Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.4.18 Printed on 08 November 2019 at 12:18:37

Proiect Information:

Assessed By: Ross Boulton (STRO028068) Building Type: Flat

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 77m²

Site Reference: B2 Stq 4 Issue Plot Reference: B2A-103-02

Address: B2A-103-02, Flat Type 2-12A, Wimbledon, London

Client Details:

Name: Galliard Homes

Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c), Mains gas (c)

Fuel factor: 1.00 (mains gas (c), mains gas (c))

Target Carbon Dioxide Emission Rate (TER) 16.1 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.53 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 41.5 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 45.0 kWh/m²

Fail

Excess energy = $3.47 \text{ kg/m}^2 (08.4 \%)$

2 Fabric U-values

Element Average Highest

External wall 0.15 (max. 0.30) 0.15 (max. 0.70) **OK**

Floor (no floor) Roof (no roof)

Openings 1.35 (max. 2.00) 1.35 (max. 3.30) **OK**

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.15

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

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 extract system		
Specific fan power:	0.31	
Maximum	0.7	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	1.77m²	
Windows facing: North East	3.48m²	
Windows facing: North East	1.59m²	
Windows facing: South West	13.23m²	
Windows facing: South East	2.74m²	
Windows facing: North East	2.74m²	
Windows facing: South East	1.75m²	
Ventilation rate:	4.00	
Blinds/curtains:	Light-coloured curtain or roller blind	
	Closed 100% of daylight hours	

10 Key features

Community heating, heat from boilers – mains gas Photovoltaic array

Predicted Energy Assessment

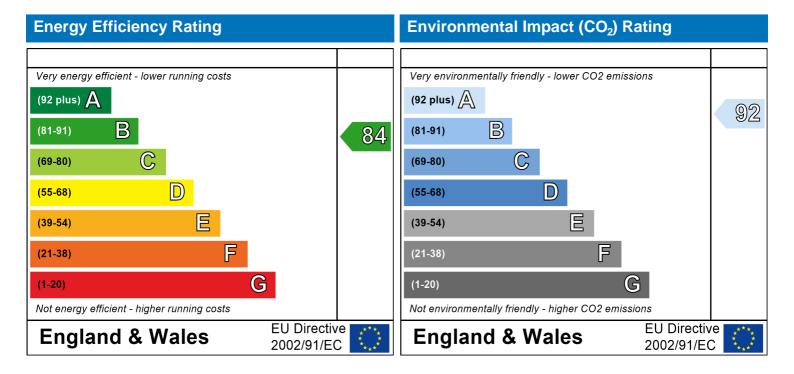


B2A-103-02 Flat Type 2-12A Wimbledon London Dwelling type: Date of assessment: Produced by: Mid floor Flat 01 December 2018 Ross Boulton

Total floor área: 77 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

SAP Input

Property Details: B2A-103-02

Address: B2A-103-02, Flat Type 2-12A, Wimbledon, London

Located in: England Region: Thames valley

UPRN:

Date of assessment:

Date of certificate:

Assessment type:

01 December 2018
08 November 2019
New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

Water use <= 125 litres/person/day: True

PCDF Version: 451

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2018

Floor Location: Floor area:

Storey height:

Floor 0 77 m² 2.6 m

Living area: 34.89 m² (fraction 0.453)

Front of dwelling faces: North

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
WT-B2.02 SW	Manufacturer	Half glazed	low-E, $En = 0.05$, soft coat	No	
SE_0.69_2.56 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
NE_1.36_2.56 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
NE_0.62_2.56 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
SW_5.07_2.61 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
SE_1.07_2.56 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
NE_1.07_2.56 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
SE 0.62 2.56 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
WT-B2.02 SW	16mm or more mm	8.0	0.45	1.35	2.91	1
SE_0.69_2.56 x 1	16mm or more	8.0	0.5	1.35	1.77	1
NE_1.36_2.56 x 1	16mm or more	8.0	0.5	1.35	3.48	1
NE_0.62_2.56 x 1	16mm or more	8.0	0.5	1.35	1.59	1
CM F 07 0 /1 1	1/	0.0	0.5	1 05	10.00	1

16mm or more SW_5.07_2.61 x 1 8.0 0.5 1.35 13.23 1 SE_1.07_2.56 x 1 16mm or more 8.0 0.5 1.35 2.74 1 2.74 NE_1.07_2.56 x 1 16mm or more 8.0 0.5 1.35 1 SE_0.62_2.56 x 1 16mm or more 8.0 0.5 1.35 1.75 1

Name:	Type-Name:	Location:	Orient:	Width:	Height:	
WT-B2.02 SW		Wall	South West	1.135	2.56	
SE_0.69_2.56 x 1		Wall	South East	0.69	2.56	
NE_1.36_2.56 x 1		Wall	North East	1.36	2.56	
NE_0.62_2.56 x 1		Wall	North East	0.62	2.56	
SW_5.07_2.61 x 1		Wall	South West	5.07	2.61	
SE_1.07_2.56 x 1		Wall	South East	1.07	2.56	
NE_1.07_2.56 x 1		Wall	North East	1.07	2.56	
SE_0.62_2.56 x 1		Wall	South East	0.685	2.56	

SAP Input

Average or unknown Overshading:

Type: Gross area: Openings: Net area: U-value: Ru value: Curtain wall: Kappa:

External Elements

0 74.554 30.21 44.34 0.15 False N/A Wall

Internal Elements Party Elements

Thermal bridges:

No information on thermal bridging (y=0.15) (y=0.15)Thermal bridges:

Yes (As designed) Pressure test:

Ventilation: Centralised whole house extract

Number of wet rooms: Kitchen + 3

Ductwork: , rigid

Approved Installation Scheme: True

0 Number of chimneys: Number of open flues: 0 Number of fans: 0 Number of passive stacks: 0 2 Number of sides sheltered: 5 Pressure test:

Community heating schemes Main heating system:

Heat source: Community CHP

heat from boilers - mains gas, heat fraction 0.666, efficiency 50.4

Heat source: Community boilers

heat from boilers - mains gas, heat fraction 0.334, efficiency 95

Piping>=1991, pre-insulated, low temp, variable flow

Main heating Control: Charging system linked to use of community heating, programmer and at least two room

thermostats

Control code: 2312

Secondary heating system: None

From main heating system Water heating:

Water code: 901

Fuel :heat from boilers - mains gas

No hot water cylinder Solar panel: False

Standard Tariff Electricity tariff:

In Smoke Control Area: Yes

Conservatory: No conservatory

100% Low energy lights: Dense urban Terrain type: **English EPC language:** Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.309

Tilt of collector: 30°

Overshading: None or very little

SAP Input

Collector Orientation: South West

Assess Zero Carbon Home:

Stroma FSAP 2012 Version: 1.0.4.18 (SAP 9.92) - http://www.stroma.com

			l loor D) otoilo:						
Assessor Name: Software Name:	Ross Boulton Stroma FSAP 20		User D	Strom Softwa	are Vei	rsion:			0028068 on: 1.0.4.18	
Address :	B2A-103-02, Flat T			Address		03-02				
1. Overall dwelling dim		ypo 2 12/	τ, ννιιτικ	olodon, E	опаоп					
			Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor					(1a) x		2.6	(2a) =	200.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1n	n)	77	(4)			_		_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	(3n) =	200.2	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+	0	=	0	X	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	X :	20 =	0	(6b)
Number of intermittent fa	ans					0	X	10 =	0	(7a)
Number of passive vent	S				Γ	0	x	10 =	0	(7b)
Number of flueless gas	fires				Ī	0	x -	40 =	0	(7c)
								A : I		_
		- > (-1 > (-		_ 、	_				nanges per ho	_
Infiltration due to chimne	eys, flues and fans =(been carried out or is intend				ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in		ей, ргосеес	110 (17),	ourer wise t	onunue m	om (9) to	(10)		0	(9)
Additional infiltration	e aeg (e)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timber	frame or	0.35 fo	r masoni	y constr	uction	• ()	•	0	(11)
	present, use the value corre	sponding to	the great	ter wall are	a (after					
deducting areas of open	• / .	اما (اما	1 /aaala	مما المم	t O					7
·	floor, enter 0.2 (unsea	ilea) or 0.	i (seale	ea), eise	enter 0				0	(12)
• •	nter 0.05, else enter 0 vs and doors draught s	tripped							0	(13)
Window infiltration	vs and doors draught s	iiippeu		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
	, q50, expressed in cu	bic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	5	(17)
If based on air permeab	• • •		•	•	•			- C C.	0.25	(18)
·	ies if a pressurisation test ha					is being u	sed			` ′
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18) x (20) =				0.21	(21)
Infiltration rate modified	for monthly wind spee	d							_	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed 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 = (2	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	1	
,		1 2.00	3.00						J	

0.27	0.27	0.26	0.23	0.23	d wind s	0.2	0.2	0.21	0.23	0.24	0.25]	
alculate effe		1	1		1	l		J	0.20	V	0.20	J	
If mechanica	al ventila	ation:										0.5	(2
If exhaust air he	eat pump	using App	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b) = (23a)			0.5	(2
If balanced with	heat reco	overy: effic	ciency in %	allowing f	for in-use f	actor (fron	n Table 4h) =				0	(2
a) If balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	d mech	anical ve	entilation	without	heat red	covery (N	MV) (24b)m = (22	2b)m + (2	23b)		_	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n				-	-				.5 × (23b)			
4c)m= 0.52	0.52	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5]	(2
d) If natural if (22b)n			ole hous m = (22						0.5]			•	
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a) or (24l	o) or (24	c) or (24	d) in box	x (25)				_	
5)m= 0.52	0.52	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(2
3. Heat losse	s and he	eat loss i	paramet	er:									
LEMENT	Gros		Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/ł	<)	k-value kJ/m²-		A X k kJ/K
oors					2.91	х	1.35		3.9285				(2
indows Type	1				1.77	x1/	[1/(1.35)-	+ 0.04] =	2.27				(2
indows Type	2				3.48	x1/	[1/(1.35)-	+ 0.04] =	4.46				(2
indows Type	3				1.59	x1/	[1/(1.35)-	+ 0.04] =	2.04				(2
indows Type	e 4				13.23	3 x1/	[1/(1.35)-	+ 0.04] =	16.95				(2
indows Type	5				2.74	<u></u>	[1/(1.35)-	+ 0.04] =	3.51				(2
indows Type	6				2.74		[1/(1.35)-	+ 0.04] =	3.51				(2
indows Type	e 7				1.75		[1/(1.35)-	+ 0.04] =	2.24				(2
/alls	74.5	55	30.2	1	44.34		0.15	i	6.65	=			(2
otal area of e	L				74.55	=							` (3
or windows and include the area	roof wind	ows, use e			alue calcul		g formula 1	/[(1/U-valu	ıe)+0.04] a	ıs given in	paragraph	1 3.2	(0
abric heat los	s, W/K	= S (A x	U)	-			(26)(30)) + (32) =				45.55	5 (3
eat capacity	Cm = S	(A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	620.8	2 (3
nermal mass	parame	eter (TMF	= Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(3
or design assess In be used inste				construct	ion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f		
nermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	<						11.18	3 (3
details of therma otal fabric he		are not kr	nown (36) =	= 0.05 x (3	31)			(33) +	(36) =			56.73	3 (3
entilation hea	at loss c	alculated	d monthly	y				(38)m	= 0.33 × (25)m x (5))		
	l	Mar	1		Jun		1	Sep			ì	1	

(00)	04.07	00.74	22.22	00.00	22.22	00.00	T 00 00	00.00	22.22	00.00			(20)
` '	34.07	33.71	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03		(38)
Heat transfer co	efficier 90.8	ot, VV/K 90.44	89.76	89.76	89.76	89.76	89.76	(39)m 89.76	= (37) + (3 89.76	38)m 89.76	89.76		
(39)11= 91.13	90.6	90.44	09.70	09.70	09.70	09.70	09.70			Sum(39) ₁	<u> </u>	90.02	(39)
Heat loss param	neter (F	HLP), W	′m²K				-		= (39)m ÷		12712—	- 00.02	
(40)m= 1.18	1.18	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17		_
Number of days	in mor	nth (Tab	le 1a)					,	Average =	Sum(40) ₁	12 /12=	1.17	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heatin	ng ener	gy requi	rement:								kWh/ye	ar:	
Assumed occup	ancy I	NI.											(40)
if TFA > 13.9,	N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9)2)] + 0.0	0013 x (T	ΓFA -13.		2.4		(42)
if TFA £ 13.9, Annual average		otor uco	no in litro	o por do	v Vd av	orago –	(25 v N)	. 26					(42)
Reduce the annual a									se target o		.28		(43)
not more that 125 lit	tres per p	person per	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in I		,				1	· <i>'</i>			T			
(44)m= 100.41	96.76	93.11	89.46	85.81	82.15	82.15	85.81	89.46	93.11	96.76	100.41	4005.00	7(44)
Energy content of he	ot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂		1095.39	(44)
(45)m= 148.91	130.23	134.39	117.16	112.42	97.01	89.9	103.16	104.39	121.65	132.8	144.21		
									Γotal = Su	m(45) ₁₁₂ =	= [1436.23	(45)
If instantaneous wat	ter heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 ₎) to (61)					
(46)m= 22.34 Water storage Id	19.54	20.16	17.57	16.86	14.55	13.48	15.47	15.66	18.25	19.92	21.63		(46)
Storage volume		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community he	ating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no		hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage lo a) If manufactur		oclared b	oss facto	or is kno	wn (k\N/k	v/dav/):							(40)
Temperature fac				טווא פו וע	wii (Kvvi	i/uay).					0		(48) (49)
Energy lost from				ear			(48) x (49)	١ =			10		(50)
b) If manufactur		_	-		or is not		(10) // (10)			'	10		(30)
Hot water storag	-			e 2 (kWl	h/litre/da	ıy)				0.	.02		(51)
If community he Volume factor from	-		on 4.3								20		(E2)
Temperature fac			2b							-	.6		(52) (53)
Energy lost from				ear			(47) x (51)	x (52) x (53) =		.03		(54)
Enter (50) or (5		_	,				, , , ,	` , , `	,		.03		(55)
Water storage lo	oss cal	culated f	or each	month			((56)m = (55) × (41)r	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 cylinder contains of	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	: 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)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	(46)m + (57)m + (59)m + (61)m
(62)m= 204.18 180.16 189.67 170.66 167.7 150.51 145.17 158.43 157.88 176.93	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	non to water nearing)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	, ,
(64)m= 204.18 180.16 189.67 170.66 167.7 150.51 145.17 158.43 157.88 176.93	186.29 199.48
Output from water heate	
•	,
Heat gains from water heating, kWh/month 0.25 $^{\circ}$ [0.85 × (45)m + (61)m] + 0.8 x [(46)m]	
(65)m= 93.73 83.24 88.91 81.75 81.6 75.05 74.11 78.52 77.5 84.67	86.95 92.17 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is t	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 144.21 144.21 144.21 144.21 144.21 144.21 144.21 144.21 144.21 144.21 144.21 144.21 144.21	144.21 144.21 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 47.49 42.18 34.3 25.97 19.41 16.39 17.71 23.02 30.89 39.23	45.78 48.81 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	· · · · · · · · · · · · · · · · · · ·
(68)m= 317.99 321.29 312.98 295.28 272.93 251.93 237.9 234.6 242.91 260.62	282.96 303.96 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 51.82 51.82 51.82 51.82 51.82 51.82 51.82 51.82 51.82 51.82	51.82 51.82 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14	-96.14 -96.14 (71)
	30.14
Water heating gains (Table 5) (72)m= 125.98 123.88 119.5 113.54 109.68 104.24 99.61 105.54 107.64 113.81	120.76 123.89 (72)
	, ,
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m + (68)m$, , , , , , , , , , , , , , , , , , ,
(73)m= 591.36 587.24 566.67 534.68 501.92 472.45 455.11 463.05 481.34 513.54	549.4 576.55 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applica	
Orientation: Access Factor Area Flux g_ Table 6d m ² Table 6a Table 6b	FF Gains Fable 6c (W)
Northeast 0.9x	0.8 = 10.88 (75)
Northeast 0.9x 0.77 x 1.59 x 11.28 x 0.5 x	0.8 = 4.97 (75)

		,						1		,		_
Northeast _{0.9x}	0.77	X	2.74	X	11.28	X	0.5	X	0.8	=	8.57	(75)
Northeast _{0.9x}	0.77	X	3.48	X	22.97	X	0.5	X	0.8	=	22.16	(75)
Northeast _{0.9x}	0.77	X	1.59	X	22.97	X	0.5	X	0.8	=	10.12	(75)
Northeast _{0.9x}	0.77	X	2.74	X	22.97	X	0.5	X	0.8	=	17.44	(75)
Northeast _{0.9x}	0.77	X	3.48	X	41.38	X	0.5	X	0.8	=	39.92	(75)
Northeast _{0.9x}	0.77	X	1.59	X	41.38	X	0.5	X	0.8	=	18.24	(75)
Northeast 0.9x	0.77	X	2.74	X	41.38	X	0.5	X	0.8	=	31.43	(75)
Northeast _{0.9x}	0.77	X	3.48	X	67.96	X	0.5	X	0.8	=	65.55	(75)
Northeast _{0.9x}	0.77	X	1.59	X	67.96	X	0.5	X	0.8	=	29.95	(75)
Northeast 0.9x	0.77	X	2.74	x	67.96	X	0.5	X	0.8	=	51.61	(75)
Northeast 0.9x	0.77	X	3.48	x	91.35	x	0.5	x	0.8	=	88.12	(75)
Northeast 0.9x	0.77	X	1.59	x	91.35	X	0.5	x	0.8	=	40.26	(75)
Northeast _{0.9x}	0.77	X	2.74	x	91.35	X	0.5	x	0.8	=	69.38	(75)
Northeast _{0.9x}	0.77	X	3.48	x	97.38	X	0.5	x	0.8	=	93.94	(75)
Northeast _{0.9x}	0.77	X	1.59	x	97.38	X	0.5	x	0.8	=	42.92	(75)
Northeast _{0.9x}	0.77	X	2.74	x	97.38	x	0.5	x	0.8] =	73.97	(75)
Northeast _{0.9x}	0.77	X	3.48	x	91.1	x	0.5	x	0.8	=	87.88	(75)
Northeast _{0.9x}	0.77	X	1.59	x	91.1	x	0.5	x	0.8	=	40.15	(75)
Northeast _{0.9x}	0.77	X	2.74	x	91.1	x	0.5	x	0.8	=	69.19	(75)
Northeast _{0.9x}	0.77	X	3.48	x	72.63	x	0.5	x	0.8	=	70.06	(75)
Northeast _{0.9x}	0.77	X	1.59	x	72.63	x	0.5	x	0.8	=	32.01	(75)
Northeast _{0.9x}	0.77	x	2.74	x	72.63	x	0.5	x	0.8	=	55.16	(75)
Northeast _{0.9x}	0.77	x	3.48	x	50.42	X	0.5	x	0.8	=	48.64	(75)
Northeast _{0.9x}	0.77	x	1.59	x	50.42	x	0.5	x	0.8	=	22.22	(75)
Northeast _{0.9x}	0.77	x	2.74	x	50.42	x	0.5	x	0.8	=	38.3	(75)
Northeast _{0.9x}	0.77	x	3.48	x	28.07	X	0.5	x	0.8	=	27.08	(75)
Northeast _{0.9x}	0.77	x	1.59	x	28.07	x	0.5	x	0.8	=	12.37	(75)
Northeast _{0.9x}	0.77	x	2.74	х	28.07	x	0.5	x	0.8	j =	21.32	(75)
Northeast _{0.9x}	0.77	x	3.48	х	14.2	x	0.5	x	0.8	j =	13.7	(75)
Northeast 0.9x	0.77	x	1.59	х	14.2	x	0.5	x	0.8	j =	6.26	(75)
Northeast _{0.9x}	0.77	X	2.74	x	14.2	x	0.5	x	0.8	j =	10.78	(75)
Northeast _{0.9x}	0.77	X	3.48	x	9.21	x	0.5	x	0.8	j =	8.89	(75)
Northeast 0.9x	0.77	x	1.59	х	9.21	x	0.5	x	0.8	j =	4.06	(75)
Northeast _{0.9x}	0.77	j×	2.74	x	9.21	x	0.5	x	0.8	j =	7	(75)
Southeast 0.9x	0.77	X	1.77	x	36.79	x	0.5	x	0.8	j =	18.05	(77)
Southeast 0.9x	0.77	X	2.74	x	36.79	X	0.5	x	0.8] =	27.95	(77)
Southeast 0.9x	0.77	X	1.75	×	36.79	X	0.5	x	0.8] =	17.85	(77)
Southeast 0.9x	0.77	X	1.77	x	62.67	X	0.5	x	0.8	=	30.75	(77)
Southeast 0.9x	0.77	X	2.74	x	62.67	X	0.5	x	0.8] =	47.6	(77)
Southeast 0.9x	0.77	X	1.75	x	62.67	X	0.5	x	0.8] =	30.4	(77)
Southeast 0.9x	0.77	X	1.77	×	85.75	X	0.5	x	0.8] =	42.07	(77)
L		_		ı		J	-	ı	-	1	-	

