#### **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 12:16:56* 

Proiect Information:

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

Dwelling Details:

**NEW DWELLING DESIGN STAGE**Total Floor Area: 49.6m<sup>2</sup>

Site Reference: B2 Stg 4 Issue Plot Reference: B2A-106-01

Address: B2A-106-01, Flat Type 2-20A, 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) 17.24 kg/m<sup>2</sup>

Dwelling Carbon Dioxide Emission Rate (DER)

9.82 kg/m<sup>2</sup>

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 35.4 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 36.2 kWh/m²

Fail

Excess energy =  $0.84 \text{ kg/m}^2 (02.4 \%)$ 

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:	0.3	
Maximum	0.7	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	2.92m²	
Windows facing: South East	6.79m²	
Windows facing: South East	2.22m <sup>2</sup>	
Ventilation rate:	4.00	
Blinds/curtains:	Light-coloured curtain or rolle	er blind
	Closed 100% of daylight hou	ırs

10 Key features

Community heating, heat from boilers - mains gas

Photovoltaic array

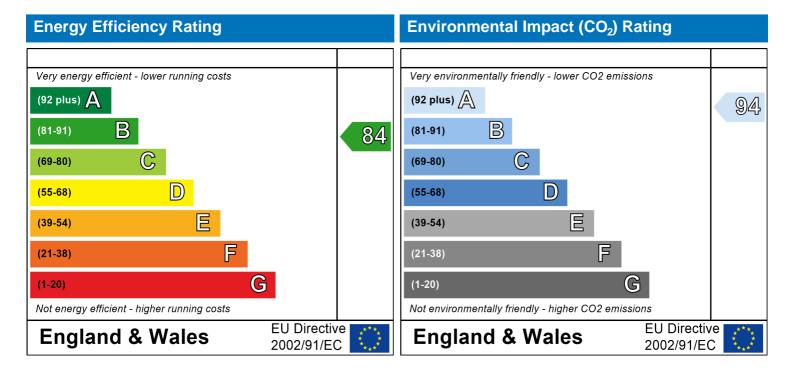
#### **Predicted Energy Assessment**



B2A-106-01 Flat Type 2-20A Wimbledon London Dwelling type: Date of assessment: Produced by: Total floor area: Mid floor Flat 01 December 2018 Ross Boulton 49.6 m<sup>2</sup>

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-106-01

Address: B2A-106-01, Flat Type 2-20A, 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 49.6 m<sup>2</sup> 2.6 m

Living area: 24.187 m<sup>2</sup> (fraction 0.482)

Front of dwelling faces: North

Opening types:

Name: Source: Type: Glazing: Argon: Frame:  $SE_1.14_2.56 \times 1$  Manufacturer Windows low-E, En = 0.05, soft coat No

Frame Factor: q-value: Name: Gap: **U-value:** Area: No. of Openings: SE\_1.14\_2.56 x 1 0.5 1.35 2.92 16mm or more 0.8 0.8 0.5 1.35 6.79 SE\_2.6\_2.61 x 1 16mm or more 1 0.5 1.35 SE\_1.14\_1.96 x 1 16mm or more 8.0 2.22 1

Location: Orient: Width: Name: Type-Name: Height: SE\_1.14\_2.56 x 1 Wall South East 1.14 2.56 2.61 SE\_2.6\_2.61 x 1 Wall South East 2.6 SE\_1.14\_1.96 x 1 Wall South East 1.135 1.96

Overshading: Average or unknown

Opaque Elements:

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

External Elements

Wall 46.563 11.93 34.63 0.15 0 False N/A

Internal Elements

Party Elements

Thermal bridges:

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

Ventilation:

Pressure test: Yes (As designed)

#### **SAP Input**

Ventilation: Centralised whole house extract

Number of wet rooms: Kitchen + 2

Ductwork: , rigid

Approved Installation Scheme: True

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

Main heating system

Main heating system: Community heating schemes

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:

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

thermostats

Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating:

Water heating: From main heating system

Water code: 901

Fuel :heat from boilers - mains gas

No hot water cylinder Solar panel: False

Others:

Electricity tariff: Standard Tariff

In Smoke Control Area: Yes

Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Dense urban

EPC language: English

Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.309

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

			Hear D	etails: -						
Accesser Name:	total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 49.6 (4)  Welling volume									
		12								
Software Name.	Ottoma i OAi 20							VCISIC	511. 1.0.4.10	
Address ·	B2A-106-01, Flat T									
		) P = _ e.	.,							
			Area	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	)
Ground floor					(1a) x			(2a) =	128.96	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	e)+(1n	)	19.6	(4)			_		
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	128.96	(5)
2. Ventilation rate:										
			y	other		total			m³ per hou	r
Number of chimneys			+	0	] = [	0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	j + F	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans				 	0	x -	10 =	0	(7a)
Number of passive vents	S						x ·	10 =		=
•					L		x 4	40 =		=
Number of flueless gas i					L				0	(70)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7a	a)+(7b)+(7	7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has		ded, proceed	d to (17), c	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration		_					[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (	<ol> <li>J.25 for steel or timber</li> <li>bresent, use the value corre</li> </ol>				•	uction			0	(11)
deducting areas of open		sponding to	ine great	ei waii are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	aled) or 0.	1 (seale	d), 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 s	stripped							0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate				(8) + (10)	• • • • • • • • • • • • • • • • • • • •	, , ,	. ,		0	(16)
Air permeability value	• •		•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabi	•								0.25	(18)
Air permeability value applie Number of sides sheltere		as been done	e or a deg	gree air pei	теарину	is being u	sea			(19)
Shelter factor	cu			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	iting shelter factor			(21) = (18)	x (20) =				0.21	(21)
Infiltration rate modified	-	ed								` ′
Jan Feb	Mar Apr May	1 1	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp	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	]	
N/ind Factor (00.)	20) 4						•		_	
Wind Factor (22a)m = $(2^{23})^{m}$	<del>'</del>	1 0.05	0.05	0.00	4	1.00	4 40	4 40	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	_	

0.27		<u> </u>				<del></del>	(21a) x	,	0.00		6.5-	I	
Calculate effe	0.27	0.26 change	0.23	0.23 he appli	0.2 cable ca	0.2	0.2	0.21	0.23	0.24	0.25		
If mechanic		_	uto 101 t	по арри	ouble ou							0.5	(2
If exhaust air h	eat pump	using Appe	endix N, (2	(23a) = (23a	ı) × Fmv (e	equation (I	N5)) , othe	wise (23b	) = (23a)			0.5	(2
If balanced with	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(2
a) If balance	ed mecha	anical ve	entilation	with hea	at recove	ery (MVI	HR) (24a	n)m = (22	2b)m + (2	23b) × [	1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance	ed mech	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b	)m = (22	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h	nouse ex n < 0.5 ×			•	•				5 × (23b	o)			
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)r	ventilation = 1, the			•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(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		(:
3. Heat losse	es and he	eat loss r	paramete	≏r·									
LEMENT	Gros	•	Openin		Net Ar	03	U-valı	10	AXU		k-value	. /	λΧk
LEWENI	area	-	operiiri m		A,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²-l		J/K
/indows Type	e 1				2.92	<b>x</b> 1/	[1/( 1.35 )-	- 0.04] =	3.74				(2
/indows Type	e 2				6.79	<u>x</u> 1/	[1/( 1.35 )-	- 0.04] =	8.7	=			(2
/indows Type	e 3				0.00		<b></b>	;					
					2.22	XI/	[1/( 1.35 )-	- 0.04] =	2.84				(2
/alls	46.5	66	11.9	3	34.63		0.15	- 0.04] = [	2.84 5.19			<b>-</b>	`
			11.93	3	34.63	x		— ;					
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Number of days in month (Table 1a)

Numbe	er of day	s in mor	nth (Tab	le 1a)										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
								•			•		•	
4. Wa	iter heat	ina ener	rgy requi	rement:								kWh/ye	ear:	
			9, 1040									,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
if TF	ed occu A > 13.9 A £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		68		(42)
								(25 x N)				.06		(43)
		_				_	-	to achieve	a water us	se target o	f		•	
not more	riiai 125		person per	uay (ali w	ialer use, r	ioi and co	ia) I		ı				1	
Hatanat	Jan .	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ır	i litres per	day for ea	ach month	Va,m = ta	ctor from	l able 1c x	(43)					ī	
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		_
Energy	content of	hot water	used - cal	culated mi	anthly – 4	190 v Vd r	n v nm v F	OTm / 3600			m(44) <sub>112</sub> =		888.72	(44)
													1	
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117		7(45)
If instan	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		lotal = Sui	m(45) <sub>112</sub> =	-	1165.26	(45)
(46)m=	18.12	15.85	16.36	14.26	13.68	11.81	10.94	12.55	12.7	14.81	16.16	17.55	]	(46)
, ,	storage		10.30	14.20	13.00	11.01	10.94	12.55	12.7	14.01	10.10	17.55		(40)
	•		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	eating a	nd no ta	nk in dw	vellina, e	nter 110	litres in	(47)						
	-	_			_			mbi boil	ers) ente	er '0' in (	47)			
Water	storage	loss:												
a) If m	anufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
Energy	lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		1	10		(50)
			eclared o										1	
		-	factor fr		e 2 (kW	h/litre/da	ay)				0.	02		(51)
	nunity n e factor	_	ee section	on 4.3								00	1	(50)
			m Table	2h								.6		(52) (53)
			storage		oor			(47) x (51)	) v (52) v (	53) -			] ]	, ,
	(50) or (		-	, KVVII/yt	zai			(47) X (31)	) X (32) X (	33) =	-	03 03		(54) (55)
	` , ` `	, ,	culated f	or each	month			((56)m = (	55) × (41):	m	1.	03		(00)
						20.00		· · · ·	, , , ,		20.00	22.04	1	(EC)
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01 0), else (5	30.98	32.01	30.98	32.01	liv H	(56)
ii Cyllilue			u solai sio	rage, (37)	11 = (30)111	<del> </del>			·			пі Аррепа	1 1	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
Primar	y circuit	loss cal	culated t	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss cal	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

(62)mise 176,00 156,50 164,31 148,55 146,40 132,2 128,21 138,97 138,10 153,08 161,24 172,28 (62)  Solar DPW Imput calculated using Appendix G or Appendix H (negative quantity) (enter '0' I' no solar contribution to water heating) (63)mise I' GPHS and/or WWHRS applies, see Appendix G)  (63)mise I' GPHS and/or WWHRS applies, see Appendix G)  (64)mise I' FGHS and/or WWHRS applies, see Appendix G)  (64)mise I' FGHS and/or WWHRS applies, see Appendix G)  (65)mise I' FGHS and/or WWHRS applies, see Appendix G)  (64)mise I' FGHS and/or WWHRS applies, see Appendix G)  (65)mise II FGHS and/or WWHRS applies, see Appendix G)  (65)mise II FGHS and I FGHS	Total heat required for	water he	eating ca	alculated	l for e	ach month	(62)	m = (	0.85 × (	45)m -	- (46)m +	(57)m +	· (59)m + (61)m	
Casima	(62)m= 176.09 155.59	164.31	148.55	146.49	132.	2 128.21	138.	.97	138.19	153.98	161.24	172.28		(62)
Casim   Casi	Solar DHW input calculated	using App	endix G or	Appendix	H (ne	gative quantity	y) (ent	er '0' i	if no solar	contrib	ution to wate	er heating)	,	
Output from water heater  (64)m= 176.09 155.59 164.31 148.55 146.49 132.2 128.21 138.97 138.19 153.98 161.24 172.28  Cuput from water heater (annual)	(add additional lines if	FGHRS	and/or V	VWHRS	appl	ies, see Ap	pend	lix G	)				-	
Column   176.09   155.59   164.31   148.55   146.49   132.2   128.21   138.97   138.19   153.98   161.24   172.28	(63)m= 0 0	0	0	0	0	0	0		0	0	0	0	]	(63)
Cuput from water heater (annual)	Output from water heat	ter											_	
Heat gains from water heating, kWh/hmoth 0.25 [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m = 84.39   75.07   80.48   74.4   74.55   68.97   68.47   72.05   70.96   77.04   78.62   83.12   (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating    Secondary   Secon	(64)m= 176.09 155.59	164.31	148.55	146.49	132.	2 128.21	138.	.97	138.19	153.98	161.24	172.28		_
(65)me								Outpu	ut from wa	iter heat	er (annual)₁	12	1816.1	(64)
include (67)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	Heat gains from water	heating,	kWh/m	onth 0.2	5 ´[0.	85 × (45)m	า + (6	1)m]	+ 0.8 x	[(46)n	n + (57)m	+ (59)m	<u>]</u> ]	
Metabolic gains (Table 5), Watts   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   (66)m   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   1	(65)m= 84.39 75.07	80.48	74.4	74.55	68.9	7 68.47	72.0	05	70.96	77.04	78.62	83.12		(65)
Metabolic gains (Table 5), Watts   Jun   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec   (66)me   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7   100.7	include (57)m in calc	ulation o	of (65)m	only if c	ylinde	er is in the	dwell	ing c	or hot wa	ater is	from com	munity l	neating	
See   Mar   Apr   May   Jun   Jul   Aug   See   Oct   Nov   Dec	5. Internal gains (see	Table 5	and 5a	):										
Company   Comp	Metabolic gains (Table	5), Wat	ts										_	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m=   32.58   28.94   23.54   17.92   13.32   11.24   12.15   15.79   21.2   26.92   31.41   33.49   (67)  Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m=   218.2   220.47   214.76   202.61   187.28   172.87   163.24   160.98   166.68   178.83   194.16   208.57   (68)  Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m=   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75	Jan Feb	Mar	Apr	May	Ju	n Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(67)m=	(66)m= 100.7 100.7	100.7	100.7	100.7	100.	7 100.7	100	).7	100.7	100.7	100.7	100.7		(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5  (68)m= 218.2 220.47 214.76 202.61 187.28 172.87 163.24 160.98 166.68 178.83 194.16 208.57 (68)  Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75 46.75	Lighting gains (calculat	ted in Ap	pendix	L, equat	ion L	or L9a), a	ilso s	ee T	able 5			-	_	
(68)m= 218.2	(67)m= 32.58 28.94	23.54	17.82	13.32	11.2	4 12.15	15.7	79	21.2	26.92	31.41	33.49	]	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 46.75	Appliances gains (calc	ulated in	Append	dix L, eq	uatior	n L13 or L1	3a), a	also	see Tab	ole 5	-		_	
Geg max    46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   46.75   4	(68)m= 218.2 220.47	214.76	202.61	187.28	172.	37 163.24	160.	.98	166.68	178.83	194.16	208.57		(68)
Pumps and fans gains (Table 5a)  (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Cooking gains (calcula	ted in Ap	pendix	L, equat	ion L	15 or L15a	), als	o se	e Table	5	•		-	
Coutheast 0.9x	(69)m= 46.75 46.75	46.75	46.75	46.75	46.7	5 46.75	46.7	75	46.75	46.75	46.75	46.75	]	(69)
Losses e.g. evaporation (negative values) (Table 5) (71)m=	Pumps and fans gains	(Table 5	ia)		•	•	•				•		•	
(71)m=	(70)m= 0 0	0	0	0	0	0	0		0	0	0	0	]	(70)
Water heating gains (Table 5)  (72)m= 113.43 111.72 108.17 103.34 100.2 95.79 92.03 96.84 98.55 103.55 109.19 111.73 (72)  Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m  (73)m= 444.53 441.44 426.78 404.08 381.11 360.21 347.74 353.93 366.74 389.61 415.09 434.1 (73)  6. Solar gains:  Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.  Orientation: Access Factor Table 6d Table 6a Table 6c (W)  Southeast 0.9x 0.77 x 2.92 x 36.79 x 0.5 x 0.8 = 29.78 (77)  Southeast 0.9x 0.77 x 2.22 x 36.79 x 0.5 x 0.8 = 22.64 (77)  Southeast 0.9x 0.77 x 2.92 x 62.67 x 0.5 x 0.8 = 22.64 (77)  Southeast 0.9x 0.77 x 2.92 x 62.67 x 0.5 x 0.8 = 50.73 (77)  Southeast 0.9x 0.77 x 2.92 x 62.67 x 0.5 x 0.8 = 50.73 (77)  Southeast 0.9x 0.54 x 6.79 x 62.67 x 0.5 x 0.8 = 82.73 (77)	Losses e.g. evaporatio	n (negat	ive valu	es) (Tab	le 5)	•	•		,		•	•	•	
(72)m=	(71)m= -67.13 -67.13	-67.13	-67.13	-67.13	-67.	13 -67.13	-67.	.13	-67.13	-67.13	-67.13	-67.13	]	(71)
Total internal gains =	Water heating gains (T	able 5)			•	•			'		•	•	-	
(73)m=	(72)m= 113.43 111.72	108.17	103.34	100.2	95.7	9 92.03	96.8	84	98.55	103.55	109.19	111.73	]	(72)
6. Solar gains:  Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.  Orientation: Access Factor Area Flux g_ FF Gains Table 6d Table 6c (W)  Southeast 0.9x 0.77 x 2.92 x 36.79 x 0.5 x 0.8 = 29.78 (77)  Southeast 0.9x 0.54 x 6.79 x 36.79 x 0.5 x 0.8 = 48.57 (77)  Southeast 0.9x 0.77 x 2.22 x 36.79 x 0.5 x 0.8 = 22.64 (77)  Southeast 0.9x 0.77 x 2.22 x 36.79 x 0.5 x 0.8 = 22.64 (77)  Southeast 0.9x 0.77 x 2.92 x 62.67 x 0.5 x 0.8 = 50.73 (77)  Southeast 0.9x 0.54 x 6.79 x 62.67 x 0.5 x 0.8 = 50.73 (77)	Total internal gains =					(66)m + (67)n	n + (68	3)m +	(69)m + (	70)m +	(71)m + (72)	m	•	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.  Orientation: Access Factor Table 6d $m^2$ Flux $g_{-}$ FF Gains Table 6b Table 6c $(W)$ Southeast $0.9x$ 0.77 $x$ 2.92 $x$ 36.79 $x$ 0.5 $x$ 0.8 $x$ 0.8 $x$ 2.77 $x$ 2.92 $x$ 36.79 $x$ 36.79 $x$ 0.5 $x$ 0.8 $x$ 0.8 $x$ 2.77 $x$ 2.77 Southeast $x$ 2.77 $x$ 2.22 $x$ 36.79 $x$ 36.79 $x$ 0.5 $x$ 0.8 $x$ 0.8 $x$ 2.22 $x$ 36.79 $x$ 0.5 $x$ 0.8 $x$ 2.23 $x$ 36.79 $x$ 0.5 $x$ 0.8 $x$ 2.24 $x$ 36.79 $x$ 0.5 $x$ 0.8 $x$ 2.25 $x$ 36.79 $x$ 0.5 $x$ 0.8 $x$ 2.26 $x$ 36.79	(73)m= 444.53 441.44	426.78	404.08	381.11	360.	21 347.74	353.	.93	366.74	389.61	415.09	434.1	]	(73)
Orientation:         Access Factor Table 6d         Area m²         Flux Table 6a $g_{-}$ Table 6b         FF Table 6c         Gains (W)           Southeast $0.9x$ $0.77$ x $2.92$ x $36.79$ x $0.5$ x $0.8$ = $29.78$ $(77)$ Southeast $0.9x$ $0.54$ x $6.79$ x $36.79$ x $0.5$ x $0.8$ = $48.57$ $(77)$ Southeast $0.9x$ $0.77$ x $2.22$ x $36.79$ x $0.5$ x $0.8$ = $22.64$ $(77)$ Southeast $0.9x$ $0.77$ x $2.92$ x $62.67$ x $0.5$ x $0.8$ = $50.73$ $(77)$ Southeast $0.9x$ $0.54$ x $6.79$ x $62.67$ x $0.5$ x $0.8$ = $82.73$ $(77)$	6. Solar gains:												4	
Table 6d $m^2$ Table 6a Table 6b Table 6c (W)  Southeast $0.9x$ 0.77	Solar gains are calculated u	using solai	flux from	Table 6a	and as	sociated equa	ations t	to con	vert to the	e applica	able orientat	ion.		
Southeast 0.9x       0.77       x       2.92       x       36.79       x       0.5       x       0.8       =       29.78       (77)         Southeast 0.9x       0.54       x       6.79       x       36.79       x       0.5       x       0.8       =       48.57       (77)         Southeast 0.9x       0.77       x       2.22       x       36.79       x       0.5       x       0.8       =       22.64       (77)         Southeast 0.9x       0.77       x       2.92       x       62.67       x       0.5       x       0.8       =       50.73       (77)         Southeast 0.9x       0.54       x       6.79       x       62.67       x       0.5       x       0.8       =       82.73       (77)		actor												
Southeast 0.9x       0.54       x       6.79       x       36.79       x       0.5       x       0.8       =       48.57       (77)         Southeast 0.9x       0.77       x       2.22       x       36.79       x       0.5       x       0.8       =       22.64       (77)         Southeast 0.9x       0.77       x       2.92       x       62.67       x       0.5       x       0.8       =       50.73       (77)         Southeast 0.9x       0.54       x       6.79       x       62.67       x       0.5       x       0.8       =       82.73       (77)	Table 6d		m²			Table 6a		Ta	able 6b		Table 6c		(VV)	
Southeast 0.9x       0.77       x       2.22       x       36.79       x       0.5       x       0.8       =       22.64       (77)         Southeast 0.9x       0.77       x       2.92       x       62.67       x       0.5       x       0.8       =       50.73       (77)         Southeast 0.9x       0.54       x       6.79       x       62.67       x       0.5       x       0.8       =       82.73       (77)	Southeast 0.9x 0.77	X	2.9	)2	x	36.79	X		0.5	x	0.8	=	29.78	(77)
Southeast 0.9x 0.77 x 2.92 x 62.67 x 0.5 x 0.8 = 50.73 (77)  Southeast 0.9x 0.54 x 6.79 x 62.67 x 0.5 x 0.8 = 82.73 (77)	Southeast 0.9x 0.54	X	6.7	'9	x	36.79	X		0.5	x	0.8	=	48.57	(77)
Southeast 0.9x 0.54 x 6.79 x 62.67 x 0.5 x 0.8 = 82.73 (77)	Southeast 0.9x 0.77	X	2.2	22	<b>x</b>	36.79	x		0.5	x [	0.8	=	22.64	(77)
	Southeast 0.9x 0.77	X	2.9	)2	x	62.67	X		0.5	x	0.8	=	50.73	(77)
Southeast $0.9x$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$ $0.77$	Southeast 0.9x 0.54	X	6.7	'9	x	62.67	X		0.5	x	0.8	=	82.73	(77)
511 511 511	Southeast 0.9x 0.77	X	2.2	22	x	62.67	x		0.5	x	0.8	=	38.57	(77)
Southeast 0.9x 0.77 x 2.92 x 85.75 x 0.5 x 0.8 = 69.41 (77)	Southeast 0.9x 0.77	X	2.9	)2	x	85.75	X		0.5	x	0.8	=	69.41	(77)
	Southeast 0.9x 0.54	X	6.7	9	x	85.75	x		0.5	x	0.8	=	113.19	(77)
Southeast $0.9x$   0.54   x   6.79   x   85.75   x   0.5   x   0.8   =   113.19   (77)	0.54	^	L 0.7	<u> </u>	<u> </u>	00.70	J ^ l		0.0	ا ^ ا	0.0		113.18	١(٠٠)

