.15		4.35	= r			(29)
Walls ⁻	Type2	20.6	57	2		18.67	, x	0.14	= 	2.64			\dashv	(29)
Walls ⁻		15.0		0		15.01		0.13		2.01			\dashv	(29)
Roof ⁻		38.8		0		38.83		0.15		5.82			\dashv	(30)
Roof ⁻		7.02		0		7.02	x	0.24		1.69			\dashv	(30)
	area of e					119.1		0.21	I	1.00	J L			(31)
				effective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	(01)
** incluc	le the area	as on both	sides of ir	nternal wal	ls and par	titions	-			, -	-			
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				30.77	(33)
Heat c	apacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	1290.11	(34)
Therm	al mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	∩ kJ/m²K			Indica	tive Value	: Low		100	(35)
	ign assess used instea			tails of the ulation.	construct	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						15.5	(36)
			are not kn	own (36) =	= 0.05 x (3	1)			()	()		1		
	abric he									(36) =			46.27	(37)
Ventila			1	monthly						1	(25)m x (5)		I	
(0.6.)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
(38)m=	23.95	23.86	23.77	23.35	23.27	22.91	22.91	22.84	23.05	23.27	23.43	23.6		(38)
	ransfer c		· · · · · · · · · · · · · · · · · · ·	,						= (37) + (3	·	1	I	
(39)m=	70.22	70.13	70.04	69.63	69.55	69.19	69.19	69.12	69.33	69.55	69.71	69.87		
										Average =	: Sum(39)₁	12 /12=	69.63	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.34	1.34	1.34	1.33	1.33	1.32	1.32	1.32	1.32	1.33	1.33	1.33		
Numbe	er of day	/s in mo	nth (Tab	le 1a)	•	•	•		,	Average =	Sum(40)1.	12 /12=	1.33	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	349 x (TF	FA -13.9	9)2)] + 0.0	0013 x (⁻	TFA -13	1. ⁻ .9)	76		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.03		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	88.03	84.83	81.63	78.43	75.23	72.03	72.03	75.23	78.43	81.63	84.83	88.03		
F						100					m(44) ₁₁₂ =		960.38	(44)
					-			DTm / 3600		· ·			I	
(45)m=	130.55	114.18	117.83	102.72	98.57	85.05	78.82	90.44	91.52	106.66	116.43	126.43	4050.0	(45)
lf instant	taneous w	vater heati	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		i otal = Su	m(45) ₁₁₂ =		1259.2	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		!	!	!	!	!	1	!	!	·			
-		. ,		• •			-	within sa	ame ves	sel	(0		(47)
	•	-			/elling, e ncludes i			n (47) ombi boil	ers) ente	er '0' in (47)			
	storage													
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				(0		(48)
•			m Table								(0		(49)
			•	e, kWh/ye	ear loss fact	or is not	known:	(48) x (49)) =		(0		(50)
				•	le 2 (kW							0		(51)
If comr	munity h	neating s	see secti	on 4.3	,		• /					-		
		from Ta									(0		(52)
			m Table								(0		(53)
		om wateı (54) in (5	•	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
	. ,	. , .	,	for each	month			((56)m = (55) x (41)	m	(0		(55)
								1			0	0	l	(56)
(56)m= If cylinde	0 er contain:	0 s dedicate	0 d solar sto	0 rage, (57)	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 50), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Append	ix H	(30)
-	0	0	0	0	0	0	0	0	0	0	0	0		(57)
(57)m=						0	0	0	0	0				
	•	•	,	om Table		50)m - 4	(58) • 24	85 ~ (11)	m		(0		(58)
	•						. ,	65 × (41) ing and a		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
	L	I	!	!	I	I	I	!	I	ļ			I	

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	0]	(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r eacl	n month	(62)m	= 0.85 ×	(45)m +	- (46)m +	(57)m +	+ (59)m + (61)m	
(62)m=	110.97	97.05	100.1	5	87.31	83.78		72.3	66.99	76.88	77.79	90.66	98.96	107.47]	(62)
Solar DH	-IW input	calculated	using A	ppe	ndix G or	· Appendix	:Н(negativ	ve quantity) (enter	0' if no sola	ar contrib	ution to wate	er heating)	
(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=	110.97	97.05	100.1	5	87.31	83.78	-	72.3	66.99	76.88	77.79	90.66	98.96	107.47]	
										Οι	tput from w	ater heat	er (annual)	112	1070.32	(64)
Heat g	ains fro	m water	heatin	g,	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8 :	x [(46)n	า + (57)m	+ (59)n	n]	
(65)m=	27.74	24.26	25.04	Ī	21.83	20.95	1	8.07	16.75	19.22	19.45	22.67	24.74	26.87]	(65)
inclu	de (57)	m in calo	culation	י ר ו	f (65)m	only if c	vlir	nder is	s in the c	dwellin	or hot w	/ater is	from com	munity	_ heating	
	. ,	ains (see			· · /	•	,			·	, ,			,	5	
Melab	Jine gain	ns (Table Feb	Ma		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m=	88.06	88.06	88.06	-	88.06	88.06		8.06	88.06	88.06	88.06	88.06	88.06	88.06	4	(66)
		(calcula]	. ,
(67)m=	9 9an 3 14.19	12.6	10.25	<u> </u>	7.76	5.8	i —	4.9	5.29	6.88	9.23	11.72	13.68	14.59	1	(67)
				_									13.00	14.55	J	(01)
		<u>,</u>	r —				r –			,	so see Ta	T	400.50	440.70	1	(68)
(68)m=	153.5	155.09	151.0	_	142.53	131.74		21.61	114.83	113.24		125.8	136.59	146.72]	(68)
	<u> </u>	<u> </u>		-i-		· · ·	<u> </u>				see Table	1		. <u> </u>	7	(22)
(69)m=	31.81	31.81	31.81		31.81	31.81	3	1.81	31.81	31.81	31.81	31.81	31.81	31.81]	(69)
Pumps	and fa	ns gains	(Table	e 5	a)						-				-	
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0		(70)
Losses	s e.g. e	vaporatic	on (neg	jati	ve valu	es) (Tab	le	5)					_		-	
(71)m=	-70.45	-70.45	-70.4	5	-70.45	-70.45	-7	70.45	-70.45	-70.45	-70.45	-70.45	-70.45	-70.45		(71)
Water	heating	gains (T	able 5)		-	_								_	
(72)m=	37.29	36.11	33.65		30.32	28.15	2	25.1	22.51	25.83	27.01	30.46	34.36	36.11]	(72)
Total i	nterna	gains =						(66)	m + (67)m	ı + (68)m	+ (69)m +	(70)m +	71)m + (72)m		
(73)m=	254.39	253.22	244.4		230.03	215.12	20	01.03	192.06	195.37	202.92	217.41	234.05	246.84]	(73)
6. So	lar gain	s:														
Solar g	ains are	calculated	using so	olar	flux from	Table 6a	and	associ	ated equa	tions to	convert to th	ne applica	able orienta	tion.		
Orienta		Access F			Area			Flu			g		FF		Gains	
		Table 6d			m²			Tat	ole 6a		Table 6b		Table 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	3	6.79		0.63	×	0.7	=	97.28	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	6	2.67		0.63	×	0.7	=	165.7	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	8	5.75		0.63	x	0.7	=	226.72	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	1(06.25		0.63	×	0.7	=	280.91	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	1	19.01		0.63	×	0.7	=	314.65	(79)

