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 12:19:32*

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGETotal Floor Area: 87.88m²

Site Reference: B1 Stq 4 Issue Plot Reference: B1M-103-07

Address: B1M-103-07, Flat Type 1-56A, 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) 15.43 kg/m²

Dwelling Carbon Dioxide Emission Rate (DER)

9.97 kg/m²

OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 39.9 kWh/m²

OK

2 Fabric U-values

ElementAverageHighestExternal wall0.15 (max. 0.30)0.15 (max. 0.70)

Floor (no floor)

Roof (no roof)

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

2a Thermal bridging

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

3 Air permeability

Air permeability at 50 pascals 5.00 (design value)

Maximum 10.0 **OK**

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous extract system		
Specific fan power:	0.31	
Maximum	0.7	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	oK
Based on:		
Overshading:	Average or unknown	
Windows facing: North West	3.18m²	
Windows facing: North West	5.48m²	
Windows facing: North West	10.02m ²	
Windows facing: South West	3.48m²	
Windows facing: North West	1.77m²	
Ventilation rate:	3.00	
Blinds/curtains:	Light-coloured curtain or ro	oller blind
	Closed 100% of daylight he	ours

10 Key features

Community heating, heat from boilers – mains gas Photovoltaic array

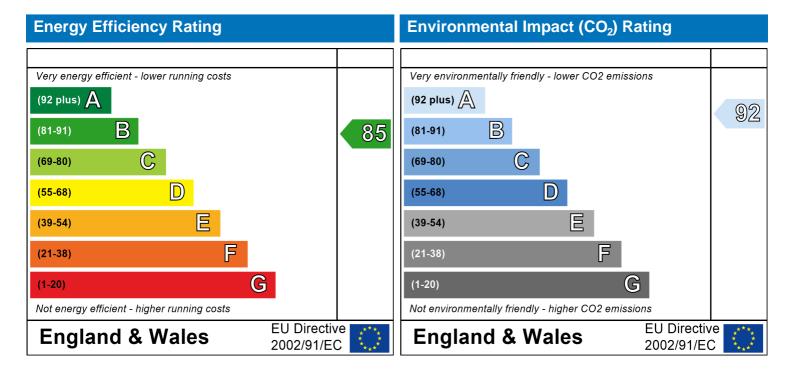
Predicted Energy Assessment



B1M-103-07 Flat Type 1-56A Wimbledon London Dwelling type: Date of assessment: Produced by: Total floor area: Mid floor Flat 01 December 2018 Ross Boulton 87.88 m²

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

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



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

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

SAP Input

Property Details: B1M-103-07

Address: B1M-103-07, Flat Type 1-56A, 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: 2019

Floor Location: Floor area:

Storey height:

Floor 0 87.883 m^2 2.6 m

Living area: 32.789 m² (fraction 0.373)

Front of dwelling faces: North

Opening types:

Name:	Source:	Type:	Glazing:	Argon:	Frame:
NW_0.62_2.56 x 2	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
NW_1.07_2.56 x 2	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
NW_3.84_2.61 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
SW_1.36_2.56 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	
NW_0.69_2.56 x 1	Manufacturer	Windows	low-E, $En = 0.05$, soft coat	No	

Name:	Gap:	Frame Fa	actor: g-value:	U-value:	Area:	No. of Openings:
NW_0.62_2.56 x 2	16mm or more	0.8	0.5	1.35	1.59	2
NW_1.07_2.56 x 2	16mm or more	0.8	0.5	1.35	2.74	2
NW_3.84_2.61 x 1	16mm or more	0.8	0.5	1.35	10.02	1
SW_1.36_2.56 x 1	16mm or more	0.8	0.5	1.35	3.48	1
NW 0.69 2.56 x 1	16mm or more	0.8	0.5	1.35	1.77	1

Name:	Type-Name:	Location:	Orient:	Width:	Height:
NW_0.62_2.56 x 2		Wall	North West	0.62	2.56
NW_1.07_2.56 x 2		Wall	North West	1.07	2.56
NW_3.84_2.61 x 1		Wall	North West	3.84	2.61
SW_1.36_2.56 x 1		Wall	South West	1.36	2.56
NW_0.69_2.56 x 1		Wall	North West	0.69	2.56

Overshading: Average or unknown

Opaque Elements

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elemen	<u>ts</u>						
Wall	68.602	23.93	44.67	0.15	0	False	N/A

Internal Elements
Party Elements

Thermal bridges

SAP Input

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

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Centralised whole house extract

Number of wet rooms: Kitchen + 3

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: 0.253

Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

			User D	etaile: -						
Access Name:	Poor Poulton				. NI	ber:		CTD.C	000000	
Assessor Name: Software Name:	Ross Boulton Stroma FSAP 20	12		Strom: Softwa					0028068 on: 1.0.4.18	
Software Name.	Stioma FSAF 20			Address				VEISIC	JII. 1.U. 4 .10	
Address :	B1M-103-07, Flat		i í			05-07				
Overall dwelling dime		. , po . oo	, , , , , , , , , , , , , , , , , , ,	olodon, E	oriaori					
3			Area	a(m²)		Av. He	ight(m)		Volume(m³)
Ground floor					(1a) x		2.6	(2a) =	228.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1	e)+(1r	1) 8	7.88	(4)			1		
Dwelling volume					(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	228.5	(5)
2. Ventilation rate:										
21 Volume and Trace.		secondar	у	other		total			m³ per hou	r
Number of chimneys	heating + [heating 0	+ [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0		0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ıns					0	x ·	10 =	0	
Number of passive vents	3				F	0	x	10 =	0	(7b)
Number of flueless gas fi					F	0	x	40 =	0	(7c)
Transor of hadrood gao h					L					
								Air cl	hanges per ho	ur
Infiltration due to chimne	ys, flues and fans = ((6a)+(6b)+(7	a)+(7b)+(7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has b	oeen carried out or is intend	ded, proceed	d to (17), d	otherwise o	ontinue fr	om (9) to	(16)			_
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0					•	uction			0	(11)
if both types of wall are pa deducting areas of openia	resent, use the value corre	esponding to	the great	er wall are	a (after					
If suspended wooden t	• / .	aled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else enter 0	,	·	ŕ					0	(13)
Percentage of windows	s and doors draught s	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,	q50, expressed in cu	bic metre	s per ho	our per s	quare m	etre of e	envelope	area	5	(17)
If based on air permeabil	lity value, then $(18) = [0]$	$(17) \div 20] + (8)$	3), otherwi	ise (18) = (16)				0.25	(18)
Air permeability value applie		as been don	e or a deg	gree air pe	meability	is being u	sed			_
Number of sides sheltere	ed			(20) = 1 -	0 075 v (4	10)1 –			2	(19)
Shelter factor	ting chalter factor			(20) = 1 - 1 (21) = (18)		19)] =			0.85	(20)
Infiltration rate incorporat	-	ام		(21) - (10)	X (20) =				0.21	(21)
Infiltration rate modified f	 	1	Jul	۸۰۰۵	Sep	Oct	Nov	Dec	7	
Jan Feb	Mar Apr May	Jun	Jui	Aug	Sep	Oct	INOV	Dec	_	
Monthly average wind sp	<u> </u>	1 00	2.0	0.7		1 40	1.5	4.7	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	J	
Wind Factor (22a)m = (2	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 infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(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 effec		_	rate for t	he appli	cable ca	se				•	•		— ,
If mechanica			andiv N. 70	2h) _ (22c) Em. (auation (N	JE)) otho	muiaa (22h) - (220)			0.5	(23a
If exhaust air he) = (23a)			0.5	(23b
If balanced with		•	•	J		`		,	.	001) .	4 (00)	0	(230
a) If balance		i			1	- ` ` 	- 	ŕ	 	, 	<u>` ` </u>) ÷ 100] 1	(24
(24a)m= 0			0	0	0	0	0	0	0	0	0		(24a
b) If balance		ı —					ÉÉÉ	í `	 			1	(O.4h
(24b)m= 0	0	0	0	0		0	0	0	0	0	0	J	(24b
c) If whole h if (22b)n					•				.5 × (23b	o)			
(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		(240
d) If natural if (22b)n				•	•				0.5]			•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(240
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)				J	
(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)
							l	1	l	1	1	1	•
3. Heat losse		•			N.				A 37.11				A 37 I
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
Windows Type	e 1				1.59	x1/	[1/(1.35)-	+ 0.04] =	2.04				(27)
Windows Type	2				2.74	<u>x</u> 1/	[1/(1.35)-	+ 0.04] =	3.51	Ħ			(27)
Windows Type	e 3				10.02	<u>x</u> 1/	[1/(1.35)-	+ 0.04] =	12.83	=			(27)
Windows Type	e 4				3.48		[1/(1.35)-	+ 0.04] ₌	4.46	=			(27)
Windows Type	e 5				1.77		[1/(1.35)-	+ 0.04] ₌	2.27	Ħ			(27)
Walls	68.6	<u></u>	23.9	3	44.67	=			6.7	=		$\neg \vdash$	(29)
Total area of e			20.0		68.6	=	0.10		0.1				(31)
* for windows and			effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ıe)+0.041 a	as aiven in	paragraph	3.2	(31)
** include the area						a.co a a.og		,[(,, o , a.o	,	.o g o	paragrap.	. 5.2	
Fabric heat los	ss, W/K =	= S (A x	U)				(26)(30)) + (32) =				37.35	(33)
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	625.41	(34)
Thermal mass	parame	ter (TMF	P = Cm +	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assess				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
can be used inste				.a.'.a. A.	ا بنام محمد	,							
Thermal bridge	,	,			•	`						10.29	(36)
if details of therma Total fabric he		are not kn	OWII (30) =	= 0.05 X (3	1)			(33) +	(36) =			47.64	(37)
Ventilation hea		alculated	l monthly	/						(25)m x (5))	47.04	(0.7
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(38)m= 39.28	38.88	38.48	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	1	(38)
Heat transfer of	<u> </u>	<u> </u>				<u> </u>			<u> </u>			J	, ,
(39)m = 86.92	86.52	86.12	85.34	85.34	85.34	85.34	85.34	85.34	= (37) + (3 85.34	85.34	85.34	1	
00.92	00.02	00.12	00.04	00.04	05.54	00.04	00.04	<u> </u>	<u> </u>	Sum(39) ₁	<u> </u>	85.64	(39)
								,	orage =	Jun (00)1	12 / 12-		(00)