Southeast 0.9x	0.77	X	2.2	2	X	85.75	x	0.5	x	0.8	=	52.77	(77)
Southeast 0.9x	0.77	x	2.9	2	x 1	06.25	x	0.5	x	0.8	=	86	(77)
Southeast 0.9x	0.54	x	6.7	9	x 1	06.25	х	0.5	x	0.8	=	140.25	(77)
Southeast 0.9x	0.77	x	2.2	2	x 1	06.25	x	0.5	x	0.8	=	65.39	(77)
Southeast 0.9x	0.77	X	2.9	2	x 1	19.01	x	0.5	x	0.8	=	96.33	(77)
Southeast 0.9x	0.54	X	6.7	9	x 1	19.01	x	0.5	x	0.8	=	157.09	(77)
Southeast 0.9x	0.77	X	2.2	2	x 1	19.01	x	0.5	x	0.8	=	73.24	(77)
Southeast 0.9x	0.77	X	2.9	2	x 1	18.15	x	0.5	x	0.8	=	95.63	(77)
Southeast 0.9x	0.54	X	6.7	9	x 1	18.15	x	0.5	x	0.8	=	155.96	(77)
Southeast 0.9x	0.77	x	2.2	2	x 1	18.15	x	0.5	x	0.8	=	72.71	(77)
Southeast 0.9x	0.77	X	2.9	2	x 1	13.91	x	0.5	x	0.8	=	92.2	(77)
Southeast 0.9x	0.54	X	6.7	9	x 1	13.91	х	0.5	x	0.8	=	150.36	(77)
Southeast 0.9x	0.77	x	2.2	2	x 1	13.91	Īx	0.5	x	0.8		70.1	(77)
Southeast 0.9x	0.77	x	2.9	2	x 1	04.39	j x	0.5	x	0.8		84.5	(77)
Southeast 0.9x	0.54	x	6.7	9	x 1	04.39	x	0.5	x	0.8		137.79	(77)
Southeast 0.9x	0.77	x	2.2	2	x 1	04.39	x	0.5	x	0.8	<del>-</del>	64.24	(77)
Southeast 0.9x	0.77	x	2.9	2	x	92.85	x	0.5	x	0.8		75.16	(77)
Southeast 0.9x	0.54	x	6.7	9	x	92.85	x	0.5	x	0.8	<del>-</del>	122.56	(77)
Southeast 0.9x	0.77	x	2.2	2	x	92.85	x	0.5	x	0.8	<del>-</del>	57.14	(77)
Southeast 0.9x	0.77	x	2.9	2	X	69.27	x	0.5	x	0.8	<del>=</del>	56.07	(77)
Southeast 0.9x	0.54	x	6.7	9	x	69.27	X	0.5	x	0.8	<del>-</del>	91.43	(77)
Southeast 0.9x	0.77	x	2.2	2	x	69.27	x	0.5	×	0.8		42.63	<del> </del> (77)
Southeast 0.9x	0.77	x	2.9	2	x .	44.07	x	0.5	x	0.8	=	35.67	(77)
Southeast 0.9x	0.54	x	6.7	9	x	44.07	x	0.5	x	0.8	<del>-</del>	58.17	(77)
Southeast 0.9x	0.77	x	2.2	2	x	44.07	x	0.5	×	0.8	=	27.12	<del> </del>  (77)
Southeast 0.9x	0.77	x	2.9	2	X :	31.49	x	0.5	x	0.8	=	25.49	(77)
Southeast 0.9x	0.54	x	6.7	9	х ;	31.49	j x	0.5	x	0.8	<del>-</del>	41.56	(77)
Southeast 0.9x	0.77	x	2.2	2	х ;	31.49	x	0.5	x	0.8	<del>-</del>	19.38	(77)
							_						
Solar gains ir	watts, ca	alculated	for eacl	n month			(83)m	ı = Sum(74)m	(82)m			_	
(83)m= 100.99	172.03	235.37	291.64	326.66	324.3	312.66	286	.53 254.86	190.12	120.96	86.43	]	(83)
Total gains –	internal a	nd solar	(84)m =	(73)m	+ (83)m	, watts			_			- -	
(84)m= 545.52	613.47	662.15	695.72	707.77	684.51	660.39	640	.45 621.6	579.73	536.05	520.53		(84)
7. Mean inte	rnal temp	erature	(heating	season	1)								
Temperatur	e during h	eating p	eriods ir	the livi	ng area	from Tal	ble 9,	Th1 (°C)				21	(85)
Utilisation fa	ctor for g	ains for I	iving are	a, h1,m	ı (see Ta	able 9a)							
_	Feb	Mar	Apr	May	Jun	Jul	Aı	ug Sep	Oct	Nov	Dec	]	
Jan			0.68	0.56	0.43	0.32	0.3	0.49	0.69	0.82	0.88	]	(86)
(86)m= 0.87	0.83	0.77							_		_	-	
(86)m= 0.87			Living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)					
			living are	ea T1 (fo 20.79	ollow ste	20.98	7 in T		20.59	20.09	19.62	]	(87)
(86)m= 0.87  Mean intern (87)m= 19.66	al temper	ature in	20.55	20.79	20.93	20.98	20.9	97 20.89	20.59	20.09	19.62	]	(87)
(86)m= 0.87 Mean intern	al temper	ature in	20.55	20.79	20.93	20.98	20.9	97 20.89 9, Th2 (°C)	20.59	20.09	19.62	] 1	(87)

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)			
(89)m= 0.86 0.81 0.74 0.65 0.52 0.38 0.25 0.28 0.44 0.65 0.8	0.87		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)			
(90)m= 18.32 18.68 19.11 19.56 19.87 20.04 20.08 20.08 19.99 19.63 18.95	18.29		(90)
fLA = Living area ÷ (4)	) =	0.49	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$			_
(92)m= 18.97 19.28 19.65 20.04 20.32 20.47 20.52 20.51 20.43 20.1 19.51	18.94		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate			
(93)m= 18.97 19.28 19.65 20.04 20.32 20.47 20.52 20.51 20.43 20.1 19.51	18.94		(93)
8. Space heating requirement			
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and the utilisation factor for gains using Table 9a	d re-calcula	ate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec		
Utilisation factor for gains, hm:			
(94)m= 0.84 0.79 0.73 0.64 0.53 0.4 0.28 0.31 0.46 0.65 0.79	0.85		(94)
Useful gains, hmGm , W = (94)m x (84)m			
(95)m= 456.02 486.11 485.17 448.73 376.43 272.23 187.22 195.66 286.49 379.32 421.1	441.23		(95)
Monthly average external temperature from Table 8			
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m-(96)m]			(07)
(97)m= 728.19 710.2 646.84 543.13 420.11 286.15 191.04 200.54 308.54 462.99 604.87	718.33		(97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m = 202.5   150.59   120.28   67.97   32.5   0   0   0   0   62.25   132.31	206.16		
Total per year (kWh/year) = Sum(98		974.55	(98)
Space heating requirement in kWh/m²/year	7)15,912		](99)
· · · ·	L	19.65	](99)
9b. Energy requirements – Community heating scheme	ama		
This part is used for space heating, space cooling or water heating provided by a community sche Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	eme.	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 for CHP and up to four other heat s	Sources: the l		]` ′
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		anor	_
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 CHP (302) x (303a)	n) =	0.67	(304a)
Fraction of total space heat from community heat source 2 (302) x (303b)	0) =	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		kWh/year	J
Annual space heating requirement		974.55	]
Space heat from Community CHP $(98) \times (304a) \times (305) \times (306) =$	. <b> </b>	681.5	(307a)
			J

			_	_
Space heat from heat source 2		(98) x (304b) x (305) x (306) =	341.77	(307b)
Efficiency of secondary/supplementary	heating system in % (from Tab	le 4a or Appendix E)	0	(308
Space heating requirement from second	dary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating				7
Annual water heating requirement  If DHW from community scheme:			1816.1	
Water heat from Community CHP		(64) x (303a) x (305) x (306) =	1270	(310a)
Water heat from heat source 2		(64) x (303b) x (305) x (306) =	636.91	(310b)
Electricity used for heat distribution	0.0	01 × [(307a)(307e) + (310a)(310e)] =	29.3	(313)
Cooling System Energy Efficiency Ratio	)		0	(314)
Space cooling (if there is a fixed cooling	g system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dw mechanical ventilation - balanced, extra	· ,	е	61.36	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	r	=(330a) + (330b) + (330g) =	61.36	(331)
Energy for lighting (calculated in Appen	dix L)		230.17	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)		-254.41	(333)
Electricity generated by wind turbine (A	ppendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heating	scheme			
10b. Fuel costs – Community heating	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
10b. Fuel costs – Community heating  Space heating from CHP	Fuel			(340a)
	<b>Fuel</b> kWh/year	(Table 12)	£/year	(340a) (340b)
Space heating from CHP	Fuel kWh/year (307a) x	(Table 12)  3.35 × 0.01 =	£/year 22.83	_
Space heating from CHP Space heating from heat source 2	Fuel kWh/year (307a) x (307b) x	(Table 12)  3.35	£/year 22.83 16.37	(340b)
Space heating from CHP Space heating from heat source 2 Water heating from CHP	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x	(Table 12)  3.35	£/year  22.83  16.37  42.54	(340b) (342a)
Space heating from CHP Space heating from heat source 2 Water heating from CHP	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x	(Table 12)  3.35	£/year  22.83  16.37  42.54	(340b) (342a)
Space heating from CHP Space heating from heat source 2 Water heating from CHP Water heating from heat source 2	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x	(Table 12)  3.35	£/year  22.83  16.37  42.54  30.51	(340b) (342a) (342b)
Space heating from CHP Space heating from heat source 2 Water heating from CHP Water heating from heat source 2 Pumps and fans	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x	(Table 12)  3.35	£/year  22.83  16.37  42.54  30.51	(340b) (342a) (342b) (342b)
Space heating from CHP Space heating from heat source 2 Water heating from CHP Water heating from heat source 2 Pumps and fans Energy for lighting	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x	(Table 12)  3.35	£/year  22.83  16.37  42.54  30.51  10.77  40.42	(340b) (342a) (342b) (349) (350)
Space heating from CHP Space heating from heat source 2 Water heating from CHP Water heating from heat source 2 Pumps and fans Energy for lighting Additional standing charges (Table 12) Energy saving/generation technologies	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x (331) (332) = (340a)(342e) + (345)(354) =	(Table 12)  3.35	£/year  22.83  16.37  42.54  30.51  10.77  40.42  88	(340b) (342a) (342b) (349) (350) (351)
Space heating from CHP Space heating from heat source 2 Water heating from CHP Water heating from heat source 2 Pumps and fans Energy for lighting Additional standing charges (Table 12) Energy saving/generation technologies Total energy cost	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x (331) (332) = (340a)(342e) + (345)(354) =	(Table 12)  3.35	£/year  22.83  16.37  42.54  30.51  10.77  40.42  88	(340b) (342a) (342b) (349) (350) (351)
Space heating from CHP Space heating from heat source 2 Water heating from CHP Water heating from heat source 2 Pumps and fans Energy for lighting Additional standing charges (Table 12) Energy saving/generation technologies Total energy cost  11b. SAP rating - Community heating	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x (331) (332) = (340a)(342e) + (345)(354) =	(Table 12)  3.35	£/year  22.83  16.37  42.54  30.51  10.77  40.42  88	(340b) (342a) (342b) (349) (350) (351) (355)
Space heating from CHP Space heating from heat source 2 Water heating from CHP Water heating from heat source 2 Pumps and fans Energy for lighting Additional standing charges (Table 12) Energy saving/generation technologies Total energy cost  11b. SAP rating - Community heating Energy cost deflator (Table 12)	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x (331) (332) = (340a)(342e) + (345)(354) = scheme	(Table 12)  3.35	£/year  22.83  16.37  42.54  30.51  10.77  40.42  88  251.45	(340b) (342a) (342b) (342b) (349) (350) (351) (355)
Space heating from CHP Space heating from heat source 2 Water heating from CHP Water heating from heat source 2 Pumps and fans Energy for lighting Additional standing charges (Table 12) Energy saving/generation technologies Total energy cost  11b. SAP rating - Community heating Energy cost deflator (Table 12) Energy cost factor (ECF)	Fuel kWh/year (307a) x (307b) x (310a) x (310b) x (331) (332) = (340a)(342e) + (345)(354) = scheme	(Table 12)  3.35	£/year  22.83  16.37  42.54  30.51  10.77  40.42  88  251.45  0.42  1.15	(340b) (342a) (342b) (349) (350) (351) (355) (356) (357)

Heat efficiency of CHP unit				50.4	(362)
		Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating from CHP)	(307a) × 100 ÷ (362) =	1352.19 ×	0.22	292.07	(363)
less credit emissions for electricity	-(307a) × (361) ÷ (362) =	432.7 ×	0.52	-224.57	(364)
Water heated by CHP	(310a) × 100 ÷ (362) =	2519.84 ×	0.22	544.28	(365)
less credit emissions for electricity	$-(310a) \times (361) \div (362) =$	806.35 ×	0.52	-418.49	(366)
Efficiency of heat source 2 (%)	If there is CHP us	ing two fuels repeat (363) to	(366) for the second fue	el 95	(367b)
CO2 associated with heat source 2	? [(307b	)+(310b)] x 100 ÷ (367b) x	0.22	222.52	(368)
Electrical energy for heat distribution	on	[(313) x	0.52	15.21	(372)
Total CO2 associated with commun	nity systems	(363)(366) + (368)(372	2)	431.02	(373)
CO2 associated with space heating	g (secondary)	(309) x	0	0	(374)
CO2 associated with water from im	mersion heater or instanta	neous heater (312) x	0.22	0	(375)
Total CO2 associated with space a	nd water heating	(373) + (374) + (375) =		431.02	(376)
CO2 associated with electricity for	pumps and fans within dwe	elling (331)) x	0.52	31.85	(378)
CO2 associated with electricity for	lighting	(332))) x	0.52	119.46	(379)
Energy saving/generation technolo Item 1	gies (333) to (334) as appli	cable	0.52 x 0.01 =	-132.04	(380)
Total CO2, kg/year	sum of (376)(382) =		_	450.28	(383)
Dwelling CO2 Emission Ra	te (383) ÷ (4) =			9.08	(384)
El rating (section 14)				93.62	(385)
13b. Primary Energy – Community	heating scheme				7
Electrical efficiency of CHP unit				32	<u> </u> (361)
Heat efficiency of CHP unit		_		50.4	(362)
		Energy kWh/year	Primary factor	P.Energy kWh/year	
Space heating from CHP)	(307a) × 100 ÷ (362) =	1352.19 ×	1.22	1649.67	(363)
less credit emissions for electricity	$-(307a) \times (361) \div (362) =$	432.7 ×	3.07	-1328.39	(364)
Water heated by CHP	(310a) × 100 ÷ (362) =	2519.84 ×	1.22	3074.2	(365)
less credit emissions for electricity	$-(310a) \times (361) \div (362) =$	806.35 ×	3.07	-2475.49	(366)
Efficiency of heat source 2 (%)	If there is CHP us	ing two fuels repeat (363) to	(366) for the second fue	el 95	(367b)
Energy associated with heat source	e 2 [(307b	)+(310b)] x 100 ÷ (367b) x	1.22	1256.83	(368)
Electrical energy for heat distribution	on	[(313) x	:	89.96	(372)
Total Energy associated with comm	nunity systems	(363)(366) + (368)(372	2) :	2266.78	(373)
if it is negative set (373) to zero	(unless specified otherwise	, see C7 in Appendix C	<b>(</b> )	2266.78	(373)
Energy associated with space heat	ting (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 and water heating	(373) + (374)	+ (375) =			2266.78	(376)
Energy associated with space cooling	(315) x		3.07	=	0	(377)
Energy associated with electricity for pumps and fans within	dwelling	(331)) x	3.07	=	188.37	(378)
Energy associated with electricity for lighting	(332))) x		3.07	=	706.63	(379)
Energy saving/generation technologies Item 1			3.07 × 0.0	)1 =	-781.05	(380)
Total Primary Energy, kWh/year sum of (37)	<b>7</b> 6)(382) =				2380.73	(383)