Courth cook s. c.		7		1		1		ı		1		٦
Southeast 0.9x	0.77	X	2.74	X	85.75	X	0.5	X	0.8] =	65.13	(77)
Southeast _{0.9x}	0.77	X	1.75	X	85.75	X	0.5	X	0.8] =	41.6	(77)
Southeast _{0.9x}	0.77	X	1.77	X	106.25	X	0.5	X	0.8	=	52.13	(77)
Southeast 0.9x	0.77	X	2.74	X	106.25	X	0.5	X	0.8	=	80.7	(77)
Southeast 0.9x	0.77	X	1.75	X	106.25	X	0.5	X	0.8	=	51.54	(77)
Southeast 0.9x	0.77	X	1.77	X	119.01	X	0.5	X	0.8	=	58.39	(77)
Southeast 0.9x	0.77	X	2.74	X	119.01	X	0.5	X	0.8	=	90.39	(77)
Southeast 0.9x	0.77	X	1.75	X	119.01	X	0.5	X	0.8	=	57.73	(77)
Southeast 0.9x	0.77	X	1.77	X	118.15	X	0.5	X	0.8	=	57.97	(77)
Southeast 0.9x	0.77	X	2.74	X	118.15	X	0.5	x	0.8	=	89.74	(77)
Southeast 0.9x	0.77	X	1.75	X	118.15	X	0.5	X	0.8	=	57.31	(77)
Southeast 0.9x	0.77	X	1.77	x	113.91	X	0.5	X	0.8	=	55.89	(77)
Southeast 0.9x	0.77	X	2.74	x	113.91	x	0.5	x	0.8	=	86.52	(77)
Southeast 0.9x	0.77	X	1.75	x	113.91	x	0.5	x	0.8	=	55.26	(77)
Southeast 0.9x	0.77	x	1.77	x	104.39	x	0.5	X	0.8	=	51.22	(77)
Southeast 0.9x	0.77	X	2.74	x	104.39	х	0.5	x	0.8	=	79.29	(77)
Southeast 0.9x	0.77	X	1.75	x	104.39	х	0.5	X	0.8	=	50.64	(77)
Southeast 0.9x	0.77	X	1.77	x	92.85	X	0.5	X	0.8	=	45.56	(77)
Southeast 0.9x	0.77	x	2.74	x	92.85	x	0.5	x	0.8	=	70.52	(77)
Southeast 0.9x	0.77	x	1.75	x	92.85	x	0.5	x	0.8	=	45.04	(77)
Southeast 0.9x	0.77	X	1.77	x	69.27	x	0.5	x	0.8	=	33.99	(77)
Southeast 0.9x	0.77	x	2.74	x	69.27	x	0.5	x	0.8	=	52.61	(77)
Southeast 0.9x	0.77	X	1.75	x	69.27	x	0.5	x	0.8	=	33.6	(77)
Southeast 0.9x	0.77	X	1.77	x	44.07	x	0.5	x	0.8	=	21.62	(77)
Southeast 0.9x	0.77	x	2.74	x	44.07	x	0.5	x	0.8	=	33.47	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.5	x	0.8	=	21.38	(77)
Southeast 0.9x	0.77	X	1.77	x	31.49	x	0.5	x	0.8	=	15.45	(77)
Southeast 0.9x	0.77	X	2.74	x	31.49	x	0.5	x	0.8	=	23.92	(77)
Southeast 0.9x	0.77	X	1.75	x	31.49	x	0.5	x	0.8	=	15.27	(77)
Southwest _{0.9x}	0.54	X	13.23	x	36.79	ĺ	0.5	x	0.8	=	94.63	(79)
Southwest _{0.9x}	0.54	x	13.23	x	62.67]	0.5	x	0.8] =	161.19	(79)
Southwest _{0.9x}	0.54	x	13.23	x	85.75]	0.5	x	0.8	=	220.55	(79)
Southwest _{0.9x}	0.54	x	13.23	x	106.25]	0.5	x	0.8	=	273.27	(79)
Southwest _{0.9x}	0.54	X	13.23	x	119.01	Ī	0.5	x	0.8	j =	306.08	(79)
Southwest _{0.9x}	0.54	X	13.23	x	118.15	Ī	0.5	x	0.8	j =	303.87	(79)
Southwest _{0.9x}	0.54	j×	13.23	x	113.91	ĺ	0.5	x	0.8	j =	292.96	(79)
Southwest _{0.9x}	0.54	j x	13.23	x	104.39	ĺ	0.5	x	0.8	j =	268.48	(79)
Southwest _{0.9x}	0.54	X	13.23	x	92.85	ĺ	0.5	x	0.8	j =	238.81	(79)
Southwest _{0.9x}	0.54	j x	13.23	x	69.27	i	0.5	x	0.8	j =	178.15	(79)
Southwest _{0.9x}	0.54	x	13.23	x	44.07	j	0.5	x	0.8	j =	113.35	(79)
Southwest _{0.9x}	0.54	x	13.23	x	31.49	i	0.5	x	0.8] =	80.98	(79)
		_						•				_

Solar	naine in	watte c	alculated	l for eac	h month			(83)m = S	sum(74)m .	(82)m				
(83)m=	182.9	319.67	458.93	604.77	710.36	719.72	687.86	606.86	509.09	359.11	220.56	155.57	1	(83)
• /		l	and solar			l .		000.00	000.00	000.11	220.00	100.01		()
(84)m=	774.26	906.91	1025.61	1139.45	1212.27	1192.17	1142.97	1069.91	990.43	872.65	769.96	732.12		(84)
7. Me	an inter	nal tem	erature	(heating	season)								
		·	neating p			•	from Tal	ole 9, Th	1 (°C)				21	(85)
•		_	ains for			•		,	,					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(86)m=	0.9	0.86	0.8	0.7	0.58	0.44	0.33	0.37	0.54	0.75	0.87	0.91		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)	ı			1	
(87)m=	19.12	19.44	19.88	20.34	20.69	20.89	20.96	20.95	20.8	20.35	19.66	19.06]	(87)
Tome	oroturo	during h	L	oriodo ir	root of	طبيماانمم	from To	hla O T	h2 (°C)	l			l	
(88)m=	19.93	19.94	neating p	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	l	(88)
(00)111=	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95		(00)
			ains for			h2,m (se	i	9a)		1			1	
(89)m=	0.89	0.85	0.78	0.67	0.53	0.38	0.26	0.29	0.48	0.71	0.85	0.9		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	le 9c)			_	
(90)m=	17.47	17.93	18.53	19.17	19.62	19.85	19.92	19.91	19.77	19.2	18.25	17.4		(90)
									f	fLA = Livin	g area ÷ (4	4) =	0.45	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	I A 🗴 T1	+ (1 – fl	A) x T2					
(92)m=	18.21	18.61	19.14	19.7	20.11	20.32	20.39	20.38	20.24	19.72	18.89	18.16]	(92)
		L	l he mear	interna	<u> </u>	L			ere appro				I	
(93)m=	18.21	18.61	19.14	19.7	20.11	20.32	20.39	20.38	20.24	19.72	18.89	18.16	1	(93)
8. Sp	ace hea	tina rea	uirement			l	l	l	l					
					re obtain	ed at ste	ep 11 of	Table 9	b, so tha	t Ti.m=(76)m an	d re-calo	culate	
			or gains						.,	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	i		_	_	_	_	_				
(94)m=	0.87	0.82	0.76	0.66	0.54	0.4	0.29	0.32	0.49	0.7	0.82	0.88		(94)
Usefu	ıl gains,	hmGm	W = (94)	4)m x (8	4)m	_	_	_		_				
(95)m=	671.48	745.93	777.78	753.26	652.36	478.83	329.99	343.3	489.95	608.96	634.7	643.48		(95)
Mont	hly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]			•	
(97)m=	1268.21	1245.2	1143.43	969.85	754.46	513.57	340.54	357.52	550.95	818.44	1058.48	1252.8		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m		-	
(98)m=	443.96	335.51	272.05	155.95	75.96	0	0	0	0	155.85	305.11	453.34		
								Tota	ıl per year	(kWh/year) = Sum(9	8) _{15,912} =	2197.72	(98)
Spac	e heatin	g require	ement in	kWh/m²	² /year								28.54	(99)
·		• .	nts – Cor		•	scheme	<u> </u>							
					Ĭ			ting prov	rided by	a comm	unity sch	neme		
									1) '0' if n			. 5	0	(301)

					_
Fraction of space heat from community system	1 – (301) =			1	(302)
The community scheme may obtain heat from several sour includes boilers, heat pumps, geothermal and waste heat for			to four other heat sources;	the latter	_
Fraction of heat from Community CHP				0.67	(303a)
Fraction of community heat from heat source 2				0.33	(303b)
Fraction of total space heat from Community C	HP		(302) x (303a) =	0.67	(304a)
Fraction of total space heat from community he	at source 2		(302) x (303b) =	0.33	(304b)
Factor for control and charging method (Table	4c(3)) for community h	eating syster	n	1	(305)
Distribution loss factor (Table 12c) for commun	ity heating system			1.05	(306)
Space heating Annual space heating requirement				kWh/year 2197.72	7
Space heat from Community CHP		(98) x (304a	a) x (305) x (306) =	1536.87	 ☐(307a)
Space heat from heat source 2			o) x (305) x (306) =	770.74	(307b)
Efficiency of secondary/supplementary heating	system in % (from Tal			0	(308
Space heating requirement from secondary/sup	·		x 100 ÷ (308) =	0	(309)
	spiememary eyetem	(55) 11 (551)	(000)		
Water heating Annual water heating requirement				2087.07	
If DHW from community scheme: Water heat from Community CHP		(64) x (303a	n) x (305) x (306) =	1459.49	(310a)
Water heat from heat source 2		(64) x (303b) x (305) x (306) =	731.94	(310b)
Electricity used for heat distribution	0.	.01 × [(307a)(307e) + (310a)(310e)] =	44.99	(313)
Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system	n, if not enter 0)	= (107) ÷ (3	14) =	0	(315)
Electricity for pumps and fans within dwelling (7 mechanical ventilation - balanced, extract or po	,	l e		98.43	
warm air heating system fans	onivo input from outoic			0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year		=(330a) + (3	330b) + (330g) =	98.43	(331)
Energy for lighting (calculated in Appendix L)		(3334) . (3	(000g)	335.44	(332)
Electricity generated by PVs (Appendix M) (neg	native quantity)			-254.41	(333)
Electricity generated by wind turbine (Appendix	,	١		0	(334)
10b. Fuel costs – Community heating scheme	, , , , , , , , , , , , , , , , , , , ,)			
- 1 del codo - Community ficating selicine	Fuel kWh/year		uel Price 「able 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	Γ	3.35 × 0.01 =	51.49	(340a)
Space heating from heat source 2	(307b) x		4.79 x 0.01 =	36.92] (340b)
- Watan baatin a faana CLID	(210a) v	<u> </u>			^ ¬,

(310a) x

Water heating from CHP

(342a)

48.89

x 0.01 =

Water heating from heat source 2	(310b) x	Γ	4.79	x 0.01 =	35.06	(342b)
-		·	Fuel Price	_		
Pumps and fans	(331)			x 0.01 =	17.28	(349)
Energy for lighting	(332)		0	x 0.01 =	58.9	(350)
Additional standing charges (Table	12)				88	(351)
Energy saving/generation technolog	iies					
Total energy cost	= (340a)(342e) + (345)	(354) =			336.54	(355)
11b. SAP rating - Community heati	ng scheme					
Energy cost deflator (Table 12)					0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0]	=			1.14	(357)
SAP rating (section12)					84.16	(358)
12b. CO2 Emissions – Community h	neating scheme			_		7
Electrical efficiency of CHP unit				Ļ	32	(361)
Heat efficiency of CHP unit		_		L	50.4	(362)
		Energy kWh/year	Emission kg CO2/k		Emissions g CO2/year	
Space heating from CHP)	(307a) × 100 ÷ (362) =	3049.34	X 0.22		658.66	(363)
less credit emissions for electricity	$-(307a) \times (361) \div (362) =$	975.79	X 0.52		-506.43	(364)
Water heated by CHP	(310a) × 100 ÷ (362) =	2895.81	x 0.22		625.49	(365)
less credit emissions for electricity	$-(310a) \times (361) \div (362) =$	926.66	X 0.52		-480.94	(366)
Efficiency of heat source 2 (%)	If there is CHP usin	g two fuels repeat (363	3) to (366) for the s	second fuel	95	(367b)
CO2 associated with heat source 2	[(307b)-	+(310b)] x 100 ÷ (367b)) x 0.22	=	341.66	(368)
Electrical energy for heat distribution	า	[(313) x	0.52	=	23.35	(372)
Total CO2 associated with commun	ity systems	(363)(366) + (368)	.(372)	=	661.79	(373)
CO2 associated with space heating	(secondary)	(309) x	0	=	0	(374)
CO2 associated with water from imr	nersion heater or instantan	eous heater (312)) x 0.22	=	0	(375)
Total CO2 associated with space an	nd water heating	(373) + (374) + (375) =	=		661.79	(376)
CO2 associated with electricity for p	umps and fans within dwell	ing (331)) x	0.52	=	51.09	(378)
CO2 associated with electricity for li	ghting	(332))) x	0.52	=	174.09	(379)
Energy saving/generation technolog Item 1	ies (333) to (334) as applic	able [0.52	x 0.01 =	-132.04	(380)
Total CO2, kg/year	sum of (376)(382) =	_		Ī	754.93	(383)
Dwelling CO2 Emission Rate	$(383) \div (4) =$				9.8	(384)
El rating (section 14)				Ī	91.71	(385)
13b. Primary Energy – Community h	neating scheme			_		
Electrical efficiency of CHP unit				Ĺ	32	(361)
Heat efficiency of CHP unit					50.4	(362)

		Energy kWh/year	Primary factor		Energy Wh/year	
Space heating from CHP)	(307a) × 100 ÷ (362) =	3049.34 ×	1.22]	3720.2	(363)
less credit emissions for electricity	$-(307a) \times (361) \div (362) =$	975.79 ×	3.07]	-2995.67	(364)
Water heated by CHP	(310a) × 100 ÷ (362) =	2895.81 ×	1.22]	3532.89	(365)
less credit emissions for electricity	$-(310a) \times (361) \div (362) =$	926.66 ×	3.07]	-2844.84	(366)
Efficiency of heat source 2 (%)	If there is CHP us	sing two fuels repeat (363) to	o (366) for the secon	nd fuel	95	(367b)
Energy associated with heat source	e 2 [(307b	o)+(310b)] x 100 ÷ (367b) x	1.22	=	1929.75	(368)
Electrical energy for heat distribution	on	[(313) x		=	138.12	(372)
Total Energy associated with comm	nunity systems	(363)(366) + (368)(37	72)	=	3480.44	(373)
if it is negative set (373) to zero	unless specified otherwise	e, see C7 in Appendix (C)		3480.44	(373)
Energy associated with space heat	ing (secondary)	(309) x	0	=	0	(374)
Energy associated with water from	immersion heater or instar	ntaneous heater(312) x	1.22	=	0	(375)
Total Energy associated with space	e and water heating	(373) + (374) + (375) =			3480.44	(376)
Energy associated with space cool	ing	(315) x	3.07	=	0	(377)
Energy associated with electricity for	or pumps and fans within o	dwelling (331)) x	3.07] =	302.18	(378)
Energy associated with electricity for	or lighting	(332))) x	3.07] =	1029.81	(379)
Energy saving/generation technolo Item 1	gies		3.07 × 0.	01 =	-781.05	(380)
Total Primary Energy, kWh	/year sum of (376	5)(382) =			4031.38	(383)

		l loor [Details:						
Assessor Name:	Ross Boulton	USEI I	Strom:	a Nijim	hor:		STRC	0028068	
Software Name:	Stroma FSAP 2012		Softwa					on: 1.0.4.18	
		Property							
Address :	B2A-103-02, Flat Type	· · ·							
1. Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m	3)
Ground floor			77	(1a) x	2	2.6	(2a) =	200.2	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(1n)	77	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	200.2	(5)
2. Ventilation rate:									
	main seco heating heat	ndary ing	other		total			m³ per hou	ır
Number of chimneys		0 +	0] = [0	X	40 =	0	(6a)
Number of open flues	0 +	0 +	0	j = C	0	x :	20 =	0	(6b)
Number of intermittent fa	ans			, <u> </u>	3	X	10 =	30	(7a)
Number of passive vents	•			F	0	x	10 =	0	(7b)
·				Ļ			40 =		=
Number of flueless gas f	iles			L	0	^	40 –	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6	6b)+(7a)+(7b)+	(7c) =	Г	30		÷ (5) =	0.15	(8)
	peen carried out or is intended, p			ontinue fr			. (0)	0.10	(0)
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber fram			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value correspond nas): if equal user 0.35	ling to the grea	ter wall are	a (after					
•	floor, enter 0.2 (unsealed)	or 0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else enter 0							0	(13)
Percentage of window	s and doors draught stripp	ed						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	`	, , ,	. ,		0	(16)
• •	q50, expressed in cubic n	•	•	•	etre of e	envelope	area	5	(17)
•	lity value, then $(18) = [(17) \div$:- <i>b</i> - :			0.4	(18)
Number of sides sheltere	es if a pressurisation test has bee ed	en done or a de	gree air pei	теаршіу	is being u	sea		2	(19)
Shelter factor	, a		(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.34	(21)
Infiltration rate modified t	for monthly wind speed								
Jan Feb	Mar Apr May J	lun Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7	•						-	
(22)m= 5.1 5		.8 3.8	3.7	4	4.3	4.5	4.7]	
		•	-		-		-	-	
Wind Factor $(22a)m = (2a)m =$		05 05-	1 0 00			1 4 4 5	1 445	1	
(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	J	