		-												_
Southwest _{0.9x}	0.77	×	8.6	5	x	1'	18.15		0.63		0.7	=	312.37	(79)
Southwest _{0.9x}	0.77	X	8.6	65	x	1'	13.91		0.63	x	0.7	=	301.16	(79)
Southwest0.9x	0.77	x	8.6	65	x	1(04.39		0.63	x	0.7	=	275.99	(79)
Southwest0.9x	0.77	x	8.6	65	x	9	2.85		0.63	×	0.7	=	245.49	(79)
Southwest _{0.9x}	0.77	x	8.6	65	x	6	9.27		0.63	x	0.7	=	183.13	(79)
Southwest0.9x	0.77	x	8.6	65	x	4	4.07		0.63	×	0.7	=	116.52	(79)
Southwest0.9x	0.77	x	8.6	65	x	3	31.49		0.63	_ x [0.7	=	83.25	(79)
										_				
Solar gains in	watts, calcul	lated	for eacl	h month				(83)m = S	um(74)m .	(82)m				
(83)m= 97.28	1	6.72	280.91	314.65	1	12.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains –	internal and	solar	(84)m =	= (73)m ·	+ (8	33)m	, watts		•		•			
(84)m= 351.67	418.92 47	1.12	510.94	529.76	5	13.4	493.22	471.36	448.4	400.54	350.57	330.09		(84)
7. Mean inte	rnal tempera	ture ('heating	season)				-				-	
	e during heati		, J		<i>.</i>	area f	from Tab	ole 9. Th	1 (°C)				21	(85)
-	ctor for gains	• ·			-				. (0)				21	
Jan		/ar	Apr	May	È	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(86)m= 0.96	+	.91	лрі 0.85	0.77		D.65	0.53	0.56	0.73	0.87	0.94	0.96		(86)
	<u> </u>				I					0.07	0.94	0.30	J	(00)
	al temperatur			· · ·					r				1	
(87)m= 18.33	18.65 19	.12	19.7	20.24	2	0.65	20.85	20.82	20.51	19.8	18.95	18.26		(87)
Temperature	e during heati	ing p	eriods ir	n rest of	dw	elling	from Ta	ble 9, T	h2 (°C)					
(88)m= 19.81	19.81 19	.81	19.82	19.82	1	9.83	19.83	19.83	19.82	19.82	19.82	19.82		(88)
L Itilisation fa	ctor for gains	for r	est of d	welling	h2	m (sc	n Tahla	(a)			•			
(89)m= 0.95	т <u>т</u> т	.89	0.83	0.73	1).58	0.41	0.45	0.66	0.85	0.93	0.96	1	(89)
	<u> </u>										0.00	0.00	J	()
	al temperatur				<u> </u>		1	·	1	,	1	1	1	(0.0)
(90)m= 17.4	17.71 18	6.17	18.74	19.24	1	9.61	19.76	19.75	19.5	18.85	18.02	17.33		(90)
									t	LA = Livi	ng area ÷ (4	4) =	0.44	(91)
Mean interna	al temperatur	e (fo	r the wh	ole dwe	llin	g) = fl	LA × T1	+ (1 – fl	A) × T2					
(92)m= 17.8	18.12 18	.58	19.16	19.68	2	0.07	20.24	20.22	19.94	19.27	18.43	17.74		(92)
Apply adjust	ment to the n	nean	internal	temper	atu	re fro	m Table	4e, whe	ere appro	priate	•			
(93)m= 17.8	18.12 18	.58	19.16	19.68	2	0.07	20.24	20.22	19.94	19.27	18.43	17.74		(93)
8. Space he	ating requirer	ment												
Set Ti to the	mean interna	al ten	nperatur	re obtair	ned	at ste	ep 11 of	Table 9	b, so tha	t Ti,m=	(76)m an	d re-calo	culate	
the utilisation	n factor for ga	ains u	using Ta	ble 9a	-								,	
Jan	Feb N	/lar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ctor for gains	<u> </u>			_							·	1	
(94)m= 0.94	0.91 0.	87	0.81	0.72	(0.59	0.46	0.49	0.67	0.83	0.91	0.95		(94)
	, hmGm , W	= (94)m x (84	4)m	_							r	1	
(95)m= 330.09	381.83 41	1.26	414.88	382.27	30	04.27	224.47	230.37	300.05	333.25	320.72	312.21		(95)
	rage external				-							i	1	
(96)m= 4.3		.5	8.9	11.7		14.6	16.6	16.4	14.1	10.6	7.1	4.2	J	(96)
	te for mean ir		· · ·		-			- ,			1	i	1	
(97)m= 948.25		6.4	714.07	554.76		78.16	251.71	263.77	404.97	602.66	789.49	945.77	J	(97)
	ng requireme				Wh				í í		- <u></u>		1	
(98)m= 459.91	366.33 323	3.75	215.42	128.33		0	0	0	0	200.44	337.51	471.37	J	

Total per year (kWh/year) = Sum(98) _{15,912} =										2503.06	(98)			
Space	e heatin	g require	ement in	kWh/m²	²/year								47.76	(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 tem	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	650.35	511.98	525.3	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	oss hm											
(101)m=	0	0	0	0	0	0.71	0.78	0.76	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	Vatts) =	(100)m x	(101)m									
(102)m=	0	0	0	0	0	464.84	399.81	399.62	0	0	0	0		(102)
Gains	(solar g	gains cal	lculated	for appli	cable we	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	666.51	641.69	617.19	0	0	0	0		(103)
						lwelling,	continue	ous (kW	(h) = 0.0	24 x [(10)3)m – (102)m]>	x (41)m	
· · ·				: 3 × (98	í									
(104)m=	0	0	0	0	0	145.21	179.96	161.87	0	0	0	0		_
										= Sum(,	=	487.03	(104)
	fraction			、					fC=	cooled a	area ÷ (4	1) =	1	(105)
		actor (Ta	r	ŕ										
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		-
0					(404)	(405)	(400)		lotal	l = Sum(104)	=	0	(106)
· .		· ·	r	month =	r`´´		<u>`</u>			0	0			
(107)m=	0	0	0	0	0	36.3	44.99	40.47	0	0	0	0		
									Iotal	= Sum(1.0.7)	=	121.76	(107)
Space	cooling	requirer	ment in k	«Wh/m²/y	/ear				(107)) ÷ (4) =			2.32	(108)
8f. Fab	ric Enei	gy Effici	iency (ca	alculated	l only un	der speo	cial cond	litions, s	ee sectio	on 11)				
Fabric Energy Efficiency									(99) ·	+ (108) =	=	[50.08	(109)

SAP Input

Property Details: Plo	ot 9							
Address: Located in: Region: UPRN: Date of assessme Date of certificat Assessment type Transaction type Tenure type: Related party dis Thermal Mass Pa Water use <= 12 PCDF Version:	e: : : closure: rameter:	Tha 08 . 28 0 Nev Nev Unk No Ind	land mes valley July 2020 October 2020 v dwelling design stage v dwelling nown related party icative Value Low False	2				
Property description	:							
Dwelling type:		Flat						
Detachment: Year Completed:		202	0					
Floor Location:		Flo	or area:					
Floor 0		52	413 m²	S	Storey height 2.5 m			
Living area:			34 m ² (fraction 0.436)		2.5 11			
Front of dwelling fa	ces:	Nor	th East					
Opening types:								
Name: NE	Source: Manufacturer		Type: Solid	Glazing:		Argon:	Fram	e:
SW	Manufacturer		Windows	double-glaze	d	Yes		
Name: NE SW	Gap: mm 16mm o	r more	Frame Factor 0 0.7	: g-value: 0 0.63	U-value: 1.4 1.4	Area: 2 8.651	No. o 1 1	f Openings:
Name: NE SW	Type-Name	9:	Location: Corridor Wall External Wall	Orient: North East South West		Width: 0 0	Heigl 0 0	nt:
Overshading:		Ave	rage or unknown					
Opaque Elements:								
Type: G External Elements	Gross area:	Opening	s: Net area:	U-value:	Ru value:	Curtain	wall:	Kappa:
External Wall	37.638	8.65	28.99	0.15	0	False		N/A
Corridor Wall Stairwell Wall	20.675 15.013	2 0	18.67 15.01	0.15 0.15	0.4 0.82	False False		N/A N/A
Flat Roof (200mm ins		0	38.83	0.15	0.82	1 0130		N/A
Flat Roof (100mm ins <u>Internal Elements</u> <u>Party Elements</u>		0	7.02	0.24	0			N/A
Thermal bridges:								
Thermal bridges:			r-defined (individual PS		e = 0.1301			
		Le i 4.7 ^e	ngth Psi-value 95 0.289		lintels (including o	other steel linte	ls)	

SAP Input

	13.2	0.047	E4	Jamb
	19.375	0.064	E7	Party floor between dwellings (in blocks of flats)
	10.9	0.078	E16	Corner (normal)
	2.725	-0.072	E17	Corner (inverted internal area greater than external area)
	2.725	0.096	E25	Staggered party wall between dwellings
[Approved]	2.725	0.06	E18	Party wall between dwellings
	5.805	0.131	E21	Exposed floor (inverted)
	13.338	0.114	E24	Eaves (insulation at ceiling level - inverted)
	7.291	0.068	E14	Flat roof
	13.812	0.56	E15	Flat roof with parapet
	2.762	0	P3	Intermediate floor between dwellings (in blocks of flats)
	2.762	0.24	P4	Roof (insulation at ceiling level)

Ventilation:	
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True 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: Others:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False
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: 0.64

SAP Input

Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West No

Assess Zero Carbon Home:

User Details:		
Assessor Name:Zahid AshrafStroma Number:STRO0Software Name:Stroma FSAP 2012Software Version:Version	001082 n: 1.0.5.9	
Property Address: Plot 9		
Address :		
1. Overall dwelling dimensions:		
Area(m²) Av. Height(m) Ground floor 52.41 (1a) x 2.5 (2a) =	Volume(m ³) 131.03 (3a)	ı)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 52.41 (4)		
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	131.03 (5)	
2. Ventilation rate:		
main secondary other total heating heating	m ³ per hour	
Number of chimneys $0 + 0 + 0 = 0 \times 40 =$	0 (6a)	ı)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	0 (6b))
Number of intermittent fans	20 (7a)	ı)
Number of passive vents 0 × 10 =	0 (7b))
Number of flueless gas fires	0 (7c)	:)
Air cha	anges per hour	
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 20$ \div (5) =	0.15 (8)	
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	0.10	
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 construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	0 (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)	6)
Percentage of windows and doors draught stripped	0 (14)	.)
Window infiltration 0.25 - [0.2 x (14) ÷ 100] =	0 (15))
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)	i)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5 (17))
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$	0.4 (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)	2)
Shelter factor $(20) = 1 - [0.075 \times (19)] =$	2 (19) 0.85 (20)	
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.34 (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 infiltra	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4		
	<i>ate effec</i> echanica		-	rate for t	he appli	cable ca	se		-					
				endix N, (2	3h) - (23a	a) x Emv (c	auation (N	(15)) othe	nwieg (23h	(23a)		l	0	(23a)
) = (23a)		l	0	(23b)
			-	iency in %	-					01.)			0	(23c)
,			i		with hea	1	r	i – – – – – – – – – – – – – – – – – – –	ŕ	<u>, </u>	1 -	1 – (23c)	÷ 100]	(24a)
(24a)m=		0	0	Ů	Ů	0	0	0	0	0	0	0		(24a)
,	· · · · ·		-	entilation			· · · · ·	r Ó 🗋	ŕ	r ́ ``	, <u> </u>			(0.4)
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
,				ntilation o then (24o	•	•				.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (22t	•	•				0.5]				
(24d)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in box	(25)					
(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
2 40		o ond he		paramete	or			•		•		•		
	MENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²·ł		A X k kJ/K
Doors			. ,			2	x	1	=	2				(26)
Windo	ws					8.651	x1,	/[1/(1.4)+	0.04] =	11.47	=			(27)
Walls ⁻	Tvpe1	37.6	34	8.65		28.99		0.18		5.22	=			(29)
Walls		20.6		2		18.67		0.18		3.36	╡╏		\dashv	(29)
Walls											╡╏		\dashv	(29)
Roof ⁻		15.0		0		15.01		0.18		2.7	╡╏		\dashv	` ´
		38.8		0		38.83		0.13	=	5.05				(30)
Roof		7.02		0		7.02	×	0.13	=	0.91				(30)
	area of e					119.1								(31)
				effective wi nternal wali			ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
			= S (A x					(26)(30)	+ (32) =			1	30.71	(33)
	apacity			,					((28).	(30) + (32	2) + (32a).	(32e) =	1290.11	(34)
			,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For des	ign assess	ments wh		tails of the				ecisely the				able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<]	17.03	(36)
if details	s of therma	l bridging	are not kn	nown (36) =	= 0.05 x (3	1)						L		
Total f	abric hea	at loss							(33) +	(36) =			47.74	(37)
Ventila	ation hea	t loss ca	alculated	monthly	/				(38)m	= 0.33 × ((25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	25.74	25.58	25.42	24.68	24.55	23.91	23.91	23.79	24.15	24.55	24.83	25.12		(38)
Heat ti	ransfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	73.48	73.32	73.16	72.42	72.28	71.64	71.64	71.53	71.89	72.28	72.56	72.85		
										Average =	Sum(39)1	12 /12=	72.42	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.4	1.4	1.4	1.38	1.38	1.37	1.37	1.36	1.37	1.38	1.38	1.39		
Numbe	er of day	, vs in mo	nth (Tab	le 1a)	•		•			Average =	Sum(40)1.	12 /12=	1.38	(40)
- turno (Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				(1 - exp	0(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		76		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.03		(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=	83.63	80.59	77.55	74.51	71.47	68.43	68.43	71.47	74.51	77.55	80.59	83.63		
-						100					m(44) ₁₁₂ =		912.36	(44)
				·	-			OTm / 3600		· ·	. <u> </u>		I	
(45)m=	124.02	108.47	111.93	97.59	93.64	80.8	74.87	85.92	86.95	101.33	110.61	120.11		
lf instan	taneous v	vater heati	ng at poin	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		l otal = Su	m(45) ₁₁₂ =	=	1196.24	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:												
Storag	e volum	e (litres)) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	•	-			velling, e			. ,	· · ·	(0) : (4-7			
	vise it no storage		not wate	er (this ir	iciudes i	nstantar	neous co	ombi boil	ers) ente	er 'O' in (47)			
	-		eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m watei	- storage	e, kWh/y	ear			(48) x (49)) =			0		(50)
				•	loss fact								1	
		-	ee secti		le 2 (kW	h/litre/da	ay)					0		(51)
	•	from Ta		011 4.0								0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	m watei	· storage	e, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (55)									0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – ([H11)] ÷ (5	50), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
								65 × (41)						
•		· · · · · ·		1		· · · · · ·		ng and a	<u> </u>	r	r í		I	
(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 eacl	n month	(62)m	= 0.85 ×	(45)m -	+ (46)m +	(57)m -	_ ⊦ (59)m + (61)m	
(62)m=	105.42	92.2	95.14	4	82.95	79.59	6	8.68	63.64	73.03	73.9	86.13	94.02	102.09]	(62)
Solar DH	-IW input	calculated	using A	ppe	endix G or	· Appendix	н ((negativ	ve quantity) (enter	'0' if no sola	ar contrib	ution to wate	er heating)	
(add a	dditiona	al lines if	FGHF	RS a	and/or \	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=	105.42	92.2	95.14	4	82.95	79.59	6	8.68	63.64	73.03	73.9	86.13	94.02	102.09]	
										Οι	tput from w	ater hea	er (annual)	112	1016.81	(64)
Heat g	ains fro	m water	heatir	ng,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	m] + 0.8 :	x [(46)r	n + (57)m	+ (59)n	n]	
(65)m=	26.36	23.05	23.79	9	20.74	19.9	1	7.17	15.91	18.26	18.48	21.53	23.5	25.52]	(65)
inclu	de (57)	m in calo	ulatio	n o	of (65)m	only if c	ylir	nder is	s in the c	dwelling	g or hot w	/ater is	from com	munity	_ heating	
5. Int	ernal a	ains (see	e Table	e 5	and 5a):	-				-			-	-	
		ns (Table) -										
metab	Jan	Feb	 Ma		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
(66)m=	88.06	88.06	88.06	-	88.06	88.06		8.06	88.06	88.06	88.06	88.06	88.06	88.06	1	(66)
Liahtin	n dains	i (calcula	L ted in	Ap	pendix	L L equat	ion	190	rl9a)a	lso see	Table 5				1	
(67)m=	14.19	12.6	10.2	<u> </u>	7.76	5.8	<u> </u>	4.9	5.29	6.88	9.23	11.72	13.68	14.59	7	(67)
											so see Ta				1	
(68)m=	153.5	155.09	151.0	_	142.53	131.74	r –	21.61	114.83	113.24		125.8	136.59	146.72	1	(68)
													100.00	140.72		(00)
	31.81	31.81	31.8	-i	31.81	L, equai	<u> </u>	1 L 15 1.81	31.81	, also : 31.81	see Table	31.81	31.81	31.81	7	(69)
(69)m=						31.01	3	01.01	31.01	31.01	31.01	31.01	31.01	31.01	J	(03)
-	-	ins gains	·		-		_								-	(70)
(70)m=	0	0	0		0	0		0	0	0	0	0	0	0]	(70)
	<u> </u>	vaporatic	r È Ì			, ``	<u> </u>	,				-	_		7	
(71)m=	-70.45	-70.45	-70.4	5	-70.45	-70.45	-7	70.45	-70.45	-70.45	-70.45	-70.45	-70.45	-70.45		(71)
Water		gains (T		ŕ								-		,	-	
(72)m=	35.42	34.3	31.97	7	28.8	26.74	2	3.85	21.39	24.54	25.66	28.94	32.64	34.31		(72)
Total i	nterna	l gains =	:					(66)	m + (67)m	+ (68)m	+ (69)m +	(70)m +	(71)m + (72)m	-	
(73)m=	252.53	251.41	242.7	2	228.51	213.71	19	99.77	190.93	194.08	201.57	215.88	3 232.33	245.03		(73)
	lar gain															
			0	olar			and			tions to	convert to th	ne applic	able orienta	tion.		
Orienta		Access F Table 6d			Area m ²			Flu	x ole 6a		g_ Table 6b		FF Table 6c		Gains (W)	
•					····										(**)	-
Southw		0.77		x	8.6	65	x	3	6.79		0.63	×	0.7	=	97.28	(79)
Southw		0.77		x	8.6	65	x	6	2.67		0.63	×	0.7	=	165.7	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	8	5.75		0.63	x	0.7	=	226.72	(79)
Southw		0.77		x	8.6	65	x	1(06.25		0.63	x	0.7	=	280.91	(79)
Southw	est <mark>0.9x</mark>	0.77		x	8.6	65	x	1.	19.01		0.63	x	0.7	=	314.65	(79)