			Ll B	N - ( - ') -						
			User D							
Assessor Name:	Ross Boulton			Strom					028068	
Software Name:	Stroma FSAF			Softwa				Versio	n: 1.0.4.18	
	504 400 04 5			Address		06-01				
Address:	B2A-106-01, F	lat Type 2-20	A, Wimb	oledon, L	ondon					
1. Overall dwelling dime	ensions:		۸۳۵	o/m²\		۸۰٬ ۵۰	iaht/m\		Volumo/m³	١
Ground floor				<b>a(m²)</b> 49.6	(1a) x		ight(m) 2.6	(2a) =	Volume(m³	(3a)
	-) . (4  -) . (4  -) . (4  -)	(4.5)					2.0	(Zu) -	120.90	(ou)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d	)+(1e)+(1r	1)	49.6	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	.(3n) =	128.96	(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	<u> </u>	0	Ī = Ē	0	x :	20 =	0	(6b)
Number of intermittent fa	ans				, <u> </u>	2	x ·	10 =	20	(7a)
Number of passive vents	3				F	0	x	10 =	0	(7b)
·					Ļ		<u> </u>	40 =		Ⅎ``
Number of flueless gas f	ires				L	0	^	+0 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	ws flues and fans	= (6a)+(6b)+(7	7a)+(7b)+(	(7c) =	Г	20		÷ (5) =		(8)
If a pressurisation test has l	-				ontinue fr	20 rom (9) to		<del>.</del> (3) =	0.16	(6)
Number of storeys in t		•	, ,,				, ,		0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or tir	nber frame or	0.35 fo	r masonı	y constr	ruction			0	(11)
if both types of wall are p deducting areas of openi			the great	ter wall are	a (after					
If suspended wooden			.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	,	•	`	,,					0	(13)
Percentage of window	s and doors drau	ght 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									0.41	(18)
Air permeability value applie Number of sides sheltere		est has been dor	ne or a de	gree air pe	rmeability	is being u	sed			(19)
Shelter factor	<del>s</del> u			(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor	,		(21) = (18	) x (20) =				0.34	(21)
Infiltration rate modified	-								0.01	
Jan Feb		May Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Monthly average wind sp		- 1			•	•	•		ı	
(22)m= 5.1 5		4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	]	
		1		1	I	1	1	ı	1	
Wind Factor (22a)m = (2	<del>' ।                                     </del>	<u> </u>					_		1	
(22a)m= 1.27 1.25	1.23 1.1 1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infilti	ration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.44	0.43	0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4	]	
Calculate effe		_	rate for t	he appli	cable ca	se			!			<u>.</u>	<del></del>
If mechanic			andiv NL (O	ah) (aa	.\ <b></b>	augtion (I	NE\\ atha	nuina (22h	) (225)			0	(238
If exhaust air h									) = (23a)			0	(23h
If balanced wit		•	•	_								0	(230
a) If balance	1	·			·	<del>-                                    </del>	<del>,                                    </del>	<u> </u>	<del> </del>	<del></del>	<del>- ` ` `</del>	) ÷ 100] 1	(0.4)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24a
b) If balance	1	i	ntilation	without	heat red	covery (l	MV) (24b	m = (22)	· ·	1		7	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24)
c) If whole h if (22b)r	nouse ex m < 0.5 >			•	•				.5 × (23k	o)		_	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)r	ventilation								0.5]			-	
(24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24
Effective air	<del></del>		<u> </u>	<u> </u>	<del>_ ` </del>	<del>``</del>	<del></del>	<u> </u>				7	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58	]	(25)
3. Heat losse	es and he	eat loss r	paramete	er:									
ELEMENT	Gros	_	Openin		Net Ar	ea	U-val	ıe	ΑXU		k-valu	e ,	ΑXk
	area	(m <sup>2</sup> )	· m		A ,r	m²	W/m2	K	(W/	K)	kJ/m²•	K I	κJ/K
Windows Type	e 1				2.92	<sub>X</sub> 1	/[1/( 1.4 )+	0.04] =	3.87				(27)
Windows Type	e 2				6.79	<sub>X</sub> 1	/[1/( 1.4 )+	0.04] =	9				(27)
Windows Type	e 3				2.22	x1	/[1/( 1.4 )+	0.04] =	2.94				(27)
Walls	46.5	56	11.9	3	34.63	3 x	0.18	=	6.23	<u> </u>			(29)
Total area of	elements	, m²			46.56	<u></u>							(31)
* for windows and ** include the are						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	h 3.2	
Fabric heat lo	ss, W/K	= S (A x	U)				(26)(30)	+ (32) =				22.05	(33)
Heat capacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a).	(32e) =	484.86	(34)
Thermal mass	s parame	eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design asses				construct	ion are no	t known pi	recisely the	indicative	values of	TMP in T	able 1f		
can be used inste						,							
Thermal bridg	•	,		• .	•	<b>&lt;</b>						2.33	(36)
if details of therm Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			24.29	(37)
Ventilation he		alculator	l monthly	,					$= 0.33 \times ($	(25)m v (5)	<b>\</b>	24.38	(37)
	1	1			lun	11	1 1		i	1	<u> </u>	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(38)
(38)m= 25.38	25.22	25.06	24.33	24.19	23.56	23.56	23.44	23.8	24.19	24.47	24.76	J	(30)
Heat transfer	1				<b>I</b>				= (37) + (	1		7	
(39)m= 49.76	49.6	49.44	48.71	48.57	47.93	47.93	47.82	48.18	48.57	48.85	49.14		
Heat loss para	ameter (H	HLP), W	m²K		i -	i			Average = = (39)m ÷		12 /12=	48.71	(39)
(40)m= 1	1	1	0.98	0.98	0.97	0.97	0.96	0.97	0.98	0.98	0.99		
									Average =	Sum(40) <sub>1</sub>	12 /12=	0.98	(40)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x (T	ΓFA -13.		68		(42)
Reduce	the annua	l average	ater usag hot water person per	usage by	5% if the a	welling is	designed t		+ 36 a water us	se target o		.06		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
İ			day for ea										l	
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47	222 = 2	7(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		888.72	(44)
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117		
If instant	taneous w	ater heatir	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =		1165.26	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		inaludin	a 001/0	olor or M	WHE	otorogo	within or	mo voc	201			' 	(47)
•		, ,	nd no ta				_		ame ves	SEI		150		(47)
Otherw	vise if no	stored			-			' '	ers) ente	er '0' in (	47)			
	storage anufact		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
			storage	-				(48) x (49)	) =			0		(50)
•			eclared of factor fr	-								0		(51)
		-	ee secti		<b>-</b> (	., 0, 0.0	.,,					o		(01)
		from Tal										0		(52)
•			m Table									0		(53)
• • • • • • • • • • • • • • • • • • • •		m water 54) in (5	storage	, KVVh/ye	ear			(47) x (51)	x (52) x (	53) =	-	0		(54) (55)
	` ' '	, ,	culated f	or each	month			((56)m = (	55) × (41)r	m		U		(00)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	dedicated	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 Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
	•		culated to		•		. ,	, ,	m cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	culated	for each	month (	(61)m =	(60) ÷ 36	65 × (41)	)m			•		1	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for v	vater he	eating ca	alculated	l for e	ach month	(62)	m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 102.69 89.81	92.68	80.8	77.53	66.	1	71.		71.99	83.9	91.58	99.45	]	(62)
Solar DHW input calculated u	Ising Appe	endix G or	Appendix	H (ne	I gative quantit	y) (ent	ter '0	if no sola	contribu	tion to wate	r heating)	ı	
(add additional lines if F											0,		
(63)m= 0 0	0	0	0	0	0		)	0	0	0	0	]	(63)
Output from water heate	<del></del> er											•	
(64)m= 102.69 89.81	92.68	80.8	77.53	66.	61.99	71.	.14	71.99	83.9	91.58	99.45	]	
				<u> </u>		<u> </u>	Outp	out from wa	ater heate	er (annual)₁	l12	990.47	(64)
Heat gains from water h	neating,	kWh/mo	onth 0.2	5 ′ [0.	85 × (45)m	ı + (6	61)m	n] + 0.8 x	: [(46)m	ı + (57)m	+ (59)m	]	_
(65)m= 25.67 22.45	23.17	20.2	19.38	16.7	3 15.5	17.	.79	18	20.97	22.9	24.86	]	(65)
include (57)m in calcu	ulation o	of (65)m	only if c	ylinde	er is in the	dwell	ling	or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (see	Table 5	and 5a	):									-	
Metabolic gains (Table													
Jan Feb	Mar	Apr	May	Ju	n Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(66)m= 83.92 83.92	83.92	83.92	83.92	83.9	2 83.92	83.	.92	83.92	83.92	83.92	83.92		(66)
Lighting gains (calculate	ed in Ap	pendix	L, equat	ion L	or L9a), a	ılso s	see -	Table 5		•	•	•	
(67)m= 13.05 11.59	9.43	7.14	5.34	4.5	4.87	6.3	33	8.49	10.78	12.58	13.42	]	(67)
Appliances gains (calcu	ılated in	Append	dix L, eq	uatio	n L13 or L1	3a),	alsc	see Tal	ole 5			1	
(68)m= 146.2 147.71	143.89	135.75	125.48	115.	32 109.37	107	'.85	111.68	119.82	130.09	139.74		(68)
Cooking gains (calculat	ed in Ap	pendix	L, equat	ion L	15 or L15a	), als	o se	ee Table	5	•			
(69)m= 31.39 31.39	31.39	31.39	31.39	31.3	9 31.39	31.	.39	31.39	31.39	31.39	31.39		(69)
Pumps and fans gains (	Table 5	ia)			•					•		•	
(70)m= 0 0	0	0	0	0	0	(	)	0	0	0	0		(70)
Losses e.g. evaporation	n (negat	ive valu	es) (Tab	le 5)	•							•	
(71)m= -67.13 -67.13	-67.13	-67.13	-67.13	-67.	13 -67.13	-67	.13	-67.13	-67.13	-67.13	-67.13		(71)
Water heating gains (Ta	able 5)							-		-	-		
(72)m= 34.51 33.41	31.14	28.06	26.05	23.2	3 20.83	23	.9	25	28.19	31.8	33.42		(72)
Total internal gains =	-				(66)m + (67)n	n + (68	8)m +	+ (69)m + (	70)m + (	71)m + (72)	)m		
(73)m= 241.93 240.89	232.64	219.12	205.04	191.	73 183.25	186	5.26	193.34	206.96	222.65	234.75		(73)
6. Solar gains:													
Solar gains are calculated u	•	r flux from	Table 6a	and as	sociated equa	ations	to co	nvert to th	e applica		tion.		
Orientation: Access Fa Table 6d	actor	Area m²			Flux Table 6a		_	g_ able 6b	-	FF able 6c		Gains (W)	
0 11 1				_		,			_				,
Southeast 0.9x 0.77	X	2.9	12	x L	36.79	X		0.63	_ X	0.7	=	32.83	<u> </u> (77)
Southeast 0.9x 0.54	X	6.7	9	x L	36.79	X		0.63	×	0.7	=	53.55	<u> </u> (77)
Southeast 0.9x 0.77	X	2.2	2	x _	36.79	X		0.63	X	0.7	=	24.96	(77)
Southeast 0.9x 0.77	X	2.9	2	x L	62.67	X		0.63	X	0.7	=	55.93	(77)
Southeast 0.9x 0.54	X	6.7	9	x L	62.67	X	<u></u>	0.63	_ x [	0.7	=	91.21	(77)
Southeast 0.9x 0.77	X	2.2	2	x L	62.67	X	<u> </u>	0.63	x	0.7	=	42.52	(77)
Southeast 0.9x 0.77	X	2.9	2	x	85.75	X		0.63	x	0.7	=	76.52	(77)
Southeast 0.9x 0.54	X	6.7	9	X	85.75	X	1	0.63	x	0.7	=	124.79	(77)

Southeast 0.9x	0.77	x	2.2	2	x	8		x	0.63	$\neg$	хГ	0.7	$\neg$	_	58.18	(77)
Southeast 0.9x	0.77	X	2.9	12	X	1	06.25	X	0.63		x [	0.7	=	=	94.82	(77)
Southeast <sub>0.9x</sub>	0.54	X	6.7	9	X	1	06.25	X	0.63		x [	0.7	一	=	154.63	(77)
Southeast 0.9x	0.77	x	2.2	22	X	1	06.25	x	0.63		x [	0.7		=	72.09	(77)
Southeast 0.9x	0.77	x	2.9	2	X	1	19.01	x	0.63	$\equiv$	x [	0.7	$\equiv$	=	106.2	(77)
Southeast 0.9x	0.54	x	6.7	9	X	1	19.01	x	0.63		x [	0.7		=	173.19	(77)
Southeast 0.9x	0.77	x	2.2	22	X	1	19.01	x	0.63		x [	0.7	一	=	80.74	(77)
Southeast 0.9x	0.77	х	2.9	2	X	1	18.15	x	0.63		x [	0.7	一	=	105.44	(77)
Southeast 0.9x	0.54	Х	6.7	9	X	1	18.15	х	0.63		x [	0.7	司	=	171.94	(77)
Southeast 0.9x	0.77	X	2.2	22	X	1	18.15	х	0.63		x [	0.7	一	=	80.16	(77)
Southeast 0.9x	0.77	х	2.9	2	X	1	13.91	x	0.63		x [	0.7		=	101.65	(77)
Southeast 0.9x	0.54	х	6.7	9	X	1	13.91	x	0.63		x [	0.7		=	165.77	(77)
Southeast 0.9x	0.77	x	2.2	2	X	1	13.91	x	0.63		×	0.7		=	77.28	(77)
Southeast 0.9x	0.77	x	2.9	2	X	1	04.39	x	0.63		x [	0.7		=	93.16	(77)
Southeast 0.9x	0.54	х	6.7	9	X	1	04.39	x	0.63		x [	0.7		=	151.92	(77)
Southeast 0.9x	0.77	x	2.2	2	X	1	04.39	x	0.63		x [	0.7	一	=	70.82	(77)
Southeast 0.9x	0.77	X	2.9	2	X	9	92.85	x	0.63		x [	0.7		=	82.86	(77)
Southeast 0.9x	0.54	X	6.7	9	X	9	92.85	x	0.63		x [	0.7		=	135.12	(77)
Southeast 0.9x	0.77	x	2.2	2	X	9	2.85	x	0.63		x [	0.7	一	=	63	(77)
Southeast 0.9x	0.77	X	2.9	2	X	6	9.27	x	0.63		x [	0.7		=	61.81	(77)
Southeast 0.9x	0.54	X	6.7	9	X	6	9.27	x	0.63		x [	0.7		=	100.8	(77)
Southeast 0.9x	0.77	x	2.2	2	X	6	9.27	X	0.63		x [	0.7	$\exists$	=	47	(77)
Southeast 0.9x	0.77	x	2.9	12	X	4	14.07	X	0.63		x [	0.7	一	=	39.33	(77)
Southeast 0.9x	0.54	X	6.7	9	X	4	14.07	X	0.63		x	0.7		=	64.13	(77)
Southeast 0.9x	0.77	X	2.2	22	X	4	4.07	X	0.63		x [	0.7	一	=	29.9	(77)
Southeast 0.9x	0.77	X	2.9	12	X	3	31.49	x	0.63		x [	0.7		=	28.1	(77)
Southeast 0.9x	0.54	X	6.7	9	X	3	31.49	x	0.63		x [	0.7		=	45.82	(77)
Southeast 0.9x	0.77	x	2.2	2	X	3	31.49	X	0.63		x [	0.7	$\exists$	=	21.36	(77)
											_			ļ		
Solar gains in	watts, ca	alculated	for eac	n month	١			(83)m	= Sum(74)r	m(8	2)m				1	
(83)m= 111.34	189.66	259.5	321.53	360.14		57.54	344.7	315	5.9 280.9	8 20	9.61	133.36	95.2	29		(83)
Total gains – ir					·							1	1		l	
(84)m= 353.27	430.55	492.13	540.65	565.18	54	49.27	527.95	502	.16 474.3	2 41	16.58	356.01	330.	04		(84)
7. Mean inter	nal temp	erature	(heating	seasor	า)											
Temperature	during h	eating p	eriods ir	the liv	ing	area	from Tal	ole 9	Th1 (°C)						21	(85)
Utilisation fac	Ť		iving are	ea, h1,n	n (s	ee Ta	ble 9a)					1			l	
Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Ser	p (	Oct	Nov	D€	ec.		
(86)m= 1	0.99	0.96	0.89	0.74	(	0.55	0.4	0.4	4 0.67	C	).92	0.99	1			(86)
Mean internal	temper	ature in	living are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)			_	_			
(87)m= 20.07	20.27	20.52	20.78	20.94	2	0.99	21	2	1 20.97	7 2	0.76	20.36	20.0	)3		(87)
Temperature	during h	eating p	eriods ir	rest of	f dw	elling	from Ta	able 9	9, Th2 (°C	;)						
(88)m= 20.08	20.08	20.09	20.1	20.1	2	20.11	20.11	20.	11 20.11	1 2	20.1	20.1	20.0	9		(88)
									•							