0.43	ation rate	0.42	0.37	0.37	0.32	0.32	0.31	0.34	0.37	0.38	0.4	1	
Calculate effec		-					0.51	0.54	0.57	0.30	0.4	l	
If mechanica	al ventilat	ion:										0	(23
If exhaust air he	eat pump u	sing Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	= (23a)			0	(23
If balanced with	heat recov	very: effici	iency in %	allowing t	for in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	d mecha	nical ve	ntilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	l	(24
b) If balance	d mecha	nical ve	ntilation	without	heat red	covery (N	ЛV) (24b	p)m = (22)	2b)m + (2	23b)	1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	İ	(24
c) If whole h if (22b)n	ouse exti n < 0.5 ×			•	•				.5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilation			•	•				0.5]			'	
24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(24
Effective air	change r	rate - er	iter (24a) or (24l	o) or (24	c) or (24	d) in box	x (25)			•		
25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(2
3. Heat losse	s and he	at loss r	naramet	ōt.									
LEMENT	Gross	S	Openin		Net Ar		U-val		AXU		k-value		ΑΧk
	area ((m²)	m	l ²	A ,r	m²	W/m2	2Κ — '	(W/h	<u>()</u>	kJ/m²-	<	kJ/K
oors					2.91	X	1.2	=	3.492	_			(2
√indows Type					1.06	x1	/[1/(1.4)+	0.04] =	1.41				(2
/indows Type					2.08	x1	/[1/(1.4)+	0.04] =	2.76				(2
/indows Type	: 3				0.95	χ1.	/[1/(1.4)+	0.04] =	1.26				(2
/indows Type	· 4				7.92	x1	/[1/(1.4)+	0.04] =	10.5				(2
/indows Type	5				1.64	x1.	/[1/(1.4)+	0.04] =	2.17				(2
/indows Type	÷ 6				1.64	x1	/[1/(1.4)+	0.04] =	2.17				(2
/indows Type	; 7				1.05	x1.	/[1/(1.4)+	0.04] =	1.39				(2
/alls	74.55	5	19.2	5	55.3	X	0.18	=	9.95				(2
otal area of e	lements,	m²			74.55	5							(3
for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	1 3.2	
include the area				ls and par	titions		(26) (20)	\					
abric heat los		•	U)				(26)(30)		(20) + (20)) . (225)	(220)	35.11	==
eat capacity	,	•	0 – Cm	TEA\;	a k 1/m2k/			., ,	(30) + (32 itive Value:	, , ,	(32e) =	774.2	=====
hermal mass or design assess	•	•		•			ecisely the				ahla 1f	250	(3
an be used inste				CONSTRUCT	ion are no	i kilowii pi	cosciy uic	rindicative	values of	TIVII III I	able II		
hermal bridge	es : S (L :	x Y) cal	culated (using Ap	pendix I	<						3.73	(3
	al bridging a	are not kn	own (36) =	= 0.05 x (3	31)								
	_							(0.0)					
details of therma otal fabric he entilation hea									$\frac{1}{1}(36) = 0.33 \times 0$			38.84	4 (3

(00)													(00)
(38)m= 39.24	39	38.76	37.65	37.44	36.48	36.48	36.3	36.85	37.44	37.86	38.3		(38)
Heat transfer of			70.40	70.00	75.04	75.04	75.44		= (37) + (37)		77.44		
(39)m= 78.07	77.83	77.6	76.49	76.28	75.31	75.31	75.14	75.69	76.28 Average =	76.7	77.14	76.49	(39)
Heat loss para	meter (H	HLP), W/	′m²K						= (39)m ÷		12 / 12-	70.43	
(40)m= 1.01	1.01	1.01	0.99	0.99	0.98	0.98	0.98	0.98	0.99	1	1		_
Number of day	c in moi	oth (Tab	lo 1a)					,	Average =	Sum(40) ₁	12 /12=	0.99	(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)
` /							<u> </u>				ļ		
4. Water heat	ing ener	av regui	rement:								kWh/ye	ar.	
4. Water fleat	ing che	gy roqui	rement.								IXVVII/ y C	,ai.	
Assumed occur if TFA > 13.9			[1 ovn	/ n nnna	240 v (TE	-Λ 12 O)2)] . O (1012 v /	Γ Γ Λ 12		2.4		(42)
if TFA £ 13.9		+ 1.70 X	[ı - exp	(-0.0003	9 X (11	A - 13.9	<i>)</i> ∠)] + 0.() X C I U	IFA - 13.	9)			
Annual averag											.28		(43)
Reduce the annua not more that 125							to achieve	a water us	se target o	t			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in				,				Sep	Oct	INOV	Dec		
(44)m= 100.41	96.76	93.11	89.46	85.81	82.15	82.15	85.81	89.46	93.11	96.76	100.41		
(1.7	000	00	301.10		020	020	00.01		Total = Su		L	1095.39	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			· /			 `
(45)m= 148.91	130.23	134.39	117.16	112.42	97.01	89.9	103.16	104.39	121.65	132.8	144.21		
			. ,						Total = Su	m(45) ₁₁₂ =	=	1436.23	(45)
If instantaneous w										i			
(46)m= 0 Water storage	0	0	0	0	0	0	0	0	0	0	0		(46)
Storage volum		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	, ,					_					100		()
Otherwise if no	_			_			, ,	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWh	n/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro b) If manufact		•	•		or ic not		(48) x (49)	=			0		(50)
Hot water stora			-								0		(51)
If community h	•			,		• /							` ,
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54)
Enter (50) or (, ,	•					(/EC) :	FF) (:::			0		(55)
Water storage							((56)m = (1			
(56)m= 0	0	0	0	0	0	0	0	0 (56)	0	0	0	5v.11	(56)
If cylinder contains	aedicate	u solar sto	rage, (57)i	11 = (56)M) – (UC)] x	птт)] ÷ (5	υ), eise (5	/ Jm = (56)	ııı wnere (mili) is fro	ın Append	х П	
(57)m= 0										1			(57)

Primary circuit loss (annual) from Ta	ole 3			()	(58)
Primary circuit loss calculated for ea	ch month (59)m =	$(58) \div 365 \times (4)$	1)m			
(modified by factor from Table H5	f there is solar wa	ater heating and	a cylinder the	nermostat)		
(59)m= 0 0 0 0	0 0	0 0	0	0 0	0	(59)
Combi loss calculated for each mont	n (61)m = (60) ÷ 3	365 × (41)m				
(61)m= 0 0 0 0	0 0	0 0	0	0 0	0	(61)
Total heat required for water heating	calculated for each	ch month (62)m	$= 0.85 \times (45)$	5)m + (46)m +	 (57)m + (59)r	n + (61)m
(62)m= 126.57 110.7 114.23 99.59		76.41 87.68		03.41 112.88	122.58	(62)
Solar DHW input calculated using Appendix G	or Appendix H (nega	tive quantity) (enter	'0' if no solar cor	ontribution to wate	r heating)	
(add additional lines if FGHRS and/o					σ,	
(63)m= 0 0 0 0	0 0	0 0	0	0 0	0	(63)
Output from water heater	- 	- I				
(64)m= 126.57 110.7 114.23 99.59	95.56 82.46	76.41 87.68	88.73 10	03.41 112.88	122.58	
, ,	1 1			r heater (annual) ₁		1220.79 (64)
Heat gains from water heating, kWh/	month 0 25 1 [0 8]					
(65)m= 31.64 27.67 28.56 24.9	 	19.1 21.92	 	25.85 28.22	30.64	(65)
` '	<u> </u>					
include (57)m in calculation of (65)	• •	is in the aweilir	g of not wate	er is from Comi	numity neatin	9
5. Internal gains (see Table 5 and s	oa):					
Metabolic gains (Table 5), Watts	1 1 .		1 - 1	_		
Jan Feb Mar Ap	-	Jul Aug	' 	Oct Nov	Dec	(22)
(66)m= 120.17 120.17 120.17 120.1	7 120.17 120.17	120.17 120.1	7 120.17 12	20.17 120.17	120.17	(66)
Lighting gains (calculated in Append	x L, equation L9	or L9a), also se	e Table 5			
(67)m= 18.99 16.87 13.72 10.39	7.76 6.55	7.08 9.21	12.36	5.69 18.31	19.52	(67)
Appliances gains (calculated in Appe	ndix L, equation l	_13 or L13a), al	so see Table	5		
(68)m= 213.06 215.27 209.7 197.8	4 182.86 168.79	159.39 157.1	3 162.75 17	74.61 189.58	203.66	(68)
Cooking gains (calculated in Append	ix L, equation L15	or L15a), also	see Table 5			
(69)m= 35.02 35.02 35.02 35.02	35.02 35.02	35.02 35.02	35.02 3	35.02 35.02	35.02	(69)
Pumps and fans gains (Table 5a)	-					
(70)m= 0 0 0 0	0 0	0 0	0	0 0	0	(70)
Losses e.g. evaporation (negative va	lues) (Table 5)	•	- !	!		
(71)m= -96.14 -96.14 -96.14 -96.1		-96.14 -96.1	96.14 -9	96.14 -96.14	-96.14	(71)
Water heating gains (Table 5)		<u> </u>				
(72)m= 42.53 41.18 38.38 34.56	32.11 28.63	25.68 29.46	30.81 34	34.75 39.19	41.19	(72)
Total internal gains =		6)m + (67)m + (68)r	ļ	ļ ļ		, ,
(73)m= 333.63 332.37 320.85 301.8	<u> </u>	1 1		284.1 306.14	323.42	(73)
6. Solar gains:	3 201.79 203.03	251.2 254.3	204.97	300.14	323.42	(10)
Solar gains are calculated using solar flux from	m Table 6a and asso	ciated equations to	convert to the ar	policable orientati	on.	
Orientation: Access Factor Are		ux	g_	FF		iins
Table 6d m		able 6a	9_ Table 6b	Table 6c		(W)
Northeast _{0.9x} 0.77 x	2.08 ×	11.28 ×	0.63	x 0.7	_ = _	7.17 (75)
N 4 .						
Northeast 0.9x 0.77 x	0.95 ×	11.28 ×	0.63	X 0.7		3.28 (75)

Northeast _{0.9x}	0.77	٦ ,	4.04	l .,	14.00	1 .,	0.00	l "	0.7	1 _	5.00	(75)
Northeast 0.9x	0.77] X	1.64	X I	11.28	X 	0.63	X	0.7] =]	5.66	=
Northeast 0.9x	0.77] X	2.08	X	22.97	X 1	0.63	X	0.7] = 1	14.6	(75)
Northeast 0.9x	0.77] X	0.95	l X l	22.97] X]	0.63	X	0.7] =]	6.67	(75)
Northeast 0.9x	0.77	X	1.64	X	22.97	J X I	0.63	X	0.7] = 1	11.51	(75)
<u>L</u>	0.77	X	2.08	X	41.38	X	0.63	X	0.7] = 1	26.3	(75)
Northeast 0.9x	0.77	X	0.95	X	41.38	X I	0.63	X	0.7] = 1	12.01	(75)
Northeast 0.9x	0.77	X	1.64	X	41.38	X	0.63	X	0.7	=	20.74	(75)
Northeast 0.9x	0.77	X	2.08	X	67.96	X	0.63	X	0.7] = 1	43.2	(75)
Northeast 0.9x	0.77	X	0.95	X	67.96	X	0.63	X	0.7] =	19.73	(75)
Northeast 0.9x	0.77	X	1.64	X	67.96	X	0.63	X	0.7	=	34.06	(75)
Northeast _{0.9x}	0.77	X	2.08	Х	91.35	X	0.63	X	0.7	=	58.07	(75)
Northeast 0.9x	0.77	X	0.95	X	91.35	X	0.63	X	0.7	=	26.52	(75)
Northeast _{0.9x}	0.77	X	1.64	X	91.35	X	0.63	X	0.7	=	45.78	(75)
Northeast _{0.9x}	0.77	X	2.08	X	97.38	X	0.63	X	0.7	=	61.9	(75)
Northeast _{0.9x}	0.77	X	0.95	X	97.38	X	0.63	X	0.7	=	28.27	(75)
Northeast _{0.9x}	0.77	X	1.64	X	97.38	X	0.63	X	0.7	=	48.81	(75)
Northeast _{0.9x}	0.77	X	2.08	X	91.1	X	0.63	X	0.7	=	57.91	(75)
Northeast _{0.9x}	0.77	X	0.95	X	91.1	X	0.63	X	0.7	=	26.45	(75)
Northeast _{0.9x}	0.77	X	1.64	x	91.1	x	0.63	X	0.7	=	45.66	(75)
Northeast _{0.9x}	0.77	X	2.08	X	72.63	X	0.63	X	0.7	=	46.17	(75)
Northeast _{0.9x}	0.77	X	0.95	X	72.63	x	0.63	X	0.7	=	21.09	(75)
Northeast _{0.9x}	0.77	X	1.64	x	72.63	x	0.63	x	0.7	=	36.4	(75)
Northeast _{0.9x}	0.77	X	2.08	x	50.42	x	0.63	x	0.7	=	32.05	(75)
Northeast _{0.9x}	0.77	x	0.95	x	50.42	x	0.63	x	0.7	=	14.64	(75)
Northeast _{0.9x}	0.77	X	1.64	х	50.42	x	0.63	x	0.7	=	25.27	(75)
Northeast _{0.9x}	0.77	X	2.08	x	28.07	x	0.63	X	0.7	=	17.84	(75)
Northeast _{0.9x}	0.77	X	0.95	х	28.07	x	0.63	x	0.7	=	8.15	(75)
Northeast _{0.9x}	0.77	X	1.64	х	28.07	x	0.63	x	0.7	=	14.07	(75)
Northeast _{0.9x}	0.77	X	2.08	х	14.2	x	0.63	x	0.7	=	9.02	(75)
Northeast 0.9x	0.77	X	0.95	х	14.2	х	0.63	x	0.7] =	4.12	(75)
Northeast _{0.9x}	0.77	x	1.64	x	14.2	x	0.63	x	0.7	=	7.12	(75)
Northeast _{0.9x}	0.77	X	2.08	x	9.21	x	0.63	x	0.7] =	5.86	(75)
Northeast 0.9x	0.77	X	0.95	x	9.21	x	0.63	x	0.7] =	2.68	(75)
Northeast _{0.9x}	0.77	x	1.64	x	9.21	x	0.63	x	0.7	=	4.62	(75)
Southeast 0.9x	0.77	X	1.06	х	36.79	х	0.63	x	0.7	j =	11.92	(77)
Southeast 0.9x	0.77	j x	1.64	x	36.79	×	0.63	x	0.7	j =	18.44	(77)
Southeast 0.9x	0.77	j x	1.05	x	36.79	x	0.63	x	0.7	j =	11.81	(77)
Southeast 0.9x	0.77	x	1.06	x	62.67	x	0.63	x	0.7	j =	20.3	(77)
Southeast _{0.9x}	0.77	X	1.64	x	62.67	x	0.63	x	0.7	=	31.41	(77)
Southeast _{0.9x}	0.77	X	1.05	x	62.67	x	0.63	x	0.7	=	20.11	(77)
Southeast _{0.9x}	0.77	X	1.06	x	85.75	X	0.63	x	0.7	=	27.78	(77)
L		_		1				ı				