Heat loss para	ameter (I	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.99	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97		
									Average =	Sum(40) ₁	12 /12=	0.97	(40)
Number of day	<u> </u>	1 `	· ·					-	<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu	upancy,	N								2	.6		(42)
if TFA > 13.		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13	.9)			
if TFA £ 13.5 Annual average	,	ater usad	ne in litre	es ner da	av Vd av	erane –	(25 x N)	+ 36		05	.85		(43)
Reduce the annua	,		,	•	•	_	` ,		se target o		.85		(43)
not more that 125	litres per	person pei	day (all w	ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 105.43	101.6	97.76	93.93	90.1	86.26	86.26	90.1	93.93	97.76	101.6	105.43		
_						_				m(44) ₁₁₂ =	L	1150.15	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	07m / 3600) kWh/mor	nth (see Ta	ables 1b, 1			
(45)m= 156.35	136.75	141.11	123.02	118.04	101.86	94.39	108.31	109.61	127.74	139.43	151.42		_
If instantaneous v	vator hoati	ina at naint	of uso (no	hot water	r storago)	ontor O in	havas (46		Total = Su	m(45) ₁₁₂ =	= [1508.03	(45)
		· ·	`	ı	· · ·	ı	· · ·	, , , I		,	1		(40)
(46)m= 23.45 Water storage	20.51	21.17	18.45	17.71	15.28	14.16	16.25	16.44	19.16	20.92	22.71		(46)
Storage volum) includir	ng anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	,					•					<u> </u>		(,
Otherwise if no	-			-			, ,	ers) ente	er '0' in ((47)			
Water storage	loss:		`					,		,			
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If manufact			-										
Hot water stor	-			le 2 (KVV	n/litre/da	ay)				0.	02		(51)
If community he Volume factor	•		011 4.3							1	03		(52)
Temperature f			2b							-	.6		(52)
Energy lost fro				ear			(47) x (51)) x (52) x (53) =		03		(54)
Enter (50) or		_	, 1	Jui			(11)11(21)	, (==, (,		03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				. ,
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain												хН	(00)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(57)m= 32.01	20.92	32.01	30.96	32.01	30.96	32.01	32.01	30.96	32.01				, ,
Primary circuit	`	,			50 \	(EO) = =					0		(58)
Primary circuit				,	•	` '	, ,		r tharma	otot)			
(modified by		1	ı —		ı —			<u> </u>		'	22.22		(59)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(38)

Combi loss cal	culated:	for each	month ((61)m =	(60) ÷ '	365 v (41)m						
(61)m= 0	0	0	0	0	0	0) 0	0	0	0	0	1	(61)
	ired for	water he	eating ca	alculated	l for ea	 ch month	(62)m	 1 = 0.85 ×	 (45)m +	(46)m +	(57)m +	- (59)m + (61)m	
(62)m= 211.63	186.67	196.39	176.52	173.32	155.36		163.5		183.01	192.93	206.69	1 ′ ′ ′	(62)
Solar DHW input o	alculated	using App	endix G oı	· Appendix	H (nega	tive quantity	y) (ente	r '0' if no sola	r contribu	tion to wat	er heating)) T	
(add additional	lines if	FGHRS	and/or \	WWHRS	applie	s, see Ap	pendi	k G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from wa	ater hea	ter											
(64)m= 211.63	186.67	196.39	176.52	173.32	155.36	149.67	163.5	9 163.1	183.01	192.93	206.69]	_
							C	utput from w	ater heate	er (annual)	112	2158.87	(64)
Heat gains fror	n water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	า + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	<u>ı</u>]	
(65)m= 96.21	85.41	91.14	83.7	83.47	76.66	75.61	80.2	79.24	86.69	89.16	94.57]	(65)
include (57)r	n in calc	culation o	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal ga	ins (see	Table 5	and 5a):									
Metabolic gain	s (Table	5), Wat	ts				_		_			_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 155.74	155.74	155.74	155.74	155.74	155.74	155.74	155.7	4 155.74	155.74	155.74	155.74]	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ilso se	e Table 5				_	
(67)m= 52.4	46.55	37.85	28.66	21.42	18.09	19.54	25.4	34.09	43.29	50.52	53.86]	(67)
Appliances gai	ns (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	lso see Ta	ble 5				
(68)m= 350.94	354.58	345.4	325.87	301.21	278.03	262.54	258.	268.08	287.61	312.28	335.45]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	or L15a), also	see Table	5			_	
(69)m= 53.17	53.17	53.17	53.17	53.17	53.17	53.17	53.1	7 53.17	53.17	53.17	53.17]	(69)
Pumps and far	ns gains	(Table 5	āa)									_	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)							_	
(71)m= -103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.8	2 -103.82	-103.82	-103.82	-103.82]	(71)
Water heating	gains (T	able 5)										_	
(72)m= 129.31	127.1	122.5	116.25	112.19	106.48	101.62	107.8	4 110.05	116.52	123.83	127.11]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68)	m + (69)m +	(70)m + (71)m + (72)m	_	
(73)m= 637.74	633.3	610.84	575.86	539.9	507.67	488.79	497.2	3 517.31	552.51	591.71	621.5]	(73)
6. Solar gains													
Solar gains are c		_					ations to		ne applica		tion.		
Orientation: A	ccess F able 6d	actor	Area m²			ux able 6a		g_ Table 6b	7	FF able 6c		Gains (W)	
							, ,				_	. ,	٦
Southwesto.9x	0.77	X	3.4		X	36.79	-	0.5	▃▎ [⋆] ▐	0.8	_ =	35.49	(79)
Southwesto or E	0.77	X	3.4		X	62.67	J	0.5	×	0.8	=	60.46	(79)
Southwesto or E	0.77	X	3.4		x	85.75] <u> </u>	0.5	×	0.8	=	82.72	(79)
Southwesto a	0.77	X	3.4		X	106.25	<u> </u>	0.5	_ ×	0.8	_ =	102.5	(79)
Southwest _{0.9x}	0.77	X	3.4	18	X	119.01	J L	0.5	X	0.8	=	114.8	(79)

Southwest _{0.9x}	0.77] x	2.49	1 x	140.45	1	0.5	l 🗸	0.0	1 =	112.07	(79)
Southwest _{0.9x}	0.77	╡	3.48] 1	118.15]]	0.5	X	0.8]]	113.97	≓ .
Southwest _{0.9x}	0.77] X	3.48	X	113.91]]	0.5	X	0.8] = _	109.88	(79)
Southwest _{0.9x}	0.77] X	3.48] X] ,	104.39] 1	0.5	X	0.8] = 1 _	100.7	(79)
Southwest _{0.9x}	0.77	X	3.48	X	92.85] 1	0.5	X	0.8] = 1	89.57	(79)
Southwest _{0.9x}	0.77	X	3.48	X	69.27] 1	0.5	X	0.8] = 1	66.82	(79)
<u> </u>	0.77	X	3.48	X	44.07] 1	0.5	X	0.8] = 1	42.51	(79)
Southwesto.9x	0.77	X	3.48] X]	31.49] 1	0.5	X	0.8	= 	30.37	(79)
Northwest 0.9x	0.77	X	1.59	X	11.28	X	0.5	X	0.8	=	9.95	(81)
Northwest 0.9x	0.77	X	2.74	X	11.28	X	0.5	X	0.8] = 1	17.14	(81)
Northwest 0.9x	0.54	X	10.02	X	11.28	X	0.5	X	0.8] = 1	21.98	(81)
Northwest 0.9x	0.77	X	1.77	X	11.28	X	0.5	X	0.8	=	5.54	(81)
Northwest _{0.9x}	0.77	X	1.59	X	22.97	X	0.5	X	0.8	=	20.25	(81)
Northwest 0.9x	0.77	X	2.74	X	22.97	X	0.5	X	0.8	=	34.89	(81)
Northwest _{0.9x}	0.54	X	10.02	X	22.97	X	0.5	X	0.8	=	44.74	(81)
Northwest _{0.9x}	0.77	X	1.77	X	22.97	X	0.5	X	0.8	=	11.27	(81)
Northwest _{0.9x}	0.77	X	1.59	X	41.38	X	0.5	X	0.8	=	36.48	(81)
Northwest _{0.9x}	0.77	X	2.74	X	41.38	X	0.5	X	0.8	=	62.86	(81)
Northwest _{0.9x}	0.54	X	10.02	X	41.38	X	0.5	X	0.8	=	80.6	(81)
Northwest 0.9x	0.77	X	1.77	X	41.38	X	0.5	X	0.8	=	20.3	(81)
Northwest 0.9x	0.77	X	1.59	X	67.96	X	0.5	X	0.8	=	59.9	(81)
Northwest _{0.9x}	0.77	X	2.74	X	67.96	X	0.5	X	0.8	=	103.23	(81)
Northwest _{0.9x}	0.54	X	10.02	X	67.96	x	0.5	x	0.8	=	132.37	(81)
Northwest _{0.9x}	0.77	X	1.77	X	67.96	X	0.5	X	0.8	=	33.34	(81)
Northwest _{0.9x}	0.77	X	1.59	X	91.35	X	0.5	x	0.8	=	80.52	(81)
Northwest _{0.9x}	0.77	X	2.74	X	91.35	X	0.5	x	0.8	=	138.76	(81)
Northwest _{0.9x}	0.54	X	10.02	X	91.35	X	0.5	x	0.8	=	177.93	(81)
Northwest _{0.9x}	0.77	X	1.77	X	91.35	x	0.5	x	0.8	=	44.82	(81)
Northwest _{0.9x}	0.77	X	1.59	x	97.38	X	0.5	x	0.8	=	85.84	(81)
Northwest _{0.9x}	0.77	X	2.74	x	97.38	x	0.5	X	0.8	=	147.93	(81)
Northwest 0.9x	0.54	x	10.02	x	97.38	x	0.5	X	0.8	=	189.69	(81)
Northwest _{0.9x}	0.77	X	1.77	x	97.38	X	0.5	X	0.8	=	47.78	(81)
Northwest _{0.9x}	0.77	x	1.59	x	91.1	x	0.5	x	0.8] =	80.31	(81)
Northwest 0.9x	0.77	X	2.74	x	91.1	x	0.5	x	0.8] =	138.39	(81)
Northwest _{0.9x}	0.54	x	10.02	x	91.1	x	0.5	x	0.8	=	177.45	(81)
Northwest _{0.9x}	0.77	x	1.77	x	91.1	x	0.5	х	0.8	j =	44.7	(81)
Northwest _{0.9x}	0.77	X	1.59	x	72.63	x	0.5	х	0.8	j =	64.02	(81)
Northwest _{0.9x}	0.77	x	2.74	×	72.63	x	0.5	x	0.8	=	110.32	(81)
Northwest _{0.9x}	0.54	x	10.02	×	72.63	x	0.5	х	0.8	=	141.47	(81)
Northwest _{0.9x}	0.77	X	1.77	X	72.63	X	0.5	X	0.8	=	35.63	(81)
Northwest _{0.9x}	0.77	X	1.59	X	50.42	X	0.5	X	0.8	=	44.45	(81)
Northwest _{0.9x}	0.77	X	2.74	X	50.42	X	0.5	X	0.8	, 	76.59	(81)
_		_		1		1		1	<u> </u>	ı	L	_ ′