l Itilie	ation fac	tor for a	ains for	rest of d	welling	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.95	0.85	0.69	0.48	0.32	0.35	0.6	0.89	0.98	1		(89)
		<u>!</u>	<u> </u>	<u> </u>	<u> </u>	ng T2 (f	<u> </u>				0.00	· .		(==)
(90)m=	19.24	19.44	19.69	19.94	20.06	20.11	20.11	20.11	20.09	19.92	19.54	19.21		(90)
` '		<u> </u>	<u> </u>	ļ	<u> </u>	<u> </u>	<u> </u>	ļ	f	LA = Livin	g area ÷ (4	4) =	0.49	(91)
Maan	. !	1 40 00 0 0 0		ماديد مماديد	میرام مام	II:a.\ fI	I A <b>T</b> 4	. /4 41	Λ\ Το			l		`
(92)m=	19.64	19.85	20.09	20.35	20.49	lling) = fl 20.54	20.54	+ (1 – 1L 20.54	20.52	20.33	19.94	19.61		(92)
						ature fro					13.34	13.01		(02)
(93)m=	19.64	19.85	20.09	20.35	20.49	20.54	20.54	20.54	20.52	20.33	19.94	19.61		(93)
		L	uirement	L	20.10	20.01	20.01	20.01	20.02	20.00	10.01	10.01		(3.2)
					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	•		ica at st	cp ii oi	Table 5	J, 30 tria	t 11,111—(	r Ojiii aii	a re care	diate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilis	ation fac	tor for g	ains, hm	1:					-					
(94)m=	0.99	0.98	0.95	0.86	0.71	0.51	0.36	0.39	0.63	0.9	0.98	0.99		(94)
Usef	ul gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	350.75	421.84	466.17	467.08	402.21	281.56	188.73	197.62	299.73	374.72	349.77	328.36		(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		e for mea		al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]				
(97)m=	763.36	741.27	672.12	557.68	426.88	284.64	189.05	198.17	309.43	472.74	627.25	757.25		(97)
-		<del>i i</del>	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97]	)m - (95	)ml x (4 <sup>-</sup>	1)m			
(98)m =						i		[(			ri –	<del></del>		
(90)111=	306.98	214.65	153.22	65.23	18.35	0	0	0	0	72.93	199.78	319.1		_
(90)111=	306.98	214.65	153.22	65.23	18.35	0		0	0	72.93	ri –	L	1350.25	(98)
		ļ	153.22 ement in	<u> </u>	<u> </u>	0		0	0	72.93	199.78	L	1350.25	(98)
Spac	e heatin	g require	ement in	kWh/m²	<u> </u>	0		0	0	72.93	199.78	L		=
Spac 8c. S	e heatin	g require	ement in Juiremer	kWh/m²	<u> </u>			0	0	72.93	199.78	L		=
Spac 8c. S	e heatin	g require	ement in Juiremer	kWh/m²	ı ²/year			0	0	72.93	199.78	L		=
Spac 8c. S Calcu	e heatin pace co plated fo Jan	g require	ement in Juiremen July and Mar	kWh/m² nt August. Apr	²/year See Tal May	ole 10b Jun	0 Jul	0 Tota	0 I per year	72.93 (kWh/year	199.78 r) = Sum(9	8)15,912 =		=
Spac 8c. S Calcu	e heatin pace co ulated fo Jan loss rate	g require	ement in Juiremen July and Mar	kWh/m² nt August. Apr	²/year See Tal May	ole 10b Jun	0 Jul	0 Tota	0 I per year	72.93 (kWh/year	199.78 r) = Sum(9	8) <sub>15,912</sub> =		=
Space 8c. S Calcu Heat (100)m=	e heatin pace co plated fo Jan loss rate	g require	ement in Juiremer July and Mar Iculated	kWh/m²  August.  Apr  using 29	See Tal May	ole 10b Jun	Jul perature	0 Tota Aug	0 I per year Sep ernal ten	72.93 (kWh/year	199.78 r) = Sum(9 Nov e from T	8) <sub>15,912</sub> =  Dec  able 10)		(99)
Space 8c. S Calcu Heat (100)m=	e heatin  pace co  ulated fo  Jan  loss rate  0  attion face	g require coling record r June, color Feb e Lm (calor	ement in Juiremer July and Mar Iculated	kWh/m²  August.  Apr  using 29	See Tal May	ole 10b Jun	Jul perature	0 Tota Aug	0 I per year Sep ernal ten	72.93 (kWh/year	199.78 r) = Sum(9 Nov e from T	8) <sub>15,912</sub> =  Dec  able 10)		(99)
Space  8c. S  Calcu  Heat  (100)m=  Utilis: (101)m=	e heatin  pace co  ulated fo  Jan  loss rate  0  ation face	g require coling recorder June, colored Feb e Lm (calored 0 ctor for lo	ement in uirement July and Mar Iculated 0 oss hm	kWh/m² August. Apr using 29	See Tal May 5°C inter	ole 10b  Jun rnal temp 450.58	Jul perature 354.71	O Total  Aug and extel 363.4	0 I per year  Sep ernal ten 0	72.93 (kWh/year Oct nperatur 0	199.78 T) = Sum(9  Nov e from T 0	8) <sub>15,912</sub> =  Dec able 10)		(100) (101)
Space  8c. S  Calcu  Heat  (100)m=  Utilis: (101)m=	pace co lated for Jan loss rate o ation face ul loss, h	g require coling recorder June, colored Feb e Lm (calored 0 ctor for lo	ement in uirement July and Mar Iculated 0 oss hm	kWh/m² August. Apr using 29	See Tal May 5°C inter 0	ole 10b  Jun rnal temp 450.58	Jul perature 354.71	O Total  Aug and extel 363.4	0 I per year  Sep ernal ten 0	72.93 (kWh/year Oct nperatur 0	199.78 T) = Sum(9  Nov e from T 0	8) <sub>15,912</sub> =  Dec able 10)		(100)
Space  8c. S  Calcu  Heat  (100)m=  Utilis.  (101)m=  Usefu  (102)m=  Gains	pace co  Jan  loss rate  o  ation face  ul loss, h  s (solar)	g require r June, c Feb e Lm (ca 0 ctor for lo	ement in Juirement July and Mar Iculated 0 pss hm 0 Vatts) = (	kWh/m² August. Apr using 29 0 (100)m >	See Tal May 5°C inter 0	ole 10b  Jun rnal temp 450.58	Jul perature 354.71 0.99	O Total  Aug and exte 363.4  0.99	Sep ernal ten 0	72.93 (kWh/year Oct nperatur 0	199.78 T) = Sum(9  Nov e from T 0	8) <sub>15,912</sub> =  Dec Table 10) 0		(100) (101) (102)
Space  8c. S  Calcu  Heat  (100)m=  Utilis:  (101)m=  Usefu  (102)m=  Gains: (103)m=	e heatin  pace co  ulated fo  Jan  loss rate  0  ation face  ul loss, heating of the color of th	g require r June, c Feb e Lm (ca 0 ctor for lo 0 nmLm (W 0 gains ca	ement in July and Mar Iculated 0 pss hm 0 Vatts) = 0 Iculated 0	kWh/m² August. Apr using 29 0 (100)m > 0 for appli	See Tal May 5°C inter 0 (101)m 0 cable we	ole 10b  Jun  rnal temp  450.58  0.98  439.44  eather re  727.49	Jul perature 354.71 0.99 351.27 egion, se 700.59	Aug and exte 363.4  0.99  358.53 e Table 669.61	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	199.78  Nov e from T  0  0	B) <sub>15,912</sub> = Dec Table 10)  0  0	27.22	(100) (101)
Space  8c. S  Calcu  Heat  (100)m=  Utilis  (101)m=  Usefu  (102)m=  Gains  (103)m=  Space	e heatin  pace co  ulated fo  Jan  loss rate  0  ation face  ul loss, h  s (solar e	g require  oling rec  r June, c  Feb  e Lm (ca  0  ctor for lo  nmLm (W  gains ca  0  g require	ement in uiremer July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0	kWh/m² August. Apr using 29 0 (100)m > for appli 0 r month,	See Tal May 5°C inter 0 (101)m 0 cable we	ole 10b  Jun  rnal temp  450.58  0.98  439.44  eather re  727.49	Jul perature 354.71 0.99 351.27 egion, se 700.59	Aug and exte 363.4  0.99  358.53 e Table 669.61	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0 0	199.78  Nov e from T  0  0	8) <sub>15,912</sub> =  Dec Table 10)  0	27.22	(100) (101) (102)
Space 8c. S Calcu Heat (100)m= Utilis (101)m= Usefu (102)m= Gains (103)m= Space set (1	pace coulated for Jan loss rate 0 ation face 0 loss, he cooling 104)m to	g require r June, c Feb e Lm (ca 0 ctor for lo 0 mLm (W 0 gains ca 0 g require 1 zero if (	ement in July and Mar Journal Coulated  Output   kWh/m² August. Apr using 29 0 (100)m > 0 for appli 0 r month, 3 × (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun rnal temp 450.58  0.98  439.44 eather re 727.49 dwelling,	Jul perature 354.71  0.99  351.27 egion, se 700.59 continue	0 Tota  Aug and exte 363.4  0.99  358.53 ee Table 669.61  ous ( kW	0	Oct nperatur 0 0 0 24 x [(10	199.78  Nov e from T 0  0  0  0  0  0  0  0  0  0  0  0  0	8) <sub>15,912</sub> =  Dec  able 10)  0  0  102)m];	27.22	(100) (101) (102)	
Space  8c. S  Calcu  Heat  (100)m=  Utilis  (101)m=  Usefu  (102)m=  Gains  (103)m=  Space	pace coulated for Jan loss rate 0 ation face 0 loss, he cooling 104)m to	g require  oling rec  r June, c  Feb  e Lm (ca  0  ctor for lo  nmLm (W  gains ca  0  g require	ement in uiremer July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0	kWh/m² August. Apr using 29 0 (100)m > for appli 0 r month,	See Tal May 5°C inter 0 (101)m 0 cable we	ole 10b  Jun  rnal temp  450.58  0.98  439.44  eather re  727.49	Jul perature 354.71 0.99 351.27 egion, se 700.59	Aug and exte 363.4  0.99  358.53 e Table 669.61	0   1   per year   Sep   ernal ten   0	72.93 (kWh/year  Oct nperatur 0  0  0  24 x [(10)	199.78  Nov e from T  0  0  0  0  0  0  0  0  0	8) <sub>15,912</sub> =  Dec  able 10)  0  0  102)m ] x	27.22 « (41)m	(100) (101) (102) (103)
Space  8c. S Calcu  Heat (100)m= Utilis (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	e heatin  pace co  ulated fo  Jan  loss rate  0  ation face  (solar e)  (se cooling (04)m to	g require  r June, c  Feb  e Lm (ca  ctor for lo  ctor for lo  gains ca  g require zero if (	ement in July and Mar Journal Coulated  Output   kWh/m² August. Apr using 29 0 (100)m > 0 for appli 0 r month, 3 × (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun rnal temp 450.58  0.98  439.44 eather re 727.49 dwelling,	Jul perature 354.71  0.99  351.27 egion, se 700.59 continue	0 Tota  Aug and exte 363.4  0.99  358.53 ee Table 669.61  ous ( kW	0   per year   Sep   ernal ten   0     0     10)   0     (h) = 0.0.0     0     Total	72.93 (kWh/year  Oct nperatur 0  0  0  24 x [(10) 0 = Sum(	199.78  Nov e from T 0  0  0  0  104)	8) <sub>15,912</sub> =   Dec   Table 10) 0 0 102)m] >	27.22 × (41)m 698.73	(100) (101) (102) (103)	
Space  8c. S  Calcu  Heat  (100)m=  Utilis: (101)m=  Gains  (103)m=  Space set (104)m=  Coolee	e heatin  pace co  ulated fo  Jan  loss rate  0  ation face  0  ul loss, h  0  s (solar e  0  te cooling  0  d fraction	g require r June, c Feb e Lm (ca 0 ctor for lo 0 mmLm (W 0 gains ca 0 g require zero if (	ement in July and Mar Journal Coulated  Output   kWh/m² August. Apr using 29 0 (100)m > 0 for appli 0 r month, 3 x (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun rnal temp 450.58  0.98  439.44 eather re 727.49 dwelling,	Jul perature 354.71  0.99  351.27 egion, se 700.59 continue	0 Tota  Aug and exte 363.4  0.99  358.53 ee Table 669.61  ous ( kW	0   per year   Sep   ernal ten   0     0     10)   0     (h) = 0.0.0     0     Total	72.93 (kWh/year  Oct nperatur 0  0  0  24 x [(10) 0 = Sum(	199.78  Nov e from T  0  0  0  0  0  0  0  0  0	8) <sub>15,912</sub> =   Dec   Table 10) 0 0 102)m] >	27.22 « (41)m	(100) (101) (102) (103)	
Space  8c. S  Calcu  Heat  (100)m=  Utilis: (101)m=  Gains  (103)m=  Space set (104)m=  Coolee	e heatin  pace co  ulated fo  Jan  loss rate  0  ation face  0  ul loss, h  0  s (solar of the cooling of the c	g require r June, c Feb e Lm (ca 0 ctor for lo 0 mmLm (W 0 gains ca 0 g require zero if (	ement in July and Mar Iculated 0 oss hm 0 lculated 0 lculated 0 ement for 104)m <	kWh/m² August. Apr using 29 0 (100)m > 0 for appli 0 r month, 3 x (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole come	ole 10b Jun rnal temp 450.58  0.98  439.44 eather re 727.49 dwelling,	Jul perature 354.71  0.99  351.27 egion, se 700.59 continue	0 Tota  Aug and exte 363.4  0.99  358.53 ee Table 669.61  ous ( kW	0   per year   Sep   ernal ten   0     0     10)   0     (h) = 0.0.0     0     Total	72.93 (kWh/year  Oct nperatur 0  0  0  24 x [(10) 0 = Sum(	199.78  Nov e from T 0  0  0  0  104)	8) <sub>15,912</sub> =   Dec   Table 10) 0 0 102)m] >	27.22 × (41)m 698.73	(100) (101) (102) (103)
Space  8c. S Calcu  Heat (100)m= Utilis (101)m= Gains (103)m= Space set (1 (104)m= Coolee Interm	e heatin  pace co  ulated fo  Jan  loss rate  0  ation face  0  ul loss, h  0  s (solar of the cooling of the c	g require  oling rec  r June, c  Feb  e Lm (ca  0  ctor for lo  omLm (W  gains ca  g require zero if (  0  actor (Ta	ement in uiremer July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement fo 104)m <	kWh/m² August. Apr using 29 0 (100)m > for appli 0 r month, 3 × (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole co)m 0	ole 10b Jun rnal temp 450.58  0.98  439.44 eather re 727.49 dwelling,	Jul perature 354.71  0.99  351.27 egion, se 700.59 continue	0 Tota Aug and exte 363.4 0.99 358.53 ee Table 669.61 ous ( kW	0   Sep   Sep   O   O   O   O   O   O   O   O   O	72.93 (kWh/year  Oct nperatur 0  0  0  24 x [(10 0 = Sum( cooled :	199.78  Nov e from T 0  0  0  0  1,0,4) area ÷ (4	8) <sub>15,912</sub> = Dec Table 10) 0 0 102)m ] x	27.22 × (41)m 698.73	(100) (101) (102) (103)

Space	cooling	requirer	ment for	month =	: (104)m	× (105)	× (106)r	n					_	
(107)m=	0	0	0	0	0	51.85	64.97	57.86	0	0	0	0		
•	Total = Sum(107) =													
Space	pace cooling requirement in kWh/m²/year $(107) \div (4) =$													
8f. Fab	ric Ene	rgy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabrio	Energ	y Efficie	ncy						(99)	+ (108) :	=		30.74	(109)
Targe	t Fabri	c Energ	y Efficie	ency (TF	EE)								35.36	(109)

			l lear F	Details:						
Access Name:	Ross Boulte	00	—— USEF L		o N	ho=-		CTDO	020060	
Assessor Name:				Strom					028068	
Software Name:	Stroma FS	AP 2012	Б ,	Softwa				versio	n: 1.0.4.18	
<b>.</b>	DOA 400 04		Property			Jb-U1				
Address :		, Flat Type 2-2	20A, Wimi	bledon, L	ondon					
Overall dwelling dime	ensions:		•	4 0						<b>.</b> .
Ground floor				a(m²)	l., ,		eight(m)	_	Volume(m <sup>3</sup>	<u>-</u>
Ground Hoor				49.6	(1a) x		2.6	(2a) =	128.96	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(	1d)+(1e)+(	1n)	49.6	(4)					
Dwelling volume					(3a)+(3b	)+(3c)+(3c	d)+(3e)+	(3n) =	128.96	(5)
2. Ventilation rate:										
	main heating	second heating		other		total			m³ per hou	ır
Number of chimneys	0	+ 0	<b>"</b> + [	0	<b> </b> =	0	х	40 =	0	(6a)
Number of open flues	0	+	╡ + ト	0	 	0	x	20 =	0	(6b)
Number of intermittent fa		J L			J    -	2	x	10 =	20	(7a)
					Ļ			10 =		= ' '
Number of passive vents					Ĺ	0			0	(7b)
Number of flueless gas f	ires					0	X	40 =	0	(7c)
								Air ch	anges per ho	r
Letter Constitution to the Second	. () (	(C-) · (Ch)	· (7-) · (7b) · ·	( <b>7</b> -)	_					_
Infiltration due to chimne					L Continuo fi	20		÷ (5) =	0.16	(8)
If a pressurisation test has be Number of storeys in t			eea 10 (17),	otrierwise (	conunue ii	om (9) to	(16)		0	(9)
Additional infiltration	ne aweiling (ns	)					[(0)	)-1]x0.1 =	0	(10)
Structural infiltration: 0	) 25 for steel or	timher frame	or 0 35 fo	r masoni	ry consti	ruction	[(9)	)-1]X0.1 =	0	(11)
if both types of wall are p					•	uction			0	(11)
deducting areas of openi					`					
If suspended wooden	floor, enter 0.2	(unsealed) or	0.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else e	enter 0							0	(13)
Percentage of window	s and doors dra	aught stripped							0	(14)
Window infiltration				0.25 - [0.2	2 x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic met	res per ho	our per s	quare m	etre of e	envelope	e area	5	(17)
If based on air permeabi	lity value, then	$(18) = [(17) \div 20]$	+(8), otherw	rise (18) = (	(16)				0.41	(18)
Air permeability value applie	es if a pressurisatio	n test has been o	lone or a de	gree air pe	rmeability	is being u	sed			_
Number of sides sheltered	ed								2	(19)
Shelter factor				(20) = 1 -	[0.075 x ( <sup>*</sup>	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fact	tor		(21) = (18	) x (20) =				0.34	(21)
Infiltration rate modified	for monthly win	d speed							•	
Jan Feb	Mar Apr	May Jur	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table	e 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 Easter (22a) (2	(2)m · 4									
Wind Factor $(22a)m = (2a)m =$	.∠)III <del>-</del> 4	1.00	0.05	T 0.02	ı	r		Г	1	