Southoost on T		7		1		1		l		1		–
Southeast 0.9x	0.77	X	1.64	X	85.75	X	0.63	X	0.7] = 1	42.98	(77)
Southeast 0.9x	0.77	X	1.05	X	85.75	X	0.63	X	0.7] =	27.52	(77)
Southeast 0.9x	0.77	X	1.06	X	106.25	X	0.63	X	0.7	=	34.42	(77)
Southeast 0.9x	0.77	X	1.64	X	106.25	X	0.63	X	0.7] =	53.25	(77)
Southeast 0.9x	0.77	X	1.05	X	106.25	X	0.63	X	0.7] =	34.1	(77)
Southeast 0.9x	0.77	X	1.06	X	119.01	X	0.63	X	0.7	=	38.55	(77)
Southeast 0.9x	0.77	X	1.64	X	119.01	X	0.63	X	0.7	=	59.65	(77)
Southeast 0.9x	0.77	X	1.05	X	119.01	X	0.63	X	0.7	=	38.19	(77)
Southeast _{0.9x}	0.77	X	1.06	X	118.15	X	0.63	X	0.7	=	38.27	(77)
Southeast 0.9x	0.77	X	1.64	X	118.15	X	0.63	X	0.7	=	59.22	(77)
Southeast _{0.9x}	0.77	X	1.05	X	118.15	X	0.63	X	0.7	=	37.91	(77)
Southeast _{0.9x}	0.77	X	1.06	X	113.91	X	0.63	X	0.7	=	36.9	(77)
Southeast _{0.9x}	0.77	X	1.64	X	113.91	x	0.63	X	0.7	=	57.09	(77)
Southeast _{0.9x}	0.77	X	1.05	X	113.91	x	0.63	X	0.7	=	36.55	(77)
Southeast 0.9x	0.77	X	1.06	X	104.39	x	0.63	X	0.7	=	33.82	(77)
Southeast 0.9x	0.77	X	1.64	X	104.39	x	0.63	X	0.7	=	52.32	(77)
Southeast 0.9x	0.77	X	1.05	X	104.39	X	0.63	X	0.7	=	33.5	(77)
Southeast 0.9x	0.77	X	1.06	X	92.85	X	0.63	X	0.7	=	30.08	(77)
Southeast 0.9x	0.77	X	1.64	x	92.85	x	0.63	x	0.7	=	46.54	(77)
Southeast 0.9x	0.77	X	1.05	X	92.85	x	0.63	X	0.7	=	29.8	(77)
Southeast 0.9x	0.77	X	1.06	X	69.27	x	0.63	X	0.7	=	22.44	(77)
Southeast 0.9x	0.77	X	1.64	X	69.27	x	0.63	x	0.7	=	34.72	(77)
Southeast 0.9x	0.77	X	1.05	X	69.27	x	0.63	x	0.7	=	22.23	(77)
Southeast 0.9x	0.77	x	1.06	X	44.07	x	0.63	x	0.7	=	14.28	(77)
Southeast 0.9x	0.77	X	1.64	X	44.07	x	0.63	x	0.7	=	22.09	(77)
Southeast 0.9x	0.77	X	1.05	X	44.07	x	0.63	X	0.7	=	14.14	(77)
Southeast 0.9x	0.77	X	1.06	X	31.49	x	0.63	x	0.7	=	10.2	(77)
Southeast 0.9x	0.77	x	1.64	X	31.49	x	0.63	x	0.7	=	15.78	(77)
Southeast 0.9x	0.77	x	1.05	X	31.49	x	0.63	x	0.7	=	10.1	(77)
Southwest _{0.9x}	0.54	x	7.92	X	36.79]	0.63	x	0.7	=	62.46	(79)
Southwest _{0.9x}	0.54	x	7.92	x	62.67]	0.63	x	0.7	=	106.39	(79)
Southwest _{0.9x}	0.54	x	7.92	x	85.75]	0.63	x	0.7	=	145.56	(79)
Southwest _{0.9x}	0.54	x	7.92	x	106.25]	0.63	x	0.7	=	180.36	(79)
Southwest _{0.9x}	0.54	x	7.92	x	119.01]	0.63	x	0.7	<u> </u>	202.02	(79)
Southwest _{0.9x}	0.54	х	7.92	x	118.15]	0.63	x	0.7] =	200.56	(79)
Southwest _{0.9x}	0.54	x	7.92	x	113.91]	0.63	x	0.7	=	193.36	(79)
Southwest _{0.9x}	0.54	x	7.92	x	104.39]	0.63	x	0.7	j =	177.2	(79)
Southwest _{0.9x}	0.54	x	7.92	x	92.85]	0.63	x	0.7	j =	157.61	(79)
Southwest _{0.9x}	0.54	x	7.92	x	69.27]	0.63	x	0.7] =	117.58	(79)
Southwest _{0.9x}	0.54	x	7.92	x	44.07]	0.63	x	0.7] =	74.81	(79)
Southwest _{0.9x}	0.54	x	7.92	x	31.49	Ī	0.63	x	0.7] =	53.45	(79)
_		-		•		•		•		•		_

	gains in				1		450.00	` 	um(74)m .	' 	445.50	400.00		(00)
(83)m=	120.73 gains — ir	210.99	302.89	399.12	468.78	474.95	453.92	400.49	335.99	237.02	145.58	102.69		(83)
(84)m=	454.36	543.36	623.75	700.97	750.57	737.98	705.13	655.39	600.96	521.12	451.72	426.11		(84)
` '			<u> </u>	<u> </u>	ļ	<u> </u>	1	1 000.00	1 000.00			==		
	ean inter			`		<i>'</i>								_
•	perature	· ·	٠.			Ū		ole 9, Th	1 (°C)				21	(85)
Utilis	ation fac				ea, h1,m	(see Ta	i – – –					ı		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.94	0.83	0.63	0.47	0.52	0.79	0.97	1	1		(86)
Mear	n interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	19.94	20.11	20.36	20.67	20.89	20.98	21	20.99	20.94	20.64	20.23	19.91		(87)
Temp	perature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=		20.07	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.08		(88)
l Itilie:	ation fac	tor for a	ains for	rest of d	welling	h2 m (se	a Tahla	(a)						
(89)m=	1	0.99	0.98	0.92	0.78	0.55	0.37	0.42	0.71	0.95	0.99	1		(89)
			<u> </u>		l	<u> </u>		<u> </u>	l	l	0.00			(3.2)
	interna			1		- ` `	l	i 						(22)
(90)m=	19.1	19.27	19.52	19.82	20.02	20.09	20.1	20.1	20.06	19.8	19.4	19.08		(90)
									I	fLA = Livin	g area ÷ (4	4) =	0.45	(91)
Mear	n interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	LA × T1	+ (1 – fL	A) × T2					
(92)m=	19.48	19.65	19.9	20.21	20.41	20.5	20.51	20.51	20.46	20.18	19.77	19.46		(92)
Apply	/ adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.48	19.65	19.9	20.21	20.41	20.5	20.51	20.51	20.46	20.18	19.77	19.46		(93)
8. Sp	ace hea	ting req	uirement	:										
						ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the u	tilisation							Ι.						
1.1699	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac				0.70	0.50	0.40	0.47	0.74	0.05	0.00			(04)
(94)m=	1	0.99	0.98	0.92	0.79	0.59	0.42	0.47	0.74	0.95	0.99	1		(94)
(95)m=	ul gains, 453.01	538.93	0.000	647.26	595.89	434.06	293.1	306.38	446.5	496.61	448.51	425.2		(95)
. ,	hly avera						293.1	300.38	440.3	490.01	440.51	423.2		(30)
(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)
	loss rate		L	<u> </u>		<u> </u>	<u> </u>	<u> </u>			7.1	7.2		(00)
(97)m=		1148.07			664.52	443.99	294.25	308.55	481.34	730.85	972.12	1176.77		(97)
	e heating													(3)
(98)m=		409.35	320.61	156.58	51.06	0	0	0	0	174.28	377	559.16		
(00)	0101		1 020.01	100.00	000			ļ		(kWh/year		l .	2592.66	(98)
•					.,			Tota	ii pei yeai	(KVVII/yeai) = Sum(9	O)15,912 —		===
Spac	e neatin	a requir	ement in	κννh/m²	/vear								33.67	(99)
	C HOGHI	<u> </u>			.,									
8c. S	pace co	• .			,,									
		oling red	quiremer	nt		ble 10b Jun	Jul	Aug	Sep	Oct	Nov	Dec		

Heat	loss rate	e Lm (ca	lculated	using 2	5°C inter	rnal temp	perature	and exte	ernal ten	nperatur	e from T	Table 10)		
(100)m=	0	0	0	0	0	707.95	557.32	571.03	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.95	0.98	0.97	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	Vatts) = ((100)m x	(101)m	1								
(102)m=	0	0	0	0	0	673.3	545.44	553.15	0	0	0	0		(102)
Gains	(solar	gains ca	lculated	for appli	cable w	eather re	gion, se	e Table	10)					
(103)m=	0	0	0	0	0	977.54	936.38	877.66	0	0	0	0		(103)
			ement fo (104)m <			dwelling,	continud	ous (kW	h' = 0.0	24 x [(1(03)m – (102)m] :	x (41)m	
(104)m=	0	0	0	0	0	219.05	290.86	241.44	0	0	0	0		
									Total	l = Sum(104)	=	751.34	(104)
	fraction	-							f C =	cooled	area ÷ (4) =	1	(105)
Interm	ttency f	actor (Ta	able 10b)					1				1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
									Tota	I = Sum((104)	=	0	(106)
•		requirer	ment for		: (104)m	× (105)							Ī	
(107)m=	0	0	0	0	0	54.76	72.71	60.36	0	0	0	0		_
									Total	l = Sum((107)	=	187.84	(107)
Space	cooling	requirer	ment in k	kWh/m²/	year				(107)) ÷ (4) =			2.44	(108)
8f. Fab	ric Ene	rgy Effic	iency (ca	alculated	l only un	ider spec	cial cond	litions, se	ee sectio	on 11)				
Fabri	c Energy	y Efficier	ncy						(99)	+ (108) =	=		36.11	(109)
Targe	et Fabri	c Energ	y Efficie	ency (TF	EE)								41.53	(109)

			User D	etails: _						
Assessor Name:	Ross Boulton		- Use r L	Strom:	a Nium	her:		STDC	0028068	
Software Name:	Stroma FSAP 20	112		Softwa					on: 1.0.4.18	
Contware Hame.	5115111a 1 57 11 25		roperty	Address				VOIOIC	511. 1.0. 1.10	
Address :	B2A-103-02, Flat		i í							
1. Overall dwelling dime		71	·	,						
			Area	a(m²)		Av. He	ight(m)		Volume(m³)
Ground floor				77	(1a) x	2	2.6	(2a) =	200.2	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	77	(4)			_		
Dwelling volume			<u> </u>		(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	200.2	(5)
2. Ventilation rate:										
	main heating	secondar heating	у	other		total			m³ per hou	r
Number of chimneys	0 +	0	+ [0	= [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī = [0	x	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	3	x ·	10 =	30	(7a)
Number of passive vents	S				F	0	x ·	10 =	0	(7b)
Number of flueless gas f					F	0	x	40 =	0	(7c)
Transcr of fideless gas i	100					0			0	(/'C)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7	a)+(7b)+(7c) =	Γ	30		÷ (5) =	0.15	(8)
If a pressurisation test has I	been carried out or is inten	ded, procee	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in t	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
deducting areas of openi	oresent, use the value corre ings); if equal user 0.35	esponaing to	tne great	er wall are	a (arter					
If suspended wooden	• / .	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.4	(18)
Air permeability value applie		as been dor	ne or a deg	gree air pe	meability	is being u	sed			7,,0
Number of sides shelters Shelter factor	ea			(20) = 1 -	0.075 x (1	19)1 =			0.85	(19) (20)
Infiltration rate incorpora	ting shelter factor			(21) = (18)		- /1			0.83	(21)
Infiltration rate modified	•	ed			` '				0.54	(=:)
Jan Feb	Mar Apr May	1	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp					•	•	•		_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
			I	1		I	<u> </u>	l	_	
Wind Factor $(22a)m = (2a)m =$	'	T 2 2 -		0.00			1 , , , ,		7	
(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	_	

Adjusted infiltra	ation rate (allowii	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.43	I .	0.42	0.37	0.37	0.32	0.32	0.31	0.34	0.37	0.38	0.4]	
Calculate effect		-	ate for t	пе арріі	саріе са	se						0	(23a)
If exhaust air he	eat pump usir	ng Appe	ndix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b) = (23a)			0	(23b)
If balanced with	n heat recover	ry: effici	ency in %	allowing f	or in-use f	actor (from	n Table 4h) =				0	(23c)
a) If balance	d mechani	ical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a)m = (2	2b)m + (23b) × [1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance	ed mechani	ical ve	ntilation	without	heat rec	overy (N	ЛV) (24b)m = (22	2b)m + (2	23b)		_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h				•	•				_	,			
	n < 0.5 × (2			, ,	<u> </u>	· ·	ŕ	<u> </u>	<u> </u>		I 0	1	(240)
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n	ventilation n = 1, then				•				0.5]			_	
(24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58]	(24d)
Effective air	change rat	te - en	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25)
3. Heat losse	s and heat	loss	aramete	er:									
ELEMENT	Gross area (m		Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	〈)	k-value kJ/m²-		A X k kJ/K
Doors	,	,			2.91	x	1.35	=	3.9285	<u> </u>			(26)
Windows Type	e 1				1.77	<u>x</u> 1/	[1/(1.35)-	- 0.04] =	2.27				(27)
Windows Type	2				3.48	<u>x</u> 1/	[1/(1.35)-	- 0.04] =	4.46				(27)
Windows Type	3				1.59	<u>x</u> 1/	[1/(1.35)-	- 0.04] =	2.04				(27)
Windows Type	e 4				13.23	x1/	[1/(1.35)-	- 0.04] =	16.95				(27)
Windows Type	÷ 5				2.74	_	[1/(1.35)-	- 0.04] ₌	3.51				(27)
Windows Type					2.74	<u>x</u> 1/	[1/(1.35)-	- 0.04] ₌	3.51	=			(27)
Windows Type	e 7				1.75	<u>x</u> 1/	[1/(1.35)-	- 0.04] ₌	2.24	=			(27)
Walls	74.55	\neg	30.2		44.34	×	0.15	— լi	6.65	=			(29)
Total area of e	elements, m	' ∩²			74.55	<u> </u>							(31)
* for windows and ** include the area					alue calcul		formula 1	/[(1/U-valu	ıe)+0.04] a	ns given in	paragrapl	1 3.2	
Fabric heat los				o arra part			(26)(30)	+ (32) =				45.55	(33)
Heat capacity		•	,					((28).	(30) + (32	2) + (32a).	(32e) =	620.82	(34)
Thermal mass	parameter	r (TMP) = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value:	Low		100	(35)
For design assess				constructi	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		`` ′
Thermal bridge				using Ap	pendix ł	<						11.18	(36)
if details of therma		e not kn	own (36) =	: 0.05 x (3	1)			(33) +	(36) =			56.73	(37)
Ventilation hea		ulated	monthly	/					$= 0.33 \times ($	25)m x (5))	50.73	(01)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
			F *	~-,				- 1		·		j	

(00)		00.70	07.05	07.44	00.40	00.40	I	22.25	07.44	07.00	000	l	(20)
(38)m= 39.24	39	38.76	37.65	37.44	36.48	36.48	36.3	36.85	37.44	37.86	38.3		(38)
Heat transfer of			04.00	04.47	00.04	00.04	00.00		= (37) + (37)		05.00	1	
(39)m= 95.97	95.73	95.49	94.38	94.17	93.21	93.21	93.03	93.58	94.17	94.59	95.03	94.38	(39)
Heat loss para	meter (H	HLP), W	m²K						= (39)m ÷	Sum(39) ₁ (4)	12 / 12=	94.36	(00)
(40)m= 1.25	1.24	1.24	1.23	1.22	1.21	1.21	1.21	1.22	1.22	1.23	1.23		_
Number of dev	o in ma	oth (Tob	lo 1o\					,	Average =	Sum(40) ₁	12 /12=	1.23	(40)
Number of day Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
(1.7		<u> </u>		<u> </u>		<u> </u>						l	, ,
4 \\/\-t==\-t==	·										1-10/1- /		
4. Water heat	ing enei	rgy requi	rement:								kWh/ye	ear:	
Assumed occu											.4		(42)
if TFA > 13.9 if TFA £ 13.9		+ 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (¯	ΓFA -13.	9)			
Annual averag	•	ater usad	ae in litre	es per da	ıv Vd.av	erage =	(25 x N)	+ 36		91	.28		(43)
Reduce the annua	ıl average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.20	I	(12)
not more that 125	litres per _l	person per	day (all w	ater use, l	not and co	ld)						•	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)					•	
(44)m= 100.41	96.76	93.11	89.46	85.81	82.15	82.15	85.81	89.46	93.11	96.76	100.41		_
Energy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1095.39	(44)
(45)m= 148.91	130.23	134.39	117.16	112.42	97.01	89.9	103.16	104.39	121.65	132.8	144.21		
								-	Total = Su	m(45) ₁₁₂ =		1436.23	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)					_
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage		inaludin	va opv o	olor or M	MUDE	otorogo	within or	ma vaa	ool		_	l	(47)
Storage volum	` ,		•			_		ame ves	sei		0		(47)
If community h Otherwise if no	•			_			. ,	ers) ente	er 'O' in <i>(</i>	4 7)			
Water storage		not wate	» (u.iio ii	10144001	notantai	10000 00	711101 0011	010) 01110	31 O III (.,,			
a) If manufact		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If manufact			-									•	
Hot water stora	_			e 2 (kW	h/litre/da	ıy)					0		(51)
If community h Volume factor	_		on 4.3										(50)
Temperature fa			2h							_	0		(52) (53)
Energy lost fro				oor			(47) v (51)	v (52) v (53) -			 	
Enter (50) or (-	, 1. VVII/ y	Jai			(47) x (51)	,	-		0		(54) (55)
Water storage	, ,	,	for each	month			((56)m = (55) × (41)ı	m		•	ı	(55)
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contains	-	-									_	ix H	(00)
													(57)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0	I	(31)

Primary circuit loss	annual) fro	om Table	e 3							0		(58)
Primary circuit loss	,			59)m = ((58) ÷ 36	55 × (41)	m				ı	
(modified by facto	r from Tab	le H5 if t	there is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)		_	
(59)m = 0 0	0	0	0	0	0	0	0	0	0	0		(59)
Combi loss calculat	ed for each	n month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m= 0 0	0	0	0	0	0	0	0	0	0	0		(61)
Total heat required	or water h	eating c	alculated	for eac	h month	(62)m =	0.85 x ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 126.57 110.		99.59	95.56	82.46	76.41	87.68	88.73	103.41	112.88	122.58		(62)
Solar DHW input calcula		l endix G o	r Appendix	L H (negati	l ve guantity	() (enter '0	L ' if no sola	r contributi	ion to wate	r heating)	l	
(add additional lines										,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
(63)m = 0 0	0	0	0	0	0	0	0	0	0	0		(63)
Output from water h	l eater			<u> </u>							ļ	
(64)m= 126.57 110.		99.59	95.56	82.46	76.41	87.68	88.73	103.41	112.88	122.58		
(6.7	1	1 00.00	1 00.00	020			<u> </u>	ater heate	l	l	1220.79	(64)
Heat gains from wa	er heating	k\\/h/m	onth 0.2	5 ′ [N 85	v (45)m](- /
(65)m= 31.64 27.6		24.9	23.89	20.62	19.1	21.92	22.18	25.85	28.22	30.64] 	(65)
` ' -		<u> </u>	ļ				l .			!	<u> </u>	(00)
include (57)m in d		` ′	•	ylinaer i	s in the d	aweiling	or not w	ater is tr	om com	munity n	eating	
5. Internal gains (ee Table (5 and 5a):									
Metabolic gains (Ta			1								I	
Jan Fe	+	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 120.17 120.	7 120.17	120.17	120.17	120.17	120.17	120.17	120.17	120.17	120.17	120.17		(66)
Lighting gains (calc	lated in A	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				•	
(67)m= 18.99 16.8	7 13.72	10.39	7.76	6.55	7.08	9.21	12.36	15.69	18.31	19.52		(67)
Appliances gains (c	alculated in	n Appen	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m= 213.06 215.2	7 209.7	197.84	182.86	168.79	159.39	157.18	162.75	174.61	189.58	203.66		(68)
Cooking gains (calc	ulated in A	ppendix	L, equa	tion L15	or L15a)	, also se	ee Table	5				
(69)m= 35.02 35.0	2 35.02	35.02	35.02	35.02	35.02	35.02	35.02	35.02	35.02	35.02		(69)
Pumps and fans ga	ns (Table	 5a)	-					•			1	
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evapora	tion (nega	tive valu	es) (Tab	le 5)							1	
(71)m= -96.14 -96. ²	$\overline{}$	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14		(71)
Water heating gains	(Table 5)	1		ļ							l	
(72)m= 42.53 41.1	` 	34.58	32.11	28.63	25.68	29.46	30.81	34.75	39.19	41.19		(72)
Total internal gain	Ļ				L		<u> </u>	(70)m + (7	l	<u> </u>	ł	
(73)m= 333.63 332.3		301.85	281.79	263.03	251.2	254.9	264.97	284.1	306.14	323.42	I	(73)
6. Solar gains:	020.00	001.00	201.70	200.00	201.2	204.0	204.07	204.1	000.14	020.42		()
Solar gains are calculate	ed using sola	ar flux from	Table 6a	and assoc	iated equa	tions to co	nvert to th	e applicab	le orientat	ion.		
Orientation: Acces	•	Area		Flu	•		g_		FF		Gains	
Table		m ²	-		ole 6a	Т	able 6b	T	able 6c		(W)	
Northeast _{0.9x}	77 ×	3.4	18	x 1	1.28	x	0.5	x	0.8		10.88	(75)
No de la companya de	77 X			-	1.28	x	0.5	^ x	0.8		4.97](75)
0.07	··^			<u> </u>	1.20	ı " <u>L</u>	0.0	」 ^ ∟	0.0		4.51	7,,