Southwest _{0.9x}	0.77	×	8.6	5	x	1'	18.15		0.63		0.7	=	312.37	(79)
Southwest _{0.9x}	0.77	x	8.6	5	x	1'	13.91		0.63	×	0.7	=	301.16	(79)
Southwest _{0.9x}	0.77	x	8.6	5	x	1(04.39		0.63	x	0.7	=	275.99	(79)
Southwest0.9x	0.77	x	8.6	5	x	9	2.85		0.63	×	0.7	=	245.49	(79)
Southwest _{0.9x}	0.77	x	8.6	5	x	6	9.27		0.63	_ x [0.7	=	183.13	(79)
Southwest _{0.9x}	0.77	x	8.6	5	x	4	4.07		0.63	x	0.7	=	116.52	(79)
Southwest0.9x	0.77	x	8.6	5	x	3	1.49		0.63	x	0.7	=	83.25	(79)
Solar <u>g</u> ains in	watts, calc	culated	for eacl	n month				(83)m = S	Sum(74)m .	(82)m			_	
(83)m= 97.28	165.7 2	226.72	280.91	314.65	3'	12.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains –	internal and	d solar	(84)m =	= (73)m ·	+ (8	33)m	, watts						_	
(84)m= 349.81	417.11 4	469.43	509.43	528.36	5′	12.14	492.09	470.07	447.05	399.02	348.85	328.28		(84)
7. Mean inte	rnal tempei	rature ((heating	season)									
Temperature	e during hea	ating pe	eriods ir	n the livi	ng	area f	from Tab	ole 9, Th	n1 (°C)				21	(85)
Utilisation fa	ctor for gair	ns for li	iving are	ea, h1,m	(S	ee Ta	ble 9a)							
Jan	Feb	Mar	Apr	May	È	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(86)m= 1	0.99	0.98	0.96	0.9	().77	0.6	0.65	0.85	0.97	0.99	1	1	(86)
		uro in li	iving or			w oto	\sim	in Tob					1	
Mean interna (87)m= 19.5	<u> </u>	19.97	20.33	20.66	<u> </u>	w Sie 0.89	20.97	20.96	20.8	20.37	19.86	19.46	1	(87)
					L				1	20.07	10.00	10.10]	
Temperature	<u>т т</u>	<u> </u>		[r			[T Ì				1	(00)
(88)m= 19.76	19.76	19.77	19.78	19.78	1	9.79	19.79	19.79	19.79	19.78	19.78	19.77]	(88)
Utilisation fa	ctor for gair	ns for r	est of d	welling,	h2,	m (se	e Table	9a)					-	
(89)m= 1	0.99	0.98	0.94	0.85	(0.67	0.46	0.5	0.78	0.95	0.99	1		(89)
Mean interna	al temperat	ure in t	he rest	of dwelli	ng	T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)				
(90)m= 18.41	18.6	18.89	19.25	19.55	1	9.74	19.78	19.78	19.68	19.29	18.79	18.39]	(90)
									f	LA = Livi	ng area ÷ (4	+) =	0.44	(91)
Mean interna	al temperat	ure (foi	r the wh	ole dwe	llin	a) – fl	Δ 🗙 Τ1	+ (1 – fl	A) x T2					
(92)m= 18.88	<u> </u>	19.36	19.72	20.03	<u> </u>	9) — II 0.24	20.3	20.29	20.17	19.76	19.26	18.85	1	(92)
Apply adjust]	
(93)m= 18.88	T T	19.36	19.72	20.03	r –	0.24	20.3	20.29	20.17	19.76	19.26	18.85	1	(93)
8. Space he	ating requir	ement									<u> </u>		J	
Set Ti to the			nperatur	e obtair	ned	at ste	ep 11 of	Table 9	b, so tha	t Ti,m=	(76)m an	d re-cal	culate	
the utilisation	n factor for	gains u	ising Ta	ble 9a							· · ·		-	
Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	<u> </u>	i			—								1	
(94)m= 0.99	0.99	0.97	0.94	0.86	(0.71	0.52	0.57	0.8	0.95	0.99	1		(94)
Useful gains	T T	<u> </u>	, ,	,	_				r				1	
(95)m= 347.9		457.44	479.01	455.66		62.16	256.63	266.35	359.38	380.34	345.07	326.91]	(95)
Monthly ave	1 1	i			<u> </u>				1 1	(a -			1	
(96)m= 4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4	14.1	10.6	7.1	4.2]	(96)
Heat loss rat			· · ·				- /	- ,			000.40	1007.01	1	(07)
		940.88	783.63	602.31		03.9	265.02	278.45	436.27	662.34	882.12	1067.61	J	(97)
Space heatin	Ť Í T	1		1001th, K	vvn T				í ì i	<u> </u>	T	551.00	1	
(98)m= 538.41	421.42	359.68	219.33	109.11		0	0	0	0	209.81	386.67	551.08]	

	Total per year (kWh/year) = Sum(98) ₁₅₉₁₂													(98)
Space	e heatir	ng require	ement in	kWh/m²	/year								53.34	(99)
8c. Sr	bace co	oling rec	uiremer	nt										
		or June, J			See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	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	673.45	530.17	543.59	0	0	0	0		(100)
Utilisa	ation fac	ctor for lo	ss hm											
(101)m=	0	0	0	0	0	0.81	0.88	0.86	0	0	0	0		(101)
Usefu	l loss, l	nmLm (W	/atts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	545.06	467.81	468.35	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable we	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	665.26	640.57	615.9	0	0	0	0		(103)
Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (4 set (104)m to zero if (104)m < 3 x (98)m												x (41)m		
(104)m=	0	0	0	0	0	86.54	128.53	109.78	0	0	0	0		
I									Total	= Sum(104)	=	324.85	(104)
Cooled	l fractio	n							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)	-	-								
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	' = Sum(104)	=	0	(106)
	cooling	requirer	nent for	month =	: (104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	21.64	32.13	27.44	0	0	0	0		_
									Total	= Sum(107)	=	81.21	(107)
Space	cooling	requirer	nent in k	(Wh/m²/y	/ear				(107)	÷ (4) =			1.55	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only un	der spec	cial conc	litions, se	ee sectio	on 11)				
Fabric	c Energ	y Efficier	псу						(99) ·	+ (108) =	=		54.89	(109)
Targe	et Fabri	c Energ	y Efficie	ency (TF	EE)								63.12	(109)

		Use	er Details:						
Assessor Name:	Zahid Ashraf		Stroma	a Numl	per:		STRO	001082	
Software Name:	Stroma FSAP 201	2	Softwa	re Ver	sion:		Versio	n: 1.0.5.9	
		Prope	rty Address:	Plot 9					
Address :									
1. Overall dwelling dimer	nsions:								
Ground floor			Area(m²) 52.41	(1a) x	Av. He i	ight(m) 2.5	(2a) =	Volume(m ³ 131.03) (3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1n)	52.41	(4)					
Dwelling volume		L		(3a)+(3b)∙	+(3c)+(3d)+(3e)+	.(3n) =	131.03	(5)
2. Ventilation rate:									
		econdary neating	other		total			m ³ per hou	r
Number of chimneys		0 +	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0	;] = [0	x 2	20 =	0	(6b)
Number of intermittent far	าร				0	x 1	10 =	0	(7a)
Number of passive vents					0	x 1	10 =	0	(7b)
Number of flueless gas fir	res				0	x 4	40 =	0	(7c)
-				L					
							Air ch	anges per ho	our
Infiltration due to chimney If a pressurisation test has be				ontinuo fra	0		÷ (5) =	0	(8)
Number of storeys in th		eu, proceeu io (1	<i>T)</i> , outerwise c	onunue no	<i>iiii (9) i</i> 0 (10)	[0	(9)
Additional infiltration						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber	frame or 0.35	for masonr	y constru	uction		İ	0	(11)
if both types of wall are pre		ponding to the g	reater wall area	a (after			-		_
deducting areas of openin If suspended wooden fl		led) or 0.1 (se	ealed), else (enter 0				0	(12)
If no draught lobby, ent		, (,,					0	(13)
Percentage of windows	and doors draught st	tripped						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 10	= [00			0	(15)
Infiltration rate			(8) + (10) +	- (11) + (12	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o		•			etre of e	nvelope	area	3	(17)
If based on air permeabili	•							0.15	(18)
Air permeability value applies Number of sides sheltered	•	s been done or a	a degree air per	meability is	s being us	sed	1		
Shelter factor	u		(20) = 1 - [0.075 x (19	9)] =			2 0.85	(19) (20)
Infiltration rate incorporati	ng shelter factor		(21) = (18)					0.03	(21)
Infiltration rate modified for	0	ł					l	0.10	
	Mar Apr May	Jun Ju	ıl Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	8 3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	?)m ÷ 4								
	1.23 1.1 1.08	0.95 0.9	0.92	1	1.08	1.12	1.18		
	I	· · · · ·	I						