1.1

1.08

0.95

0.95

0.92

1.08

1.12

1.18

1.23

(22a)m=

1.27

1.25

	ation rate (all	owing for st	nelter an	d wind s	:peed) =	(21a) x	(22a)m					
0.44	0.43 0.4	1	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4		
<i>Calcul<mark>ate effec</mark></i> If mechanica	<i>ctive air chan</i> al ventilation:	-	the applic	cable ca	se						0	(23
	eat pump using /		?3b) = (23a	ı) × Fmv (e	equation (N	N5)), other	wise (23b	) = (23a)			0	(23
	h heat recovery:		, ,	, ,	• `	,, .	,	, ( ,			0	(23
	ed mechanica	,	Ū		`	,		2h)m + (	23h) 🗴 [	1 <i>– (2</i> 3c)	_	(20
(24a)m= 0	0 0		0	0	0	0	0	0	0	0		(24
	ed mechanica	L I ventilation	without	heat red	covery (N	<b>∟</b> Л\/) (24b	)m = (22	2b)m + (;	L 23h)			
24b)m= 0	0 0		0	0	0	0	0	0	0	0		(24
	ouse extract	ventilation (	or positiv	re input v	ventilatio	n from c	utside	ļ				
,	$n < 0.5 \times (23)$		•	•				.5 × (23b	)			
24c)m= 0	0 0	0	0	0	0	0	0	0	0	0		(2
d) If natural	ventilation or	whole hous	se positiv	e input	ventilatio	on from I	oft	•		•	•	
if (22b)n	n = 1, then (2	(4d)m = (22)	b)m othe	rwise (2	:4d)m = (	0.5 + [(2	2b)m² x	0.5]		,	•	
24d)m= 0.6	0.59 0.5	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(2
Effective air	change rate	- enter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				•	
25)m= 0.6	0.59 0.5	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(2
3. Heat losse	s and heat lo	ss naramet	er.									
ELEMENT	Gross	Openir		Net Ar	ea ·ea	U-valı	IE.	AXU		k-value	_ Δ	Χk
LLEIVILINI	area (m²)	r		A ,r		W/m2		(W/I	<)	kJ/m²·l		J/K
Vindows Type	<del>)</del> 1			2.92	x1/	[1/( 1.35 )+	- 0.04] =	3.74				(2
Vindows Type	e 2			6.79	<u></u>	[1/( 1.35 )+	- 0.04] =	8.7	=			(2
Vindows Type	∋ 3			2.22	<b>=</b>   <sub>x1</sub> /	[1/( 1.35 )+	- 0.04] =	2.84	=			(2
Valls	46.56	11.9	3	34.63	3 x	0.15		5.19	=			(2
otal area of e			<u> </u>	46.56	_	00		00				` (3
for windows and	•	ıse effective w	indow U-va			ı formula 1	/[/4/  ]	10) 10 041 0	ıs aiven in	paragraph		(0
* include the area					J		/II I/U-Vail	101+0.041 a			1 3.2	
abric heat los	ss, W/K = S(A)	A x U)					/[( I/ <b>U-</b> Valu	<i>le)</i> +0.04j a	o givoii iii	, <del>.</del>	1 3.2	
Heat capacity	$Cm = S(\Lambda \times I)$	,				(26)(30)		ie)+0.04j a	o givoiriii	,	20.48	(3
.sac supuonty	CIII = S(A X )	,				(26)(30)	+ (32) =	(30) + (32				==
• •	•	<b>(</b> )	÷ TFA) in	n kJ/m²K		(26)(30)	+ (32) = ((28)		2) + (32a).		20.48	(3
Thermal mass  For design assess	parameter (	( ) TMP = Cm - e details of the	,			, , , ,	+ (32) = ((28) Indica	(30) + (32	2) + (32a). : Low	(32e) =	20.48 484.86	(3
Thermal mass For design assess an be used inste	s parameter (\bar{1} sments where the ead of a detailed in	( )  TMP = Cm - e details of the calculation.	constructi	ion are no	t known pr	, , , ,	+ (32) = ((28) Indica	(30) + (32	2) + (32a). : Low	(32e) =	20.48 484.86	(3
Thermal mass For design assess can be used inste	s parameter (Tesments where the lad of a detailed less: S (L x Y)	TMP = Cm - e details of the calculation. calculated	constructi	ion are noi	t known pr	, , , ,	+ (32) = ((28) Indica	(30) + (32	2) + (32a). : Low	(32e) =	20.48 484.86	(3
Fhermal mass For design assess can be used instea Fhermal bridge f details of therma	s parameter (Tesments where the lead of a detailed less: S (L x Y) all bridging are no	TMP = Cm - e details of the calculation. calculated	constructi	ion are noi	t known pr	, , , ,	+ (32) = ((28) Indica	(30) + (32 tive Values	2) + (32a). : Low	(32e) =	20.48 484.86 100 6.98	(3)
Fhermal mass for design assess an be used instead for the mal bridge of details of thermal fotal fabric he	s parameter (Tesments where the land of a detailed less: S (L x Y) all bridging are not last loss	TMP = Cm - e details of the calculation. calculated ot known (36) =	constructiusing Ap	ion are noi	t known pr	, , , ,	(28) Indica indicative	(30) + (32) tive Value: e values of	2) + (32a).: : Low TMP in T	(32e) =	20.48 484.86 100	(3)
Fhermal mass For design assess Fan be used instea Fhermal bridge F details of therma Fotal fabric he Fentilation hea	s parameter (Tesments where the lad of a detailed lees: S (L x Y) all bridging are not leat loss calculated.	TMP = Cm - e details of the calculation. calculated ot known (36) =	constructi	pendix I	t known pr	recisely the	(28) Indica indicative (33) + (38)m	(30) + (32) tive Value: e values of  (36) = = 0.33 × (	2) + (32a). : Low TMP in To 25)m x (5)	(32e) =	20.48 484.86 100 6.98	(3)
Thermal mass for design assess an be used instead for thermal bridge details of thermal fotal fabric he fentilation head	s parameter (Tesments where the lead of a detailed lees: S (L x Y) all bridging are not leat loss at loss calculated less M	TMP = Cm - e details of the calculation. calculated ot known (36) =	using Ap = 0.05 x (3	opendix I  Jun	t known pr	recisely the	(33) + (38)m Sep	(30) + (32) tive Values e values of  (36) = = 0.33 × (	2) + (32a). Low TMP in To 25)m x (5) Nov	(32e) = able 1f	20.48 484.86 100 6.98	(3)
Thermal mass for design assess an be used instead for details of thermal for the formal fabric hed for the formal fabric hed for the formal fabric hed fab	s parameter (Tesments where the lad of a detailed less: S (L x Y) all bridging are not lest loss at loss calculated less. The lad of	TMP = Cm - e details of the calculation. calculated ot known (36) = ated monthl ar Apr 06 24.33	constructi	pendix I	t known pr	recisely the	(33) + (38)m Sep 23.8	(30) + (32) tive Values of e values of  (36) = = 0.33 × (  Oct 24.19	2) + (32a). Low TMP in T. 25)m x (5 Nov 24.47	(32e) =	20.48 484.86 100 6.98	(3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (3 (
Thermal mass For design assess For design assess For mal bridge For details of thermal For the management Fo	s parameter (Tesments where the lad of a detailed less: S (L x Y) all bridging are not loss at loss calculated by the latter of	TMP = Cm - e details of the calculation. calculated of known (36) = ated monthl ar Apr 06 24.33	using Ap = 0.05 x (3  y  May 24.19	pendix I  Jun  23.56	t known pr K Jul 23.56	Aug 23.44	(33) + (38)m Sep (39)m	(30) + (32) tive Value: e values of  (36) = = 0.33 × (  Oct 24.19 = (37) + (32)	2) + (32a). Low TMP in To 25)m x (5) Nov 24.47	(32e) = able 1f  Dec 24.76	20.48 484.86 100 6.98	(3)
Thermal mass For design assess For design assess For mal bridge For details of thermal For the management Fo	s parameter (Tesments where the lad of a detailed less: S (L x Y) all bridging are not lest loss at loss calculated less. The lad of	TMP = Cm - e details of the calculation. calculated of known (36) = ated monthl ar Apr 06 24.33	using Ap = 0.05 x (3	opendix I  Jun	t known pr	recisely the	(33) + (38)m Sep 23.8 (39)m 51.26	(30) + (32) tive Values of  (36) = = 0.33 × (  Oct 24.19 = (37) + (32)	22) + (32a). Low TMP in To 25)m x (5) Nov 24.47 38)m 51.93	(32e) = able 1f  Dec 24.76	20.48 484.86 100 6.98 27.46	(3)
Fhermal mass For design assess Fan be used instead Fhermal bridge F details of thermal Fotal fabric he Fentilation head Jan Sas)m= 25.38  Heat transfer co Say)m= 52.84	s parameter (Tasments where the lad of a detailed les : S (L x Y) all bridging are not lest loss calculated less calculated le	TMP = Cm - e details of the calculation. calculated ot known (36) = ated monthl ar Apr 06 24.33	using Ap = 0.05 x (3  y  May 24.19	pendix I  Jun  23.56	t known pr K Jul 23.56	Aug 23.44	(33) + (38)m Sep 23.8 (39)m 51.26	(30) + (32) tive Value: e values of  (36) = = 0.33 × (  Oct 24.19 = (37) + (32)	22) + (32a). Low TMP in To 25)m x (5) Nov 24.47 38)m 51.93 Sum(39),	(32e) = able 1f  Dec 24.76	20.48 484.86 100 6.98	(3)
Fhermal mass For design assess can be used instea Thermal bridge f details of therma Fotal fabric he Ventilation hea Jan 38)m= 25.38 Heat transfer of	s parameter (Tasments where the lad of a detailed les : S (L x Y) all bridging are not lest loss calculated less calculated le	TMP = Cm - e details of the calculation. calculated of known (36) = ated monthl ar Apr 06 24.33  T/K 52 51.79  , W/m²K	using Ap = 0.05 x (3  y  May 24.19	pendix I  Jun  23.56	t known pr K Jul 23.56	Aug 23.44	(33) + (38)m Sep 23.8 (39)m 51.26	(30) + (32) tive Values of  e values of  (36) = = 0.33 × (  Oct 24.19 = (37) + (32)  Strenge = (37) + (32)	22) + (32a). Low TMP in To 25)m x (5) Nov 24.47 38)m 51.93 Sum(39),	(32e) = able 1f  Dec 24.76	20.48 484.86 100 6.98 27.46	(36)

Number of days in month (Table 1a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	gy requi	rement:								kWh/ye	ear:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x (T	ΓFA -13.		68		(42)
Reduce	the annua	l average	ater usag hot water person per	usage by	5% if the a	welling is	designed t			se target o		.06		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
İ			day for ea										Ī	
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		7(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		888.72	(44)
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117		
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Γotal = Su	m(45) <sub>112</sub> =	=	1165.26	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		includin	a anv sa	olar or M	/\//HRS	storage	within es	me ves	امء		0	1	(47)
•		, ,	nd no ta				_		arrie ves	361		0		(47)
Otherw	vise if no	stored	hot wate		-			' '	ers) ente	er '0' in (	47)			
	storage anufact		eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	rature fa	actor fro	m Table	2b								0		(49)
			storage	-				(48) x (49)	) =			0		(50)
•			eclared of factor fr	-								0		(51)
		-	ee secti		- (		,,					0	l	(= -)
		from Tal		01								0		(52)
•			m Table						(==> (	>		0		(53)
• • • • • • • • • • • • • • • • • • • •		m water 54) in (5	storage	, KVVh/ye	ear			(47) x (51)	x (52) x (	53) =	-	0		(54) (55)
	` ' '	, ,	culated f	or each	month			((56)m = (	55) × (41)r	m		U		(00)
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	dedicated	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 Append	I ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (an	nual) fro	m Table	3							0		(58)
	•		culated from Tab		,		. ,	, ,		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss cal	culated	for each	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 for wat	ter he	eating ca	alculated	l for	each month	(62)r	n = 0.85 >	د (45)m	+ (46)m +	(57)m +	(59)m + (61)m	
	2.68	80.8	77.53	_	61.99	71.		<u> </u>	<del>-                                    </del>	99.45		(62)
Solar DHW input calculated using	g Appe	endix G or	Appendix	H (n	egative quantity	) (ent	er '0' if no so	lar contril	ution to wate	er heating)	l	
(add additional lines if FGI												
(63)m= 0 0	0	0	0		0 0	0	0	0	0	0		(63)
Output from water heater				•	· · · · · · · · · · · · · · · · · · ·				<u>.</u>		•	
· — — — —	2.68	80.8	77.53	66	61.99	71.′	14 71.99	83.9	91.58	99.45		
<u> </u>				•			Output from	water hea	ater (annual) <sub>1</sub>	112	990.47	(64)
Heat gains from water hea	iting,	kWh/mo	onth 0.2	5 ´[	0.85 × (45)m	+ (6	1)m] + 0.8	3 x [(46)	m + (57)m	+ (59)m	]	_
(65)m= 25.67 22.45 23	3.17	20.2	19.38	16	.73 15.5	17.7	79 18	20.9	7 22.9	24.86		(65)
include (57)m in calcula	tion o	of (65)m	only if c	ylin	der is in the o	dwelli	ng or hot	water is	from com	munity h	neating	
5. Internal gains (see Ta	ble 5	and 5a	):								-	
Metabolic gains (Table 5),	Watt	S										
	<i>M</i> ar	Apr	May	J	un Jul	Αι	ıg Sep	Oc	t Nov	Dec		
(66)m= 83.92 83.92 83	3.92	83.92	83.92	83	.92 83.92	83.9	92 83.92	83.9	2 83.92	83.92		(66)
Lighting gains (calculated	in Ap	pendix	L, equat	ion l	 _9 or L9a), a	lso s	ee Table t	 5	•	•		
(67)m= 13.03 11.58 9.	.41	7.13	5.33	4	.5 4.86	6.3	2 8.48	10.7	7 12.57	13.4		(67)
Appliances gains (calculat	ed in	Append	dix L, eq	uati	on L13 or L1	3a), a	also see T	able 5	•	•	<u>.</u>	
	3.89	135.75	125.48		5.82 109.37	107.			2 130.09	139.74		(68)
Cooking gains (calculated	in Ap	pendix	L, equat	tion	L15 or L15a)	, also	see Tab	le 5	•		<u>.</u>	
(69)m= 31.39 31.39 31	.39	31.39	31.39	31	.39 31.39	31.3	31.39	31.3	31.39	31.39		(69)
Pumps and fans gains (Ta	ble 5	a)			•		•	<u>.</u>	•		•	
(70)m= 0 0	0	0	0		0 0	0	0	0	0	0		(70)
Losses e.g. evaporation (r	negati	ive valu	es) (Tab	le 5	)		•		•	•	•	
(71)m= -67.13 -67.13 -67	7.13	-67.13	-67.13	-67	7.13 -67.13	-67.	13 -67.13	-67.1	3 -67.13	-67.13		(71)
Water heating gains (Table	e 5)			•	•		•		•	•	•	
(72)m= 34.51 33.41 31	.14	28.06	26.05	23	.23 20.83	23.	9 25	28.1	31.8	33.42		(72)
Total internal gains =					(66)m + (67)m	+ (68	)m + (69)m	+ (70)m +	(71)m + (72)	)m		
(73)m= 241.91 240.88 23.	2.62	219.11	205.03	19	1.72 183.24	186.	25 193.33	3 206.9	5 222.63	234.73		(73)
6. Solar gains:												
Solar gains are calculated using	g solar	flux from	Table 6a	and a	associated equa	tions t	o convert to	the appli	cable orientat	tion.		
Orientation: Access Factor	or	Area			Flux		g_ 		FF		Gains	
Table 6d	_	m²			Table 6a	_	Table 6	D	Table 6c		(W)	_
Southeast 0.9x 0.77	X	2.9	2	x	36.79	X	0.5	X	0.8	=	29.78	(77)
Southeast 0.9x 0.54	X	6.7	'9	x [	36.79	X	0.5	X	0.8	=	48.57	(77)
Southeast 0.9x 0.77	X	2.2	22	x	36.79	x	0.5	X	0.8	=	22.64	(77)
Southeast 0.9x 0.77	X	2.9	2	x	62.67	x	0.5	X	0.8	=	50.73	(77)
Southeast 0.9x 0.54	X	6.7	'9	x	62.67	x	0.5	X	0.8	=	82.73	(77)
Southeast 0.9x 0.77	X	2.2	2	x	62.67	x	0.5	X	0.8	=	38.57	(77)
Southeast 0.9x 0.77	x	2.9	12	x	85.75	x	0.5	X	0.8	=	69.41	(77)
Southeast 0.9x 0.54	x	6.7	'9	x [	85.75	х	0.5	X	0.8	=	113.19	(77)

Southea	est o ou F		<del></del>		_				1			¬			ĺ		7(77)
Southea	<u> </u>	0.77	X	2.2		X		85.75	] X ]		0.5	×	0.8	=	=	52.77	(77)
	느	0.77	×	2.9		X		06.25	] X ]		0.5	×	0.8	=	=	86	(77)
Southea	<u> </u>	0.54	X	6.7		X		06.25	] X ]		0.5	×	0.8	=	=	140.25	(77)
Southea	<u> </u>	0.77	X	2.2	2	X		06.25	X		0.5	×	0.8	_	=	65.39	<b>—</b> (77)
Southea	느	0.77	X	2.9	2	X	1	19.01	X		0.5	X	0.8	_	=	96.33	(77)
Southea	<u> </u>	0.54	X	6.7	9	X	1	19.01	X		0.5	X	0.8	_	=	157.09	(77)
Southea	<u> </u>	0.77	X	2.2	2	X	1	19.01	X		0.5	X	0.8		=	73.24	(77)
Southea	<u> </u>	0.77	X	2.9	2	X	1	18.15	X		0.5	X	0.8		=	95.63	(77)
Southea	ast 0.9x	0.54	X	6.7	9	X	1	18.15	X		0.5	X	0.8		=	155.96	(77)
Southea	ast 0.9x	0.77	X	2.2	2	X	1	18.15	X		0.5	X	0.8		=	72.71	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.9	2	X	1	13.91	X		0.5	X	0.8		=	92.2	(77)
Southea	ast <sub>0.9x</sub>	0.54	X	6.7	9	X	1	13.91	X		0.5	X	0.8		=	150.36	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.2	2	X	1	13.91	x		0.5	x	0.8		=	70.1	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.9	2	X	1	04.39	x		0.5	x	0.8		=	84.5	(77)
Southea	ast <sub>0.9x</sub>	0.54	X	6.7	9	X	1	04.39	X		0.5	x	0.8		=	137.79	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.2	2	X	1	04.39	x		0.5	X	0.8		=	64.24	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.9	2	X	9	2.85	x		0.5	x	0.8		= [	75.16	(77)
Southea	ast <sub>0.9x</sub>	0.54	X	6.7	9	X	9	2.85	x		0.5	x	0.8		= [	122.56	(77)
Southea	ast <sub>0.9x</sub>	0.77	x	2.2	2	X	9	2.85	x		0.5	x	0.8	$\equiv$	= [	57.14	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.9	2	X	6	9.27	х		0.5	х	0.8		=	56.07	(77)
Southea	ast <sub>0.9x</sub>	0.54	X	6.7	9	X	6	9.27	x		0.5	х	0.8		=	91.43	(77)
Southea	ast 0.9x	0.77	X	2.2	2	X	6	9.27	х		0.5	x	0.8		=	42.63	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.9	2	X	4	4.07	х		0.5	x	0.8		=	35.67	(77)
Southea	ast <sub>0.9x</sub>	0.54	X	6.7	9	X	4	4.07	х		0.5	х	0.8		=	58.17	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.2	2	X	4	4.07	x		0.5	x	0.8		=	27.12	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.9	2	X	3	31.49	х		0.5	x	0.8		=	25.49	(77)
Southea	ast <sub>0.9x</sub>	0.54	x	6.7	9	X	3	31.49	x		0.5	x	0.8		=	41.56	(77)
Southea	ast <sub>0.9x</sub>	0.77	x	2.2	2	X	3	31.49	x		0.5	×	0.8		=	19.38	(77)
	_								,						,		
Solar g	ains in v	watts, cal	lculated	for eacl	n month	1			(83)m	n = Sun	n(74)m	(82)m					
(83)m=	100.99	172.03	235.37	291.64	326.66	3	24.3	312.66	286	.53	254.86	190.12	2 120.96	86.4	3		(83)
Total g	ains – ir	nternal ar	nd solar	(84)m =	: (73)m	+ (8	83)m	, watts					_				
(84)m=	342.9	412.9	467.99	510.75	531.69	5	16.02	495.89	472	.78	448.19	397.07	343.59	321.1	16		(84)
7. Me	an inter	nal tempe	erature	(heating	seasor	n)											
Temp	erature	during he	eating p	eriods ir	the liv	ing	area	from Tal	ole 9	, Th1	(°C)					21	(85)
Utilisa	tion fac	tor for ga	ins for I	iving are	a, h1,n	า (ร	ee Ta	ıble 9a)							,		
	Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	Oct	Nov	De	С		
(86)m=	0.95	0.92	0.88	0.8	0.7	(	0.55	0.42	0.4	16	0.64	0.83	0.93	0.96	;		(86)
Mean	internal	tempera	ture in l	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)		•			•	
(87)m=	18.94	19.27	19.7	20.19	20.59	_	0.85	20.95	20.	- 1	20.76	20.23	19.5	18.8	8		(87)
L	erature	during he	ating n	eriode in	rest of	- 4\v	مراالم	from To	able (	 G Th'	I					l	
(88)m=	20.03	20.03	20.03	20.05	20.05	_	20.06	20.06	20.		20.06	20.05	20.04	20.0	4		(88)
()								L					1				. ,

l Itilie:	ation fac	tor for a	ains for I	rest of d	welling	h2 m (se	a Tahla	0a)						
(89)m=	0.95	0.91	0.86	0.78	0.65	0.49	0.34	0.38	0.58	0.81	0.92	0.95		(89)
Mean	interna	temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	r in Tabl	e 9c)	<u>l</u>	<u>I</u>		
(90)m=	18.15	18.47	18.89	19.37	19.74	19.96	20.04	20.03	19.89	19.42	18.71	18.1		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.49	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	A × T1	+ (1 – fl	A) × T2					
(92)m=	18.53	18.86	19.29	19.77	20.15	20.4	20.48	20.47	20.31	19.81	19.09	18.48		(92)
	/ adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.53	18.86	19.29	19.77	20.15	20.4	20.48	20.47	20.31	19.81	19.09	18.48		(93)
8. Sp	ace hea	ting requ	uirement											
				•		ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the ut			or gains						_	_				
Liera	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.93	tor for g	ains, hm <sub>0.85</sub>	0.77	0.66	0.51	0.38	0.41	0.6	0.8	0.9	0.94		(94)
(94)m=			, W = (94	L		0.51	0.36	0.41	0.0	0.0	0.9	0.94		(34)
(95)m=	319.97	370.89	397.12	393.17	350.57	265.49	188.57	195.14	269.6	316.83	310.39	302.47		(95)
. ,			rnal tem	<u> </u>			.00.0.		200.0	0.0.00	0.0.00	002		( )
(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	for mea	an intern	ıal tempe	erature,	Lm , W =	-[(39)m :	x [(93)m	– (96)m	]		ļ		
(97)m=	752.09	735.35	671.55	563.18	436.61	295.66	197.94	207.16	318.51	475.98	622.82	745.64		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	321.5	244.91	204.18	122.41	64.01	0	0	0	0	118.4	224.95	329.72		
								Tota	l per year	(kWh/year	) = Sum(9	8)15,912 =	1630.07	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								32.86	(99)
8c. S	pace co	oling rec	quiremen	nt										
Calcu	lated fo	r June, c	July and	August.	See Tal	ole 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
										<del></del>		able 10)		
(100)m=		0	0	0	0	479.54	377.51	386.81	0	0	0	0		(100)
	ation fac					0.05	0.0	0.00		_				(101)
(101)m=		0	0	0	0 (4.04)	0.85	0.9	0.88	0	0	0	0		(101)
(102)m=		mLm (v	/atts) = (	(100)m x	(101)m	408.44	339.25	342.23	0	0	0	0		(102)
		_	L ollowed	<u> </u>						U	U	0		(102)
(103)m=		0	0		0	686.58	661.15	633.46	0	0	0	0		(103)
		_										102)m ] :	c (41)m	( /
•	,		104)m <	-		woming,	oonima	340 ( NV	11) — 0.01	211/10	,0,111 (	102)111 ] )	( ( 1 /////	
(104)m=	0	0	0	0	0	200.27	239.49	216.68	0	0	0	0		
				-					Total	= Sum(	104)	=	656.44	(104)
Cooled	d fraction								f C =	cooled	area ÷ (4	4) =	1	(105)
Interm	ittency fa	,		<del>i                                      </del>	_	0.05	0.05	0.05						
		actor (Ta	able 10b	0	0	0.25	0.25	0.25	0 Total	0 I = Sum(	0	0	0	(106)