Northeast _{0.9x}	0.77	7 x	0.74	1 ,	44.00	1 x	0.5	x	0.0	1 =	0.57	(75)
Northeast 0.9x	0.77	╡	2.74] X] ,	11.28] 1	0.5	! !	0.8] 1	8.57	=
Northeast 0.9x	0.77] X] ,	3.48] X] ,	22.97] X] ,	0.5	X	0.8] =] _	22.16	(75)
Northeast 0.9x	0.77] X] v	1.59] X] v	22.97] X] _v	0.5	X	0.8] = 1 _	10.12	(75) (75)
Northeast 0.9x	0.77] X] ,	2.74] X] ,	22.97] X] ,	0.5	X	0.8] =	17.44	=
Northeast 0.9x	0.77] X] ,	3.48] X] ,	41.38	X	0.5	X	0.8] =] _	39.92	(75)
Northeast 0.9x	0.77] X] ,	1.59] X] ,	41.38] X] ,	0.5	X	0.8] =	18.24	(75)
Northeast 0.9x	0.77] X]	2.74] X]	41.38] X]	0.5	X	0.8] =]	31.43	(75)
Northeast 0.9x	0.77] X]	3.48] X]	67.96] X]	0.5	X	0.8] =]	65.55	(75)
Northeast 0.9x	0.77] X] ,	1.59] X] ,	67.96] X] ,	0.5	X	0.8] = 1 _	29.95	(75)
Northeast 0.9x	0.77] X] ,	2.74] X] ,	67.96] X] ,	0.5	X	0.8] =] _	51.61	(75)
Northeast 0.9x	0.77] X] ,	3.48] X] v	91.35] X] _v	0.5	X	0.8] = 1 _	88.12	(75) (75)
Northeast 0.9x	0.77] X] ,	1.59] X] ,	91.35] X] ,	0.5	X	0.8] =] _	40.26	=
Northeast 0.9x	0.77] X] ,	2.74] X] v	91.35] X] v	0.5	X	0.8] =] _	69.38	(75)
Northeast 0.9x	0.77] X] ,	3.48] X] ,	97.38] X] ,	0.5	X	0.8] =] _	93.94	(75) (75)
Northeast 0.9x	0.77] X] ,	1.59] X] ,	97.38] X] ,	0.5	X	0.8] = 1 _	42.92	=
Northeast 0.9x	0.77	」× T	2.74] X] v	97.38] X] v	0.5	X	0.8] =] _	73.97	(75) (75)
Northeast 0.9x	0.77	」× T	3.48] X] v	91.1] X] _v	0.5	X	0.8] = 1 _	87.88	(75)
Northeast 0.9x	0.77] X] ,	1.59] X] ,	91.1] X] ,	0.5	X	0.8] =] _	40.15	╡`′
Northeast 0.9x	0.77] X] ,	2.74] X] ,	91.1] X] ,	0.5	X	0.8] =] _	69.19	(75)
Northeast 0.9x	0.77] X] ,	3.48] X] ,	72.63] X] ,	0.5	X	0.8] =] _	70.06	(75)
Northeast 0.9x	0.77] X]	1.59] X]	72.63] X]	0.5	X	0.8] =]	32.01	(75)
Northeast 0.9x	0.77] X] ,	2.74] X] ,	72.63] X] ,	0.5	X	0.8] =] _	55.16	(75)
Northeast 0.9x	0.77]	3.48] X] v	50.42] X] _v	0.5	X	0.8] = 1 _	48.64	(75) (75)
Northeast 0.9x	0.77	」 x] x	1.59] X] v	50.42] ×] ,	0.5	X	0.8] =] =	22.22	(75)
Northeast 0.9x	0.77	」 ^] x	2.74	x x	50.42] x] x	0.5	x	0.8] =] =	38.3	(75)
Northeast 0.9x	0.77	」 ^] x	1.59] ^] x	28.07] ^] x	0.5	^ x	0.8] =] =	27.08 12.37	(75)
Northeast 0.9x	0.77] ^] x	2.74] ^] x	28.07] ^] x	0.5	X	0.8] =	21.32	(75)
Northeast 0.9x	0.77] ^] x	3.48] ^] x	14.2] ^] x	0.5	^ x	0.8] -] =	13.7	(75)
Northeast 0.9x	0.77] ^] x	1.59] ^] x	14.2] ^] x	0.5	x	0.8] =	6.26	(75)
Northeast 0.9x	0.77]	2.74] ^] x	14.2] ^] x	0.5	x	0.8] =	10.78	(75)
Northeast 0.9x	0.77] x	3.48) ^] x	9.21] ^] x	0.5	x	0.8] =	8.89	(75)
Northeast 0.9x	0.77] x	1.59] x	9.21] x	0.5	x	0.8]] =	4.06	(75)
Northeast 0.9x	0.77] x	2.74] x	9.21] x	0.5	x	0.8]] =	7	(75)
Southeast 0.9x	0.77] x	1.77	X	36.79) x	0.5	x	0.8] =	18.05	(77)
Southeast 0.9x	0.77] x	2.74) x	36.79] x	0.5	x	0.8]] =	27.95	(77)
Southeast 0.9x	0.77]	1.75] ^] x	36.79] ^] x	0.5	X	0.8] =	17.85	(77)
Southeast 0.9x	0.77] x	1.77) ^] x	62.67] ^] x	0.5	x	0.8]] =	30.75	(77)
Southeast 0.9x	0.77] x	2.74) x	62.67] x	0.5	x	0.8]] =	47.6	(77)
Southeast 0.9x	0.77] x	1.75) x	62.67) x	0.5	x	0.8] =	30.4	(77)
Southeast 0.9x	0.77] x	1.77) ^] x	85.75]	0.5	x	0.8]] =	42.07	(77)
	J.1.1	1		J		J	0.0	1	L	J	12.01	┛`′

Southeast 0.9x	. 77	l .	0.74	l "	05.75	1 .	0.5	l .	0.0	1 _	05.40	(77)
).77	X	2.74	X	85.75	X I	0.5	X	0.8] =]	65.13	= '
Courthogat -).77	X	1.75	X	85.75	X I	0.5	X	0.8] = 1	41.6	(77)
0	0.77	X	1.77	X	106.25	l x l	0.5	X I	0.8] =]	52.13	(77)
0).77	X	2.74	X	106.25	X 1	0.5	X	0.8] =]	80.7	(77)
0).77	X	1.75	X	106.25	X I	0.5	Х	0.8] = 1	51.54	(77)
).77	X	1.77	X	119.01	X 1	0.5	X	0.8] = 1	58.39	(77)
).77	X	2.74	X	119.01	X	0.5	X	0.8] = 1	90.39	(77)
0).77	X	1.75	X	119.01	X	0.5	X	0.8] = 1	57.73	(77)
0).77	X	1.77	X	118.15	X	0.5	X	0.8] = 1	57.97	(77)
Courthogot).77	X	2.74	X	118.15	X I	0.5	X	0.8] = 1	89.74	(77)
Cavithagata).77	X	1.75	X	118.15	X	0.5	X	0.8] = 1	57.31	(77)
).77	X	1.77	X	113.91	X	0.5	Х	0.8	=	55.89	(77)
0).77	Х	2.74	X	113.91	X	0.5	X	0.8] = 1	86.52	(77)
0 11 1).77	X	1.75	X	113.91	X	0.5	Х	0.8] = 1	55.26	(77)
=).77	X	1.77	X	104.39	X	0.5	X	0.8] =	51.22	(77)
).77	Х	2.74	X	104.39	X	0.5	Х	0.8	=	79.29	(77)
).77	Х	1.75	X	104.39	X	0.5	Х	0.8	=	50.64	(77)
).77	X	1.77	X	92.85	X	0.5	Х	0.8] =	45.56	(77)
).77	X	2.74	X	92.85	X	0.5	X	0.8	=	70.52	(77)
).77	X	1.75	X	92.85	X	0.5	X	0.8	=	45.04	(77)
).77	X	1.77	X	69.27	X	0.5	Х	0.8	=	33.99	(77)
).77	X	2.74	X	69.27	X	0.5	X	0.8	=	52.61	(77)
Southeast 0.9x 0).77	X	1.75	X	69.27	X	0.5	X	0.8	=	33.6	(77)
).77	X	1.77	X	44.07	X	0.5	X	0.8	=	21.62	(77)
).77	X	2.74	X	44.07	X	0.5	X	0.8	=	33.47	(77)
).77	X	1.75	X	44.07	X	0.5	х	0.8	=	21.38	(77)
Southeast 0.9x 0).77	X	1.77	X	31.49	X	0.5	X	0.8	=	15.45	(77)
Southeast 0.9x 0).77	x	2.74	X	31.49	x	0.5	X	0.8	=	23.92	(77)
Southeast 0.9x 0).77	x	1.75	x	31.49	x	0.5	X	0.8	=	15.27	(77)
Southwest _{0.9x} 0).54	X	13.23	X	36.79		0.5	X	0.8	=	94.63	(79)
).54	X	13.23	X	62.67		0.5	X	0.8	=	161.19	(79)
).54	X	13.23	X	85.75		0.5	х	0.8	=	220.55	(79)
).54	X	13.23	X	106.25		0.5	X	0.8	=	273.27	(79)
Southwest _{0.9x} 0).54	X	13.23	X	119.01		0.5	X	0.8	=	306.08	(79)
Southwest _{0.9x} 0	.54	X	13.23	X	118.15		0.5	X	0.8	=	303.87	(79)
Southwest _{0.9x} 0).54	x	13.23	x	113.91]	0.5	x	0.8	=	292.96	(79)
Southwest _{0.9x} 0).54	x	13.23	x	104.39]	0.5	x	0.8	=	268.48	(79)
Southwest _{0.9x} 0).54	x	13.23	x	92.85		0.5	x	0.8	=	238.81	(79)
	.54	x	13.23	x	69.27		0.5	x	0.8	=	178.15	(79)
).54	x	13.23	x	44.07		0.5	x	0.8	=	113.35	(79)
Southwest _{0.9x} 0).54	x	13.23	x	31.49		0.5	x	0.8	=	80.98	(79)

•			alculated				i e	(83)m = S	um(74)m .	`		1		
(83)m=	182.9	319.67	458.93	604.77	710.36	719.72	687.86	606.86	509.09	359.11	220.56	155.57		(83)
Total g	ains – i	nternal a	and solar	(84)m =	= (73)m -	+ (83)m	, watts							
(84)m=	516.54	652.04	779.79	906.62	992.15	982.76	939.06	861.76	774.06	643.21	526.7	478.99		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
Temp	erature	during h	neating p	eriods ir	n the livii	ng area t	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ıble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.96	0.93	0.88	0.79	0.67	0.53	0.4	0.45	0.65	0.85	0.94	0.96		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)					
(87)m=	18.51	18.9	19.43	20.04	20.52	20.82	20.93	20.91	20.67	20.01	19.14	18.44		(87)
T		ا ممانده ا		ا ماماء		مانين مالئم م	l from To	hla O Ti	L (%C)	<u>I</u>		<u> </u>		
	19.88	19.89	neating p	19.9	19.9	19.91	19.91	19.91	19.91	10.0	19.9	10.90		(88)
(88)m=	19.00	19.69	19.69	19.9	19.9	19.91	19.91	19.91	19.91	19.9	19.9	19.89		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.95	0.92	0.86	0.76	0.62	0.46	0.32	0.36	0.58	0.82	0.93	0.96		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to 7	7 in Tabl	e 9c)				
(90)m=	17.63	18.01	18.52	19.11	19.55	19.8	19.88	19.87	19.7	19.11	18.26	17.57		(90)
									1	LA = Livin	g area ÷ (4	4) =	0.45	(91)
Mean	interna	l temner	ature (fo	r the wh	ole dwe	lling) – fl	Ι Δ ν Τ1	+ (1 – fl	A) × T2			'		
(92)m=	18.03	18.41	18.93	19.53	19.99	20.26	20.36	20.34	20.14	19.52	18.66	17.96		(92)
			he mear						<u> </u>	<u> </u>	10.00	17.00		(-)
(93)m=	18.03	18.41	18.93	19.53	19.99	20.26	20.36	20.34	20.14	19.52	18.66	17.96		(93)
		<u> </u>	uirement		10.00					10.02	10.00	11100		(==)
			ternal ter		re ohtain	ed at st	en 11 of	Tahla 9l	n so tha	t Ti m-(76)m an	d re-calc	ulate	
			or gains			ieu at st	ер 11 ог	Table 3	J, 30 tila	ıt 11,111—(r Ojiii aii	u re-carc	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm											
(94)m=	0.94	0.9	0.84	0.75	0.63	0.48	0.35	0.4	0.6	0.8	0.91	0.95		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	484.7	587.34	657.89	680.44	620.69	470.78	331.59	341.29	462.24	516.61	479.35	453.61		(95)
Month	nly aver	age exte	ernal tem	perature	from Ta	able 8	•		•	•				
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	1317.63	1293.27	1187.23	1003.66	780.66	527.85	350.28	366.74	565.18	839.8	1093.81	1307.98		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	4 x [(97))m – (95)m] x (4	1)m			
(98)m=	619.7	474.39	393.83	232.72	119.02	0	0	0	0	240.46	442.41	635.65		
			•			•	•	Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	3158.17	(98)
Space	e heatin	a reauir	ement in	kWh/m²	² /vear								41.02	(99)
			quiremer											
					See Tal	hla 10h								
Calcu	Jan	Feb	July and Mar	August. Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	Jan	1 60	I IVIAI	Αρι	iviay	Juli	l Jui	Aug	l ogb	1 001	1100	שפט		

Heat I	oss rate	ELm (ca	lculated	using 2	5°C inte	rnal temp	oerature	and exte	ernal ten	nperatur	e from T	able 10))	
(100)m=	0	0	0	0	0	876.14	689.73	707.01	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	ss hm										•	
(101)m=	0	0	0	0	0	0.84	0.88	0.86	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	Vatts) = ((100)m x	(101)m								•	
(102)m=	0	0	0	0	0	731.94	608.28	607.36	0	0	0	0		(102)
Gains	(solar g	gains ca	lculated	for appli	cable w	eather re	gion, se	e Table	10)					
(103)m=	0	0	0	0	0	1276.81	1222.5	1130.51	0	0	0	0		(103)
•	-		ement fo (104)m <			dwelling,	continu	ous (kW	h') = 0.0	24 x [(1(03)m – (102)m]:	x (41)m	
(104)m=	0	0	0	0	0	392.31	456.99	389.22	0	0	0	0		
														_
										= Sum(•	=	1238.52	(104)
Cooled		•								= Sum(cooled	•		1238.52 1	(104)
000.00		•	able 10b)	•					,	•			⊣ `′
000.00		•	able 10b	0	0	0.25	0.25	0.25		,	•			⊣ `′
Intermit (106)m=	ttency fa	actor (Ta	0	0					f C =	cooled	area ÷ (4	4) =		⊣ `′
Intermit (106)m=	ttency fa	actor (Ta	0	0		0.25 × (105)			f C =	cooled o	area ÷ (4	4) =	1	(105)
Intermit (106)m=	ttency fa	actor (Ta	0	0					f C =	cooled o	area ÷ (4	4) =	1	(105)
Intermit (106)m=	ttency for 0	actor (Ta	nent for	0 month =	: (104)m	× (105)	× (106)r	m	f C = 0 Total	cooled 0 $I = Sum($	o (1,0,4)	4) = 0 =	1	(105)
Intermit (106)m= Space (107)m=	ttency for 0 cooling 0	o o requirer	nent for	0 month = 0	(104)m	× (105)	× (106)r	m	f C = 0 Total 0 Total	$\begin{array}{c} \text{cooled } \\ \hline 0 \\ I = Sum(\\ \hline 0 \\ \end{array}$	o (1,0,4)	4) = 0 = 0 0	0	(105)
Intermit (106)m= Space (107)m=	ttency for a cooling o	requirer	nent for 0	0 month = 0 :Wh/m²/	(104)m 0 year	× (105)	× (106)r	m 97.31	f C = 0 Total 0 Total (107)	cooled: 0 $I = Sum($ 0 $= Sum($ $0 \div (4) =$	o (1,0,4)	4) = 0 = 0 0	0 309.63	(105)

			Пост Г) otoilo:						
Assessor Name: Software Name:	Ross Boulton Stroma FSAP 20		User D	Strom Softwa	are Vei	rsion:			0028068 on: 1.0.4.18	
Address :	B2A-103-02, Flat T			Address		03-02				
1. Overall dwelling dim		ypo 2 12	, , , , , , , , , , , , , , , , , , ,	olodon, E	опаоп					
			Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor					(1a) x		2.6	(2a) =	200.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	77	(4)			_		_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	200.2	(5)
2. Ventilation rate:										
		secondar heating	У	other		total			m³ per hou	ır
Number of chimneys	0 +	0	_ + _	0	=	0	X	40 =	0	(6a)
Number of open flues	0 +	0] + [0] = [0	X :	20 =	0	(6b)
Number of intermittent f	ans					0	X	10 =	0	(7a)
Number of passive vent	S				Γ	0	x	10 =	0	(7b)
Number of flueless gas	fires				Ī	0	x -	40 =	0	(7c)
								A : I		_
		- > (-) (-)	- \	_ 、	_				nanges per ho	_
Infiltration due to chimne	eys, flues and fans =(been carried out or is intend				ontinuo fr	0		÷ (5) =	0	(8)
Number of storeys in		ieu, procee	u 10 (17), 1	ourer wise t	onunue m	om (9) to	(10)		0	(9)
Additional infiltration	are arreaining (rie)						[(9)	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel or timber	frame or	0.35 fo	r masoni	y constr	uction	• ()		0	(11)
	present, use the value corre	sponding to	the great	ter wall are	a (after					
	nings); if equal user 0.35	مامط/ مع 0	1 (222)	مما مامم	antar A				_	7,40
·	floor, enter 0.2 (unsea	alea) or 0.	. i (seaie	ea), eise	enter 0				0	(12)
•	nter 0.05, else enter 0 vs and doors draught s	tripped							0	(13)
Window infiltration	vs and doors draught s	uiippeu		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
	e, q50, expressed in cu	bic metre	s per ho	. , , ,	, , ,	, , ,	, ,	area	5	(17)
If based on air permeab			•	•	•			G	0.25	(18)
•	ies if a pressurisation test ha					is being u	sed			` ′
Number of sides shelter	red								2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18) x (20) =				0.21	(21)
Infiltration rate modified	for monthly wind spee	d								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed 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 = (2	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	1	
` ' L									j	