Northwest 0.9	0.54	x	10.	02	x	50.42	x	0.5	X	0.8	=	98.21	(81)
Northwest 0.9	0.77	х	1.7	77	x	50.42	x [0.5	x	0.8	=	24.74	(81)
Northwest 0.9	0.77	х	1.5	59	x	28.07	x	0.5	X	0.8	=	24.74	(81)
Northwest 0.9	0.77	х	2.7	74	x	28.07	x	0.5	x	0.8	=	42.64	(81)
Northwest 0.9	0.54	х	10.	02	x	28.07	x	0.5	X	0.8	=	54.67	(81)
Northwest 0.9	0.77	x	1.7	77	x	28.07	x	0.5	X	0.8	=	13.77	(81)
Northwest 0.9	0.77	х	1.5	59	x	14.2	x	0.5	x	0.8	=	12.51	(81)
Northwest 0.9	0.77	Х	2.7	74	x	14.2	x	0.5	X	0.8	=	21.57	(81)
Northwest 0.9	0.54	х	10.	02	x	14.2	x	0.5	X	0.8	=	27.65	(81)
Northwest 0.9	0.77	х	1.7	77	x	14.2	x	0.5	x	0.8	=	6.97	(81)
Northwest 0.9	0.77	х	1.5	59	x	9.21	x	0.5	X	0.8	=	8.12	(81)
Northwest 0.9	0.77	X	2.7	74	x	9.21	x	0.5	X	0.8	=	14	(81)
Northwest 0.9	0.54	х	10.	02	x	9.21	x	0.5	x	0.8	=	17.95	(81)
Northwest 0.9	0.77	х	1.7	77	x	9.21	x	0.5	X	0.8	=	4.52	(81)
Solar gains	in watts, ca	alculated	for eac	h month			(83)m	= Sum(74)m	(82)m			-	
(83)m= 90.0		282.96	431.34	556.84	585.2		452.	15 333.56	202.64	111.21	74.96		(83)
Total gains	internal a			<u> </u>	<u>` </u>	<u> </u>						7	
(84)m= 727.	83 804.9	893.8	1007.2	1096.74	1092.	9 1039.52	949.	38 850.87	755.15	702.92	696.47		(84)
7. Mean in	ternal temp	perature	(heating	season)								
Temperatu	ıre during h	neating p	eriods ir	n the livi	ng are	a from Tab	ole 9,	Th1 (°C)				21	(85)
								` ,					1, ,
Utilisation	factor for g	ains for I	iving are	ea, h1,m	(see	Table 9a)		,					``
Utilisation Ja		ains for I Mar	iving are Apr	ea, h1,m May	(see	<u> </u>	Αι		Oct	Nov	Dec]	
	n Feb			T	<u> </u>	n Jul	I .	ıg Sep	Oct 0.8	Nov 0.9	Dec 0.93]	(86)
(86)m= 0.9	n Feb	Mar 0.85	Apr 0.75	May 0.61	Jur 0.46	0.35	Au 0.3	ug Sep 9 0.6	-	+			
(86)m= 0.9	n Feb 3 0.9	Mar 0.85	Apr 0.75	May 0.61	Jur 0.46	0.35 teps 3 to 7	Au 0.3	ug Sep 9 0.6 able 9c)	-	+]	
(86)m= 0.9 Mean inter (87)m= 19.3	n Feb 3 0.9 rnal temper 33 19.56	0.85 cature in 19.95	Apr 0.75 living are 20.41	0.61 ea T1 (fo	0.46 ollow s 20.92	0.35 steps 3 to 7 2 20.97	0.3 7 in T	ug Sep 9 0.6 able 9c) 96 20.82	0.8	0.9	0.93		(86)
(86)m= 0.9 Mean inter (87)m= 19.3	n Feb 3 0.9 rnal temper 33 19.56 ure during h	0.85 cature in 19.95	Apr 0.75 living are 20.41	0.61 ea T1 (fo	0.46 ollow s 20.92	0.35 steps 3 to 7 2 20.97	0.3 7 in T	ug Sep 9 0.6 able 9c) 96 20.82 9, Th2 (°C)	0.8	0.9	0.93]	(86)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatu (88)m= 20.0	n Feb 3 0.9 rnal temper 33 19.56 ure during h	Mar 0.85 rature in 19.95 neating p 20.1	Apr 0.75 living ard 20.41 eriods in 20.11	May 0.61 ea T1 (for 20.74 n rest of 20.11	Jur 0.46 ollow s 20.92 dwelli 20.1	Jul 0.35 steps 3 to 7 2 20.97 ng from Ta 1 20.11	0.37 in T 20.9	ug Sep 9 0.6 able 9c) 96 20.82 0, Th2 (°C)	20.39	19.8	0.93		(86)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatu (88)m= 20.0 Utilisation	n Feb 3 0.9 That temper 3 19.56 Ure during h 9 20.1 factor for g	Mar 0.85 rature in 19.95 neating p 20.1 ains for r	Apr 0.75 living ard 20.41 eriods in 20.11	May 0.61 ea T1 (for 20.74 rest of 20.11 welling,	Jur 0.46 ollow s 20.92 dwellii 20.11	Jul 0.35 steps 3 to 7 2 20.97 ng from Ta 2 20.11 see Table	Au 0.3 7 in T 20.9 able 9 20.1	g Sep 9 0.6 able 9c) 96 20.82 9, Th2 (°C)	20.39	0.9 19.8 20.11	0.93 19.3 20.11		(86) (87) (88)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatu (88)m= 20.6 Utilisation (89)m= 0.9	n Feb 3 0.9 rnal temper 3 19.56 ure during h 9 20.1 factor for g 2 0.89	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83	Apr 0.75 living ard 20.41 eriods in 20.11 rest of d	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57	Jur 0.46 ollow s 20.92 dwelli 20.11 h2,m (0.41	Jul 0.35 steps 3 to 7 2 20.97 ng from Ta 2 20.11 see Table 0.28	Au 0.3 7 in T 20.9 able 9 20.1 9a) 0.3	g Sep 9 0.6 able 9c) 06 20.82 0, Th2 (°C) 11 20.11	0.8 20.39 20.11	19.8	0.93		(86)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatu (88)m= 20.6 Utilisation (89)m= 0.9 Mean inter	n Feb 3 0.9 That temper 3 19.56 Ure during h 9 20.1 factor for g 2 0.89 That temper	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83	Apr 0.75 living are 20.41 eriods in 20.11 rest of d 0.72 the rest	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (1 Jul 0.35 steps 3 to 7 2 20.97 and from Ta 20.11 (see Table 0.28 (follow ste	Au 0.37 in T 20.9 able 9 20.1 9a) 0.3	ug Sep 9 0.6 able 9c) 96 20.82 9, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab	0.8 20.39 20.11 0.77 e 9c)	0.9 19.8 20.11 0.88	0.93 19.3 20.11 0.92		(86) (87) (88) (89)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatu (88)m= 20.6 Utilisation (89)m= 0.9	n Feb 3 0.9 That temper 3 19.56 Ure during h 9 20.1 factor for g 2 0.89 That temper	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83	Apr 0.75 living ard 20.41 eriods in 20.11 rest of d	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57	Jur 0.46 ollow s 20.92 dwelli 20.11 h2,m (0.41	1 Jul 0.35 steps 3 to 7 2 20.97 and from Ta 20.11 (see Table 0.28 (follow ste	Au 0.3 7 in T 20.9 able 9 20.1 9a) 0.3	ug Sep 9 0.6 able 9c) 96 20.82 0, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 08 19.94	0.8 20.39 20.11 0.77 e 9c) 19.38	0.9 19.8 20.11 0.88	0.93 19.3 20.11 0.92		(86) (87) (88) (89)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatu (88)m= 20.6 Utilisation (89)m= 0.9 Mean inter	n Feb 3 0.9 That temper 3 19.56 Ure during h 9 20.1 factor for g 2 0.89 That temper	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83	Apr 0.75 living are 20.41 eriods in 20.11 rest of d 0.72 the rest	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (1 Jul 0.35 steps 3 to 7 2 20.97 and from Ta 20.11 (see Table 0.28 (follow ste	Au 0.37 in T 20.9 able 9 20.1 9a) 0.3	ug Sep 9 0.6 able 9c) 96 20.82 0, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 08 19.94	0.8 20.39 20.11 0.77 e 9c) 19.38	0.9 19.8 20.11 0.88	0.93 19.3 20.11 0.92	0.37	(86) (87) (88) (89)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatur (88)m= 20.6 Utilisation (89)m= 0.9 Mean inter (90)m= 17.8	n Feb 3 0.9 rnal temper 3 19.56 ure during h 9 20.1 factor for g 2 0.89 rnal temper 37 18.2	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83 rature in 1	Apr 0.75 living ard 20.41 eriods in 20.11 rest of d 0.72 the rest 19.39	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell 19.82	Jur 0.46 collow s 20.92 dwelli 20.11 h2,m (Jul 0.35 steps 3 to 7 2 20.97 ng from Ta 2 20.11 see Table 0.28 (follow steps 3 to 7 2 20.97	Au 0.3 7 in T 20.9 able 9 20.1 9a) 0.3 eps 3 20.0	ug Sep 9 0.6 able 9c) 96 20.82 0, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 08 19.94	0.8 20.39 20.11 0.77 e 9c) 19.38	0.9 19.8 20.11 0.88	0.93 19.3 20.11 0.92	0.37	(86) (87) (88) (89)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatur (88)m= 20.6 Utilisation (89)m= 0.9 Mean inter (90)m= 17.8 Mean inter (92)m= 18.4	n Feb 3 0.9 rnal temper 3 19.56 ure during h 9 20.1 factor for g 2 0.89 rnal temper 37 18.2 rnal temper 11 18.71	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83 rature in 1 18.75	Apr 0.75 living ard 20.41 eriods in 20.11 rest of d 0.72 the rest 19.39 r the wh	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell 19.82 nole dwe 20.17	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (Jul 0.35 steps 3 to 7 2 20.97 ng from Ta 2 20.11 see Table 0.28 (follow steps 3 to 7 2 20.97 graph of the properties of the propertie	9a) 0.3 20.1 9a) 0.3 20.0 + (1 - 20.4	ug Sep 9 0.6 able 9c) 06 20.82 0, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 08 19.94 fLA) × T2 11 20.27	0.8 20.39 20.11 0.77 e 9c) 19.38 fLA = Liv	0.9 19.8 20.11 0.88	0.93 19.3 20.11 0.92	0.37	(86) (87) (88) (89)
Ja	n Feb 3 0.9 rnal temper 3 19.56 ure during h 9 20.1 factor for g 2 0.89 rnal temper 37 18.2 rnal temper 11 18.71 stment to t	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83 rature in 1 18.75 rature (fo 19.2 he mean	Apr 0.75 living are 20.41 eriods in 20.11 rest of d 0.72 the rest 19.39 r the wh 19.77 interna	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell 19.82 nole dwe 20.17 I temper	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (Jul 0.35 steps 3 to 7 2 20.97 ng from Ta 2 20.11 see Table 0.28 (follow steps 3 20.09 = fLA × T1 3 20.42 from Table	Au 0.3 7 in T 20.9 able 9 20.1 9a) 0.3 eps 3 20.0 + (1 - 20.4 44e, V	ug Sep 9 0.6 able 9c) 96 20.82 9, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 19.94 - fLA) × T2 11 20.27 where appre	0.8 20.39 20.11 0.77 e 9c) 19.38 fLA = Liv	0.9 19.8 20.11 0.88 18.55 ing area ÷ (4) 19.02	0.93 19.3 20.11 0.92 17.84 4) =	0.37	(86) (87) (88) (89) (90) (91)
(86)m= 0.9 Mean inter (87)m= 19.3 Temperatu (88)m= 20.6 Utilisation (89)m= 0.9 Mean inter (90)m= 17.8 Mean inter (92)m= 18.4 Apply adju (93)m= 18.4	n Feb 3 0.9 rnal temper 3 19.56 ure during h 9 20.1 factor for g 2 0.89 rnal temper 37 18.2 rnal temper 11 18.71 stment to t 11 18.71	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83 rature in 1 18.75 rature (fo 19.2 he mean 19.2	Apr 0.75 living ard 20.41 eriods in 20.11 rest of d 0.72 the rest 19.39 r the wh 19.77 interna 19.77	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell 19.82 nole dwe 20.17	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (Jul 0.35 steps 3 to 7 2 20.97 ng from Ta 2 20.11 see Table 0.28 (follow steps 3 20.09 = fLA × T1 3 20.42 from Table	9a) 0.3 20.1 9a) 0.3 20.0 + (1 - 20.4	ug Sep 9 0.6 able 9c) 96 20.82 9, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 19.94 - fLA) × T2 11 20.27 where appre	0.8 20.39 20.11 0.77 e 9c) 19.38 fLA = Liv	0.9 19.8 20.11 0.88 18.55 ing area ÷ (4	0.93 19.3 20.11 0.92 17.84 4) =	0.37	(86) (87) (88) (89) (90) (91)
Ja	n Feb 3 0.9 rnal temper 33 19.56 ure during h 9 20.1 factor for g 2 0.89 rnal temper 1 18.2 rnal temper 1 18.71 stment to t 1 18.71	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83 rature in 1 18.75 rature (fo 19.2 he mean 19.2 uirement	Apr 0.75 living are 20.41 eriods in 20.11 rest of d 0.72 the rest 19.39 r the wh 19.77 interna 19.77	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell 19.82 nole dwe 20.17 I temper 20.17	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (Jul 0.35 teps 3 to 7 2 20.97 ng from Ta 1 20.11 see Table 0.28 (follow ste 3 20.09 = fLA × T1 6 20.42 from Table 5 20.42	9a) 0.3 eps 3 20.0 + (1 - 20.4 20.4	Ig Sep 9 0.6 able 9c) 96 20.82 9, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 19.94 - fLA) × T2 11 20.27 where appre	0.8 20.39 20.11 0.77 e 9c) 19.38 fLA = Liv 19.75 ppriate 19.75	0.9 19.8 20.11 0.88 18.55 ing area ÷ (4) 19.02	0.93 19.3 20.11 0.92 17.84 18.39		(86) (87) (88) (89) (90) (91)
Ja	n Feb 3 0.9 That temper 3 19.56 The during here during here 2 0.89 That temper 3 18.2 That temper 4 18.71 The temper 4 18.71 Th	Mar 0.85 rature in 1 19.95 neating p 20.1 ains for r 0.83 rature in 1 18.75 rature (fo 19.2 he mean 19.2 uirement ternal	Apr 0.75 living ard 20.41 eriods in 20.11 rest of d 0.72 the rest 19.39 r the wh 19.77 interna 19.77	May 0.61 ea T1 (for 20.74 rest of 20.11 welling, 0.57 of dwell 19.82 cole dwe 20.17 I temper 20.17	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (Jul 0.35 teps 3 to 7 2 20.97 ng from Ta 1 20.11 see Table 0.28 (follow ste 3 20.09 = fLA × T1 6 20.42 from Table 5 20.42	9a) 0.3 eps 3 20.0 + (1 - 20.4 20.4	ug Sep 9 0.6 able 9c) 96 20.82 9, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 19.94 - fLA) × T2 11 20.27 where appre	0.8 20.39 20.11 0.77 e 9c) 19.38 fLA = Liv 19.75 ppriate 19.75	0.9 19.8 20.11 0.88 18.55 ing area ÷ (4) 19.02	0.93 19.3 20.11 0.92 17.84 18.39		(86) (87) (88) (89) (90) (91)
Mean inter (87)m= 19.3 Temperatu (88)m= 20.0 Utilisation (89)m= 0.9 Mean inter (90)m= 17.8 Mean inter (92)m= 18.4 Apply adju (93)m= 18.4 Set Ti to the utilisation	n Feb 3 0.9 rnal temper 3 19.56 ure during h 9 20.1 factor for g 2 0.89 rnal temper 37 18.2 rnal temper 1 18.71 stment to t 1 18.71 neating require mean interion factor for	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83 rature in 19.2 rature (fo 19.2 he mean 19.2 uirement ternal ternor gains or	Apr 0.75 living are 20.41 eriods in 20.11 rest of d 0.72 the rest 19.39 r the wh 19.77 interna 19.77	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell 19.82 nole dwe 20.17 I temper 20.17 re obtain able 9a	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (Jul 0.35	Au 0.3 7 in T 20.9 able 9 20.1 9a) 0.3 20.0 + (1 - 20.4 Table	g Sep 9 0.6 able 9c) 96 20.82 0, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 08 19.94	0.8 20.39 20.11 0.77 le 9c) 19.38 fLA = Liv 19.75 opriate 19.75	0.9 19.8 20.11 0.88 18.55 ing area ÷ (4 19.02 19.02	0.93 19.3 20.11 0.92 17.84 4) = 18.39 d re-calc		(86) (87) (88) (89) (90) (91)
Mean inter (87)m= 19.3 Temperatu (88)m= 20.6 Utilisation (89)m= 0.9 Mean inter (90)m= 17.8 Mean inter (92)m= 18.4 Apply adju (93)m= 18.4 Set Ti to the utilisation Jan	n Feb 3 0.9 rnal temper 3 19.56 ure during h 9 20.1 factor for g 2 0.89 rnal temper 37 18.2 rnal temper 11 18.71 stment to t 11 18.71 neating require mean intion factor for g n Feb	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83 rature in 18.75 rature (fo 19.2 he mean 19.2 uirement ternal teror gains of Mar	Apr 0.75 living are 20.41 eriods in 20.11 est of d 0.72 the rest 19.39 r the wh 19.77 interna 19.77 mperaturusing Ta	May 0.61 ea T1 (for 20.74 rest of 20.11 welling, 0.57 of dwell 19.82 cole dwe 20.17 I temper 20.17	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (Jul 0.35	9a) 0.3 eps 3 20.0 + (1 - 20.4 20.4	g Sep 9 0.6 able 9c) 96 20.82 0, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 08 19.94	0.8 20.39 20.11 0.77 e 9c) 19.38 fLA = Liv 19.75 ppriate 19.75	0.9 19.8 20.11 0.88 18.55 ing area ÷ (4) 19.02	0.93 19.3 20.11 0.92 17.84 18.39		(86) (87) (88) (89) (90) (91)
Mean inter (87)m= 19.3 Temperatu (88)m= 20.6 Utilisation (89)m= 0.9 Mean inter (90)m= 17.8 Mean inter (92)m= 18.4 Apply adju (93)m= 18.4 Set Ti to the utilisation Jan	n Feb 3 0.9 rnal temper 3 19.56 ure during h 9 20.1 factor for g 2 0.89 rnal temper 3 18.2 rnal temper 4 18.71 stment to t 4 18.71 neating require mean into factor for g n Feb factor for g	Mar 0.85 rature in 19.95 neating p 20.1 ains for r 0.83 rature in 18.75 rature (fo 19.2 he mean 19.2 uirement ternal teror gains of Mar	Apr 0.75 living are 20.41 eriods in 20.11 est of d 0.72 the rest 19.39 r the wh 19.77 interna 19.77 mperaturusing Ta	May 0.61 ea T1 (for 20.74 n rest of 20.11 welling, 0.57 of dwell 19.82 nole dwe 20.17 I temper 20.17 re obtain able 9a	Jur 0.46 ollow s 20.92 dwellii 20.11 h2,m (Jul 0.35	Au 0.3 7 in T 20.9 able 9 20.1 9a) 0.3 20.0 + (1 - 20.4 Table	Ig Sep 9 0.6 able 9c) 96 20.82 9, Th2 (°C) 11 20.11 2 0.54 to 7 in Tab 19.94 - fLA) × T2 11 20.27 where appress 12 20.27 where appress 2 9b, so that Ig Sep	0.8 20.39 20.11 0.77 le 9c) 19.38 fLA = Liv 19.75 opriate 19.75	0.9 19.8 20.11 0.88 18.55 ing area ÷ (4 19.02 19.02	0.93 19.3 20.11 0.92 17.84 4) = 18.39 d re-calc		(86) (87) (88) (89) (90) (91)