Space cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n					_	
(107)m= 0	0	0	0	0	50.07	59.87	54.17	0	0	0	0		
								Total	= Sum(	107)	=	164.11	(107)
Space cooling	requiren	ment in k	:Wh/m²/y	/ear				(107)	) ÷ (4) =			3.31	(108)
8f. Fabric Ene	rgy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric Energy	y Efficier	псу						(99) -	+ (108) =	=		36.17	(109)

			lloor 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-106-01, Flat T			Address		06-01				
1. Overall dwelling dim		ype 2-20	Λ, VVIIIII	Jiedon, L	OHUOH					
1. Overall aweiling aim			Are	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup>	3)
Ground floor					(1a) x		2.6	(2a) =	128.96	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+(1d)+(1	e)+(1r	n)	49.6	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	128.96	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0	+ [	0	= [	0	X e	40 =	0	(6a)
Number of open flues	0 +	0	Ī + Ē	0	Ī = Ē	0	x :	20 =	0	(6b)
Number of intermittent f	ans				, <u> </u>	0	x	10 =	0	(7a)
Number of passive vent	s				F	0	x	10 =	0	(7b)
Number of flueless gas	fires				F	0	x -	40 =	0	(7c)
<b>3</b>					L					(, ,
								Air ch	nanges per ho	our
Infiltration due to chimne	eys, flues and fans = (	6a)+(6b)+(7	'a)+(7b)+(	(7c) =	Γ	0		÷ (5) =	0	(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)
	nings); if equal user 0.35	sportaing to	ine great	er wan are	a (aitei					
If suspended wooden	floor, enter 0.2 (unsea	iled) or 0.	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, e	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2			(45)		0	(15)
Infiltration rate		L:		(8) + (10)	, , ,	, , ,	, ,		0	(16)
If based on air permeab	e, q50, expressed in cubility value, then $(18) = 10$		•	•	•	etre or e	envelope	area	5	(17)
•	lies if a pressurisation test ha					is beina u	sed		0.25	(18)
Number of sides shelter				, ,	,	3			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 <i>÷ 1</i>									
(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	
(-20)	0	1 3.55	L 5.55	1 0.02		L	I ''' <sup>2</sup>	L '''	]	

	ration rate	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.27	0.27	0.26	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	•		•	•	•	•	
If mechanical If exhaust air h			andiv N. (2	2h) _ (22a	) v Emy (c	auation (N	JEN otho	ruino (22h	) - (22a)			0.5	(23a)
									) = (23a)			0.5	(23b)
If balanced with		•	•	Ū		`			21.)	001) [	4 (00.)	0	(23c)
a) If balance	1 1					<del></del>	<del>- ´ ` -</del>	<u> </u>	<del> </del>	<del> </del>	<del>1 ` ´</del>	÷ 100] I	(240)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance							<del>ÉÉÉ</del>	<u> </u>	<del> </del>	<del></del>		İ	(0.41.)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)r	nouse ext m < 0.5 ×			•	•				.5 × (23b	))			
(24c)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		(24c)
d) If natural if (22b)r	ventilation $n = 1$ , the								0.5]			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(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		(25)
2 Heat lead	o and ha	ot loop r	aramata	~ P.							•		
3. Heat losse	S and ne	•			Net Ar	00	U-valı	10	AXU		k-value		\
ELEMENT	area	_	Openin m		A,r		W/m2		(W/I	<b>K</b> )	kJ/m²-l		J/K
Windows Type	e 1				2.92	x1/	[1/( 1.35 )+	0.04] =	3.74	,			(27)
Windows Type	e 2				6.79	<u></u>	[1/( 1.35 )+	- 0.04] =	8.7	=			(27)
Windows Type	e 3				2.22		[1/( 1.35 )+	· 0.04] <sub>=</sub>	2.84	Ħ			(27)
Walls	46.5	6	11.93	$\overline{}$	34.63	=	0.15		5.19	=			(29)
Total area of e					46.56	=	00		00				(31)
* for windows and			ffective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	ns aiven in	paragraph	3.2	(01)
** include the area								2(	,	<b>J</b>	7-3-3-7		
Fabric heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				20.48	(33)
Heat capacity	Cm = S(	Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	484.86	(34)
Thermal mass	s parame	ter (TMF	P = Cm ÷	- TFA) ir	kJ/m²K					Low		100	(35)
For design asses	sments wh							Indica	tive Value:	LOW			(33)
J				constructi	ion are not	t known pr	ecisely the				able 1f		(33)
can be used inste	ead of a det	ailed calcu	ulation.			,	ecisely the				able 1f		
can be used inste Thermal bridg	ead of a det es : S (L	ailed calcu x Y) calc	<i>ulation.</i> culated ι	using Ap	pendix ł	,	ecisely the				able 1f	6.98	(36)
can be used inste Thermal bridg if details of thermal	ead of a det es : S (L al bridging	ailed calcu x Y) calc	<i>ulation.</i> culated ι	using Ap	pendix ł	,	ecisely the	indicative	e values of		able 1f		(36)
can be used inste Thermal bridg if details of therma Total fabric he	ead of a det es:S(L al bridging eat loss	ailed calcu x Y) calcu are not kn	ulation. culated ( own (36) =	using Ap = 0.05 x (3	pendix ł	,	ecisely the	indicative	(36) =	TMP in T		6.98 27.46	
Thermal bridg if details of thermal Total fabric he Ventilation hea	ead of a det es:S(L al bridging eat loss at loss ca	ailed calcu x Y) calcu are not known	ulation. culated to own (36) =	using Ap = 0.05 x (3	pendix ł	<b>〈</b>	,	(33) + (38)m	(36) = = 0.33 × (	TMP in T	)		(36)
can be used inste Thermal bridg if details of therma Total fabric he Ventilation hea	ead of a det es: S (L al bridging eat loss at loss ca	ailed calcu x Y) calc are not kno alculated Mar	ulation. culated to own (36) = I monthly	using Ap - 0.05 x (3 / May	pendix ł 1) Jun	Jul	Aug	(33) + (38)m Sep	(36) = = 0.33 × (	7MP in 7 25)m x (5 Nov	Dec		(36)
Thermal bridg if details of thermal Total fabric he Ventilation hea  Jan (38)m= 22.17	ead of a det es: S (L al bridging leat loss at loss ca Feb 21.94	x Y) calc x Y) calc are not know alculated Mar 21.72	ulation. culated to	using Ap = 0.05 x (3	pendix ł	<b>〈</b>	,	(33) + (38)m Sep 21.28	(36) = = 0.33 × ( Oct 21.28	25)m x (5 Nov 21.28	)		(36)
Thermal bridg if details of thermal Total fabric he Ventilation hea  Jan (38)m= 22.17  Heat transfer of	ead of a det es: S (L al bridging eat loss at loss ca Feb 21.94 coefficier	x Y) calc x Y) calc are not kn alculated Mar 21.72	ulation. culated to own (36) = I monthly Apr 21.28	using Ap = 0.05 x (3  / May 21.28	Jun 21.28	Jul 21.28	Aug 21.28	(33) + (38)m Sep 21.28 (39)m	(36) = = 0.33 × ( Oct 21.28 = (37) + (3	25)m x (5 Nov 21.28 38)m	Dec 21.28		(36)
Thermal bridg if details of thermal Total fabric he Ventilation hea  Jan (38)m= 22.17	ead of a det es: S (L al bridging leat loss at loss ca Feb 21.94	x Y) calc x Y) calc are not know alculated Mar 21.72	ulation. culated to own (36) = I monthly	using Ap - 0.05 x (3 / May	pendix ł 1) Jun	Jul	Aug	(33) + (38)m Sep 21.28 (39)m 48.74	(36) = = 0.33 × ( Oct 21.28 = (37) + (3	25)m x (5 Nov 21.28 38)m 48.74	Dec 21.28	27.46	(36)
Can be used instermal bridg if details of thermal Total fabric her Ventilation hea  [38]m= 22.17  Heat transfer (39)m= 49.63	ead of a det es: S (L al bridging leat loss at loss ca Feb 21.94 coefficier 49.4	x Y) calc x Y) calc are not know alculated Mar 21.72 ht, W/K 49.18	ulation.   culated to   own (36) =   monthly   Apr   21.28	using Ap = 0.05 x (3  / May 21.28	Jun 21.28	Jul 21.28	Aug 21.28	(33) + (38)m Sep 21.28 (39)m 48.74	(36) = = 0.33 × ( Oct 21.28 = (37) + (3	25)m x (5 Nov 21.28 38)m 48.74 Sum(39),	Dec 21.28		(36)
Thermal bridg if details of thermal Total fabric he Ventilation hea  [38]m= 22.17  Heat transfer of	ead of a det es: S (L al bridging leat loss at loss ca Feb 21.94 coefficier 49.4	x Y) calc x Y) calc are not know alculated Mar 21.72 ht, W/K 49.18	ulation.   culated to   own (36) =   monthly   Apr   21.28	using Ap = 0.05 x (3  / May 21.28	Jun 21.28	Jul 21.28	Aug 21.28	(33) + (38)m Sep 21.28 (39)m 48.74	(36) = = 0.33 × ( Oct 21.28 = (37) + (34) Average =	25)m x (5 Nov 21.28 38)m 48.74 Sum(39),	Dec 21.28	27.46	(36)

Number	of days	s in mor	nth (Tabl	le 1a)										
	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. Wate	er heati	ng ener	gy requi	rement:								kWh/ye	ear:	
Assume	d occur	nancy I	N								1	68		(42)
if TFA	> 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		.00		( /
if TFA Annual a	£ 13.9	•	ator usac	na in litra	se nar da	y Vd av	erage –	(25 v NI)	<b>+</b> 36		7.	00		(42)
Reduce th	e annual	average	hot water	usage by	5% if the c	lwelling is	designed			se target o		.06		(43)
not more ti	hat 125 l	itres per p	person per	day (all w	ater use, i	hot and co	ld)							
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	<del>-</del>		day for ea		1			· <i>'</i>					l	
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		<b></b>
Energy co	ntent of I	not water	used - cal	culated mo	onthly = $4$ .	190 x Vd,r	m x nm x E	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		888.72	(44)
(45)m= 1	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117		
(10)			.00.00	00.00	V	1	1	00.00			m(45) <sub>112</sub> =	l	1165.26	(45)
If instantar	neous wa	ater heatir	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46			, ,	!		
	18.12	15.85	16.36	14.26	13.68	11.81	10.94	12.55	12.7	14.81	16.16	17.55		(46)
Water st	•		مالم بالم ما		-lo o \ \	WALLDO	-1	م ماطالات					· I	(47)
Storage		,					_		ame ves	sei		0		(47)
If common Otherwise	•	_			_			` '	ers) ente	er 'O' in <i>(</i>	47)			
Water st				(					,		, ,			
a) If ma	nufactu	ırer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempera	ature fa	ctor fro	m Table	2b								0		(49)
Energy I			_	-				(48) x (49)	) =		1	10		(50)
b) If ma Hot wate				-								.02		(51)
If commi		•			0 2 (1117	11/11(10/00	<b>^y</b> /				0.	.02		(31)
Volume	factor f	rom Tal	ble 2a								1.	03		(52)
Tempera	ature fa	ctor fro	m Table	2b							0	.6		(53)
Energy I			_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (5	, ,	, ,	•						,		1.	.03		(55)
Water st			culated f					· · ·	55) × (41)	m r	1		I	
` '	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	51.1	(56)
If cylinder					1						1		IX FI	
(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		•	,									0		(58)
Primary					,	•		, ,		r thormo	otot)			
` —	23.26	21.01	23.26	22.51	23.26	22.51	23.26	ng and a	cylinde 22.51	23.26	22.51	23.26		(59)
` '	-				Į				۲۲.۷۱	25.20		20.20		(00)
Combi lo					<del>`                                    </del>	<del>ì ´                                     </del>	· ` `	<del>Í – –</del>			<u> </u>		1	(64)
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat requ	uired for	water he	eating ca	alculated	l for	each month	(62)n	$n = 0.85 \times 0$	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m= 176.09	155.59	164.31	148.55	146.49	13	2.2 128.21	138.9	7 138.19	153.98	161.24	172.28	]	(62)
Solar DHW input of	calculated	using App	endix G oı	· Appendix	<b></b> :Н (n	egative quantity	) (ente	r '0' if no sola	r contribu	ition to wate	er heating)	1	
(add additiona	l lines if	FGHRS	and/or \	wwhrs	app	olies, see Ap	pendi	x G)					
(63)m= 0	0	0	0	0		0 0	0	0	0	0	0		(63)
Output from w	ater hea	ter				•						'	
(64)m= 176.09	155.59	164.31	148.55	146.49	13	2.2 128.21	138.9	7 138.19	153.98	161.24	172.28	[	
		•			•	· · · · ·	C	output from w	ater heat	er (annual)₁	12	1816.1	(64)
Heat gains from	m water	heating,	kWh/m	onth 0.2	5 ´[(	0.85 × (45)m	+ (61	)m] + 0.8 x	x [(46)m	ı + (57)m	+ (59)m	]	
(65)m= 84.39	75.07	80.48	74.4	74.55	68	.97 68.47	72.0	5 70.96	77.04	78.62	83.12		(65)
include (57)	m in cald	culation of	of (65)m	only if c	ylind	der is in the	dwellii	ng or hot w	ater is	rom com	munity h	eating	
5. Internal ga	ains (see	e Table 5	and 5a	):									
Metabolic gain	s (Table	e 5), Wat	ts										
Jan	Feb	Mar	Apr	May	J	un Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 83.92	83.92	83.92	83.92	83.92	83	.92 83.92	83.9	2 83.92	83.92	83.92	83.92		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion l	_9 or L9a), a	lso se	e Table 5		-	-		
(67)m= 13.03	11.58	9.41	7.13	5.33	4	.5 4.86	6.32	8.48	10.77	12.57	13.4		(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uatio	on L13 or L1	3a), a	lso see Ta	ble 5				
(68)m= 146.2	147.71	143.89	135.75	125.48	115	5.82 109.37	107.8	111.68	119.82	130.09	139.74		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	tion	L15 or L15a)	, also	see Table	5	-	-		
(69)m= 31.39	31.39	31.39	31.39	31.39	31	.39 31.39	31.3	9 31.39	31.39	31.39	31.39		(69)
Pumps and fai	ns gains	(Table 5	<del></del> ба)			•		•	•	•		•	
(70)m= 0	0	0	0	0		0 0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5	)		•					
(71)m= -67.13	-67.13	-67.13	-67.13	-67.13	-67	7.13 -67.13	-67.1	3 -67.13	-67.13	-67.13	-67.13		(71)
Water heating	gains (T	able 5)				•		•	•	•		•	
(72)m= 113.43	111.72	108.17	103.34	100.2	95	.79 92.03	96.8	4 98.55	103.55	109.19	111.73		(72)
Total internal	gains =					(66)m + (67)m	+ (68)	m + (69)m +	(70)m + (	71)m + (72)	m	•	
(73)m= 320.83	319.18	309.64	294.39	279.18	264	4.28 254.44	259.′	9 266.88	282.31	300.02	313.04		(73)
6. Solar gains	S:												
Solar gains are o	alculated	using sola	r flux from	Table 6a	and a	associated equa	tions to	convert to th	ne applica	ble orientat	ion.		
Orientation: A			Area			Flux		g_ T-1-1- 01-	_	FF		Gains	
_	Table 6d		m²		_	Table 6a		Table 6b		Table 6c		(W)	_
Southeast 0.9x	0.77	X	2.9	)2	x L	36.79	Х	0.5	×	8.0	=	29.78	(77)
Southeast 0.9x	0.54	X	6.7	'9	× L	36.79	x	0.5	× [	0.8	=	48.57	(77)
Southeast 0.9x	0.77	X	2.2	22	x	36.79	х	0.5	x	0.8	=	22.64	(77)
Southeast 0.9x	0.77	X	2.9	)2	x _	62.67	x	0.5	x	0.8	=	50.73	(77)
Southeast 0.9x	0.54	X	6.7	'9	x	62.67	х	0.5	x	0.8	=	82.73	(77)
Southeast 0.9x	0.77	X	2.2	22	x	62.67	Х	0.5	×	8.0	=	38.57	(77)
Southeast 0.9x	0.77	X	2.9	)2	x	85.75	Х	0.5	×	0.8	=	69.41	(77)
Southeast 0.9x	0.54	X	6.7	'9	x	85.75	Х	0.5	x	0.8	=	113.19	(77)