0.27	0.27	e (allowi	0.23	0.23	0.2	0.2	0.2	0.21	0.23	0.24	0.25]	
Calculate effe			rate for t	he appli	cable ca	se		ļ					
If mechanica												0.5	(23
If exhaust air h									o) = (23a)			0.5	(23
If balanced with		-	-	_								0	(23
a) If balance				i	1		- ^ ` 	í `	 	 	1 ` ´	; ÷ 100]	/-
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24
b) If balance				i	1	- 	 	í `	r `		ı	1	(0
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
c) If whole h				•					E v (22h	.\			
$\frac{11 (220)1}{24c)m} = 0.52$	0.52	0.51	0.5	0.5 = (231)	0.5	0.5	C) = (221)	0.5	.5 × (23b 0.5	0.5	0.5	1	(2
, L	<u> </u>			<u> </u>	<u> </u>		<u> </u>		0.5	0.5	0.5	J	(2
d) If natural if (22b)r		on or wn en (24d)							0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(2
Effective air	change	rate - er	nter (24a	or (24l	o) or (24	c) or (24	d) in box	x (25)				,	
25)m= 0.52	0.52	0.51	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5]	(2
O Hooklassa	م م مما الم	ot loss :	0 0 4 0 100 0 4									,	
3. Heat losse	s and ne	·			Net Ar	00	U-valı	110	AXU		k-value		ΑΧk
LEMENT	area		Openin m	=	A,r		W/m2		(W/k	<)	kJ/m².		kJ/K
oors					2.91	X	1.35	=	3.9285				(2
/indows Type	e 1				1.77	<u>x</u> 1/	[1/(1.35)	+ 0.04] =	2.27	Ħ			(2
/indows Type	2				3.48	<u>x</u> 1/	[1/(1.35)-	+ 0.04] =	4.46	=			(2
/indows Type	3				1.59	<u></u>	[1/(1.35)-	+ 0.04] =	2.04	=			(2
/indows Type					13.23	_	[1/(1.35)-	+ 0.04] ₌	16.95	=			(2
/indows Type					2.74		[1/(1.35)-		3.51	=			(2
/indows Type					2.74	ऱ .	[1/(1.35)-		3.51	=			(2
/indows Type						ऱ .	[1/(1.35)-			=			(2
/alls					1.75	=		—, ¦	2.24	륵 ,			`
	74.5		30.2	1	44.34	_	0.15	=	6.65				(2
otal area of e			· (* (*		74.55		. (15/4/11					(3
for windows and include the area						atea using	j tormula 1	/[(1/U-vail	ie)+0.04j a	is given in	paragrapi	1 3.2	
abric heat los	ss, W/K :	= S (A x	U)	•			(26)(30)) + (32) =				45.55	(3
eat capacity	Cm = S((A x k)						((28).	(30) + (32	2) + (32a).	(32e) =	620.82	
hermal mass			o = Cm -	: TFA) ir	n kJ/m²K			Indica	ntive Value:	Low		100	(3
or design assess	•	•		•			ecisely the	e indicative	e values of	TMP in T	able 1f		`
an be used inste													
hermal bridge	•	,			•	<						11.18	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	· (36) =				
ntal tahrın ha	สมาบออ							(33) +	(00) =			56.73	(3
otal fabric he entilation hea		alouioto -	l manthi					(20)	$i = 0.33 \times (2)$	25)m v (5)	\		

(2.2)	1	T								l			(00)
(38)m= 34.42	34.07	33.71	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03	33.03		(38)
Heat transfer			00.70	00.70	00.70	00.70	00.70	· · · ·	= (37) + (37)				
(39)m= 91.15	90.8	90.44	89.76	89.76	89.76	89.76	89.76	89.76	89.76	89.76	89.76	90.02	(39)
Heat loss para	ameter (I	HLP), W	m²K				_		= (39)m ÷	Sum(39) ₁ . (4)	12 / 12=	90.02	(00)
(40)m= 1.18	1.18	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17		_
Number of da	vs in mo	nth (Tab	le 1a)					1	Average =	Sum(40) ₁	12 /12=	1.17	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	iting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occ	unancv	N											(40)
if TFA > 13. if TFA £ 13.	.9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		2.4		(42)
Annual average	•	ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		91	.28		(43)
Reduce the annu	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o				· /
not more that 125		· ·	r day (all w	rater use, r	not and co	<u> </u>	1						
Jan Hot water usage	Feb	Mar r day for or	Apr	May	Jun	Jul Table 10 x	Aug	Sep	Oct	Nov	Dec		
	· ·		1		1	1							
(44)m= 100.41	96.76	93.11	89.46	85.81	82.15	82.15	85.81	89.46	93.11	96.76	100.41	1005.00	7(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	m x nm x C	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1095.39	(44)
(45)m= 148.91	130.23	134.39	117.16	112.42	97.01	89.9	103.16	104.39	121.65	132.8	144.21		
If instantaneous v	water heati	na at noint	of use (no	hot water	r storage)	enter () in	hoves (46		Γotal = Su	m(45) ₁₁₂ =	=	1436.23	(45)
			·			ı		` '	40.05	10.00	04.00		(46)
(46)m= 22.34 Water storage	19.54 loss:	20.16	17.57	16.86	14.55	13.48	15.47	15.66	18.25	19.92	21.63		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	heating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if n		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage			(- /1.14/1	. / .1							
a) If manufac				or is kno	wn (kvvr	1/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		_	-		or is not		(48) x (49)) =		1	10		(50)
Hot water stor			-							0.	.02		(51)
If community I	_		on 4.3										
Volume factor			01							1.	.03		(52)
Temperature t										0	0.6		(53)
Energy lost fro Enter (50) or		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		.03		(54)
Water storage			for each	month			((56)m = (55) v (41):	m	1.	.03		(55)
					00.00			, , ,		00.00	00.04		(EC)
(56)m= 32.01 If cylinder contain	28.92	d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (32.01 H11)] ÷ (5	32.01 0). else (5	30.98 7)m = (56)	32.01 m where (30.98 H11) is fro	32.01	¢Η	(56)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	· · ·	(57)
(57)m= 32.01	20.92	JZ.U1	30.96	32.01	30.96	32.01	32.01	30.96	32.01	30.96	32.01		(01)

Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m =	- (46)m + (57)m + (59)m + (61)m
(62)m= 204.18 180.16 189.67 170.66 167.7 150.51 145.17 158.43 157.88 176.93	
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution of the contr	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	dion to water nearing)
(63)m= 0 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 204.18 180.16 189.67 170.66 167.7 150.51 145.17 158.43 157.88 176.93	3 186.29 199.48
Output from water heat	
Heat gains from water heating, kWh/month $0.25 \cdot [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m]$ $(65)m = \begin{bmatrix} 93.73 & 83.24 & 88.91 & 81.75 & 81.6 & 75.05 & 74.11 & 78.52 & 77.5 & 84.67 \end{bmatrix}$	
	, ,
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community heating
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov Dec
(66)m= 120.17 120.17 120.17 120.17 120.17 120.17 120.17 120.17 120.17 120.17 120.17 120.17	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 18.99 16.87 13.72 10.39 7.76 6.55 7.08 9.21 12.36 15.69	18.31 19.52 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 213.06 215.27 209.7 197.84 182.86 168.79 159.39 157.18 162.75 174.61	189.58 203.66 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 35.02 35.02 35.02 35.02 35.02 35.02 35.02 35.02 35.02 35.02	35.02 35.02 (69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14 -96.14	96.14 -96.14 (71)
Water heating gains (Table 5)	1 1
(72)m= 125.98 123.88 119.5 113.54 109.68 104.24 99.61 105.54 107.64 113.81	120.76 123.89 (72)
	· · · · ·
	387.71 406.12 (73)
6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the application.	phla ariantation
	FF Gains
ŏ−	Table 6c (W)
	0.8 = 10.88 (75)
Northeast 0.9x 0.77	0.8 = 4.97 (75)

Northeast _{0.9x}	0.77	7 x	0.74	1 ,	44.00	1 x	0.5	x	0.0	1 =	0.57	(75)
Northeast 0.9x	0.77	╡	2.74] X] ,	11.28] 1	0.5		0.8] 1	8.57	=
Northeast 0.9x	0.77] X	3.48] X] ,	22.97] X] ,	0.5	X	0.8] =] _	22.16	(75)
Northeast 0.9x	0.77	」× T	1.59] X] v	22.97] X] _v	0.5	X	0.8] = 1 _	10.12	(75) (75)
Northeast 0.9x	0.77] X] ,	2.74] X] ,	22.97] X] ,	0.5	X	0.8] =] _	17.44	=
Northeast 0.9x	0.77] X	3.48] X] ,	41.38	X	0.5	X	0.8] =] _	39.92	(75)
Northeast 0.9x	0.77] X	1.59] X] ,	41.38] X] ,	0.5	X	0.8] =] _	18.24	(75)
Northeast 0.9x	0.77	」× T	2.74] X] v	41.38] X] v	0.5	X	0.8] = 1 _	31.43	(75) (75)
Northeast 0.9x	0.77] X] v	3.48] X] v	67.96] X] _v	0.5	X	0.8] = 1 _	65.55	(75) (75)
Northeast 0.9x	0.77] X	1.59	x x	67.96] x] x	0.5	x	0.8] =] =	29.95	(75)
Northeast 0.9x	0.77	」^] ×	2.74] ^] x	67.96] ^] x	0.5	X	0.8] -] =	51.61	(75)
Northeast 0.9x	0.77	」^] ×	3.48] ^] x	91.35] ^] x	0.5	X	0.8] -] =	88.12	(75)
Northeast 0.9x	0.77	╡	1.59]]	91.35] 1	0.5		0.8] 1	40.26	= '
Northeast 0.9x	0.77] X] v	2.74] X] v	91.35] X] v	0.5	X	0.8] =] _	69.38	(75) (75)
Northeast 0.9x	0.77] X] ,	3.48] X] ,	97.38] X] ,	0.5	X	0.8] =] _	93.94	(75)
Northeast 0.9x	0.77] X] ,	1.59] X] ,	97.38] X] ,	0.5	X	0.8] = 1 _	42.92	╡
Northeast 0.9x	0.77	」× T	2.74] X] v	97.38] X] v	0.5	X	0.8] =] _	73.97	(75)
Northeast 0.9x	0.77] X] ,	3.48] X] ,	91.1] X] ,	0.5	X	0.8] =] _	87.88	(75) (75)
Northeast 0.9x	0.77	」× T	1.59] X] ,	91.1] X] ,	0.5	X	0.8] =] _	40.15	╡`′
Northeast 0.9x	0.77] X	2.74] X]	91.1] X]	0.5	X	0.8] =]	69.19	(75)
Northeast 0.9x	0.77] X] ,	3.48] X] ,	72.63] X] ,	0.5	X	0.8] =] _	70.06	(75)
Northeast 0.9x	0.77] X	1.59] X]	72.63] X]	0.5	X	0.8] =]	32.01	(75)
Northeast 0.9x	0.77] X] ,	2.74] X] ,	72.63] X] ,	0.5	X	0.8] =] _	55.16	(75)
Northeast 0.9x	0.77] X	3.48] X] ,	50.42] X] ,	0.5	X	0.8] =] _	48.64	(75)
Northeast 0.9x	0.77] X] ,	1.59] X] ,	50.42] X] ,	0.5	X	0.8] =] _	22.22	(75)
Northeast 0.9x	0.77] X] v	2.74] X] v	50.42] X] v	0.5	X	0.8] = 1 _	38.3	(75) (75)
Northeast 0.9x	0.77] X	3.48] ×] v	28.07] x] x	0.5	x	0.8] =] =	27.08	(75)
Northeast 0.9x	0.77	」^] ×	1.59] X] v	28.07] 1	0.5]]	0.8] 1	12.37	(75)
Northeast 0.9x	0.77	-	2.74	x	28.07	x x	0.5	x	0.8	=	21.32	(75)
Northeast 0.9x	0.77] x] x	3.48] ^] x	14.2] ^] x	0.5	X	0.8] =] =	13.7	(75)
Northeast 0.9x	0.77	」^] ×	2.74] ^] x	14.2] ^] x	0.5	X	0.8]	6.26 10.78	(75)
Northeast 0.9x	0.77] ^] x	3.48] ^] x	9.21] ^] x	0.5	X	0.8] =	8.89	(75)
Northeast 0.9x	0.77] ^] x	1.59] ^] x	9.21] ^] x	0.5	X	0.8]	4.06	(75)
Northeast 0.9x	0.77] ^] x	2.74	l ^	9.21] ^] x	0.5	X	0.8] =	7	(75)
Southeast 0.9x	0.77] ^] x	1.77] ^] x	36.79] ^] x	0.5	X	0.8] =	18.05	(77)
Southeast 0.9x	0.77] ^] x	2.74] ^] x	36.79] ^] x	0.5	x	0.8] =	27.95	(77)
Southeast 0.9x	0.77] ^] x	1.75] ^] x	36.79] ^] x	0.5	X	0.8] -] =	17.85	(77)
Southeast 0.9x	0.77] ^] x	1.77] ^] x	62.67] ^] x	0.5	X	0.8] =	30.75	(77)
Southeast 0.9x	0.77] ^] x	2.74] ^] x	62.67] ^] x	0.5	X	0.8] =	47.6	(77)
Southeast 0.9x	0.77] ^] x	1.75] ^] x	62.67] ^] x	0.5	X	0.8]	30.4	= (77)
Southeast 0.9x	0.77]	1.77] ^] x	85.75] ^] x	0.5	X	0.8] =	42.07	(77)
	0.11	」 ^	1.77] ^	00.70	J ^	0.0	l	L 0.0	J	72.01	

F		,								,		_
Southeast 0.9x	0.77	X	2.74	X	85.75	X	0.5	X	0.8	=	65.13	(77)
Southeast 0.9x	0.77	X	1.75	X	85.75	X	0.5	X	0.8	=	41.6	(77)
Southeast _{0.9x}	0.77	X	1.77	X	106.25	X	0.5	X	0.8	=	52.13	(77)
Southeast _{0.9x}	0.77	X	2.74	X	106.25	X	0.5	X	0.8	=	80.7	(77)
Southeast _{0.9x}	0.77	X	1.75	X	106.25	X	0.5	X	0.8	=	51.54	(77)
Southeast 0.9x	0.77	X	1.77	X	119.01	X	0.5	X	0.8	=	58.39	(77)
Southeast 0.9x	0.77	X	2.74	x	119.01	X	0.5	X	0.8	=	90.39	(77)
Southeast 0.9x	0.77	X	1.75	x	119.01	x	0.5	x	0.8	=	57.73	(77)
Southeast 0.9x	0.77	X	1.77	x	118.15	x	0.5	x	0.8	=	57.97	(77)
Southeast 0.9x	0.77	X	2.74	x	118.15	X	0.5	x	0.8	=	89.74	(77)
Southeast 0.9x	0.77	X	1.75	x	118.15	X	0.5	x	0.8	=	57.31	(77)
Southeast 0.9x	0.77	X	1.77	х	113.91	x	0.5	X	0.8] =	55.89	(77)
Southeast 0.9x	0.77	X	2.74	x	113.91	x	0.5	x	0.8] =	86.52	(77)
Southeast 0.9x	0.77	x	1.75	x	113.91	x	0.5	x	0.8] =	55.26	(77)
Southeast 0.9x	0.77	X	1.77	x	104.39	x	0.5	x	0.8	=	51.22	(77)
Southeast 0.9x	0.77	x	2.74	x	104.39	x	0.5	x	0.8	j =	79.29	(77)
Southeast 0.9x	0.77	x	1.75	x	104.39	x	0.5	x	0.8	=	50.64	(77)
Southeast 0.9x	0.77	x	1.77	x	92.85	x	0.5	x	0.8	=	45.56	(77)
Southeast 0.9x	0.77	x	2.74	x	92.85	x	0.5	x	0.8	j =	70.52	(77)
Southeast 0.9x	0.77	x	1.75	x	92.85	x	0.5	x	0.8	j =	45.04	(77)
Southeast 0.9x	0.77	X	1.77	x	69.27	x	0.5	x	0.8] =	33.99	(77)
Southeast 0.9x	0.77	x	2.74	x	69.27	x	0.5	x	0.8] =	52.61	(77)
Southeast 0.9x	0.77	x	1.75	x	69.27	x	0.5	x	0.8	=	33.6	(77)
Southeast 0.9x	0.77	x	1.77	x	44.07	x	0.5	x	0.8	j =	21.62	(77)
Southeast 0.9x	0.77	x	2.74	x	44.07	x	0.5	x	0.8	j =	33.47	(77)
Southeast 0.9x	0.77	x	1.75	x	44.07	x	0.5	x	0.8] =	21.38	(77)
Southeast 0.9x	0.77	X	1.77	x	31.49	x	0.5	x	0.8] =	15.45	(77)
Southeast 0.9x	0.77	x	2.74	x	31.49	x	0.5	x	0.8] =	23.92	(77)
Southeast 0.9x	0.77	x	1.75	x	31.49	x	0.5	x	0.8	=	15.27	(77)
Southwest _{0.9x}	0.54	x	13.23	x	36.79	ĺ	0.5	x	0.8	j =	94.63	(79)
Southwest _{0.9x}	0.54	x	13.23	х	62.67	j	0.5	x	0.8	j =	161.19	(79)
Southwest _{0.9x}	0.54	x	13.23	х	85.75	j	0.5	x	0.8	j =	220.55	(79)
Southwest _{0.9x}	0.54	x	13.23	х	106.25	j	0.5	X	0.8	j =	273.27	(79)
Southwest _{0.9x}	0.54	x	13.23	х	119.01	j	0.5	x	0.8	j =	306.08	(79)
Southwest _{0.9x}	0.54	X	13.23	x	118.15	j	0.5	x	0.8	j =	303.87	(79)
Southwest _{0.9x}	0.54	x	13.23	x	113.91	į	0.5	x	0.8	j =	292.96	(79)
Southwest _{0.9x}	0.54	x	13.23	x	104.39	į	0.5	x	0.8	j =	268.48	(79)
Southwest _{0.9x}	0.54	x	13.23	x	92.85	j	0.5	x	0.8	i =	238.81	(79)
Southwest _{0.9x}	0.54	X	13.23	x	69.27	ĺ	0.5	x	0.8	=	178.15	(79)
Southwest _{0.9x}	0.54	X	13.23	x	44.07	ĺ	0.5	x	0.8	=	113.35	(79)
Southwest _{0.9x}	0.54	X	13.23	x	31.49	ĺ	0.5	x	0.8	=	80.98	(79)
L				ı		•						_