Useful gains, hmGm , W = (94)m x (84)m						
	30.61 467.	.63 571.31	605.82	629.45		(95)
Monthly average external temperature from Table 8						` '
	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	5)m]			ı	
(97)m= 1226.67 1194.86 1093.47 927.49 722.54 491.69 325.91 34	42.08 526.	.28 781.26	1017.12	1210.7		(97)
Space heating requirement for each month, kWh/month = 0.024 x	k [(97)m –	(95)m] x (4	1)m		•	
(98)m= 427.81 334.18 273.3 151.01 67.8 0 0	0 0	156.2	296.13	432.45		_
	Total per y	ear (kWh/year	r) = Sum(9	8) _{15,912} =	2138.89	(98)
Space heating requirement in kWh/m²/year					24.34	(99)
9b. Energy requirements – Community heating scheme						
This part is used for space heating, space cooling or water heating		•	unity sch	neme.		7(204)
Fraction of space heat from secondary/supplementary heating (Tal	ble II) U	ii none			0	(301)
Fraction of space heat from community system 1 – (301) =					1	(302)
The community scheme may obtain heat from several sources. The procedure allow includes boilers, heat pumps, geothermal and waste heat from power stations. See			other heat	sources; t	he latter	
Fraction of heat from Community CHP	трропах С.				0.67	(303a)
Fraction of community heat from heat source 2					0.33	(303b)
Fraction of total space heat from Community CHP		(3	02) x (303	a) =	0.67	(304a)
Fraction of total space heat from community heat source 2		(3	02) x (303	b) =	0.33	(304b)
Factor for control and charging method (Table 4c(3)) for community	y heating s	system			1	(305)
Distribution loss factor (Table 12c) for community heating system					1.05	(306)
Space heating				'	kWh/yea	-
Annual space heating requirement					2138.89	
Space heat from Community CHP	(98)	x (304a) x (30	5) x (306) =	=	1495.73	(307a)
Space heat from heat source 2	(98)	x (304b) x (30	5) x (306) =	=	750.11	(307b)
Efficiency of secondary/supplementary heating system in % (from	Table 4a c	or Appendix	E)		0	(308
Space heating requirement from secondary/supplementary system	ן (98)	x (301) x 100 -	÷ (308) =		0	(309)
Water heating						
Annual water heating requirement					2158.87	
If DHW from community scheme: Water heat from Community CHP	(64)	x (303a) x (30	5) x (306) :	=	1509.7	(310a)
Water heat from heat source 2	(64)	x (303b) x (30	5) x (306) :	=	757.12	(310b)
Electricity used for heat distribution	0.01 × [(30)7a)(307e) +	· (310a)…((310e)] =	45.13	(313)
Cooling System Energy Efficiency Ratio					0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (10	07) ÷ (314) =			0	(315)
Electricity for pumps and fans within dwelling (Table 4f):		_				
mechanical ventilation - balanced, extract or positive input from our	tside				112.34	(330a)
warm air heating system fans					0	(330b)