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(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 c</i> al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) , othei	wise (23h) = (23a)			0.5	=
								n Table 4h) = (200)			0.5	(23b)
				•	U		`			2b)m i (f	02h) v [1 (22a)	79.05	(23c)
a) II (24a)m=		0.26	0.26	0.25	0.24	0.23	0.23	HR) (24a 0.22	0.23	0.24	230) × [0.25	0.25	÷ 100]	(24a)
												0.20		(210)
D) II (24b)m=	· · · · · · · · · · · · · · · · · · ·							VV) (24b	0 m = (22)	$\frac{1}{2}$ $\frac{1}$	230)	0		(24b)
		-	-	-	-	-	_		•	0	0	0		(240)
,					•	•		on from c c) = (22b		5 × (23b)	-		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,								on from l 0.5 + [(2		0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(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)
2 40	at losso	s and he	at loce r	aramat	or:	•	•	•						
		Gros		Openin		Net Ar	ea	U-valı	IP	AXU		k-value	Δ Δ	Xk
		area	-	m		A ,r		W/m2		(W/ł	<)	kJ/m²·l		/K
Doors						2	x	1.4		2.8				(26)
Windo	ws					8.651	x1	/[1/(1.4)+	0.04] =	11.47				(27)
Walls ⁻	Type1	37.6	64	8.65		28.99) x	0.15] = [4.35	ו ד			(29)
Walls ⁻	Type2	20.6	57	2		18.67	7 X	0.14		2.64	i F		\exists	(29)
Walls ⁻		15.0		0		15.01		0.13		2.01	= 1			(29)
Roof ⁻		38.8		0		38.83		0.15		5.82	= 7		\exists	(30)
Roof ⁻		7.02		0		7.02					╡╏			(30)
		elements		0				0.24		1.69	L			
				offective wi	ndow U-va	119.1		g formula 1,	/[(1/]_vəlu	مر(م	is aiven in	naraaranh	32	(31)
		as on both					alou using	g ionnaia n	/((// O - Valu	0)+0.0+j u	s given in	paragrapi	10.2	
Fabric	heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				30.77	(33)
Heat c	apacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	1290.11	(34)
Therm	al mass	parame	ter (TMF		- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
	0	sments wh ad of a dei			construct	ion are not	t known pr	recisely the	e indicative	values of	TMP in Ta	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						15.5	(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) =			46.27	(37)
Ventila	ation hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	11.56	11.42	11.28	10.59	10.46	9.77	9.77	9.63	10.04	10.46	10.73	11.01		(38)
Heat ti	ransfer o	coefficier	nt, W/K	_					(39)m	= (37) + (3	38)m			
(39)m=	57.83	57.7	57.56	56.87	56.73	56.04	56.04	55.9	56.32	56.73	57.01	57.28		
										Average =	Sum(39)1	12 /12=	56.83	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.1	1.1	1.1	1.09	1.08	1.07	1.07	1.07	1.07	1.08	1.09	1.09		
Numb	or of day		nth (Tab			<u> </u>		!	,	Average =	Sum(40)1.	12 /12=	1.08	(40)
NULLD	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	ned occu A > 13.9 A £ 13.9	9, N = 1		: [1 - exp	0(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		76		(42)
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.03		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ii	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from 7	Table 1c x	(43)					I	
(44)m=	88.03	84.83	81.63	78.43	75.23	72.03	72.03	75.23	78.43	81.63	84.83	88.03		
Energy	content of	hot water	used - cal	culated me	onthly = 4.	190 x Vd,r	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		960.38	(44)
(45)m=	130.55	114.18	117.83	102.72	98.57	85.05	78.82	90.44	91.52	106.66	116.43	126.43		
lf incton		ator booti	na of noint	hofuoo (n	hot water		ontor 0 in	hoves (46		Total = Su	m(45) ₁₁₂ =	-	1259.2	(45)
			· ·		1			boxes (46)	1		47.40	10.00	l	(46)
(46)m= Water	19.58 storage	17.13 IOSS:	17.67	15.41	14.78	12.76	11.82	13.57	13.73	16	17.46	18.96		(46)
	-) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	-	-			velling, e									
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
	storage nanufact		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
			m Table				" ,)):					0		(49)
			[.] storage		ear			(48) x (49)) =		1	10		(50)
,				•	loss fact									
		-	factor fr		le 2 (kW	h/litre/da	ay)				0.	02		(51)
	e factor	-		011 4.5							1.	03		(52)
			m Table	2b								.6		(53)
Energ	y lost fro	m water	[.] storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter	(50) or ((54) in (5	55)								1.	03		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylind	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=	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)
Prima	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	•				,	,	• •	65 × (41)						
•			r	r	r	1	i	ng and a	· ·	1	, 	00.0-	I	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h r	nonth ((61)m =	(60) ÷ 36	65 × (41)	m						
(61)m=	0	0	0		0	0		0	0	0	0	0	0	0]	(61)
Total h	eat req	uired for	water	hea	ating ca	alculated	l fo	r eacl	n month	(62)m	= 0.85 ×	(45)m +	(46)m +	(57)m ·	- + (59)m + (61)m	
(62)m=	185.83	164.11	173.1		156.22	153.84	13	38.55	134.09	145.72	145.02	161.94	169.92	181.71	7	(62)
Solar DH	IW input	calculated	using Ap	pper	ndix G or	Appendix	Н (negativ	ve quantity) (enter '	0' if no sola	r contribu	ition to wate	er heating	1)	
(add ad	dditiona	al lines if	FGHR	S a	nd/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=	185.83	164.11	173.1		156.22	153.84	13	38.55	134.09	145.72	145.02	161.94	169.92	181.71	7	
										Ou	put from w	ater heat	er (annual)₁	12	1910.04	(64)
Heat g	ains fro	m water	heating	g, k	kWh/ma	onth 0.2	5 í	[0.85	× (45)m	+ (61)	n] + 0.8 x	k [(46)m	n + (57)m	+ (59)r	n]	
(65)m=	87.63	77.91	83.4		76.95	76.99	7	1.08	70.43	74.29	73.23	79.69	81.51	86.26	7	(65)
inclu	de (57)	m in calo	ulatior	n of	f (65)m	only if c	ylir	nder is	s in the c	dwelling	, or hot w	ater is t	from com	munity	_ heating	
5. Int	ernal g	ains (see	Table	5 8	and 5a)):										
		ns (Table			·											
motab	Jan	Feb	Mar		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec	7	
(66)m=	105.68	105.68	105.68	3	105.68	105.68	10	05.68	105.68	105.68	105.68	105.68	105.68	105.68	4	(66)
Lightin	g gains	(calcula	ted in A	- App	pendix l	L, equat	ion	L9 oi	r L9a), al	lso see	Table 5				_	
(67)m=	35.48	31.51	25.63	<u> </u>	19.4	14.5	_	2.24	13.23	17.2	23.08	29.31	34.2	36.46	7	(67)
Appliar	nces da	ains (calc	ulated	in /	Append	dix L. ea	uat	ion L'	13 or L1	3a), als	u o see Ta	ble 5	1	I	_	
(68)m=	229.1	231.48	225.49	- T	212.73	196.63		81.5	171.39	169.02	175.01	187.76	203.86	218.99	7	(68)
	a gains	s (calcula	ited in a	 Apr	pendix	l equat	ion	115	or I 15a)	alsos	ee Table	5	1		_	
(69)m=	47.33	47.33	47.33		47.33	47.33		7.33	47.33	47.33	47.33	47.33	47.33	47.33	7	(69)
Pumps	and fa	ns gains	I (Table	52	a)						1				_	
(70)m=					0	0		0	0	0	0	0	0	0	7	(70)
		vaporatio	n (nea	 ativ			ا ما		_		-		-			. ,
(71)m=		1	r È T	-	-70.45	-70.45	_	70.45	-70.45	-70.45	-70.45	-70.45	-70.45	-70.45	7	(71)
		gains (T		_	10.10	10.10		0.10	10.10	10.10	10.10	10.10	10.10	10.10		()
(72)m=	117.78	115.93	112.09	·	106.88	103.49	9	8.72	94.66	99.86	101.7	107.1	113.2	115.94	7	(72)
		gains =			100.00	100.10	Ů						71)m + (72)			(/
(73)m=	464.91	461.48	445.76	<u>.</u>	421.56	397.18	3	75.02	361.84	368.62	1	406.73	1	453.95	7	(73)
. ,	ar gain	1	440.70	<u></u>	421.00	007.10	51	0.02	301.04	300.02	002.04	400.75	400.02	400.00		(10)
			using so	lar f	flux from	Table 6a	and	associ	ated equa	tions to a	onvert to th	ne applica	ble orientat	ion.		
-		Access F	•		Area			Flu			g_		FF		Gains	
		Table 6d			m²				ole 6a		Table 6b	٦	Table 6c		(W)	
Southw	est <mark>0.9x</mark>	0.77		×「	8.6	5	x	3	6.79		0.63	ר × ר	0.7	=	97.28	(79)
Southw	est <mark>0.9x</mark>	0.77		× [8.6		x		2.67		0.63	╡╷┟	0.7	=	165.7](79)
Southw	L	0.77		× [8.6		x		5.75		0.63		0.7	= =	226.72	(79)
Southw	est <mark>0.9x</mark>	0.77		× [8.6		x		06.25		0.63	╡╷┟	0.7	=	280.91](79)
Southw	est <mark>0.9x</mark>	0.77		× [8.6		x		19.01		0.63	╡╷┟	0.7	=	314.65	(79)