Southeast 0.9x	0.77	x	2.2	22	х	8	5.75	x		0.5	X	0.8	$\neg$	_	52.77	(77)
Southeast 0.9x	0.77	X	2.9	)2	X	1	06.25	X		0.5	×	0.8	一	=	86	(77)
Southeast 0.9x	0.54	X	6.7	<b>'</b> 9	x	1	06.25	X		0.5	×	0.8	一	=	140.25	(77)
Southeast <sub>0.9x</sub>	0.77	x	2.2	22	x	1	06.25	X		0.5	×	0.8	一	=	65.39	(77)
Southeast <sub>0.9x</sub>	0.77	x	2.9	)2	х	1	19.01	X		0.5	X	0.8	一	=	96.33	(77)
Southeast <sub>0.9x</sub>	0.54	х	6.7	9	x	1	19.01	x		0.5	×	0.8		=	157.09	(77)
Southeast 0.9x	0.77	x	2.2	22	х	1	19.01	x		0.5	×	0.8	司	=	73.24	(77)
Southeast <sub>0.9x</sub>	0.77	х	2.9	)2	x	1	18.15	x		0.5	×	0.8		=	95.63	(77)
Southeast <sub>0.9x</sub>	0.54	Х	6.7	<b>'</b> 9	x	1	18.15	x		0.5	x	0.8		=	155.96	(77)
Southeast 0.9x	0.77	X	2.2	22	x	1	18.15	x		0.5	x	0.8		=	72.71	(77)
Southeast <sub>0.9x</sub>	0.77	Х	2.9	)2	x	1	13.91	x		0.5	x	0.8		=	92.2	(77)
Southeast <sub>0.9x</sub>	0.54	Х	6.7	<b>'</b> 9	x	1	13.91	x		0.5	x	0.8		=	150.36	(77)
Southeast <sub>0.9x</sub>	0.77	х	2.2	22	x	1	13.91	x		0.5	×	0.8	一	=	70.1	(77)
Southeast <sub>0.9x</sub>	0.77	X	2.9	)2	x	1	04.39	x		0.5	×	0.8		=	84.5	(77)
Southeast <sub>0.9x</sub>	0.54	х	6.7	<b>'</b> 9	x	1	04.39	x		0.5	x	0.8	Ħ	=	137.79	(77)
Southeast <sub>0.9x</sub>	0.77	x	2.2	22	x	1	04.39	X		0.5	T x	0.8	一	=	64.24	(77)
Southeast <sub>0.9x</sub>	0.77	x	2.9	)2	x	9	2.85	X		0.5	X	0.8		=	75.16	(77)
Southeast <sub>0.9x</sub>	0.54	X	6.7	9	x	9	2.85	X		0.5	×	0.8		=	122.56	(77)
Southeast <sub>0.9x</sub>	0.77	x	2.2	22	х	g	2.85	X		0.5	T x	0.8	一	=	57.14	(77)
Southeast <sub>0.9x</sub>	0.77	X	2.9	)2	x	6	9.27	X		0.5	×	0.8		=	56.07	(77)
Southeast <sub>0.9x</sub>	0.54	X	6.7	9	x	6	9.27	x		0.5	×	0.8		=	91.43	(77)
Southeast 0.9x	0.77	X	2.2	22	x	6	9.27	X		0.5	i x	0.8	一	=	42.63	(77)
Southeast 0.9x	0.77	X	2.9	)2	x	4	4.07	X		0.5	×	0.8	一	=	35.67	(77)
Southeast <sub>0.9x</sub>	0.54	X	6.7	9	x	4	4.07	X		0.5	×	0.8		=	58.17	(77)
Southeast 0.9x	0.77	X	2.2	22	x	4	4.07	X		0.5	i x	0.8	一	=	27.12	(77)
Southeast <sub>0.9x</sub>	0.77	X	2.9	)2	x	3	1.49	X		0.5	×	0.8		=	25.49	(77)
Southeast <sub>0.9x</sub>	0.54	X	6.7	9	x	3	1.49	X		0.5	×	0.8		=	41.56	(77)
Southeast <sub>0.9x</sub>	0.77	x	2.2	22	х	3	1.49	X		0.5	X	0.8	一	=	19.38	(77)
_																
Solar gains in	watts, ca	alculated	for eac	h month	1			(83)m	n = Sum	n(74)m	.(82)m				•	
(83)m= 100.99	172.03	235.37	291.64	326.66		24.3	312.66	286	.53 2	254.86	190.12	120.96	86.4	13		(83)
Total gains – ii					<del>-</del>										1	
(84)m= 421.82	491.21	545.02	586.03	605.84	58	38.58	567.1	545	.72 5	521.74	472.43	420.99	399.	47		(84)
7. Mean inter	nal temp	erature	(heating	seasor	า)											
Temperature	during h	eating p	eriods ir	the livi	ing a	area	from Tab	ole 9,	, Th1	(°C)					21	(85)
Utilisation fac	tor for g	ains for I	iving are	ea, h1,n	n (se	ee Ta	ble 9a)								•	_
Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	A	ug	Sep	Oct	Nov	D	ес		
(86)m= 0.92	0.89	0.83	0.74	0.63	C	).49	0.36	0.3	39	0.57	0.77	0.89	0.9	3		(86)
Mean interna	l temper	ature in	living are	ea T1 (f	ollo	w ste	ps 3 to 7	' in T	able	9c)						
(87)m= 19.33	19.63	20.01	20.41	20.72	2	20.9	20.97	20.	96	20.84	20.45	19.84	19.2	29		(87)
Temperature	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	 9, Th2	(°C)						
(88)m= 20.08	20.09	20.09	20.1	20.1	_	20.1	20.1	20.		20.1	20.1	20.1	20.	1		(88)
					•			•					•		•	

Utilis	ation fac	tor for a	ains for	rest of d	wellina l	n2 m (se	ee Table	9a)						
(89)m=	0.91	0.87	0.81	0.72	0.59	0.43	0.29	0.32	0.51	0.73	0.87	0.92		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)			l	
(90)m=	17.87	18.29	18.83	19.39	19.79	20.01	20.08	20.07	19.95	19.45	18.6	17.82		(90)
									1	LA = Livin	g area ÷ (4	4) =	0.49	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwel	ling) = f	LA × T1	+ (1 – fL	.A) × T2					_
(92)m=	18.58	18.94	19.4	19.89	20.24	20.44	20.51	20.5	20.38	19.94	19.2	18.54		(92)
Apply	adjustn	nent to t	he mean	interna	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	18.58	18.94	19.4	19.89	20.24	20.44	20.51	20.5	20.38	19.94	19.2	18.54		(93)
8. Sp	ace hea	ting requ	uirement											
			ernal ter or gains			ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	culate	
tile di	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	•	,		<u> </u>		<u>'</u>	<u> </u>		<u>I</u>	l	
(94)m=	0.89	0.85	0.79	0.71	0.59	0.45	0.33	0.35	0.53	0.73	0.85	0.9		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	376.82	418.63	433.24	415.08	358.86	265.58	185.11	192.86	275.12	344.18	358.61	360.99		(95)
		<u> </u>	rnal tem	i									İ	
(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)
							=[(39)m :	<del>-``</del>	<del>- `                                   </del>	<del></del>	500.04	000.04	1	(07)
(97)m=		693.85	634.6	535.6	416.43	284.85	190.64	200.01	306.25	455.08	589.91	698.84		(97)
(98)m=	246.95	184.95	149.81	86.78	42.83	0	th = 0.02	0	0 0	82.51	166.53	251.36		
(00)	2.0.00			000	.2.00			<u> </u>	l per year	!			1211.72	(98)
Spac	e heatin	a reauire	ement in	kWh/m²	?/vear			. 0.0	po. you.	(, ) ca.	,	<b>3</b> /13,312	24.43	] (99)
		• •			•	cehome							21.10	
			nts – Cor nace hea	· ·			ater heat	ina prov	rided by	a comm	unity sch	neme		
		-		• .		-	heating (	• .	-		unity con	1011101	0	(301)
Fraction	on of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The con	nmunity so	cheme ma	y obtain he	eat from se	everal sour	ces. The p	orocedure	allows for	CHP and	up to four	other heat	sources; t	he latter	_
			-		aste heat f	rom powe	r stations.	See Appe	ndix C.					٦,,,,,
			Commun										0.67	(303a)
		•	heat fro										0.33	(303b)
Fraction	on of tota	al space	heat fro	m Comn	nunity C	HP				(3	02) x (303	a) =	0.67	(304a)
Fraction	on of tota	al space	heat fro	m comm	unity he	at sourc	e 2			(3	02) x (303	b) =	0.33	(304b)
Factor	for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	unity hea	ating sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	2c) for o	commun	ity heati	ng syste	m					1.05	(306)
Space	heating	g											kWh/year	_
Annua	I space	heating	requirem	nent									1211.72	_
Space	heat fro	m Comr	munity C	HP					(98) x (30	04a) x (30	5) x (306) :	=	847.36	(307a)

					_
Space heat from heat source 2		(98) x (304b)	x (305) x (306) =	424.95	(307b)
Efficiency of secondary/supplement	ntary heating system in % (	from Table 4a or Appe	ndix E)	0	(308
Space heating requirement from se	econdary/supplementary s	ystem (98) x (301) x	100 ÷ (308) =	0	(309)
Water heating					_
Annual water heating requirement				1816.1	
If DHW from community scheme: Water heat from Community CHP		(64) x (303a)	x (305) x (306) =	1270	(310a)
Water heat from heat source 2		(64) x (303b)	x (305) x (306) =	636.91	(310b)
Electricity used for heat distribution	า	0.01 × [(307a)(30	7e) + (310a)(310e)] =	31.79	(313)
Cooling System Energy Efficiency	Ratio			0	(314)
Space cooling (if there is a fixed co	ooling system, if not enter (	)) = (107) ÷ (314	1) =	0	(315)
Electricity for pumps and fans with mechanical ventilation - balanced,	<b>O</b> \ ,	om outside		61.36	] (330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	 ☐(330g)
Total electricity for the above, kWh	n/year	=(330a) + (33	0b) + (330g) =	61.36	<u> </u>  (331)
Energy for lighting (calculated in A	ppendix L)			230.17	(332)
Electricity generated by PVs (Appe	endix M) (negative quantity	)		-254.41	(333)
Electricity generated by wind turbing	ne (Appendix M) (negative	quantity)		0	(334)
12b. CO2 Emissions – Community	heating scheme				
Floatrical officionay of CHD unit					
Electrical efficiency of CHP unit				32	(361)
Heat efficiency of CHP unit				32 50.4	(361) (362)
•		Energy	Emission factor	50.4 Emissions	
•		Energy kWh/year	Emission factor kg CO2/kWh	50.4	
•	(307a) × 100 ÷ (362) =			50.4 Emissions	
Heat efficiency of CHP unit	$(307a) \times 100 \div (362) =$ $-(307a) \times (361) \div (362) =$	kWh/year	kg CO2/kWh	50.4 Emissions kg CO2/year	(362)
Heat efficiency of CHP unit  Space heating from CHP)		kWh/year  1681.26 ×	0.22	50.4 Emissions kg CO2/year  363.15	(362)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity	$-(307a) \times (361) \div (362) =$	kWh/year  1681.26	0.22 0.52	50.4  Emissions kg CO2/year  363.15  -279.22	(362) (363) (364)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP	$-(307a) \times (361) \div (362) =$ $(310a) \times 100 \div (362) =$ $-(310a) \times (361) \div (362) =$	kWh/year  1681.26	0.22 0.52 0.22 0.52	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49	(362) (363) (364) (365)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP  less credit emissions for electricity	$-(307a) \times (361) \div (362) =$ $(310a) \times 100 \div (362) =$ $-(310a) \times (361) \div (362) =$ If there is CHP u	kWh/year  1681.26	0.22 0.52 0.52 0.52 0.52 0.6366) for the second fue	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49	(362) (363) (364) (365) (366)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP  less credit emissions for electricity  Efficiency of heat source 2 (%)	$-(307a) \times (361) \div (362) =$ $(310a) \times 100 \div (362) =$ $-(310a) \times (361) \div (362) =$ If there is CHP u	kWh/year  1681.26	0.22 0.52 0.52 0.52 0.52 0.52 0.52 0.22 0.366) for the second fue	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49  95	(362) (363) (364) (365) (366) (367b)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP  less credit emissions for electricity  Efficiency of heat source 2 (%)  CO2 associated with heat source 2	$-(307a) \times (361) \div (362) =$ $(310a) \times 100 \div (362) =$ $-(310a) \times (361) \div (362) =$ If there is CHP u	kWh/year  1681.26	kg CO2/kWh  0.22  0.52  0.52  0.52  0.52  0.52  0.22  0.52  0.22  0.52	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49  95  241.43	(362) (363) (364) (365) (366) (367b) (368)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP  less credit emissions for electricity  Efficiency of heat source 2 (%)  CO2 associated with heat source 2  Electrical energy for heat distribution	$-(307a) \times (361) \div (362) =$ $(310a) \times 100 \div (362) =$ $-(310a) \times (361) \div (362) =$ If there is CHP using the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the	kWh/year  1681.26	kg CO2/kWh  0.22  0.52  0.52  0.52  0.52  0.52  0.52  0.52  = 0.52	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49  95  241.43  16.5	(362) (363) (364) (365) (366) (367b) (368) (372)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP  less credit emissions for electricity  Efficiency of heat source 2 (%)  CO2 associated with heat source 2  Electrical energy for heat distribution  Total CO2 associated with communications	-(307a) × (361) ÷ (362) =  (310a) × 100 ÷ (362) =  -(310a) × (361) ÷ (362) =  If there is CHP u  [(307) on  inity systems  g (secondary)	kWh/year  1681.26	kg CO2/kWh  0.22  0.52  0.52  0.52  0.52  0.52  0.52  0.52  = 0.52	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49  95  241.43  16.5  467.65	(362) (363) (364) (365) (366) (367b) (368) (372) (373)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP  less credit emissions for electricity  Efficiency of heat source 2 (%)  CO2 associated with heat source 2  Electrical energy for heat distribution  Total CO2 associated with space heating	-(307a) × (361) ÷ (362) =  (310a) × 100 ÷ (362) =  -(310a) × (361) ÷ (362) =  If there is CHP uses the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content	kWh/year  1681.26	kg CO2/kWh  0.22  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49  95  241.43  16.5  467.65  0	(362) (363) (364) (365) (366) (367b) (368) (372) (373) (374)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP  less credit emissions for electricity  Efficiency of heat source 2 (%)  CO2 associated with heat source 2  Electrical energy for heat distribution  Total CO2 associated with space heating  CO2 associated with water from in	-(307a) × (361) ÷ (362) =  (310a) × 100 ÷ (362) =  -(310a) × (361) ÷ (362) =  If there is CHP uses the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content	kWh/year  1681.26	kg CO2/kWh  0.22  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49  95  241.43  16.5  467.65  0	(362) (363) (364) (365) (366) (367b) (368) (372) (373) (374) (375)
Heat efficiency of CHP unit  Space heating from CHP)  less credit emissions for electricity  Water heated by CHP  less credit emissions for electricity  Efficiency of heat source 2 (%)  CO2 associated with heat source 2  Electrical energy for heat distribution  Total CO2 associated with space heating  CO2 associated with water from intotal CO2 associated with space as	-(307a) × (361) ÷ (362) =  (310a) × 100 ÷ (362) =  -(310a) × (361) ÷ (362) =  If there is CHP use  2 [(307) on  Inity systems  g (secondary) Inmersion heater or instantal and water heating  pumps and fans within dw	kWh/year  1681.26	kg CO2/kWh  0.22  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52  0.52	50.4  Emissions kg CO2/year  363.15  -279.22  544.28  -418.49  95  241.43  16.5  467.65  0  467.65	(362) (363) (364) (365) (366) (367b) (368) (372) (373) (374) (375) (376)

Energy saving/generation technologies (333) to (334) as applicable x 0.01 = Item 1 (380) -132.04 0.52 sum of (376)...(382) = Total CO2, kg/year (383) 486.92  $(383) \div (4) =$ **Dwelling CO2 Emission Rate** 9.82 (384) El rating (section 14)

(385)

93.1

			lloor D	) otoilo						
Assessor Name: Software Name:	Ross Boulton Stroma FSAP 201	2	User D	Strom Softwa					0028068 on: 1.0.4.18	
				Address		06-01				
Address :	B2A-106-01, Flat Ty	ype 2-20	A, Wimb	oledon, L	ondon					
1. Overall dwelling dime	nsions:			4 0						,
Ground floor				<b>a(m²)</b> 49.6	(1a) x		<b>ight(m)</b> 2.6	(2a) =	<b>Volume(m³</b> 128.96	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e	e)+(1r	n)	49.6	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	(3n) =	128.96	(5)
2. Ventilation rate:										
Number of chimneys	heating h	econdar neating	'y □ + □	other	7 <sub>=</sub> [	total	x.	40 =	m³ per hou	r (6a)
•		0	╛╘	0	╛╘	0			0	= ' '
Number of open flues	0 +	0	_] +	0	_ = _	0	X 2	20 =	0	(6b)
Number of intermittent far	ns					2	X '	10 =	20	(7a)
Number of passive vents						0	Χ.	10 =	0	(7b)
Number of flueless gas fir	res				Ī	0	X 4	40 =	0	(7c)
					_					
								Air cr	nanges per ho	our —
Infiltration due to chimney					Ļ	20		÷ (5) =	0.16	(8)
If a pressurisation test has be Number of storeys in th		ed, procee	d to (17),	otherwise (	continue fr	om (9) to	(16)			<b>—</b> (0)
Additional infiltration	ie dweiling (115)						[(9)	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	.25 for steel or timber	frame or	0.35 fo	r masoni	v constr	uction	1(0)	ijko.i –	0	(11)
	resent, use the value corres				•					` ′
deducting areas of opening	•	l 1\) 0	4 / 1	1\	0					<b>-</b>
If suspended wooden fl	•	iea) or u	.1 (seale	ea), eise	enter 0				0	(12)
If no draught lobby, ent Percentage of windows		trinnad							0	(13)
Window infiltration	s and doors draught si	irippeu		0.25 - [0.2	x (14) ÷ 1	001 =			0	(14)
Infiltration rate				(8) + (10)			+ (15) =		0	(16)
Air permeability value,	q50, expressed in cub	oic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabili			•	•	•		•		0.41	(18)
Air permeability value applies	s if a pressurisation test ha	s been dor	ne or a de	gree air pe	rmeability	is being u	sed			
Number of sides sheltere	d			(00)		0)1			2	(19)
Shelter factor				(20) = 1 -		9)] =			0.85	(20)
Infiltration rate incorporati	-			(21) = (18	) x (20) =				0.34	(21)
Infiltration rate modified for	<del></del>	1		T .			T		1	
1	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	1			1	4	1.0	1		1	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	J	
Wind Factor (22a)m = (22	2)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	]	

Adjusted infil	Itration rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	: (21a) x	(22a)m					
0.44		0.42	0.38	0.37	0.33	0.33	0.32	0.34	0.37	0.39	0.4	]	
Calculate eff		_	rate for t	he appli	cable ca	se		l					_
If mechani			on die N. (O	OL) (OO-			MEW - do -		) (00-)			0	(23a)
If exhaust air									)) = (23a)			0	(23b)
If balanced w		-	-	_								0	(23c)
a) If baland						<del>, ` `                                   </del>	<del>,                                    </del>	ŕ	<del> </del>	<del>`                                    </del>	<del>- ` ´</del>	) ÷ 100] 1	(0.4-)
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If baland	1	r	1		1	· · · ·	1	<u> </u>	<u> </u>	1	<u> </u>	1	(O.4h.)
(24b)m= 0	0	0	0	0		0	0	0	0	0	0		(24b)
c) If whole if (22b	house ex )m < 0.5 >			•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natura	al ventilation	on or wh	ole hous	e positiv	re input	ventilatio	on from I	oft	!	!	!	J	
,	)m = 1, th			•					0.5]			_	
(24d)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(24d)
Effective a	ir change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in bo	(25)				_	
(25)m= 0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
3. Heat loss	ses and he	eat loss i	paramet	er:									
ELEMENT			Openin		Net Ar	ea	U-val	ue	ΑXU		k-value	e A	Χk
	area	$(m^2)$	m		A ,r		W/m2		(W/		kJ/m²-		I/K
Windows Ty	pe 1				2.92	<sub>X</sub> 1	/[1/( 1.4 )+	0.04] =	3.87				(27)
Windows Ty	pe 2				6.79	<sub>x</sub> 1	/[1/( 1.4 )+	0.04] =	9				(27)
Windows Ty	pe 3				2.22	x1	/[1/( 1.4 )+	0.04] =	2.94				(27)
Walls	46.5	56	11.9	3	34.63	3 X	0.18	=	6.23	$\overline{}$ [			(29)
Total area of	elements	, m²			46.56	5							(31)
* for windows a						lated using	g formula 1	/[(1/U-valu	ue)+0.04] á	as given in	paragrapl	h 3.2	
Fabric heat I							(26)(30)	) + (32) =				22.05	(33)
Heat capacit	·	•	,					((28).	(30) + (32	2) + (32a).	(32e) =	484.86	(34)
Thermal mas	ss parame	ter (TMF	c = Cm +	- TFA) ir	n kJ/m²K	,		Indica	itive Value	: Medium		250	(35)
For design asse	-						recisely the	e indicative	e values of	TMP in Ta	able 1f		
can be used ins													_
Thermal brid	-				-	K						2.33	(36)
if details of there Total fabric h		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	· (36) =			24.20	(27)
		aloulator	l monthly						= 0.33 × (	(25)m v (5)	<b>\</b>	24.38	(37)
Ventilation h		r	· ·		lup	11	Δυα		<u> </u>	1	i _	1	
Jan	+	Mar	Apr 24.33	May 24.19	Jun	Jul	23.44	Sep 23.8	Oct	Nov 24.47	24.76	-	(38)
(38)m= 25.38		25.06	۷4.১১	44.19	23.56	23.56	23.44	<u> </u>	24.19	ļ	24.70	J	(50)
Heat transfer	_	r	10	40.7-	4	<b>1</b>	1		(37) + (			1	
(39)m= 49.76	49.6	49.44	48.71	48.57	47.93	47.93	47.82	48.18	48.57	48.85	49.14	40.74	(30)
Heat loss pa	rameter (I	HLP), W	/m²K						Average = = (39)m ÷		12 / 12=	48.71	(39)
(40)m= 1	1	1	0.98	0.98	0.97	0.97	0.96	0.97	0.98	0.98	0.99		
									Average =	Sum(40) <sub>1</sub>	12 /12=	0.98	(40)