				_
pump for solar water heating			0	(330g)
Total electricity for the above, kWh	/year	=(330a) + (330b) + (330g) =	112.34	(331)
Energy for lighting (calculated in Ap	ppendix L)		370.19	(332)
Electricity generated by PVs (Appe	ndix M) (negative quantity)		-208.31	(333)
Electricity generated by wind turbin	e (Appendix M) (negative quanti	ity)	0	(334)
10b. Fuel costs – Community hear	ting scheme			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	3.35 x 0.01 =	50.11	(340a)
Space heating from heat source 2	(307b) x	4.79 x 0.01 =	35.93	(340b)
Water heating from CHP	(310a) x	3.35 × 0.01 =	50.57	(342a)
Water heating from heat source 2	(310b) x	4.79 x 0.01 =	36.27	(342b)
		Fuel Price		
Pumps and fans	(331)	0 x 0.01 =	19.73	(349)
Energy for lighting	(332)	0 x 0.01 =	65.01	(350)
Additional standing charges (Table	12)		88	(351)
Energy saving/generation technology Total energy cost	gies = (340a)(342e) + (345)(354)	=	345.61	(355)
11b. SAP rating - Community hear	ting schome			
The ordinating Continuating fical	ung scheme			
	ung scheme		0.43	7(356)
Energy cost deflator (Table 12)	[(355) x (356)] ÷ [(4) + 45.0] =		0.42	(356) (357)
	J		0.42 1.06 85.15	(356) (357) (358)
Energy cost deflator (Table 12) Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =		1.06	(357)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12)	[(355) x (356)] ÷ [(4) + 45.0] =		1.06	(357)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community	[(355) x (356)] ÷ [(4) + 45.0] =		1.06	(357)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit	[(355) x (356)] ÷ [(4) + 45.0] =	Energy Emission factor kWh/year kg CO2/kWh	1.06 85.15 32 50.4	(357) (358) (361)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit	[(355) x (356)] ÷ [(4) + 45.0] =	0 ,	1.06 85.15 32 50.4 Emissions	(357) (358) (361)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit Heat efficiency of CHP unit	[(355) x (356)] ÷ [(4) + 45.0] = heating scheme	kWh/year kg CO2/kWh	1.06 85.15 32 50.4 Emissions kg CO2/year	(357) (358) (361) (362)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit Heat efficiency of CHP unit	[(355) × (356)] ÷ [(4) + 45.0] = heating scheme (307a) × 100 ÷ (362) =	kWh/year kg CO2/kWh 2967.72 × 0.22	1.06 85.15 32 50.4 Emissions kg CO2/year	(357) (358) (361) (362) (363)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit Heat efficiency of CHP unit Space heating from CHP) less credit emissions for electricity	$[(355) \times (356)] \div [(4) + 45.0] =$ heating scheme $(307a) \times 100 \div (362) =$ $-(307a) \times (361) \div (362) =$	kWh/year kg CO2/kWh 2967.72 × 0.22 949.67 × 0.52	1.06 85.15 32 50.4 Emissions kg CO2/year 641.03 -492.88	(357) (358) (361) (362) (363) (364)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit Heat efficiency of CHP unit Space heating from CHP) less credit emissions for electricity Water heated by CHP	$[(355) \times (356)] \div [(4) + 45.0] =$ heating scheme $(307a) \times 100 \div (362) =$ $-(307a) \times (361) \div (362) =$ $(310a) \times 100 \div (362) =$ $-(310a) \times (361) \div (362) =$	kWh/year kg CO2/kWh 2967.72 × 0.22 949.67 × 0.52 2995.43 × 0.22	1.06 85.15 32 50.4 Emissions kg CO2/year 641.03 -492.88 647.01 -497.48	(357) (358) (361) (362) (363) (364) (365)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit Heat efficiency of CHP unit Space heating from CHP) less credit emissions for electricity Water heated by CHP less credit emissions for electricity	$[(355) \times (356)] \div [(4) + 45.0] =$ heating scheme $(307a) \times 100 \div (362) =$ $-(307a) \times (361) \div (362) =$ $(310a) \times 100 \div (362) =$ $-(310a) \times (361) \div (362) =$ If there is CHP using two	kWh/year kg CO2/kWh 2967.72 X 0.22 949.67 X 0.52 2995.43 X 0.22 958.54 X 0.52 o fuels repeat (363) to (366) for the second fuels	1.06 85.15 32 50.4 Emissions kg CO2/year 641.03 -492.88 647.01 -497.48	(357) (358) (361) (362) (363) (364) (365) (366)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit 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 (%)	[(355) x (356)] ÷ [(4) + 45.0] = heating scheme (307a) x 100 ÷ (362) = -(307a) x (361) ÷ (362) = (310a) x 100 ÷ (362) = -(310a) x (361) ÷ (362) = If there is CHP using two [(307b)+(310)	kWh/year kg CO2/kWh 2967.72 X 0.22 949.67 X 0.52 2995.43 X 0.22 958.54 X 0.52 o fuels repeat (363) to (366) for the second fuels (363) to (366) for the second fuels (367b) x 0.22	1.06 85.15 32 50.4 Emissions kg CO2/year 641.03 -492.88 647.01 -497.48	(357) (358) (361) (362) (363) (364) (365) (366) (367b)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit 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	$[(355) \times (356)] \div [(4) + 45.0] =$ heating scheme $(307a) \times 100 \div (362) =$ $-(307a) \times (361) \div (362) =$ $(310a) \times 100 \div (362) =$ $-(310a) \times (361) \div (362) =$ If there is CHP using two $[(307b) + (310a) $	kWh/year kg CO2/kWh 2967.72 X 0.22 949.67 X 0.52 2995.43 X 0.22 958.54 X 0.52 o fuels repeat (363) to (366) for the second fuels (367b) x 0.22 3b)] x 100 ÷ (367b) x 0.22 3) x 0.52	1.06 85.15 32 50.4 Emissions kg CO2/year 641.03 -492.88 647.01 -497.48 95 342.7	(357) (358) (361) (362) (363) (364) (365) (366) (367b) (368)
Energy cost deflator (Table 12) Energy cost factor (ECF) SAP rating (section12) 12b. CO2 Emissions – Community Electrical efficiency of CHP unit 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	[(355) x (356)] ÷ [(4) + 45.0] = heating scheme (307a) x 100 ÷ (362) = -(307a) x (361) ÷ (362) = (310a) x 100 ÷ (362) = -(310a) x (361) ÷ (362) = If there is CHP using two [(307b)+(310) nn [(313) nnity systems (363)	kWh/year kg CO2/kWh 2967.72 × 0.22 949.67 × 0.52 2995.43 × 0.22 958.54 × 0.52 o fuels repeat (363) to (366) for the second fuels (367b) x 0.22 3) x 0.52 3) x 0.52	1.06 85.15 32 50.4 Emissions kg CO2/year 641.03 -492.88 647.01 -497.48 95 342.7 23.42	(357) (358) (361) (362) (363) (364) (365) (366) (367b) (368) (372)

					_
CO2 associated with water from immersion heater	er or instantaneous heater	(312) x 0.	22 =	0	(375)
Total CO2 associated with space and water heat	ing (373) + (374) +	(375) =		663.8	(376)
CO2 associated with electricity for pumps and far	ns within dwelling (331)) x	0.	52 =	58.31	(378)
CO2 associated with electricity for lighting	(332))) x	0.	52 =	192.13	(379)
Energy saving/generation technologies (333) to (334) as applicable	0.50	¬ x 0.01 = ¬	100.11	7(200)
	⁷ 6)(382) =	0.52		-108.11	(380)
Total GGZ, Kg/y Gal			Ļ	806.12](383)] ₍₂₀₄₎
Dironing GGE Ennocion Rato	. -		L	9.17](384)] ₍₃₈₅₎
El rating (section 14)	20		L	91.87	(385)
13b. Primary Energy – Community heating scher Electrical efficiency of CHP unit	ne		Г	32	(361)
Heat efficiency of CHP unit			L		J` `
near emciency of one unit	_		L	50.4	(362)
	Energy kWh/ye		•	'.Energy Wh/year	
Space heating from CHP) (307a) × 100 ÷	(2000)				7(262)
less credit emissions for electricity –(307a) × (361)	. (262)		22	3620.61](363)
·	(200)		07	-2915.48](364)
, c	2000.4		22	3654.43	(365)
less credit emissions for electricity -(310a) × (361)				-2942.71	<u></u> (366)
(,	there is CHP using two fuels repe	eat (363) to (366) for t	ne second fuel	95	(367b)
Energy associated with heat source 2	[(307b)+(310b)] x 100 ÷	(367b) x 1.	22 =	1935.6	(368)
Electrical energy for heat distribution	[(313) x		=	138.54	(372)
Total Energy associated with community systems	363)(366) +	(368)(372)	=	3490.98	(373)
if it is negative set (373) to zero (unless specifi	ed otherwise, see C7 in Ap	pendix C)		3490.98	(373)
Energy associated with space heating (secondar	y) (309) x		=	0	(374)
Energy associated with water from immersion he	ater or instantaneous heate	er(312) x 1.	22 =	0	(375)
Total Energy associated with space and water he	eating (373) + (374) +	(375) =		3490.98	(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 =	344.89	(378)
Energy associated with electricity for lighting	(332))) x	3.	07 =	1136.49	(379)
Energy saving/generation technologies Item 1		2.07	x 0.01 = [620 5	(380)
	sum of (376)(382) =	3.07		-639.5	J` `
Total Primary Energy, kWh/year	sum or (370)(302) =		L	4332.86	(383)

		_ Lloor-I	Details:						
Accesses Name:	Ross Boulton	User I		- M	h a v .		CTDC	0028068	
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa					on: 1.0.4.18	
Contware Hame.	Olioma 1 O/11 2012	Property	Address:				VOIOIC	JII. 1.0. 1.10	
Address :	B1M-103-07, Flat Type	· · · · ·							
1. Overall dwelling dime	• • • • • • • • • • • • • • • • • • • •								
		Are	a(m²)		Av. He	eight(m)		Volume(m	3)
Ground floor			87.88	(1a) x		2.6	(2a) =	228.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+	(1n)	87.88	(4)			_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	228.5	(5)
2. Ventilation rate:									
	main seco heating heat	ndary	other		total			m³ per hou	ır
Number of chimneys		0 +	0] = [0	X ·	40 =	0	(6a)
Number of open flues	0 +	0 +	0	j = F	0	x	20 =	0	(6b)
Number of intermittent fa	ans			,	3	X	10 =	30	(7a)
Number of passive vents				L			10 =		╡``
•				Ļ	0			0	(7b)
Number of flueless gas f	ires			L	0	X :	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(7a)+(7b)+	(7c) =	Г	30		÷ (5) =	0.13	(8)
	peen carried out or is intended, p			ontinue fr			. (0) –	0.13	
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	0.25 for steel or timber fran	ne or 0.35 fc	r masonr	y consti	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value correspond	ding to the grea	ter wall area	a (after					
•	floor, enter 0.2 (unsealed)	or 0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	iter 0.05, else enter 0	,	,.					0	(13)
Percentage of window	s and doors draught stripp	oed						0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	100] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	q50, expressed in cubic n	•	•	•	etre of e	envelope	area	5	(17)
·	lity value, then $(18) = [(17) \div$							0.38	(18)
Air permeability value applie Number of sides sheltere	es if a pressurisation test has bee	en done or a de	gree air per	meability	is being u	sed			— (40)
Shelter factor	eu		(20) = 1 - [0.075 x (²	19)] =			0.85	(19) (20)
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.32	(21)
Infiltration rate modified	_							0.02	(= - /
Jan Feb		Jun Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	peed from Table 7	'						-	
(22)m= 5.1 5		3.8 3.8	3.7	4	4.3	4.5	4.7]	
					•		•	4	
Wind Factor $(22a)m = (2a)m =$	'	1			1	1		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]	