Southwest0.9x	0.77	x	8.6	65	×	118.15		0.63	x	0.7	=	312.37	(79)
Southwest0.9x	0.77	x	8.6	65	x [113.91		0.63	_ x [0.7	=	301.16	(79)
Southwest0.9x	0.77	x	8.6	65	x [104.39		0.63	x	0.7	=	275.99	(79)
Southwest0.9x	0.77	x	8.6	65	×	92.85		0.63	x	0.7	=	245.49	(79)
Southwest0.9x	0.77	x	8.6	65	x [69.27		0.63	x [0.7	=	183.13	(79)
Southwest0.9x	0.77	x	8.6	65	×	44.07		0.63	x	0.7	=	116.52	(79)
Southwest0.9x	0.77	x	8.6	65	x [31.49		0.63	x	0.7	=	83.25	(79)
					_								
Solar <u>g</u> ains ir	watts, c	alculated	for eac	h month			(83)m = S	um(74)m .	(82)m	-			
(83)m= 97.28	165.7	226.72	280.91	314.65		2.37 301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains –		1 1	· ,	= (73)m ·	<u>`</u>								
(84)m= 562.19	627.18	672.48	702.48	711.82	68	7.39 663	644.62	627.83	589.86	550.34	537.2		(84)
7. Mean inte	rnal temp	perature	(heating	season)								
Temperature	e during h	neating p	eriods ir	n the livi	ng a	area from Tal	ble 9, Th	1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	iving are	ea, h1,m	(se	e Table 9a)							
Jan	Feb	Mar	Apr	May		Jun Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.89	0.85	0.8	0.72	0.61	0	.48 0.36	0.38	0.54	0.73	0.85	0.9		(86)
Mean intern	al temper	rature in	living are	ea T1 (fo	ollov	w steps 3 to 7	7 in Tabl	e 9c)					
(87)m= 19.38		19.97	20.37	20.68		0.89 20.96	20.95	20.83	20.44	19.86	19.33		(87)
Temperatur			oriode ir	rest of	L dwa	elling from Ta	1 bla 0 T	ا لمع (۹۵)					
(88)m= 20	20	20	20.01	20.02		20.03 20.03	20.03	20.02	20.02	20.01	20.01		(88)
											20101		
	т <u> </u>		()			m (see Table	T Í	0.40	0.00	0.00	0.00		(89)
(89)m= 0.87	0.83	0.78	0.69	0.57	0	.41 0.28	0.31	0.48	0.69	0.83	0.88		(69)
Mean intern	al temper	rature in	the rest	of dwelli	ng	T2 (follow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m= 17.88	18.23	18.71	19.26	19.67	19	9.93 20	20	19.86	19.38	18.57	17.81		(90)
								f	LA = Livin	ig area ÷ (4	4) =	0.44	(91)
Mean intern	al temper	rature (fo	r the wh	ole dwe	lling	$g) = fLA \times T1$	+ (1 – fL	A) × T2					
(92)m= 18.53	18.84	19.26	19.75	20.11	20	0.35 20.42	20.41	20.29	19.84	19.13	18.47		(92)
Apply adjust	ment to t	he mean	interna	temper	atur	re from Table	e 4e, whe	ere appro	opriate				
(93)m= 18.53	18.84	19.26	19.75	20.11	20	0.35 20.42	20.41	20.29	19.84	19.13	18.47		(93)
8. Space he													
					led	at step 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisatio	Feb	<u> </u>					A	San	Oct	Nev	Dee		
Jan Utilisation fa		Mar Mar	Apr	May		Jun Jul	Aug	Sep	Oct	Nov	Dec		
(94)m= 0.85	0.81	0.76	0.68	0.57	0	.44 0.31	0.34	0.5	0.69	0.8	0.86		(94)
Useful gains													
(95)m= 477.07	-	511.15	478.49	408.51	29	9.11 207.41	216.12	313.26	404.74	442.78	461.8		(95)
Monthly ave		ernal tem	perature	e from Ta	able		I						
(96)m= 4.3	4.9	6.5	8.9	11.7	<u> </u>	4.6 16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra	te for me	an intern	al tempe	erature,	Lm	, W =[(39)m	x [(93)m	– (96)m]				
(97)m= 823.21	804.45	734.66	616.77	477.37	32	2.03 214.12	224.43	348.34	524.27	686.06	817.56		(97)
Space heati	ng requir	ement fo	r each n	nonth, k	Nh/	month = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 257.53	198.5	166.29	99.56	51.24		0 0	0	0	88.93	175.16	264.68		

		Total per year (kWh/year) = $Sum(98)_{15,912}$ =	1301.9	(98)
Space heating requirement in kWh/m²/yea	r		24.84	(99)
9b. Energy requirements – Community hea	ting scheme			
This part is used for space heating, space of Fraction of space heat from secondary/supp	o o i		0	(301)
Fraction of space heat from community syst	tem 1 – (301) =		1	(302)
The community scheme may obtain heat from several includes boilers, heat pumps, geothermal and waste h	•		he latter	_
Fraction of heat from Community boilers			1	(303a)
Fraction of total space heat from Communit	y boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Tal	ble 4c(3)) for community	heating system	1	(305)
Distribution loss factor (Table 12c) for comm	nunity heating system		1.05	(306)
Space heating Annual space heating requirement			kWh/yea ı 1301.9	ๅ
Space heat from Community boilers		(98) x (304a) x (305) x (306) =	1366.99	(307a)
Efficiency of secondary/supplementary heat	ting system in % (from Ta	able 4a or Appendix E)	0	(308
Space heating requirement from secondary	/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			1910.04	7
If DHW from community scheme: Water heat from Community boilers		(64) x (303a) x (305) x (306) =	2005.55	(310a)
Electricity used for heat distribution		0.01 × [(307a)(307e) + (310a)(310e)] =	33.73	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling sys	stem, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwellin mechanical ventilation - balanced, extract o		ide	181.84	(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) =	181.84	(331)
Energy for lighting (calculated in Appendix I	_)		250.62	(332)
Electricity generated by PVs (Appendix M)	(negative quantity)		-526.94	(333)
Electricity generated by wind turbine (Appen	ndix M) (negative quantity	<i>y</i>)	0	(334)
10b. Fuel costs – Community heating sche	eme			
	Fuel	Fuel Price	Fuel Cost	
	kWh/year	(Table 12)	£/year	
Space heating from CHP	(307a) x	4.24 x 0.01 =	57.96	(340a)
Water heating from CHP	(310a) x	4.24 x 0.01 =	85.04	(342a)

			Fuel Price			
Pumps and fans	(331)		13.19	0.01 =	23.98	(349)
Energy for lighting	(332)		13.19	0.01 =	33.06	(350)
Additional standing charges (Table 12)				Γ	120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (34	45)(354) =		Γ	320.04	(355)
11b. SAP rating - Community heating	scheme					
Energy cost deflator (Table 12)				Г	0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) +	45.0] =		Г	1.38	(357)
SAP rating (section12)				Ē	80.75	(358)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emission kg CO2/k\		missions g CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		HP) ^o using two fuels repeat (3	363) to (366) for the se	econd fuel	94	(367a)
CO2 associated with heat source 1	[(3	07b)+(310b)] x 100 ÷ (367	7b) x 0.22	=	774.97	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	17.5	(372)
Total CO2 associated with community s	systems	(363)(366) + (368	i)(372)	=	792.47	(373)
CO2 associated with space heating (se	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instar	ntaneous heater (31	12) x 0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375	5) =		792.47	(376)
CO2 associated with electricity for pum	ps and fans within c	welling (331)) x	0.52	=	94.38	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	130.07	(379)
Energy saving/generation technologies Item 1	(333) to (334) as a	oplicable	0.52	< 0.01 =	-273.48	(380)
Total CO2, kg/year	sum of (376)(382) =			Г	743.43	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			Ē	14.18	(384)
El rating (section 14)				Ľ	89.77	(385)
13b. Primary Energy – Community heat	ing scheme	_				
		Energy kWh/year	Primary factor		.Energy Wh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)		t CHP) P using two fuels repeat (3	363) to (366) for the se	econd fuel	94	(367a)
Energy associated with heat source 1	[(3	07b)+(310b)] x 100 ÷ (367	7b) x 1.22	=	4377.13	(367)
Electrical energy for heat distribution		[(313) x		=	103.54	(372)
Total Energy associated with communit	y systems	(363)(366) + (368	3)(372)	=	4480.66	(373)
if it is negative set (373) to zero (unle	ss specified otherw	ise, see C7 in Apper	ndix C)		4480.66	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)

Total Primary Energy, kWh/year sum of (37)	6)(382) =			4190.59	(383)
Energy saving/generation technologies Item 1	Γ	3.07	x 0.01 =	-1617.72	(380)
Energy associated with electricity for lighting	(332))) x	3.07	- =	769.39	(379)
Energy associated with electricity for pumps and fans within o	dwelling (331)) x 3.07	- =	558.25	(378)
Energy associated with space cooling	(315) x	3.07	- =	0	(377)
Total Energy associated with space and water heating	(373) + (374) + (375) =	=		4480.66	(376)
Energy associated with water from immersion heater or insta	ntaneous heater(312)	x 1.22	2 =	0	(375)

			User D	etails:						
Assessor Name: Software Name:	001082 on: 1.0.5.9									
	Stroma FSA			Softwa Address:		51011.		Vereic		
Address :										
1. Overall dwelling dimer	sions:									
Ground floor			-	a(m²) 2.41	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³) 131.03	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1	1d)+(1e)+(1r	n) 5	2.41	(4)			-		-
Dwelling volume					(3a)+(3b)	+(3c)+(3c	l)+(3e)+	.(3n) =	131.03	(5)
2. Ventilation rate:										
Number of chimneys	main heating	secondar heating + 0	у] + [_	other 0] = [total 0	x 4	40 =	m ³ per hour	r (6a)
Number of open flues	0	+ 0	+	0	=	0	x	20 =	0	(6b)
Number of intermittent fan	S					2	x .	10 =	20	(7a)
Number of passive vents					Γ	0	x '	10 =	0	(7b)
Number of flueless gas fire	es				Г	0	x	40 =	0	(7c)
								Air ch	anges per ho	_ ur
Infiltration due to chimney	s flues and fa	ns = (6a) + (6b) + (7)	a)+(7b)+()	7c) =	Г	20		÷ (5) =	0.15	(8)
If a pressurisation test has be					ontinue fro	-		÷ (3) –	0.15	
Number of storeys in the									0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2						uction			0	(11)
if both types of wall are pre deducting areas of opening	s); if equal user (0.35	-							_
If suspended wooden flo		. ,	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	-								0	(13)
Percentage of windows Window infiltration	and doors dra	lught stripped		0.25 - [0.2	x (14) ∸ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(15) (16)
Air permeability value, c	50. expressed	d in cubic metre						area	5	(17)
If based on air permeabilit	•		•	•	•				0.4	(18)
Air permeability value applies						is being u	sed			
Number of sides sheltered									2	(19)
Shelter factor				(20) = 1 - [9)] =			0.85	(20)
Infiltration rate incorporation	•			(21) = (18)	x (20) =				0.34	(21)
Infiltration rate modified fo	<u> </u>							_	I	
	/lar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe									I	
(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		