Solar	naine in	watte c	alculated	l for eac	h month			(83)m = S	um(74)m .	(82)m				
(83)m=	182.9	319.67	458.93	604.77	710.36	719.72	687.86	606.86	509.09	359.11	220.56	155.57]	(83)
Total g	jains – ii	nternal a	and solar	(84)m =	= (73)m ·	+ (83)m	, watts	<u> </u>					J	
(84)m=	599.99	734.73	860.9	985.58	1069.72	1058.36	1012.99	937.84	850.89	722.27	608.27	561.69]	(84)
7. Me	an inter	nal temr	perature	(heating	season)								
		·	neating p			,	from Tab	ole 9. Th	1 (°C)				21	(85)
•		_	ains for l			•		,	(- /					┛` ′
•	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(86)m=	0.94	0.91	0.85	0.76	0.63	0.49	0.37	0.41	0.6	0.81	0.91	0.95		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)			ı	ı	
(87)m=	18.81	19.17	19.67	20.21	20.62	20.86	20.95	20.93	20.75	20.19	19.4	18.75]	(87)
Tomr	oraturo	during h	neating p	oriode i	roct of	dwolling	from To	hlo 0 T	L h2 (°C\				ı	
(88)m=	19.93	19.94	19.94	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	19.95	1	(88)
, ,		<u> </u>	<u> </u>		<u>l</u>	<u> </u>	<u>l</u>	<u>l</u>	10.00	10.00	10.00	10.00	J	(00)
			ains for			· `	i				ı	·	1	(00)
(89)m=	0.93	0.89	0.83	0.72	0.58	0.42	0.29	0.33	0.53	0.77	0.9	0.94		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to	7 in Tabl	e 9c)			_	
(90)m=	17.03	17.55	18.25	19.01	19.54	19.83	19.92	19.9	19.71	19	17.9	16.96		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.45	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$														
(92)m=	17.83	18.29	18.89	19.55	20.03	20.29	20.38	20.37	20.18	19.54	18.58	17.77]	(92)
Apply	adjustn	nent to t	he mean	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate		<u> </u>	J	
(93)m=	17.83	18.29	18.89	19.55	20.03	20.29	20.38	20.37	20.18	19.54	18.58	17.77]	(93)
8. Sp	ace hea	ting requ	uirement											
Set T	i to the r	mean int	ternal ter	nperatu	re obtain	ed at st	ep 11 of	Table 9l	b, so tha	t Ti,m=(76)m an	d re-cal	culate	
the u	tilisation	factor fo	or gains	using Ta	able 9a	•						•	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ation fac	tor for g	ains, hm	:		•						-	1	
(94)m=	0.91	0.87	0.81	0.71	0.58	0.44	0.32	0.36	0.55	0.76	0.88	0.92		(94)
			W = (94)	<u> </u>								i	1	
(95)m=		639.24	695.32	700.09	624.67	467.79	326.1	337.7	468.03	547.56	533.3	518.18]	(95)
			rnal tem		ì	i						ı	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)
					1	r	-``	- ` 	– (96)m				1	
			1121.04		747.86	511.14	339.72	356.33	545.87	802.34	1030.55	1218.2]	(97)
•					i	i	i e)m – (95	<u> </u>	·	1	1	
(98)m=	510.5	387.3	316.73	184.39	91.65	0	0	0	0	189.55	358.02	520.82		_
								Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2558.96	(98)
Spac	e heatin	g require	ement in	kWh/m²	²/year								33.23	(99)
9b. En	ergy rec	quiremer	nts – Cor	nmunity	heating	scheme	;							
									rided by 1) '0' if n		unity sch	neme.		(301)
Fracilo	ni oi spa	ace nedl	110111 50	conuary.	ouppien	i c ilialy i	i c alliy ((able I	1) 0 11 11	OHE			0	(301)

	_		_
Fraction of space heat from community system $1 - (301) =$		1	(302)
The community scheme may obtain heat from several sources. The procedure allows includes boilers, heat pumps, geothermal and waste heat from power stations. See A			7,
Fraction of heat from Community CHP		0.67	(303a)
Fraction of community heat from heat source 2	<u></u>	0.33	(303b)
Fraction of total space heat from Community CHP	(302) x (303a) =	0.67	(304a)
Fraction of total space heat from community heat source 2	(302) x (303b) =	0.33	(304b)
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	Г	kWh/year 2558.96	٦
	(00) + (2045) + (205) + (206)]] ₍₂₀₇₅)
Space heat from Community CHP	(98) x (304a) x (305) x (306) =	1789.48	(307a)
Space heat from heat source 2	(98) x (304b) x (305) x (306) =	897.43	(307b)
Efficiency of secondary/supplementary heating system in % (from Ta	· · · · · · · · · · · · · · · · · · ·	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		2087.07]
If DHW from community scheme: Water heat from Community CHP	(64) x (303a) x (305) x (306) =	1459.49	(310a)
Water heat from heat source 2	(64) x (303b) x (305) x (306) =	731.94	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	48.78	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outs	ide	98.43	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	98.43	(331)
Energy for lighting (calculated in Appendix L)	Γ	335.44	(332)
Electricity generated by PVs (Appendix M) (negative quantity)	Γ	-254.41	(333)
Electricity generated by wind turbine (Appendix M) (negative quantit	y)	0	(334)
12b. CO2 Emissions – Community heating scheme			
Electrical efficiency of CHP unit		32	(361)
Heat efficiency of CHP unit		50.4	(362)
	Energy Emission factor E kWh/year kg CO2/kWh k	missions g CO2/year	
Space heating from CHP) $(307a) \times 100 \div (362) =$	3550.56 × 0.22	766.92	(363)
less credit emissions for electricity $-(307a) \times (361) \div (362) =$	1136.18 × 0.52	-589.68	(364)

Water heated by CHP	(310a) × 100 ÷ (362) =	2895.81 X	0.22		625.49	(365)
less credit emissions for electricity	$-(310a) \times (361) \div (362) =$	926.66 X	0.52		-480.94	(366)
Efficiency of heat source 2 (%)	If there is CHP us	sing two fuels repeat (363) to (3	366) for the secon	d fuel	95	(367b)
CO2 associated with heat source 2	2 [(307b	b)+(310b)] x 100 ÷ (367b) x	0.22	=	370.47	(368)
Electrical energy for heat distribution	on	[(313) x	0.52	=	25.32	(372)
Total CO2 associated with commu	nity systems	(363)(366) + (368)(372)		=	717.59	(373)
CO2 associated with space heating	g (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from in	nmersion heater or instanta	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space a	and water heating	(373) + (374) + (375) =			717.59	(376)
CO2 associated with electricity for	pumps and fans within dwe	elling (331)) x	0.52	=	51.09	(378)
CO2 associated with electricity for	lighting	(332))) x	0.52	=	174.09	(379)
Energy saving/generation technologitem 1	ogies (333) to (334) as appl		x 0.0	01 =	-132.04	(380)
			0.52 X 0.0		-132.04	J
Total CO2, kg/year	sum of (376)(382) =			L	810.73	(383)
Dwelling CO2 Emission Ra	te $(383) \div (4) =$				10.53	(384)
El rating (section 14)					91.1	(385)

			Пост Г) etaile.						
Assessor Name: Software Name:	Ross Boulton Stroma FSAP 20	12	User D	Strom Softwa					0028068 on: 1.0.4.18	
A daluero -	D2A 402 02 Flot T		i i	Address)3-02				
Address: 1. Overall dwelling dim	B2A-103-02, Flat T	ype 2-12	A, vvimi	oledon, L	ondon					
1. Overall dwelling diff	ensions.		Δro	a(m²)		Δν Ηρ	ight(m)		Volume(m ³	31
Ground floor					(1a) x		2.6	(2a) =	200.2	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	77	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	200.2	(5)
2. Ventilation rate:										
	heating	econdar heating	-	other	, –	total		40	m³ per hou	_
Number of chimneys	0 +	0	」⁺	0] = [0	x -	40 =	0	(6a)
Number of open flues	0 +	0	+ [0] = [0	x 2	20 =	0	(6b)
Number of intermittent f	ans				Γ	3	x	10 =	30	(7a)
Number of passive vent	S				Ē	0	x ·	10 =	0	(7b)
Number of flueless gas	fires				F	0	x	40 =	0	(7c)
ŭ										(- 7
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7	'a)+(7b)+((7c) =	Γ	30		÷ (5) =	0.15	(8)
If a pressurisation test has	been carried out or is intend	led, procee	d to (17),	otherwise o	continue fr	om (9) to	(16)			_
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration		_					[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corre				•	uction			0	(11)
deducting areas of open		sportaing to	ine great	ei wali ale	a (aitei					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	vs and doors draught s	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	, , ,	, , ,	, ,		0	(16)
	, q50, expressed in cu		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeab	inity value, then (10) = (1 ies if a pressurisation test ha					is heina u	sed		0.4	(18)
Number of sides shelter		.o 20011 doi	, o o, a ao,	groo an po	modelinty	io boilig a			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18	x (20) =				0.34	(21)
Infiltration rate modified	for monthly wind spee	d								
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed 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 Faster (CCs) (22) 4								-	
Wind Factor (22a)m = $(23a)$ m =		1 005	0.05	0.00	4	4.00	4 40	1 10	1	
(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	J	

0.43	ation rate	0.42	0.37	0.37	0.32	0.32	0.31	0.34	0.37	0.38	0.4	1	
Calculate effec		-					0.51	0.54	0.57	0.30	0.4	l	
If mechanica	al ventilat	ion:										0	(23
If exhaust air he	eat pump u	sing Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	= (23a)			0	(23
If balanced with	heat recov	very: effici	iency in %	allowing t	for in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	d mecha	nical ve	ntilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	l	(24
b) If balance	d mecha	nical ve	ntilation	without	heat red	covery (N	ЛV) (24b	p)m = (22)	2b)m + (2	23b)	1	1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	İ	(24
c) If whole h if (22b)n	ouse exti n < 0.5 ×			•	•				.5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)n	ventilation			•	•				0.5]			'	
24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(24
Effective air	change r	rate - er	iter (24a) or (24l	o) or (24	c) or (24	d) in box	x (25)			•		
25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(2
3. Heat losse	s and he	at loss r	naramet	ōt.									
LEMENT	Gross	S	Openin		Net Ar		U-val		AXU		k-value		ΑΧk
	area ((m²)	m	l ²	A ,r	m²	W/m2	2Κ — '	(W/h	<u>()</u>	kJ/m²-	<	kJ/K
oors					2.91	X	1.2	=	3.492	_			(2
√indows Type					1.06	x1	/[1/(1.4)+	0.04] =	1.41				(2
/indows Type					2.08	x1	/[1/(1.4)+	0.04] =	2.76				(2
/indows Type	: 3				0.95	χ1.	/[1/(1.4)+	0.04] =	1.26				(2
/indows Type	· 4				7.92	x1	/[1/(1.4)+	0.04] =	10.5				(2
/indows Type	5				1.64	x1.	/[1/(1.4)+	0.04] =	2.17				(2
/indows Type	÷ 6				1.64	x1	/[1/(1.4)+	0.04] =	2.17				(2
/indows Type	; 7				1.05	x1.	/[1/(1.4)+	0.04] =	1.39				(2
/alls	74.55	5	19.2	5	55.3	X	0.18	=	9.95				(2
otal area of e	lements,	m²			74.55	5							(3
for windows and						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	1 3.2	
include the area				ls and par	titions		(26) (20))					
abric heat los		•	U)				(26)(30)		(20) + (20)) . (225)	(220)	35.11	==
eat capacity	,	•	0 – Cm	TEA\;	a k 1/m2k/			., ,	(30) + (32 itive Value:	, , ,	(32e) =	774.2	=====
hermal mass or design assess	•	•		•			ecisely the				ahla 1f	250	(3
an be used inste				CONSTRUCT	ion are no	i kilowii pi	cosciy uic	rindicative	values of	TIVII III T	able II		
hermal bridge	es : S (L :	x Y) cal	culated (using Ap	pendix I	<						3.73	(3
	al bridging a	are not kn	own (36) =	= 0.05 x (3	31)								
	_							(0.0)					
details of therma otal fabric he entilation hea									$\frac{1}{1}(36) = 0.33 \times 0$			38.84	4 (3

												ı	
(38)m= 39.24	39	38.76	37.65	37.44	36.48	36.48	36.3	36.85	37.44	37.86	38.3		(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (3	38)m		ı	
(39)m= 78.07	77.83	77.6	76.49	76.28	75.31	75.31	75.14	75.69	76.28	76.7	77.14		7
Heat loss para	meter (l	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	76.49	(39)
(40)m= 1.01	1.01	1.01	0.99	0.99	0.98	0.98	0.98	0.98	0.99	1	1		_
Number of day	e in mo	nth (Tah	(12 ما					/	Average =	Sum(40) ₁	12 /12=	0.99	(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)
. ,	<u>I</u>						l			<u> </u>			
4. Water heat	ting ene	rav reau	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (ΓFA -13.		2.4		(42)
Annual averag	•	ater usaç	ge in litre	s per da	ay Vd,av	erage =	(25 x N)	+ 36		91	.28		(43)
Reduce the annua							to achieve	a water us	se target o	f		l	
		· ·				<u> </u>							
Jan Hot water usage is	Feb	Mar r day for ea	Apr ach month	May $Vd.m = fa$	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 100.41	96.76	93.11	89.46	85.81	82.15	82.15	85.81	89.46	93.11	96.76	100.41		
(44)111= 100.41	90.70	93.11	09.40	00.01	02.13	02.10	00.01			m(44) ₁₁₂ :	<u> </u>	1095.39	(44)
Energy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	OTm / 3600			· /		1000.00	()
(45)m= 148.91	130.23	134.39	117.16	112.42	97.01	89.9	103.16	104.39	121.65	132.8	144.21		
									Γotal = Su	m(45) ₁₁₂ :	=	1436.23	(45)
If instantaneous w	/ater heati I	ng at point	of use (no	hot water	r storage),	enter 0 in) to (61)				l	
(46)m= 22.34 Water storage	19.54	20.16	17.57	16.86	14.55	13.48	15.47	15.66	18.25	19.92	21.63		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	` '		•			•							, ,
Otherwise if no	_			-			, ,	ers) ente	er '0' in (47)			
Water storage												ı	
a) If manufact				or is kno	wn (kWr	n/day):				1.	.39		(48)
Temperature f							(10)			0	.54		(49)
Energy lost fro b) If manufact		•	•		or is not		(48) x (49)) =		0	.75		(50)
Hot water stor			-								0		(51)
If community h	_		on 4.3										
Volume factor			OI.							-	0		(52)
Temperature f											0		(53)
Energy lost fro Enter (50) or (_	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	-	0		(54)
Water storage	. , .	•	for each	month			((56)m = (55) v (41)r	m	0	.75		(55)
					00.50					00.50	00.00		(EC)
(56)m= 23.33 If cylinder contains	21.07 s dedicate	23.33 d solar sto	22.58 rage. (57)	23.33 m = (56)m	22.58 x [(50) – (23.33 H11)l ÷ (5	23.33 0), else (5	22.58 7)m = (56)	23.33 m where (22.58 H11) is fro	23.33 m Append	ix H	(56)
			1			ı						- 	(57)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(31)

Primary	circuit	loss (an	nual) fro	m Table	e 3							0		(58)
-		,	culated t			59)m = ((58) ÷ 36	65 × (41)	m					
(modi	ified by	factor fi	om Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi I	oss cal	culated	for each	month ((61)m =	(60) ÷ 30	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
∟ Total he	eat requ	ired for	water he	eating ca	alculated	l for eac	h month	(62)m =	: 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	195.5	172.32	180.99	162.26	159.02	142.1	136.49	149.75	149.48	168.25	177.89	190.8		(62)
L Solar DH	W input c	alculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contributi	ion to wate	r heating)	1	
(add ad	ditional	lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (3)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output f	from wa	iter hea	ter		!		!	!	!					
(64)m=	195.5	172.32	180.99	162.26	159.02	142.1	136.49	149.75	149.48	168.25	177.89	190.8		
L					l		l	Outp	out from wa	ater heate	r (annual)₁	12	1984.85	(64)
Heat ga	ins fron	n water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	-
(65)m=	86.79	76.97	81.96	75.03	74.66	68.33	67.17	71.58	70.78	77.73	80.23	85.23	-	(65)
includ	de (57)n	n in calc	culation of	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
	. ,		Table 5		-	•		J						
		,	5), Wat		/									
Metabol	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	120.17	120.17	120.17	120.17	120.17	120.17	120.17	120.17	120.17	120.17	120.17	120.17		(66)
Liahtina	gains (calcula [*]	ted in Ap	pendix	L. eguat	ion L9 o	r L9a). a	lso see	L Table 5				1	
(67)m=	18.99	16.87	13.72	10.39	7.76	6.55	7.08	9.21	12.36	15.69	18.31	19.52		(67)
	ces daii	ns (calc	ulated in	Annend	l I ea	L uation I	13 or I 1	a) alsc	see Tal	hle 5			ı	
	213.06	215.27	209.7	197.84	182.86	168.79	159.39	157.18	162.75	174.61	189.58	203.66		(68)
L	!		ted in A	nnendix	<u> </u>	<u> </u>		<u> </u>	L ee Table	5			I	
(69)m=	35.02	35.02	35.02	35.02	35.02	35.02	35.02	35.02	35.02	35.02	35.02	35.02		(69)
` ′		s gains	(Table 5		<u> </u>		<u> </u>	<u> </u>	<u> </u>	ļ			I	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
		anoratio	n (nega										I	, ,
	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14	-96.14		(71)
Water h											••••		I	, ,
	116.65	`	110.16	104.21	100.34	94.9	90.28	96.2	98.31	104.47	111.43	114.55	1	(72)
Total in					100.01	<u> </u>				(70)m + (7			I	, ,
	410.75	408.73	395.63	374.48	353.02	332.3	318.8	324.64	335.47	356.83	381.38	399.78	1	(73)
` '	ar gains		000.00	014.40	000.02	002.0	010.0	024.04	000.41	000.00	001.00	000.70		()
			using sola	r flux from	Table 6a	and assoc	iated equa	itions to co	onvert to th	ne applicab	le orientat	ion.		
Orientat	tion: A	ccess F	actor	Area		Flu	X		g_		FF		Gains	
	T	able 6d		m²		Tal	ble 6a	Т	able 6b	Ta	able 6c		(W)	
Northeas	st _{0.9x}	0.77	X	2.0	08	x 1	1.28	X	0.63	×	0.7	=	7.17	(75)
Northeas	st _{0.9x}	0.77	X	0.9	95		1.28	x	0.63	x	0.7		3.28	(75)
	<u></u>													•