,	ation rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.41	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38		
Calculate effect		-	rate for t	he appli	cable ca	se	-	_		-	-	_	
If exhaust air he			andiv N (2	3h) - (23s	a) v Emy (e	nguation (N	VS)) othe	rwise (23h)) <i>– (</i> 23a)			0	(23a
If balanced with		0 11		, ,	,	. `	,, .) = (25a)			0	(23b
		•	-	_					Ob)m i (i	22h) [1 (220)	0	(23c
a) If balance	a mecha o	o o	ntilation 0	with nea	at recove	ery (IVIVI	1R) (248	$\frac{1}{10} = \frac{1}{10}$	0 + (1)	23b) x [0) ÷ 100]]	(24a
							<u> </u>					J	(244
b) If balance	a mecha	anicai ve	entilation 0	without	neat rec	overy (i	0 (240	0)m = (22)	2D)M + (2 0	23b) 0	0	1	(24b
									U	0		J	(240
c) If whole he if (22b)m				•	•				5 × (23b))	_		
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c
d) If natural v if (22b)m									0.5]				
(24d)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57]	(24d
Effective air	 change	rate - er	nter (24a	or (24b	o) or (240	c) or (24	d) in box	 к (25)			ļ.	J	
(25)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57]	(25)
0 11		-1.1											
3. Heat losses		·			Nat Am		اميراا		A V I I		بريامير با	_	A V Is
ELEMENT	Gros area	-	Openin m		Net Are A ,n		U-valı W/m2		A X U (W/I	〈)	k-value kJ/m²-		A X k kJ/K
Windows Type	1				1.46	x1.	/[1/(1.4)+	0.04] =	1.94				(27)
Windows Type	2				2.52	x1.	/[1/(1.4)+	0.04] =	3.34				(27)
Windows Type	3				9.2	x1.	/[1/(1.4)+	0.04] =	12.2				(27)
Windows Type	4				3.2	x1.	/[1/(1.4)+	0.04] =	4.24				(27)
Windows Type	5				1.63	x ₁ ,	/[1/(1.4)+	0.04] =	2.16	=			(27)
Walls	68.6	<u></u>	21.99	a	46.61	X	0.18		8.39	=			(29)
Total area of el			21.0		68.6	=	0.10		0.00				(31)
* for windows and			effective wi	ndow U-va		 ated using	ı formula 1	/[(1/U-valu	e)+0.041 a	ns aiven in	paragraph	h 3.2	(01)
** include the area								, ((), 0 1 3 3 3	-,	J	p		
Fabric heat los	s, W/K =	= S (A x	U)				(26)(30)) + (32) =				37.54	(33)
Heat capacity (Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	652.57	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(35)
For design assess				construct	ion are not	known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
can be used instea				icina An	nondiy k	•						0.40	(20)
Thermal bridge if details of therma	`	,		٠.	•	`						3.43	(36)
Total fabric hea		are not kii	10W11 (30) =	- 0.00 X (3	1)			(33) +	(36) =			40.97	(37)
Ventilation hea	t loss ca	alculatec	d monthly	/				(38)m	= 0.33 × (25)m x (5)	ı		` ′
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
—	43.89	43.64	42.49	42.28	41.28	41.28	41.09	41.66	42.28	42.71	43.17	1	(38)
(38)m= 44.14										<u> </u>		1	
` ′	pefficien	nt. W/K						(39)m	= (37) + (3	38)m			
(38)m= 44.14 Heat transfer c (39)m= 85.11	oefficier	nt, W/K 84.62	83.47	83.25	82.25	82.25	82.06	(39)m 82.64	= (37) + (3 83.25	38)m 83.69	84.14	1	

Heat loss para	ameter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.97	0.97	0.96	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.95	0.96		
	!	•							Average =	Sum(40) ₁ .	12 /12=	0.95	(40)
Number of day	<u> </u>	· `											
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. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13. if TFA £ 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		.6		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.85		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i							•						
(44)m= 105.43	101.6	97.76	93.93	90.1	86.26	86.26	90.1	93.93	97.76	101.6	105.43		
									Total = Su	m(44) ₁₁₂ =		1150.15	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 156.35	136.75	141.11	123.02	118.04	101.86	94.39	108.31	109.61	127.74	139.43	151.42		_
If instantaneous v	vator hoati	na at noint	of use (no	hot water	r storaga)	enter∩in	hoves (16		Total = Su	m(45) ₁₁₂ =	• [1508.03	(45)
													(40)
(46)m= 0 Water storage	loss:	0	0	0	0	0	0	0	0	0	0		(46)
Storage volum) includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWh	n/day):					0		(48)
Temperature f											0		(49)
Energy lost from		_	-		or io not		(48) x (49)) =			0		(50)
b) If manufactHot water stor			-								0		(51)
If community h	•			- (77					<u> </u>		(- /
Volume factor	from Ta	ble 2a									0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , ` `	,									0		(55)
Water storage	loss cal	culated f	or each	month	_	_	((56)m = (55) × (41)	m	_			
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendi	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nnual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
(modified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss ca	lculated	for each	month ((61)m –	(60) -	± 365 ∨ (41	١m						
(61)m= 0	0	0	0	0 0	00) -	0) 0	0	0	Ιο	0		(61)
												(59)m + (61)m	(- /
(62)m= 132.9	116.23	119.94	104.57	100.34	86.5		92.07		108.58	118.52	128.7	(39)111 + (01)111	(62)
Solar DHW input	1									1			()
(add additiona									ii ooniinbu	uon to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from w	ater hea	ter					<u> </u>		<u> </u>	1	<u> </u>	ı	
(64)m= 132.9	116.23	119.94	104.57	100.34	86.5	8 80.23	92.07	93.17	108.58	118.52	128.7		
		ļ					0	 utput from w	ater heate	er (annual)	l12	1281.83	(64)
Heat gains fro	m water	heating,	kWh/me	onth 0.2	5 ′ [0.	.85 × (45)m	ı + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 33.22	29.06	29.99	26.14	25.08	21.6		23.02	-	27.14	29.63	32.18]	(65)
include (57)	m in cal	culation of	of (65)m	only if c	vlinde	er is in the	dwellir	g or hot w	ater is f	rom com	munity h	ı neating	
5. Internal g					,						,		
Metabolic gair	,												
Jan	Feb	Mar	Apr	May	Ju	n Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 129.78	129.78	129.78	129.78	129.78	129.	78 129.78	129.7	8 129.78	129.78	129.78	129.78		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L	9 or L9a), a	lso se	e Table 5				•	
(67)m= 20.96	18.62	15.14	11.46	8.57	7.2	3 7.82	10.16	13.64	17.32	20.21	21.54		(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uatio	n L13 or L1	3a), al	so see Ta	ble 5	•		•	
(68)m= 235.13	237.57	231.42	218.33	201.81	186.	28 175.9	173.4	6 179.61	192.7	209.22	224.75		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L	15 or L15a), also	see Table	5			•	
(69)m= 35.98	35.98	35.98	35.98	35.98	35.9	8 35.98	35.98	35.98	35.98	35.98	35.98		(69)
Pumps and fa	ns gains	(Table 5	ōa)			•		•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)	•		•		•		•	
(71)m= -103.82	-103.82	-103.82	-103.82	-103.82	-103.	82 -103.82	-103.8	2 -103.82	-103.82	-103.82	-103.82		(71)
Water heating	gains (T	able 5)		-		-			-		-		
(72)m= 44.66	43.24	40.3	36.31	33.72	30.0	6 26.96	30.94	32.35	36.48	41.15	43.25		(72)
Total internal	gains =	:				(66)m + (67)n	า + (68)	n + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 362.68	361.36	348.8	328.04	306.03	285.	51 272.61	276.5	287.53	308.44	332.52	351.48		(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and as	sociated equa	itions to	convert to th	ne applica	ble orienta	tion.		
Orientation:			Area			Flux		g_ Table Ch	-	FF		Gains	
-	Table 6d		m²		_	Table 6a		Table 6b	_ ' 	able 6c		(W)	_
Southwest _{0.9x}	0.77	X	3.	2	x	36.79	<u> </u>	0.63	x	0.7	=	35.98	(79)
Southwest _{0.9x}	0.77	X	3.	2	x	62.67		0.63	x	0.7	=	61.29	(79)
Southwest _{0.9x}	0.77	X	3.:	2	x	85.75	<u> </u>	0.63	x [0.7	=	83.86	(79)
Southwest _{0.9x}	0.77	X	3.	2	x	106.25	<u> </u>	0.63	x	0.7	=	103.91	(79)
Southwest _{0.9x}	0.77	X	3	2	x	119.01		0.63	x	0.7	=	116.39	(79)

Southwest _{0.9x}	0.77	٦ ,		1 ,	440.45	1	0.00	l v	0.7	1 _	445.55	(79)
Southwest _{0.9x}	0.77] X] ,	3.2	X	118.15]]	0.63	X	0.7] =	115.55	=
Southwest _{0.9x}	0.77] X] ,	3.2	X	113.91]]	0.63	X	0.7] =] _	111.4	(79)
Southwest _{0.9x}	0.77] X] ,	3.2] X] ,	104.39] 1	0.63	X	0.7] =	102.09	(79)
Southwest _{0.9x}	0.77	X	3.2	X	92.85] 1	0.63	X	0.7] = 1	90.81	(79)
Southwest _{0.9x}	0.77	X	3.2	X	69.27] 1	0.63	X	0.7] = 1	67.74	(79)
<u> </u>	0.77	X	3.2	X	44.07] 1	0.63	X	0.7] = 1	43.1	(79)
Southwesto.9x	0.77	X	3.2	X	31.49] 1	0.63	X	0.7] = 1	30.79	(79)
Northwest 0.9x	0.77	X	1.46	X	11.28	X	0.63	X	0.7] = 1	10.07	(81)
Northwest 0.9x	0.77	X	2.52	X	11.28	X	0.63	X	0.7] =	17.38	(81)
Northwest 0.9x	0.54	X	9.2	X	11.28	X	0.63	X	0.7] =	22.25	(81)
Northwest 0.9x	0.77	X	1.63	X	11.28	X	0.63	X	0.7	=	5.62	(81)
Northwest 0.9x	0.77	X	1.46	X	22.97	X	0.63	X	0.7	=	20.5	(81)
Northwest 0.9x	0.77	X	2.52	X	22.97	X	0.63	X	0.7	=	35.38	(81)
Northwest _{0.9x}	0.54	X	9.2	X	22.97	X	0.63	X	0.7	=	45.29	(81)
Northwest _{0.9x}	0.77	X	1.63	X	22.97	X	0.63	X	0.7	=	11.44	(81)
Northwest _{0.9x}	0.77	X	1.46	X	41.38	X	0.63	X	0.7	=	36.93	(81)
Northwest _{0.9x}	0.77	X	2.52	X	41.38	X	0.63	X	0.7	=	63.74	(81)
Northwest _{0.9x}	0.54	X	9.2	X	41.38	X	0.63	X	0.7	=	81.59	(81)
Northwest _{0.9x}	0.77	X	1.63	X	41.38	X	0.63	X	0.7	=	20.61	(81)
Northwest 0.9x	0.77	X	1.46	X	67.96	X	0.63	X	0.7	=	60.64	(81)
Northwest _{0.9x}	0.77	X	2.52	X	67.96	X	0.63	X	0.7	=	104.67	(81)
Northwest _{0.9x}	0.54	X	9.2	x	67.96	x	0.63	x	0.7	=	134	(81)
Northwest 0.9x	0.77	X	1.63	X	67.96	X	0.63	X	0.7	=	33.85	(81)
Northwest _{0.9x}	0.77	X	1.46	X	91.35	X	0.63	x	0.7	=	81.52	(81)
Northwest _{0.9x}	0.77	X	2.52	X	91.35	X	0.63	x	0.7	=	140.7	(81)
Northwest _{0.9x}	0.54	X	9.2	X	91.35	X	0.63	x	0.7	=	180.12	(81)
Northwest _{0.9x}	0.77	X	1.63	X	91.35	x	0.63	x	0.7	=	45.5	(81)
Northwest _{0.9x}	0.77	X	1.46	x	97.38	X	0.63	x	0.7	=	86.9	(81)
Northwest _{0.9x}	0.77	X	2.52	x	97.38	x	0.63	x	0.7	=	150	(81)
Northwest 0.9x	0.54	X	9.2	x	97.38	x	0.63	x	0.7	=	192.02	(81)
Northwest _{0.9x}	0.77	X	1.63	x	97.38	X	0.63	x	0.7	=	48.51	(81)
Northwest _{0.9x}	0.77	x	1.46	x	91.1	x	0.63	x	0.7	=	81.3	(81)
Northwest 0.9x	0.77	x	2.52	x	91.1	x	0.63	x	0.7] =	140.32	(81)
Northwest _{0.9x}	0.54	x	9.2	x	91.1	x	0.63	x	0.7	=	179.63	(81)
Northwest 0.9x	0.77	X	1.63	x	91.1	x	0.63	х	0.7	j =	45.38	(81)
Northwest _{0.9x}	0.77	x	1.46	x	72.63	x	0.63	х	0.7	j =	64.81	(81)
Northwest _{0.9x}	0.77	×	2.52	×	72.63	x	0.63	x	0.7	j =	111.87	(81)
Northwest _{0.9x}	0.54	x	9.2	×	72.63	x	0.63	x	0.7	j =	143.21	(81)
Northwest _{0.9x}	0.77	X	1.63	X	72.63	X	0.63	x	0.7	=	36.18	(81)
Northwest _{0.9x}	0.77	X	1.46	x	50.42	x	0.63	x	0.7	=	44.99	(81)
Northwest _{0.9x}	0.77	X	2.52	X	50.42	X	0.63	x	0.7] =	77.66	(81)
L		_		1		ı		I		1		」 ` ′