Adjuste	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-				
<i>.</i>	0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4		
		<i>ctive air (</i> al ventila	-	rate for t	he appli	cable ca	se							(23a)
				endix N (2	3b) = (23a	a) x Fmv (e	equation (N5)) , othe	rwise (23h) = (23a)			0	(23a) (23b)
								n Table 4h) = (20u)			0	
					Ū		``	HR) (24a	, ,	2b)m ± ('	23h) v [[,]	1 _ (23c)	0	(23c)
(24a)m=				0	0				0		0	1 - (200)]	(24a)
		-	-	÷	-	-		I MV) (24b	-	-	23h)	ů	l	
(24b)m=	r			0	0				0		0	0]	(24b)
		-	-	-		-	-	on from c	L utside]	
,					•	•		c) = (22t		.5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilati	n from l	oft				1	
i	if (22b)n	n = 1, the	en (24d)	m = (22k	<i>.</i>	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(24d)
	ctive air	change	rate - er	· · · ·) or (24t	o) or (24	, <u>,</u>	d) in boy	(25)	1			1	
(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. He	at losse	s and he	eat loss p	paramete	er:									
ELEN	IENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²·l		A X k (J/K
Doors						2	x	1	=	2				(26)
Windov	ws					8.651		/[1/(1.4)+	0.04] =	11.47				(27)
Walls ⁻	Type1	37.6	64	8.65		28.99) X	0.18		5.22	= r			(29)
Walls ⁻	Type2	20.6	67	2		18.67	, x	0.18		3.36	īĒ		\exists	(29)
Walls ⁻	ТуреЗ	15.0)1	0		15.01	x	0.18	=	2.7	i F		\exists	(29)
Roof 1	Type1	38.8	3	0		38.83	3 X	0.13		5.05	i F		\exists	(30)
Roof 1	Type2	7.02	2	0		7.02	×	0.13		0.91	-		\exists	(30)
Total a	area of e	elements				119.1	8		I		L			(31)
				ffective wi	ndow U-va			g formula 1	/[(1/U-valu	ıe)+0.04] a	is given in	paragraph	n 3.2	
** includ	le the area	as on both	sides of ir	nternal wal	ls and par	titions								
		ss, W/K =		U)				(26)(30)	+ (32) =				30.71	(33)
		Cm = S(. ,	_						(30) + (32		(32e) =	1290.11	(34)
		•	•		,	n kJ/m²K				tive Value:			250	(35)
can be ι	used inste	ad of a de	tailed calc	ulation.				recisely the	e indicative	e values of	TMP in Ta	able 1f		
	-	•			• •	pendix ł	<						17.03	(36)
	s of therma abric he	al bridging	are not kn	own (36) =	= 0.05 x (3	:1)			(33) +	(36) =				(27)
		at loss ca	alculator	lmonthly	,					$= 0.33 \times ($	25)m x (5)		47.74	(37)
ventild	Jan	Feb	Mar	Apr	/ May	Jun	Jul	Aug	Sep	= 0.33 x (Nov	Dec]	
(38)m=	25.74	25.58	25.42	24.68	24.55	23.91	23.91	23.79	24.15	24.55	24.83	25.12		(38)
		coefficier								= (37) + (3		L	1	
(39)m=	73.48	73.32	73.16	72.42	72.28	71.64	71.64	71.53	71.89	72.28	72.56	72.85]	
···</td <td></td> <td></td> <td>L</td> <td></td> <td>•</td> <td></td> <td></td> <td></td> <td></td> <td>Average =</td> <td></td> <td></td> <td>72.42</td> <td>(39)</td>			L		•					Average =			72.42	(39)

Heat le	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.4	1.4	1.4	1.38	1.38	1.37	1.37	1.36	1.37	1.38	1.38	1.39		
Numb	er of day	us in mo	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	1.38	(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 hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				:[1 - exp	0(-0.0003	349 x (TI	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13.		76		(42)
Reduce	the annua	al average		usage by	5% if the c	welling is	designed	(25 x N) to achieve		se target o		.03		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	83.63	80.59	77.55	74.51	71.47	68.43	68.43	71.47	74.51	77.55	80.59	83.63		
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,ı	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		912.36	(44)
(45)m=	124.02	108.47	111.93	97.59	93.64	80.8	74.87	85.92	86.95	101.33	110.61	120.11		
			·	· · · ·	·	·		I		Total = Su	m(45) ₁₁₂ =	-	1196.24	(45)
			· ·		1	i		boxes (46)	i	·	·			
(46)m= Water	18.6 storage	16.27	16.79	14.64	14.05	12.12	11.23	12.89	13.04	15.2	16.59	18.02		(46)
	-) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If com	munity h	neating a	and no ta	nk in dv	velling, e	nter 110) litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	storage		eclared I	oss fact	or is kno	wn (k\M	n/dav).					20		(48)
			m Table				i/day).					39 54		(40)
•			storage		ear			(48) x (49)) =			75		(50)
	•		eclared of			or is not	known:	(,,,	/		0.	15		(00)
		-	factor fr		le 2 (kW	h/litre/da	ay)					0		(51)
		ieating s from Ta	ee secti	on 4.3										(50)
			m Table	2b								0 0		(52) (53)
			storage		ear			(47) x (51)) x (52) x (53) =		0		(54)
-		(54) in (5	-	, ,						,	<u> </u>	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 contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	ix H	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Prima	ry circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Prima	ry circuit	loss cal	culated	for each	month (,	. ,	65 × (41)			_			
			r	· · · · · · · · · · · · · · · · · · ·	r	· · · · · · · · · · · · · · · · · · ·	r	ng and a	· ·	1	,			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	h month	(61)m =	(60) ÷	365 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	l for ea	ch month	(62)m =	= 0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	170.62	150.56	158.53	142.68	140.23	125.8) 121.47	132.51	132.04	147.92	155.7	166.71		(62)
Solar DH	W input	calculated	using Ap	pendix G d	r Appendix	H (neg	ative quantity	y) (enter 'C)' if no sola	r contribu	tion to wate	er heating)		
(add ad	dditiona	l lines if	FGHR	S and/or	WWHRS	applie	es, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water heater														
(64)m=	170.62	150.56	158.53	142.68	140.23	125.8) 121.47	132.51	132.04	147.92	155.7	166.71		
	Output from water heater (annual) ₁₁₂ 1744.86 (64												(64)	
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]														
(65)m=	78.51	69.74	74.49	68.52	68.41	62.94	62.17	65.84	64.98	70.97	72.85	77.21		(65)
inclu	de (57)	m in calo	ulation	of (65)m	n only if c	ylinde	is in the	dwelling	or hot w	vater is f	rom com	munity h	eating	
5. Int	ernal ga	ains (see	Table	5 and 5a	ı):	-		-					-	
	Ŭ	ns (Table			/									
motabl	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	88.06	88.06	88.06	88.06	88.06	88.06		88.06	88.06	88.06	88.06	88.06		(66)
Lightin	g gains	(calcula	ted in A		L, equat	ion L9	or L9a), a	lso see	Table 5				1	
(67)m=	14.19	12.6	10.25	7.76	5.8	4.9	5.29	6.88	9.23	11.72	13.68	14.59		(67)
Appliar	nces da	ins (calc	ulated i	n Appen	u dix L. ea	uation	 L13 or L1	i 3a), also) see Ta	ble 5	Į	ļ	1	
(68)m=	153.5	155.09	151.08	<u> </u>	131.74	121.6		113.24	117.25	125.8	136.59	146.72]	(68)
		i (calcula			L equat	ion I 1	5 or L15a) also si	I ee Table				1	
(69)m=	31.81	31.81	31.81	31.81	31.81	31.81	31.81	31.81	31.81	31.81	31.81	31.81		(69)
		ı ns gains											1	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	1	(70)
			n (nea		ies) (Tab		-				_		I	. ,
	-70.45	· ·	<u> </u>	-	-70.45	-70.4	5 -70.45	-70.45	-70.45	-70.45	-70.45	-70.45]	(71)
		gains (T			10.10	10.10		10.10	10.10		10.10	10.10	I	()
(72)m=	105.53	103.77	100.13	-	91.95	87.42	83.56	88.5	90.25	95.39	101.18	103.78	1	(72)
				55.17	01.00		i6)m + (67)m						l	(• =)
(73)m=	325.64	gains =	313.87	297.88	281.91	266.34		261.04	269.16	285.33	303.87	317.51	1	(73)
. ,	ar gains		313.07	297.00	201.91	200.34	+ 250.11	201.04	209.10	200.55	303.87	517.51		(10)
			usina sol	ar flux from	Table 6a a	and ass	ociated equa	ations to co	onvert to th	ne applica	ble orientat	ion.		
-		Access F	-	Area			lux		g_		FF		Gains	
•		Table 6d		m²	-		able 6a	Т	able 6b	Т	able 6c		(W)	
Southw	est <mark>o,9x</mark>	0.77	,	(8.	65	×	36.79		0.63	□ x [0.7		97.28	(79)
Southw	est <mark>0,9x</mark>	0.77			65	× 🗖	62.67	i	0.63		0.7		165.7	(79)
Southw	Ļ	0.77			65	×	85.75		0.63		0.7		226.72	(79)
Southw		0.77			65	×	106.25	i ⊨	0.63		0.7		280.91](79)
Southw	L	0.77			65	x	119.01		0.63		0.7		314.65](79)
		0.77	′	`°.	00	~ L	113.01	」 匚	0.05	^ L	0.7		514.05	