No wile a seat		,		1		1		ı		1		٦
Northeast _{0.9x}	0.77	X	1.64	X	11.28	X	0.63	X	0.7	=	5.66	(75)
Northeast _{0.9x}	0.77	X	2.08	X	22.97	X	0.63	X	0.7	=	14.6	(75)
Northeast _{0.9x}	0.77	X	0.95	X	22.97	X	0.63	X	0.7	=	6.67	(75)
Northeast _{0.9x}	0.77	X	1.64	X	22.97	X	0.63	X	0.7	=	11.51	(75)
Northeast _{0.9x}	0.77	X	2.08	X	41.38	X	0.63	X	0.7	=	26.3	(75)
Northeast _{0.9x}	0.77	X	0.95	X	41.38	X	0.63	X	0.7	=	12.01	(75)
Northeast _{0.9x}	0.77	X	1.64	X	41.38	X	0.63	X	0.7	=	20.74	(75)
Northeast _{0.9x}	0.77	X	2.08	X	67.96	X	0.63	X	0.7	=	43.2	(75)
Northeast _{0.9x}	0.77	X	0.95	x	67.96	X	0.63	x	0.7	=	19.73	(75)
Northeast 0.9x	0.77	X	1.64	X	67.96	X	0.63	x	0.7	=	34.06	(75)
Northeast _{0.9x}	0.77	X	2.08	X	91.35	X	0.63	X	0.7	=	58.07	(75)
Northeast _{0.9x}	0.77	X	0.95	X	91.35	X	0.63	X	0.7	=	26.52	(75)
Northeast _{0.9x}	0.77	X	1.64	x	91.35	x	0.63	x	0.7	=	45.78	(75)
Northeast _{0.9x}	0.77	X	2.08	x	97.38	x	0.63	x	0.7	=	61.9	(75)
Northeast _{0.9x}	0.77	X	0.95	x	97.38	x	0.63	x	0.7	=	28.27	(75)
Northeast _{0.9x}	0.77	X	1.64	x	97.38	x	0.63	x	0.7] =	48.81	(75)
Northeast _{0.9x}	0.77	x	2.08	x	91.1	x	0.63	x	0.7	=	57.91	(75)
Northeast _{0.9x}	0.77	X	0.95	x	91.1	x	0.63	x	0.7	=	26.45	(75)
Northeast _{0.9x}	0.77	X	1.64	x	91.1	x	0.63	x	0.7	j =	45.66	(75)
Northeast _{0.9x}	0.77	X	2.08	x	72.63	x	0.63	x	0.7	=	46.17	(75)
Northeast _{0.9x}	0.77	X	0.95	x	72.63	x	0.63	x	0.7	j =	21.09	(75)
Northeast _{0.9x}	0.77	X	1.64	x	72.63	х	0.63	х	0.7	j =	36.4	(75)
Northeast _{0.9x}	0.77	X	2.08	x	50.42	х	0.63	х	0.7	j =	32.05	(75)
Northeast _{0.9x}	0.77	X	0.95	x	50.42	x	0.63	x	0.7	=	14.64	(75)
Northeast _{0.9x}	0.77	X	1.64	x	50.42	x	0.63	x	0.7	=	25.27	(75)
Northeast _{0.9x}	0.77	X	2.08	x	28.07	x	0.63	x	0.7	=	17.84	(75)
Northeast _{0.9x}	0.77	X	0.95	x	28.07	x	0.63	x	0.7	=	8.15	(75)
Northeast _{0.9x}	0.77	x	1.64	x	28.07	х	0.63	х	0.7	j =	14.07	(75)
Northeast _{0.9x}	0.77	X	2.08	x	14.2	x	0.63	х	0.7	j =	9.02	(75)
Northeast _{0.9x}	0.77	X	0.95	x	14.2	x	0.63	x	0.7	j =	4.12	(75)
Northeast _{0.9x}	0.77	X	1.64	x	14.2	x	0.63	x	0.7	j =	7.12	(75)
Northeast _{0.9x}	0.77	X	2.08	x	9.21	x	0.63	х	0.7	j =	5.86	(75)
Northeast _{0.9x}	0.77	X	0.95	x	9.21	x	0.63	х	0.7	j =	2.68	(75)
Northeast _{0.9x}	0.77	j×	1.64	x	9.21	x	0.63	x	0.7	j =	4.62	(75)
Southeast 0.9x	0.77	X	1.06	x	36.79	x	0.63	x	0.7	j =	11.92	(77)
Southeast 0.9x	0.77	X	1.64	×	36.79	x	0.63	x	0.7	=	18.44	(77)
Southeast 0.9x	0.77	X	1.05	x	36.79	x	0.63	x	0.7	=	11.81	(77)
Southeast 0.9x	0.77	X	1.06	×	62.67	x	0.63	x	0.7	=	20.3	(77)
Southeast 0.9x	0.77	X	1.64	x	62.67	X	0.63	x	0.7	=	31.41	(77)
Southeast 0.9x	0.77	X	1.05	x	62.67	X	0.63	x	0.7	=	20.11	(77)
Southeast 0.9x	0.77	X	1.06	X	85.75	X	0.63	x	0.7	=	27.78	(77)
<u> </u>		_		ı		1		I		1	_	

F		,								,		_
Southeast 0.9x	0.77	X	1.64	X	85.75	X	0.63	X	0.7	=	42.98	(77)
Southeast _{0.9x}	0.77	X	1.05	X	85.75	X	0.63	X	0.7	=	27.52	(77)
Southeast _{0.9x}	0.77	X	1.06	X	106.25	X	0.63	X	0.7	=	34.42	(77)
Southeast _{0.9x}	0.77	X	1.64	X	106.25	X	0.63	X	0.7	=	53.25	(77)
Southeast 0.9x	0.77	X	1.05	X	106.25	X	0.63	X	0.7	=	34.1	(77)
Southeast 0.9x	0.77	X	1.06	X	119.01	X	0.63	X	0.7	=	38.55	(77)
Southeast 0.9x	0.77	X	1.64	x	119.01	X	0.63	X	0.7	=	59.65	(77)
Southeast 0.9x	0.77	X	1.05	x	119.01	x	0.63	x	0.7	=	38.19	(77)
Southeast 0.9x	0.77	X	1.06	X	118.15	X	0.63	X	0.7	=	38.27	(77)
Southeast 0.9x	0.77	X	1.64	x	118.15	X	0.63	X	0.7	=	59.22	(77)
Southeast 0.9x	0.77	X	1.05	x	118.15	x	0.63	x	0.7	=	37.91	(77)
Southeast 0.9x	0.77	X	1.06	x	113.91	X	0.63	x	0.7	=	36.9	(77)
Southeast 0.9x	0.77	X	1.64	x	113.91	X	0.63	x	0.7	=	57.09	(77)
Southeast 0.9x	0.77	X	1.05	x	113.91	X	0.63	x	0.7	=	36.55	(77)
Southeast 0.9x	0.77	X	1.06	x	104.39	X	0.63	X	0.7	=	33.82	(77)
Southeast 0.9x	0.77	X	1.64	x	104.39	X	0.63	x	0.7	=	52.32	(77)
Southeast 0.9x	0.77	X	1.05	x	104.39	X	0.63	x	0.7	=	33.5	(77)
Southeast 0.9x	0.77	X	1.06	x	92.85	X	0.63	X	0.7	=	30.08	(77)
Southeast 0.9x	0.77	X	1.64	x	92.85	X	0.63	x	0.7	=	46.54	(77)
Southeast 0.9x	0.77	X	1.05	x	92.85	x	0.63	x	0.7	=	29.8	(77)
Southeast 0.9x	0.77	X	1.06	x	69.27	X	0.63	X	0.7	=	22.44	(77)
Southeast 0.9x	0.77	X	1.64	x	69.27	X	0.63	x	0.7	=	34.72	(77)
Southeast 0.9x	0.77	X	1.05	x	69.27	X	0.63	X	0.7	=	22.23	(77)
Southeast _{0.9x}	0.77	X	1.06	x	44.07	X	0.63	x	0.7	=	14.28	(77)
Southeast 0.9x	0.77	X	1.64	x	44.07	X	0.63	x	0.7	=	22.09	(77)
Southeast 0.9x	0.77	X	1.05	x	44.07	X	0.63	x	0.7	=	14.14	(77)
Southeast 0.9x	0.77	X	1.06	x	31.49	X	0.63	X	0.7	=	10.2	(77)
Southeast 0.9x	0.77	X	1.64	x	31.49	x	0.63	x	0.7	=	15.78	(77)
Southeast 0.9x	0.77	X	1.05	x	31.49	x	0.63	x	0.7	=	10.1	(77)
Southwest _{0.9x}	0.54	X	7.92	x	36.79		0.63	x	0.7	=	62.46	(79)
Southwest _{0.9x}	0.54	X	7.92	x	62.67]	0.63	x	0.7	=	106.39	(79)
Southwest _{0.9x}	0.54	X	7.92	x	85.75		0.63	X	0.7	=	145.56	(79)
Southwest _{0.9x}	0.54	X	7.92	х	106.25		0.63	x	0.7	=	180.36	(79)
Southwest _{0.9x}	0.54	X	7.92	x	119.01		0.63	x	0.7	=	202.02	(79)
Southwest _{0.9x}	0.54	X	7.92	x	118.15		0.63	x	0.7	=	200.56	(79)
Southwest _{0.9x}	0.54	X	7.92	x	113.91]	0.63	x	0.7] =	193.36	(79)
Southwest _{0.9x}	0.54	X	7.92	x	104.39]	0.63	x	0.7	<u> </u>	177.2	(79)
Southwest _{0.9x}	0.54	X	7.92	х	92.85	Ì	0.63	x	0.7	j =	157.61	(79)
Southwest _{0.9x}	0.54	X	7.92	x	69.27]	0.63	x	0.7] =	117.58	(79)
Southwest _{0.9x}	0.54	X	7.92	х	44.07		0.63	x	0.7	j =	74.81	(79)
Southwest _{0.9x}	0.54	X	7.92	х	31.49	Ì	0.63	x	0.7	j =	53.45	(79)
_		_		-		-		-		-		

Solar	naine in	watte c	alculated	l for eac	h month			(83)m - S	um(74)m .	(82)m				
(83)m=		210.99	302.89	399.12	468.78	474.95	453.92	400.49	335.99	237.02	145.58	102.69		(83)
, ,		l	l		= (73)m -	l		1 .000	000.00		1.0.00	102.00		(22)
(84)m=	531.48	619.72	698.53	773.6	821.8	807.25	772.73	725.13	671.46	593.85	526.95	502.47		(84)
7. Me	an inter	nal temp	perature	(heating	season)								
					n the livii	,	from Tak	ole 9 Th	1 (°C)				21	(85)
		•	٠.		ea, h1,m	_		o.o o,	. (0)					
Otilise	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.97	0.91	0.78	0.58	0.43	0.47	0.73	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	r in Tabl	e 9c)				ı	
(87)m=	20.03	20.2	20.44	20.73	20.92	20.99	21	21	20.96	20.71	20.32	20		(87)
Temr		during h	l	ariade ir	n rest of	dwelling	from Ta	hla 0 T	h2 (°C)					
(88)m=	20.07	20.07	20.08	20.09	20.09	20.1	20.1	20.1	20.1	20.09	20.09	20.08		(88)
, ,		<u> </u>	<u>l</u>		<u>l</u>				20.1	20.00	20.00	20.00		(00)
					welling,	<u> </u>					 		İ	
(89)m=	0.99	0.99	0.96	0.89	0.73	0.51	0.34	0.38	0.65	0.92	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.78	19.03	19.38	19.78	20.01	20.09	20.1	20.1	20.07	19.76	19.21	18.75		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.45	(91)
Mean	Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$													_
(92)m=	19.35	19.56	19.86	20.21	20.42	20.5	20.51	20.51	20.47	20.19	19.71	19.32		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	priate			•	
(93)m=	19.35	19.56	19.86	20.21	20.42	20.5	20.51	20.51	20.47	20.19	19.71	19.32		(93)
8. Sp	ace hea	ting requ	uirement											
		mean int				ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
1110 01	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g		<u> </u>	I	- Guii	001	1 7149	Сор	- 001	1101	200		
(94)m=	0.99	0.98	0.96	0.89	0.75	0.54	0.38	0.42	0.68	0.92	0.99	0.99		(94)
Usefu	∟ ul gains,	hmGm	, W = (94	1)m x (8	4)m				ļ.					
(95)m=			671.5	690.8	614.75	437.6	293.57	307.31	459.13	548.3	519.05	499.94		(95)
Montl	hly aver	age exte	rnal tem	perature	e from Ta	able 8					ı			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1174.96	1141.04	1036.75	864.99	665.32	444.22	294.29	308.62	482.13	731.65	967.38	1166.24		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mont	h = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m=	481.38	356.75	271.74	125.41	37.62	0	0	0	0	136.42	322.8	495.73		
		-	-		-			Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2227.86	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								28.93	(99)
9a. En	ergy red	quiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												_

Fraction of space heat from secondary/supplementary system

(201)

									_
Fraction of space heat from main system(s) (202) = 1 - (201) =							1	(202)	
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =								1	(204)
Efficiency of main space heating system 1								93.5	(206)
Efficiency of secondary/supplementary heating s	system	, %						0	(208)
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating requirement (calculated above) 481.38 356.75 271.74 125.41 37.62		0	0	0	136.42	222.0	40E 72	1	
	0	0	0	0	130.42	322.8	495.73		(044)
$(211)m = \{[(98)m \times (204)] \} \times 100 \div (206)$ $514.85 381.55 290.64 134.13 40.24$	0	0	0	0	145.9	345.24	530.19]	(211)
				I (kWh/yea		211) _{15,1012}		2382.73	(211)
Space heating fuel (secondary), kWh/month									
= {[(98)m x (201)] } x 100 ÷ (208)								,	
(215)m= 0 0 0 0 0	0	0	0	0	0	0	0		٦
W. a. I. a.			Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating Output from water heater (calculated above)									
	142.1	136.49	149.75	149.48	168.25	177.89	190.8		
Efficiency of water heater								79.8	(216)
(217)m= 87.13 86.71 85.9 84.14 81.65	79.8	79.8	79.8	79.8	84.26	86.38	87.25		(217)
Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m									
(219)III = (04)III × 100 ÷ (217)III									
(219)m= 224.39 198.72 210.7 192.85 194.76 1	178.07	171.04	187.66	187.32	199.68	205.93	218.69		
(219)m= 224.39 198.72 210.7 192.85 194.76 1	178.07	171.04		187.32 I = Sum(2		205.93	218.69	2369.81	(219)
Annual totals	178.07	171.04			19a) ₁₁₂ =	205.93 Wh/year		kWh/year	
Annual totals Space heating fuel used, main system 1	178.07	171.04			19a) ₁₁₂ =				
Annual totals	178.07	171.04			19a) ₁₁₂ =			kWh/year	
Annual totals Space heating fuel used, main system 1	178.07	171.04			19a) ₁₁₂ =			kWh/year 2382.73	
Annual totals Space heating fuel used, main system 1 Water heating fuel used	178.07	171.04			19a) ₁₁₂ =			kWh/year 2382.73	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot	178.07	171.04			19a) ₁₁₂ =			kWh/year 2382.73	
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump:	178.07	171.04	Tota		19a) ₁₁₂ = k \	Wh/year	30	kWh/year 2382.73	(230c)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue	178.07	171.04	Tota	I = Sum(2 ⁻	19a) ₁₁₂ = k \	Wh/year	30	kWh/year 2382.73 2369.81	(230c) (230e)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year			Tota	I = Sum(2 ⁻¹ of (230a).	19a) ₁₁₂ = k \	Wh/year	30	kWh/year 2382.73 2369.81	(230c) (230e) (231)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu	ıding mi	Tota	I = Sum(2 ⁻¹ of (230a).	19a) ₁₁₂ = k\ (230g) =	Wh/year	30 45	kWh/year 2382.73 2369.81 75 335.44	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu		Tota	I = Sum(2 ⁻¹ of (230a).	19a) ₁₁₂ = k\ (230g) =	Wh/year	30 45	kWh/year 2382.73 2369.81	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting	ns inclu Enc kW	iding mid	Tota	I = Sum(2 ⁻¹ of (230a).	19a) ₁₁₂ = kk\footnote{k\footn	ion fac	30 45	kWh/year 2382.73 2369.81 75 335.44	(230c) (230e) (231) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system	ns inclu Enc kW (211	ergy h/year	Tota	I = Sum(2 ⁻¹ of (230a).	(230g) = Emiss kg CO2	ion factorist	30 45 tor	kWh/year 2382.73 2369.81 75 335.44 Emissions kg CO2/year 514.67	(230c) (230e) (231) (232) (232)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system Space heating (main system 1) Space heating (secondary)	Enc kW (211 (215	ergy h/year	Tota	I = Sum(2 ⁻¹ of (230a).	19a) ₁₁₂ = kk\footnote{k\footn	ion fact 2/kWh	30 45 tor	kWh/year 2382.73 2369.81 75 335.44 Emissions kg CO2/year 514.67	(230c) (230e) (231) (232) (261) (263)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Enc kW (211 (215 (219	ergy h/year) ×	sum	I = Sum(2 ⁻¹)	(230g) = Emiss kg CO2	ion fact 2/kWh	30 45 tor = =	kWh/year 2382.73 2369.81 75 335.44 Emissions kg CO2/yea 514.67 0	(230c) (230e) (231) (232) (261) (263) (264)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Enc kW (211 (215 (219 (261	ergy h/year x x x x x x x x x x x x x x x x x x	Tota	I = Sum(2 ⁻¹)	19a) ₁₁₂ = k1	ion fact 2/kWh	30 45 tor = = =	kWh/year 2382.73 2369.81 75 335.44 Emissions kg CO2/yea 514.67 0 511.88	(230c) (230e) (231) (232) (261) (263) (264) (265)
Annual totals Space heating fuel used, main system 1 Water heating fuel used Electricity for pumps, fans and electric keep-hot central heating pump: boiler with a fan-assisted flue Total electricity for the above, kWh/year Electricity for lighting 12a. CO2 emissions — Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Enc kW (211 (215 (219 (261 (231	ergy h/year) ×	sum	I = Sum(2 ⁻¹)	19a) ₁₁₂ = kk\footnote{k\footn	ion fact 2/kWh	30 45 tor = =	kWh/year 2382.73 2369.81 75 335.44 Emissions kg CO2/yea 514.67 0	(230c) (230e) (231) (232) (261) (263) (264)

Total CO2, kg/year sum of (265)...(271) = 1239.57 (272)

TER = 16.1 (273)