Northwest 0.9x	0.54	X	9.:	2	x	50	.42	x	0.63		x [0.7		=	99.42	(81)
Northwest 0.9x	0.77	X	1.6	33	x	50	.42	х	0.63		x	0.7		=	25.12	(81)
Northwest 0.9x	0.77	X	1.4	16	x	28	.07	х	0.63		x [0.7		=	25.05	(81)
Northwest 0.9x	0.77	X	2.5	52	x	28	.07	х	0.63		x [0.7		=	43.23	(81)
Northwest 0.9x	0.54	X	9.2	2	x	28	.07	х	0.63		x	0.7		=	55.34	(81)
Northwest 0.9x	0.77	X	1.6	63	x	28	.07	х	0.63		x [0.7		=	13.98	(81)
Northwest 0.9x	0.77	X	1.4	16	x	14	1.2	х	0.63		x [0.7		=	12.67	(81)
Northwest 0.9x	0.77	X	2.5	52	x	14	1.2	х	0.63		x [0.7		= [21.87	(81)
Northwest 0.9x	0.54	X	9.3	2	x	14	1.2	х	0.63		x [0.7		=	27.99	(81)
Northwest 0.9x	0.77	X	1.6	33	x	14	1.2	х	0.63		x [0.7		=	7.07	(81)
Northwest 0.9x	0.77	X	1.4	16	x	9.:	21	х	0.63		x [0.7		=	8.22	(81)
Northwest 0.9x	0.77	X	2.5	52	x	9.2	21	х	0.63		x [0.7		=	14.19	(81)
Northwest 0.9x	0.54	X	9.:	2	x	9.2	21	х	0.63		x [0.7		=	18.17	(81)
Northwest 0.9x	0.77	X	1.6	33	x	9.:	21	х	0.63		x [0.7		=	4.59	(81)
Solar gains in	watts, ca	alculated	for eac	h month	ı			(83)m	= Sum(74)n	n(82	?)m					
(83)m= 91.3	173.89	286.73	437.07	564.22	592	2.99	558.03	458.	15 338	20	5.34	112.7	75.9	7		(83)
Total gains –	internal a	nd solar	(84)m =	= (73)m	+ (83	3)m ,	watts								1	
(84)m= 453.98	535.25	635.53	765.11	870.25	87	8.5	830.65	734.	65 625.53	513	3.78	445.22	427.4	15		(84)
7. Mean inte	rnal temp	erature	(heating	season	1)											
Temperature	e during h	eating p	eriods ir	n the livi	ng a	rea fr	om Tab	ole 9.	Th1 (°C)						21	(85)
								,	(•)							
Utilisation fa	ctor for ga	ains for l	iving are	ea, h1,m	ı (se	e Tab		,	(•)							
Utilisation fa	ctor for ga	ains for l	iving are Apr	ea, h1,m May	TÌ.	e Tab lun		Αι		<u> </u>	Oct	Nov	De	:C		
	T	I		I	J		le 9a)	I .	ıg Sep	+	Oct .98	Nov 1	De 1	:C		(86)
(86)m= 1	Feb 1	Mar 0.99	Apr 0.94	May 0.8	0.	lun 59	Jul 0.43	Αι 0.5	ıg Sep	+		+		c		(86)
Jan	Feb 1	Mar 0.99	Apr 0.94	May 0.8	O.	lun 59	Jul 0.43	Αι 0.5	ug Sep 1 0.81 able 9c)	0.		+				(86)
(86)m= 1 Mean internation (87)m= 19.93	Feb 1 al tempera 20.08	0.99 ature in 1	Apr 0.94 iving are 20.68	May 0.8 ea T1 (fo 20.91	0.000000000000000000000000000000000000	59 v step:	Jul 0.43 s 3 to 7	0.5 in T	ug Sep 1 0.81 able 9c) 20.93	0.	.98	1	1			
Jan (86)m= 1 Mean interna (87)m= 19.93 Temperature	Feb 1 1 al tempera 20.08 e during h	Mar 0.99 ature in l 20.34 eating p	Apr 0.94 iving are 20.68 eriods ir	May 0.8 ea T1 (for 20.91	J 0. ollow 20 dwe	v step 0.99	Jul 0.43 s 3 to 7 21 from Ta	Au 0.5 7 in T 21 able 9	ug Sep 1 0.81 able 9c) 20.93 7, Th2 (°C)	20	98	20.2	1	1		
(86)m= 1 Mean internation (87)m= 19.93 Temperature (88)m= 20.11	Feb 1 1 20.08 20.11	Mar 0.99 ature in I 20.34 eating p	Apr 0.94 iving are 20.68 eriods ir 20.13	May 0.8 ea T1 (for 20.91 rest of 20.13	J 0.3 ollow 20 dwe 20	v step 0.99	Jul 0.43 s 3 to 7 21 rom Ta 20.14	0.57 in T 21 able 9 20.1	ug Sep 1 0.81 able 9c) 20.93 0, Th2 (°C)	20	.98	1	19.9	1		(87)
Jan (86)m= 1 Mean internation (87)m= 19.93 Temperature (88)m= 20.11 Utilisation fa	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga	Mar 0.99 ature in I 20.34 eating p 20.11 ains for r	Apr 0.94 iving are 20.68 eriods ir 20.13	May 0.8 ea T1 (for 20.91 rest of 20.13 welling,	ollow 20 dwe 20 h2,n	v step 0.99 billing f 0.14	Jul 0.43 s 3 to 7 21 from Ta 20.14	Au 0.57 in T 21 able 9 20.1	ug Sep 1 0.81 able 9c) 20.93 1, Th2 (°C) 14 20.13	0.	0.6	20.2	19.9	1		(87)
(86)m= 1 Mean internation (87)m= 19.93 Temperature (88)m= 20.11	Feb 1 1 20.08 20.11	Mar 0.99 ature in I 20.34 eating p	Apr 0.94 iving are 20.68 eriods ir 20.13	May 0.8 ea T1 (for 20.91 rest of 20.13	ollow 20 dwe 20 h2,n	v step 0.99	Jul 0.43 s 3 to 7 21 rom Ta 20.14	0.57 in T 21 able 9 20.1	ug Sep 1 0.81 able 9c) 20.93 1, Th2 (°C) 14 20.13	0.	98	20.2	19.9	1		(87)
Jan (86)m= 1 Mean internation (87)m= 19.93 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (89)m= 1	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera	Mar 0.99 ature in l 20.34 eating p 20.11 ains for r 0.99 ature in t	Apr 0.94 iving are 20.68 eriods ir 20.13 est of dr 0.93 the rest	May 0.8 ea T1 (for 20.91) rest of 20.13 welling, 0.75 of dwell	J 0.0 collow 20 dwe 20 h2,n 0.0 ing T	v step: 0.99 elling f 0.14 n (see 51	Jul 0.43 s 3 to 7 21 rom Ta 20.14 e Table 0.35	Au 0.57 in T 21 20.1 9a) 0.4	ug Sep 1 0.81 able 9c) 20.93 0, Th2 (°C) 14 20.13 2 0.74 to 7 in Ta	0.	98 0.6 0.13	20.2	19.9	1		(87) (88) (89)
Jan (86)m= 1	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga	Mar 0.99 ature in I 20.34 eating p 20.11 ains for r 0.99	Apr 0.94 iving are 20.68 eriods ir 20.13 est of denotes the denotes of denotes the denotes	May 0.8 ea T1 (for 20.91 n rest of 20.13 welling, 0.75	J 0.0 collow 20 dwe 20 h2,n 0.0 ing T	v step: .99 elling f .14 n (see	Jul 0.43 s 3 to 7 21 from Ta 20.14 e Table 0.35	Au 0.5 7 in T 21 able 9 20.1 9a) 0.4	ug Sep 1 0.81 able 9c) 20.93 0, Th2 (°C) 14 20.13 2 0.74 to 7 in Ta	0. 20) 20 ble 90 19	98 0.6 0.13 97 0.13	20.2 20.12 1	19.9 20.1:	2		(87) (88) (89) (90)
Jan (86)m= 1 Mean internation (87)m= 19.93 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (89)m= 1	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera	Mar 0.99 ature in l 20.34 eating p 20.11 ains for r 0.99 ature in t	Apr 0.94 iving are 20.68 eriods ir 20.13 est of dr 0.93 the rest	May 0.8 ea T1 (for 20.91) rest of 20.13 welling, 0.75 of dwell	J 0.0 collow 20 dwe 20 h2,n 0.0 ing T	v step: 0.99 elling f 0.14 n (see 51	Jul 0.43 s 3 to 7 21 rom Ta 20.14 e Table 0.35	Au 0.57 in T 21 20.1 9a) 0.4	ug Sep 1 0.81 able 9c) 20.93 0, Th2 (°C) 14 20.13 2 0.74 to 7 in Ta	0. 20) 20 ble 90 19	98 0.6 0.13 97 0.13	20.2	19.9 20.1:	2	0.37	(87) (88) (89)
Jan (86)m= 1 Mean internation (87)m= 19.93 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (89)m= 1	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27	Mar 0.99 ature in l 20.34 eating p 20.11 ains for r 0.99 ature in t 19.53	Apr 0.94 iving are 20.68 eriods ir 20.13 est of de 0.93 the rest 19.87	May 0.8 ea T1 (for 20.91 n rest of 20.13 welling, 0.75 of dwell 20.07	J 0 0 20 dwe 20 h2,n 0 20 1 20	v step: 0.99 elling f 0.14 n (see 51	Jul 0.43 s 3 to 7 21 from Ta 20.14 e Table 0.35	Au 0.57 in T 21 20.1 9a) 0.4 eps 3 20.1	ug Sep 1 0.81 able 9c) 20.93 0, Th2 (°C) 14 20.13 2 0.74 to 7 in Ta	0. 20) 20 ble 90 flA =	98 0.6 0.13 97 0.13	20.2 20.12 1	19.9 20.1:	2	0.37	(87) (88) (89) (90)
Jan (86)m= 1 1	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27	Mar 0.99 ature in l 20.34 eating p 20.11 ains for r 0.99 ature in t 19.53	Apr 0.94 iving are 20.68 eriods ir 20.13 est of de 0.93 the rest 19.87	May 0.8 ea T1 (for 20.91 n rest of 20.13 welling, 0.75 of dwell 20.07	J 0.: ollow 20 dwe 20 h2,n 0.: ing 1	v step: 0.99 elling f 0.14 n (see 51	Jul 0.43 s 3 to 7 21 from Ta 20.14 e Table 0.35	Au 0.57 in T 21 20.1 9a) 0.4 eps 3 20.1	ug Sep 1 0.81 able 9c) 20.93 1, Th2 (°C) 14 20.13 2 0.74 to 7 in Ta 14 20.1 - fLA) × T	0. 20) 0. ble 90 15 fLA =	98 0.6 0.13 97 0.13	20.2 20.12 1	19.9 20.1:	1 1	0.37	(87) (88) (89) (90)