		_						. —						_
Southwest0.9x	0.77	x	8.6	5	x	11	18.15		0.63	×	0.7	=	312.37	(79)
Southwest _{0.9x}	0.77	x	8.6	5	x	11	13.91		0.63	x	0.7	=	301.16	(79)
Southwest _{0.9x}	0.77	x	8.6	5	x	1(04.39		0.63	x	0.7	=	275.99	(79)
Southwest0.9x	0.77	x	8.6	5	x	9	2.85		0.63	x	0.7	=	245.49	(79)
Southwest0.9x	0.77	x	8.6	5	x	6	9.27		0.63	×	0.7	=	183.13	(79)
Southwest0.9x	0.77	x	8.6	5	x	4	4.07		0.63	x	0.7	=	116.52	(79)
Southwest0.9x	0.77	x	8.6	5	x	3	1.49		0.63	×	0.7	=	83.25	(79)
Solar <u>g</u> ains ir	watts, calcu	ulated	for eacl	n month				(83)m = S	um(74)m .	(82)m				
(83)m= 97.28	165.7 22	26.72	280.91	314.65	3'	12.37	301.16	275.99	245.49	183.13	116.52	83.25		(83)
Total gains –		solar	(84)m =	= (73)m ·	+ (8	33)m	, watts				-			
(84)m= 422.91	489.59 54	40.59	578.79	596.56	57	78.71	557.27	537.03	514.65	468.46	420.38	400.76		(84)
7. Mean inte	rnal tempera	ature (heating	season)									
Temperature	e during hea	ting pe	eriods ir	n the livii	ng	area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisation fa	ctor for gain	s for li	ving are	ea, h1,m	(s	ее Та	ble 9a)							
Jan	Feb	Mar	Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.99	0.99 (0.97	0.94	0.86	().71	0.54	0.58	0.8	0.95	0.99	0.99		(86)
Mean intern	al temperatu	ire in li	iving are	a T1 (fr	ى سالە	w ste	ns 3 to 7	' in Tahl	ب م 9م)				1	
(87)m= 19.62		20.08	20.43	20.72		0.92	20.98	20.97	20.85	20.47	19.98	19.58		(87)
									ļ				I	
Temperature	т ^т т	111ng pe 9.77	eriods ir 19.78	19.78	r –	elling 9.79	19.79	19.79	n2 (°C) 19.79	19.78	19.78	19.77	1	(88)
(88)11= 19.76	19.70	9.77	19.70	19.70		9.79	19.79	19.79	19.79	19.70	19.76	19.77		(00)
Utilisation fa	<u> </u>	I						,			1		1	
(89)m= 0.99	0.98 0	0.96	0.91	0.8	().61	0.41	0.44	0.71	0.92	0.98	0.99		(89)
Mean intern	al temperatu	ire in t	he rest	of dwelli	ng	T2 (fo	ollow ste	ps 3 to	7 in Tabl	e 9c)	_			
<mark>(90)m=</mark> 17.96	18.24 1	8.64	19.13	19.52	1	9.74	19.78	19.78	19.68	19.2	18.5	17.92		(90)
									f	LA = Livii	ng area ÷ (4	4) =	0.44	(91)
Mean intern	al temperatu	ıre (foi	r the wh	ole dwe	lling	g) = fL	_A × T1	+ (1 – fL	_A) × T2					
(92)m= 18.68	<u> </u>	9.27	19.69	20.04		0.25	20.3	20.3	, 20.19	19.75	19.14	18.64		(92)
Apply adjust	ment to the	mean	internal	temper	atu	re fro	m Table	4e, whe	ere appro	priate			1	
(93)m= 18.68	18.92 1	9.27	19.69	20.04	2	0.25	20.3	20.3	20.19	19.75	19.14	18.64		(93)
8. Space he	ating require	ement												
Set Ti to the					ed	at ste	ep 11 of	Table 9	b, so tha	t Ti,m=	(76)m and	d re-calo	culate	
the utilisatio		<u> </u>								-			1	
Jan	-l	Mar	Apr	Мау		Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa		s, hm: 0.96		0.82		0.65	0.47	0.5	0.74	0.02	0.08	0.00	1	(94)
. ,			0.91			0.65	0.47	0.5	0.74	0.92	0.98	0.99		(34)
Useful gains (95)m= 417.94	T T	7 = (94 17.86	527.96	487.83	3	75.13	259.9	271.16	382.3	432.39	411.12	396.94		(95)
Monthly ave							200.0	211.10	002.0	-02.03	I I I I Z	000.94	l	(00)
(96)m= 4.3		6.5	8.9	11.7	<u> </u>	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra											1		1	. /
(97)m= 1056.8		33.97	781.62	603.1	-)4.83	265.36	278.93	437.76	661.59	873.97	1052.32		(97)
Space heati				nonth, k	Nh	/mont	h = 0.02						I	
(98)m= 475.35	- <u>r</u>	09.59	182.64	85.76		0	0	0	0	170.52	, 333.25	487.6		
	I				—								1	

								Tota	l per year	(kWh/year	⁻) = Sum(9	8)15,912 =	2413.61	(98)
Spac	e heating	g require	ement ir	n kWh/m²	/year								46.05	(99)
9a. En	ergy req	uiremer	nts – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatin	-	t from o	ocondor	vloupplo	montory	avetam						0	
Fraction of space heat from secondary/supplementary system Fraction of space heat from main system(s) (202) = 1 - (201) =												0	(201)	
Fraction of space neat from main system(s) $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$												1	(202)	
Efficiency of main space heating system 1												1 93.5	(204)	
Efficiency of secondary/supplementary heating system, %													93.5	(200)
Liner		Feb	Mar	1	May	- ·	Jul	Aug	Son	Oct	Nov	Dec	kWh/ye	
Spac	Jan e heating			Apr calculate	,	Jun	Jui	Aug	Sep		INOV	Dec	Kvvn/ye	al
-1	475.35	368.89	309.59	182.64	85.76	0	0	0	0	170.52	333.25	487.6		
(211)m	n = {[(98)	m x (20	94)]}x´	100 ÷ (20)6)									(211)
	508.4	394.54	331.11	195.33	91.73	0	0	0	0	182.38	356.42	521.5		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2581.4	(211)
•		•		ry), kWh/	month									
= {[(98 (215)m=)m x (20	1)]}x1 0	00 ÷ (20	08) 0	0	0	0	0	0	0	0	0		
(210)11-		0	Ŭ	0	0	0	0	-	-	-	215) _{15,1012}	-	0	(215)
Water	heating													
	-		ter (calc	ulated a	bove)	-	r						L	
	170.62	150.56	158.53	142.68	140.23	125.89	121.47	132.51	132.04	147.92	155.7	166.71		٦
	ncy of wa		r	05.47	00.55			70.0	70.0	05.40	00.70	07.54	79.8	(216)
(217)m=		87.11	86.57	85.47	83.55	79.8	79.8	79.8	79.8	85.19	86.79	87.51		(217)
	or water $1 = (64)$	-											_	
(219)m=	195.21	172.83	183.12	166.93	167.84	157.76	152.22	166.06	165.46	173.63	179.39	190.5		_
								Tota	I = Sum(2				2070.95	(219)
	l totals	fueluse	n main	system	1					k	Wh/year		kWh/year 2581.4	٦
•	Ũ			oyotom										
	heating												2070.95	
		•		electric	keep-ho	t							L	
centra	al heatin	g pump	:									30		(230c)
boiler with a fan-assisted flue 45										(230e)				
Total electricity for the above, kWh/year sum of (230a)(230g) =									75	(231)				
Electri	city for li	ghting											250.62	(232)
12a. (CO2 em	issions ·	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHF)					
EnergyEmission factorkWh/yearkg CO2/kWh									Emissions kg CO2/yea					
Space	heating	(main s	ystem 1)		(21	1) x			0.2	16	=	557.58	(261)

Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	447.33	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1004.91	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	130.07	(268)
Total CO2, kg/year	sum	of (265)(271) =		1173.9	(272)

TER =

22.4 (273)