Number of days in month (Table 1a)

Numbe	<del> </del>		Man		N4=	1	11	Δ	0	0-4	Nierr	Data	I	
(44)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing ener	rgy requi	rement:								kWh/ye	ear:	
Assum	ed occu	pancy, I	N								1.	68		(42)
			+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.	.9)			
	A £ 13.9 Laverag	•	ater usag	ae in litre	s per da	av Vd.av	erage =	(25 x N)	+ 36		74	.06		(43)
Reduce	the annua	l average	hot water	usage by	5% if the c	lwelling is	designed t	` ,		se target o		.00		(40)
not more	e that 125	litres per p	person per	day (all w	ater use, i	not and co	ld)						•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	er usage ir	litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					•	
(44)m=	81.47	78.5	75.54	72.58	69.62	66.65	66.65	69.62	72.58	75.54	78.5	81.47		_
Energy (	content of	hot water	used - cal	culated m	onthly – 1	100 v Vd r	n v nm v Γ	Tm / 360(			m(44) <sub>112</sub> = ables 1b, 1		888.72	(44)
			·			1		ı		,		,	Ī	
(45)m=	120.81	105.66	109.03	95.06	91.21	78.71	72.94	83.69	84.69	98.7	107.74	117	1405.00	7(45)
If instant	taneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		i otai = Su	m(45) <sub>112</sub> =		1165.26	(45)
(46)m=	18.12	15.85	16.36	14.26	13.68	11.81	10.94	12.55	12.7	14.81	16.16	17.55		(46)
` '	storage		.0.00	0	.0.00		10.01	12.00	.=		1			, ,
Storag	e volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If comr	munity h	eating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)						
			hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
	storage		oclared l	occ foct	or ic kno	wo (k\\/k	2/d2v/):					00	Ī	(40)
,			eclared l		טווא פו וכ	wii (Kvvi	i/uay).					39		(48)
•			m Table					(40) v (40)	<b>\</b>			54		(49)
• • • • • • • • • • • • • • • • • • • •			storage eclared o	-		or is not		(48) x (49)	) =		0.	75		(50)
			factor fr	-								0		(51)
	•	•	ee secti	on 4.3										
	e factor			O.								0		(52)
-			m Table									0		(53)
			storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	-	0		(54)
	(50) or (	, ,	,	or ooob	manth			//EC\m /	FF) (44).		0.	75		(55)
1			culated f						55) × (41)ı				1	(50)
(56)m=		21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58 H11) is fro	23.33	iv L	(56)
-													I	
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
	•	•	nual) fro									0		(58)
	-		culated f			•	. ,	, ,						
,	<del></del>		rom Tab					<del></del>			<u> </u>	20.00	Ī	(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
1	loss cal	culated	for each		(61)m =	(60) ÷ 30	65 × (41)	)m		·	1		•	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)

Total heat required for wa	iter he	eating ca	alculated	for	each month	(62)r	n = 0.85 ×	: (45)m -	+ (46)m +	(57)m +	(59)m + (61)m	
<del></del>	55.63	140.15	137.81		3.8 119.53	130.		<del>``</del>	<del>`</del>	163.6	]	(62)
Solar DHW input calculated usir	ng Appe	endix G or	Appendix	H (n	egative guantity	) (ente	er '0' if no so	lar contrib	ution to wate	I er heating)		
(add additional lines if FG										0,		
(63)m= 0 0	0	0	0		0 0	0		0	0	0		(63)
Output from water heater					l							
·	55.63	140.15	137.81	12	3.8 119.53	130.	29 129.79	145.3	152.83	163.6		
	!					(	Output from	water hea	ter (annual) <sub>1</sub>	112	1713.87	(64)
Heat gains from water he	ating,	kWh/mo	onth 0.2	5 ′ [	0.85 × (45)m	+ (6	1)m] + 0.8	x [(46)r	n + (57)m	+ (59)m	]	_
(65)m= 77.45 68.8 7	3.53	67.68	67.6	62	.24 61.53	65.	1 64.23	70.09	71.9	76.18		(65)
include (57)m in calcula	ation o	of (65)m	only if c	ylin	der is in the o	dwelli	ng or hot	water is	from com	munity h	neating	
5. Internal gains (see Ta	able 5	and 5a)	):									
Metabolic gains (Table 5)	. Watt	S										
	Mar	Apr	May	J	un Jul	Αι	ıg Sep	Oct	Nov	Dec		
(66)m= 83.92 83.92 8	3.92	83.92	83.92	83	.92 83.92	83.9	92 83.92	83.92	83.92	83.92		(66)
Lighting gains (calculated	in Ap	pendix l	_, equat	on I	 _9 or L9a), a	lso se	ee Table 5	5	•	•	•	
(67)m= 13.05 11.59 9	9.43	7.14	5.34	4	.5 4.87	6.3	3 8.49	10.78	12.58	13.42		(67)
Appliances gains (calcula	ted in	Append	lix L, eq	uatio	on L13 or L13	3a), a	also see T	able 5	•	•	•	
(68)m= 146.2 147.71 14	43.89	135.75	125.48	11	5.82 109.37	107.	85 111.68	119.82	2 130.09	139.74		(68)
Cooking gains (calculated	in Ap	pendix	L, equat	ion	L15 or L15a)	, also	see Tab	le 5		•	•	
(69)m= 31.39 31.39 3	1.39	31.39	31.39	31	.39 31.39	31.3	31.39	31.39	31.39	31.39		(69)
Pumps and fans gains (Ta	able 5	a)			•		•	•	•	•	•	
(70)m= 3 3	3	3	3		3 3	3	3	3	3	3		(70)
Losses e.g. evaporation (	negati	ive valu	es) (Tab	le 5	)		•		•		•	
(71)m= -67.13 -67.13 -6	67.13	-67.13	-67.13	-67	7.13 -67.13	-67.	13 -67.13	-67.13	-67.13	-67.13		(71)
Water heating gains (Tab	le 5)				-		-		-	-		
(72)m= 104.09 102.38 9	8.83	94	90.87	86	.45 82.7	87.5	51 89.21	94.21	99.86	102.39		(72)
Total internal gains =					(66)m + (67)m	+ (68	)m + (69)m -	+ (70)m +	(71)m + (72)	)m	•	
(73)m= 314.52 312.86 30	03.32	288.06	272.85	25	7.95 248.11	252.	86 260.56	275.99	293.71	306.73		(73)
6. Solar gains:												
Solar gains are calculated using	ng solar	flux from	Table 6a	and a	associated equa	tions t	o convert to	the applic		tion.		
Orientation: Access Fac	tor	Area			Flux		g_ Table 6l	_	FF		Gains	
Table 6d	_	m²		_	Table 6a		i able bi		Table 6c		(W)	,
Southeast 0.9x 0.77	X	2.9	2	x L	36.79	X	0.63	X	0.7	=	32.83	(77)
Southeast 0.9x 0.54	X	6.7	9	x L	36.79	X	0.63	X	0.7	=	53.55	(77)
Southeast 0.9x 0.77	X	2.2	2	x L	36.79	X	0.63	X	0.7	=	24.96	(77)
Southeast 0.9x 0.77	X	2.9	2	x [	62.67	X	0.63	X	0.7	=	55.93	(77)
Southeast 0.9x 0.54	X	6.7	9	x [	62.67	X	0.63	X	0.7	=	91.21	(77)
Southeast 0.9x 0.77	×	2.2	2	x [	62.67	X	0.63	x	0.7	=	42.52	(77)
Southeast 0.9x 0.77	×	2.9	2	x [	85.75	X	0.63	X	0.7	=	76.52	(77)
Southeast 0.9x 0.54	X	6.7	9	x	85.75	X	0.63	X	0.7	=	124.79	(77)

Southea	oct o o. F								1			<b>-</b>	_					<b>—</b> (77)
Southea	<u> </u>	0.77	X	2.2		X		5.75	] X ]		0.63	×		0.7		=	58.18	(77)
	<u> </u>	0.77	X	2.9		X		06.25	] X ]		0.63	×		0.7	_	=	94.82	(77)
Southea	느	0.54	X	6.7		X		06.25	] X ]		0.63	×		0.7		=	154.63	(77)
Southea	<u> </u>	0.77	X	2.2		X		06.25	] X ]		0.63	\tiny ×		0.7		=	72.09	(77)
Southea	<u> </u>	0.77	X	2.9	2	X	1	19.01	X		0.63	×		0.7	_	=	106.2	(77)
Southea	<u> </u>	0.54	X	6.7	9	X	1	19.01	X		0.63	×		0.7		=	173.19	(77)
Southea	<u> </u>	0.77	Х	2.2	22	X	1	19.01	X		0.63	X		0.7		=	80.74	(77)
Southea	<u> </u>	0.77	X	2.9	2	X	1	18.15	X		0.63	X		0.7		=	105.44	(77)
Southea	<u> </u>	0.54	X	6.7	9	X	1	18.15	X		0.63	X		0.7		=	171.94	(77)
Southea	<u> </u>	0.77	X	2.2	22	X	1	18.15	X		0.63	X		0.7		=	80.16	(77)
Southea	ast 0.9x	0.77	X	2.9	2	X	1	13.91	X		0.63	X		0.7		=	101.65	(77)
Southea	ast 0.9x	0.54	X	6.7	'9	X	1	13.91	X		0.63	X		0.7		=	165.77	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.2	22	X	1	13.91	X		0.63	X		0.7		=	77.28	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.9	12	X	1	04.39	X		0.63	X		0.7		=	93.16	(77)
Southea	ast <sub>0.9x</sub>	0.54	X	6.7	'9	X	1	04.39	X		0.63	X		0.7		=	151.92	(77)
Southea	ast <sub>0.9x</sub>	0.77	х	2.2	22	X	1	04.39	x		0.63	x		0.7		=	70.82	(77)
Southea	ast <sub>0.9x</sub>	0.77	X	2.9	2	X	9	2.85	X		0.63	X		0.7		=	82.86	(77)
Southea	ast 0.9x	0.54	X	6.7	'9	X	9	2.85	х		0.63	х		0.7		=	135.12	(77)
Southea	ast <sub>0.9x</sub>	0.77	x	2.2	2	X	9	2.85	x		0.63	×		0.7		=	63	(77)
Southea	ast <sub>0.9x</sub>	0.77	x	2.9	2	X	6	9.27	x		0.63	×		0.7		=	61.81	(77)
Southea	ast <sub>0.9x</sub>	0.54	x	6.7	9	X	6	9.27	x		0.63	x		0.7		=	100.8	(77)
Southea	ast <sub>0.9x</sub>	0.77	x	2.2	2	X	6	9.27	x		0.63	x		0.7		=	47	(77)
Southea	ast <sub>0.9x</sub>	0.77	х	2.9	2	X	4	4.07	x		0.63	x		0.7		=	39.33	(77)
Southea	ast <sub>0.9x</sub>	0.54	x	6.7	9	X	4	4.07	x		0.63	x		0.7		=	64.13	(77)
Southea	ast <sub>0.9x</sub>	0.77	x	2.2	22	X	4	4.07	x		0.63	x		0.7		=	29.9	(77)
Southea	ast <sub>0.9x</sub>	0.77	x	2.9	2	X	3	1.49	х		0.63	x		0.7	一	=	28.1	(77)
Southea	ast <sub>0.9x</sub>	0.54	x	6.7	9	X	3	1.49	x		0.63	×		0.7	司	=	45.82	(77)
Southea	ast <sub>0.9x</sub>	0.77	x	2.2	2	X	3	1.49	x		0.63	= x		0.7		=	21.36	(77)
	_								_				•					
Solar g	ains in v	watts, ca	lculated	for eacl	n month	1			(83)m	n = Su	m(74)m .	(82)n	า					
(83)m=	111.34	189.66	259.5	321.53	360.14	3	57.54	344.7	315	5.9	280.98	209.0	61 13	33.36	95.	.29		(83)
Total g	ains – ir	nternal a	nd solar	(84)m =	(73)m	+ (8	33)m	, watts									_	
(84)m=	425.86	502.52	562.82	609.6	632.99	6	15.49	592.81	568	.76	541.54	485.	6 42	27.07	402	2.01		(84)
7. Me	an interr	nal temp	erature	(heating	seasor	n)												
Temp	erature	during h	eating p	eriods ir	the livi	ng	area	from Tal	ole 9	, Th1	(°C)						21	(85)
Utilisa	tion fact	tor for ga	ains for I	iving are	ea, h1,m	า (ร	ee Ta	ble 9a)										
	Jan	Feb	Mar	Apr	May	Ĺ	Jun	Jul	Α	ug	Sep	Oc	t	Nov	D	ес	]	
(86)m=	0.99	0.97	0.93	0.84	0.68	7	0.49	0.36	0.3	39	0.6	0.87	7 0	.97	0.9	99		(86)
Mean	internal	tempera	ature in l	living are	ea T1 (f	ollo	w ste	ns 3 to 7	7 in T	able	9c)						4	
(87)m=	20.2	20.4	20.62	20.84	20.96	_	0.99	21	2		20.98	20.8	4 2	0.49	20.	.17	]	(87)
L	!	<u> </u>	!									<u> </u>					J	
(88)m=	20.08	during he	20.09	20.1	20.1	_	eiiing 20.11	20.11	20.		20.11	20.1	1 2	20.1	20.	.09	1	(88)
(55)	_5.55	_5.55	_5.55	_0.1						··	_3				1 -0.		J	(-2)

Litilioot	tion foo	tor for a	aina far	root of d	volling l	2 m (ac	o Tabla	00)						
(89)m=	0.98	0.96	0.91	0.8	0.63	0.43	e Table	9a) 0.31	0.53	0.83	0.96	0.99	l	(89)
` ′ L	I										0.90	0.99		(00)
Mean (90)m=	19.04	temper	19.64	the rest	of dwelli 20.07	ng 12 (fo 20.11	ollow ste	20.11	7 in Tabl <sub>20.1</sub>	e 9c)	19.46	19	l	(90)
(90)111=	19.04	19.32	19.04	19.93	20.07	20.11	20.11	20.11	<u> </u>		g area ÷ (4	ļ	0.40	(91)
										L/( - L/())	g aroa . (-	,, –	0.49	(91)
Г	1						LA × T1						1	
(92)m=	19.61	19.84	20.12	20.38	20.5	20.54	20.54	20.55	20.53	20.37	19.96	19.57		(92)
							i		ere appro	·			l	(00)
(93)m=	19.61	19.84	20.12	20.38	20.5	20.54	20.54	20.55	20.53	20.37	19.96	19.57		(93)
		·	uirement				44 (	T	41		70)			
				mperatui using Ta		ed at ste	ep 11 of	Table 9	o, so tha	t II,m=(	/6)m an	d re-calc	ulate	
L	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ı	
			ains, hm										l	
(94)m=	0.98	0.96	0.91	0.81	0.65	0.46	0.32	0.35	0.56	0.84	0.96	0.99	ı	(94)
Г			<u> </u>	4)m x (84					1		ı	<del>- 1</del>	1	(0.5)
` ′	418.53	482.87	514.58	494.92	411.71	282.97	188.89	197.91	304.36	408.64	410.68	396.67		(95)
Г				·	from Ta		400	40.4		40.0			İ	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	761.59	741.14	an intern 673.33	559.06	427.49	_m , vv = 284.75	=[(39)m : 189.06	x [(93)m· 198.2	- (96)m 309.77	474.69	628.13	755.14	1	(97)
` ′									)m – (95			755.14		(31)
· -	255.24	173.56	118.11	46.18	11.74	0	0.02	0	0	49.14	156.56	266.7	1	
(55)=	200.24	170.00	110.11	40.10	11.74	•			l per year			L	1077.23	(98)
Space	heating	a require	ement in	kWh/m²	:/vear			Tota	ii pei yeai	(KVVII/yCai	) = Odin(3	O)15,912 —	21.72	(99)
·		• •			•	ratama :	ام ماز د مازام م	rojera C	NID)				21.72	
			its – Inai	ividuai n	eating sy	/stems i	ncluding	micro-C	JHP)					
•	heating	_	at from se	econdar	y/supple	mentarv	svstem					ı	0	(201)
	•					,	•	(202) = 1 -	- (201) <b>=</b>				1	(202)
Fraction of space heat from main system(s) $ (202) = 1 - (201) =  $ Fraction of total heating from main system 1 $ (204) = (202) \times [1 - (203)] =  $											1	(204)		
			•	ing syste									93.5	(206)
	•	•		0 ,	y heating	g system	າ, %						0	(208)
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	
Space					d above)			119					,.	
· -	255.24	173.56	118.11	46.18	11.74	0	0	0	0	49.14	156.56	266.7	1	
(211)m	= {[(98)	)m x (20	4)1 } x 1	00 ÷ (20	)6)									(211)
` <i>′</i> _	272.99	185.62	126.32	49.39	12.56	0	0	0	0	52.56	167.45	285.24	1	( )
L	!						ļ	Tota	l (kWh/yea	ar) =Sum(2	L 211) <sub>15.1012</sub>	=	1152.11	(211)
Space	heatin	a fuel (s	econdar	y), kWh/	month						, 1012	l		<b>」</b> ` ′
•		• '	00 ÷ (20	• •										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0	l	
L							•	Tota	l (kWh/yea	ar) =Sum(2	215),,,,5,10,12	=	0	(215)
												·		_

167.41 147.75 155.63 140.15 137.81 1	123.8 119.53	130.29	129.79	145.3	152.83	163.6		
Efficiency of water heater	120.0	100.20	120.70	140.0	102.00	100.0	79.8	] <sub>(2</sub>
	79.8 79.8	79.8	79.8	82.26	84.88	86.11	75.0	_` 2)
Fuel for water heating, kWh/month								
219)m = (64)m x 100 ÷ (217)m				ī		·		
219)m= 194.8   173.32   185.08   170.48   171.09   1	55.14 149.79	163.27	162.64	176.64 19a) <sub>112</sub> =	180.06	189.98		1
		2072.29	(2					
Annual totals Space heating fuel used, main system 1				k'	Wh/year	[	<b>kWh/year</b> 1152.11	1
Vater heating fuel used							2072.29	] ]
· ·						l	2072.29	]
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30		(2
boiler with a fan-assisted flue						45		(2
otal electricity for the above, kWh/year		75	(2					
Electricity for lighting						ĺ	230.52	(2
12a. CO2 emissions – Individual heating system	s including mi	icro-CHP						_
Tza. 002 cillissions – individual neating system	<u> </u>							
Tza. 002 emissions – maiwada neating system				<b>Emiss</b>	ion fac	tor	<b>Emissions</b>	
Tza. 002 emissions – maividual neating system	<b>Energy</b> kWh/year			Emiss kg CO		tor	Emissions kg CO2/yea	r
Ŭ.	Energy				2/kWh	tor = [		r ](2
Space heating (main system 1) Space heating (secondary)	<b>Energy</b> kWh/year			kg CO	2/kWh		kg CO2/yea	,
Space heating (main system 1)	Energy kWh/year			kg CO	2/kWh	= [	kg CO2/yea	](2
Space heating (main system 1) Space heating (secondary) Vater heating	Energy kWh/year (211) x (215) x		264) =	0.2 0.5	2/kWh	=	kg CO2/yea	(2
Space heating (main system 1) Space heating (secondary) Vater heating Space and water heating	Energy kWh/year (211) x (215) x (219) x		264) =	0.2 0.5	2/kWh 16 19	=	kg CO2/yea	](2 ](2 ](2 ](2
Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x (219) x (261) + (262)		264) =	0.2 0.5 0.2	2/kWh 16 19 16	=	kg CO2/yea 248.86 0 447.61 696.47	](2 ](2 ](2

TER =

(273)

17.24