Jan (86)m= 1 Mean internation (87)m= 19.93 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (90)m= 19.12	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27 al tempera 19.57	Mar 0.99 ature in l 20.34 eating p 20.11 ains for r 0.99 ature in t 19.53 ature (fo	Apr 0.94 iving are 20.68 eriods ir 20.13 est of de 0.93 the rest 19.87 r the wh	May 0.8 ea T1 (for 20.91 n rest of 20.13 welling, 0.75 of dwell 20.07	J 0 0 20 4 20 1 20 2 1 20 2 2 2 2 2 2 3 4 1 1 1 4 5 7 1 5 7 7 6 7 7 7 7 7 7 7 7 8 7 7 9 7 7 10 7 1	v step: 0.99 elling f 0.14 π (see 51 Γ2 (fol 0.13) = fL/ 0.45	Jul 0.43 s 3 to 7 21 from Ta 20.14 e Table 0.35 llow ste 20.14 A × T1 20.46	9a) 0.4 0.5 20.1 4 (1 - 20.4	Ig Sep 1 0.81 able 9c) 20.93 0, Th2 (°C) 14 20.13 2 0.74 to 7 in Ta 14 20.1 - fLA) × T 16 20.41	0. 200 0. ble 90 19 fLA = 22 20	98 0.6 0.13 97 0.0) 99.8 E. Livir	1 20.2 20.12 1 1 19.41 ng area ÷ (4	1 19.9 20.1: 1 19.1 1) =	1 1	0.37	(87) (88) (89) (90) (91)
Jan	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27 al tempera 19.57	Mar 0.99 ature in l 20.34 eating p 20.11 ains for r 0.99 ature in t 19.53 ature (fo	Apr 0.94 iving are 20.68 eriods ir 20.13 est of de 0.93 the rest 19.87 r the wh	May 0.8 ea T1 (for 20.91 n rest of 20.13 welling, 0.75 of dwell 20.07	J 0.: 0.: 20 dwe 20 20	v step: 0.99 elling f 0.14 π (see 51 Γ2 (fol 0.13) = fL/ 0.45	Jul 0.43 s 3 to 7 21 from Ta 20.14 e Table 0.35 llow ste 20.14 A × T1 20.46	9a) 0.4 0.5 20.1 4 (1 - 20.4	able 9c) 20.93 7, Th2 (°C) 20.13 2 0.74 to 7 in Ta 20.1 - fLA) × T 6 20.41 where app	0. 20 20 0. ble 90 15 fLA = 22 20 propria	98 0.6 0.13 97 0.0) 99.8 E. Livir	1 20.2 20.12 1 1 19.41 ng area ÷ (4	1 19.9 20.1: 1 19.1 1) =	1 1	0.37	(87) (88) (89) (90) (91)
Jan (86)m= 1 Mean internation (87)m= 19.93 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (90)m= 19.12 Mean internation (92)m= 19.42 Apply adjust	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27 al tempera 19.57 ment to th 19.57	Mar 0.99 ature in l 20.34 eating p 20.11 ains for r 0.99 ature in t 19.53 ature (fo 19.83 ne mean 19.83	Apr 0.94 iving are 20.68 eriods ir 20.13 est of dr 0.93 the rest 19.87 r the wh 20.17 internal	May 0.8 ea T1 (for 20.91 n rest of 20.13 welling, 0.75 of dwell 20.07 cole dwe 20.39 I temper	J 0.: 0.: 20 dwe 20 20	v step: 0.99 elling f 0.14 T2 (fol 0.13) = fL/ 0.45 e from	Jul 0.43 s 3 to 7 21 from Ta 20.14 e Table 0.35 llow ste 20.14 A x T1 20.46 n Table	Au 0.57 in T 21 able 9 20.1 9a) 0.4 eps 3 20.1 + (1 - 20.4 4e, v	able 9c) 20.93 7, Th2 (°C) 20.13 2 0.74 to 7 in Ta 20.1 - fLA) × T 6 20.41 where app	0. 20 20 0. ble 90 15 fLA = 22 20 propria	98 0.06 0.13 97 0.) 9.8 Liviri	1 20.2 20.12 1 1 19.41 ng area ÷ (4 19.7	1 19.9 20.1: 1 19.1 1) =	1 1	0.37	(87) (88) (89) (90) (91) (92)
Jan	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27 al tempera 19.57 ment to th 19.57 ating requesting requestin	Mar 0.99 ature in l 20.34 eating pr 20.11 ains for r 0.99 ature in t 19.53 ature (fo 19.83 ne mean 19.83 virement ernal ten	Apr 0.94 iving are 20.68 eriods ir 20.13 est of de 0.93 the rest 19.87 r the wh 20.17 internal 20.17	May 0.8 ea T1 (for 20.91 no rest of 20.13 welling, 0.75 of dwell 20.07 cole dwe 20.39 I temper 20.39 re obtain	dwe 20 h2,n 0 ing 1 20 cature 20 20	v step: 0.99 elling f 0.14 T2 (fol 0.13) = fL/ 0.45 e from	Jul 0.43 s 3 to 7 21 from Ta 20.14 e Table 0.35 llow ste 20.14 A × T1 20.46 n Table 20.46	Au 0.57 in T 21 able 9 20.1 9a) 0.4 eps 3 20.1 + (1 - 20.4 4e, 1) 20.4	1g Sep 1 0.81 able 9c) 20.93 1, Th2 (°C) 14 20.13 2 0.74 to 7 in Ta 14 20.1 - fLA) × T 16 20.41 where app 16 20.41	0. 20 20 0. ble 90 15 fLA = 22 20 20 20	98 0.0.6 0.13 97 0.) 9.8 Liviring	1 20.2 20.12 1 1 19.41 ang area ÷ (4 19.7 19.7	1 19.9 20.1: 1 19.1 19.4 19.4	1 1 1 1		(87) (88) (89) (90) (91) (92)
Mean internations (86)m= 1 Mean internations (87)m= 19.93 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internations (90)m= 19.12 Mean internations (92)m= 19.42 Apply adjust (93)m= 19.42 8. Space here the utilisations	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27 al tempera 19.57 ment to th 19.57 ating requ mean intent factor for	Mar 0.99 ature in l 20.34 eating pr 20.11 ains for r 0.99 ature in t 19.53 ature (fo 19.83 ne mean 19.83 uirement ernal ten or gains to	Apr 0.94 iving are 20.68 eriods ir 20.13 est of dr 0.93 the rest 19.87 r the wh 20.17 internal 20.17	May 0.8 ea T1 (for 20.91 n rest of 20.13 welling, 0.75 of dwell 20.07 cole dwe 20.39 I temper 20.39 re obtain able 9a	J 0 0 20 dwe 20 20	v step: 0.99	Jul 0.43 s 3 to 7 21 rom Ta 20.14 e Table 0.35 llow ste 20.14 A x T1 20.46 n Table 20.46	Au 0.57 in T 21 able 9 20.1 9a) 0.4 eps 3 20.1 + (1 - 20.4 4e,) 20.4 Table	able 9c) 20.93 20.93 20.74 20.13 20.74 20.74 20.74 20.74 20.74 20.74 20.74 20.74 20.74 20.74 20.75 20.74 20.74 20.75 20.74 20.74 20.75 20.74 20.75 20.	0. 20 0. 10 10 10 10 10 10 10 10 10 10 10 10 10	98 0.6 0.13 97 0) 9.8 Livir ate 0.1 m=(1 20.2 20.12 1 1 19.41 ng area ÷ (4 19.7 19.7 (76)m and	19.9 20.1: 1 19.1 19.4 19.4 dre-c	1 2 1 1 1 1 calc		(87) (88) (89) (90) (91) (92)
Jan (86)m= 1 Mean interna (87)m= 19.93 Temperature (88)m= 20.11 Utilisation fa (89)m= 1 Mean interna (90)m= 19.12 Mean interna (92)m= 19.42 Apply adjust (93)m= 19.42 8. Space her Set Ti to the the utilisation Jan	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27 al tempera 19.57 ment to th 19.57 ating requ mean inten factor for	Mar 0.99 ature in I 20.34 eating pr 20.11 ains for r 0.99 ature in t 19.53 ature (for 19.83 ne mean 19.83 attrement ernal ten or gains to Mar	Apr 0.94 iving are 20.68 eriods ir 20.13 est of do 0.93 the rest 19.87 r the wh 20.17 internal 20.17 enperaturusing Ta	May 0.8 ea T1 (for 20.91 no rest of 20.13 welling, 0.75 of dwell 20.07 cole dwe 20.39 I temper 20.39 re obtain	J 0 0 20 dwe 20 20	v step: 0.99 elling f 0.14 T2 (fol 0.13) = fL/ 0.45 e from	Jul 0.43 s 3 to 7 21 from Ta 20.14 e Table 0.35 llow ste 20.14 A × T1 20.46 n Table 20.46	Au 0.57 in T 21 able 9 20.1 9a) 0.4 eps 3 20.1 + (1 - 20.4 4e, 1) 20.4	able 9c) 20.93 7, Th2 (°C) 20.13 2 0.74 to 7 in Ta 20.1 - fLA) × T 20.41 where app 26 20.41 e 9b, so th	0. 20 0. 10 10 10 10 10 10 10 10 10 10 10 10 10	98 0.0.6 0.13 97 0.) 9.8 Liviring	1 20.2 20.12 1 1 19.41 ang area ÷ (4 19.7 19.7	1 19.9 20.1: 1 19.1 19.4 19.4	1 2 1 1 1 1 calc		(87) (88) (89) (90) (91) (92)
Mean internations (86)m= 1 Mean internations (87)m= 19.93 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internations (90)m= 19.12 Mean internations (92)m= 19.42 Apply adjust (93)m= 19.42 8. Space here the utilisations	Feb 1 al tempera 20.08 e during h 20.11 ctor for ga 1 al tempera 19.27 al tempera 19.57 ment to th 19.57 ating requ mean inten factor for	Mar 0.99 ature in I 20.34 eating pr 20.11 ains for r 0.99 ature in t 19.53 ature (for 19.83 ne mean 19.83 attrement ernal ten or gains to Mar	Apr 0.94 iving are 20.68 eriods ir 20.13 est of do 0.93 the rest 19.87 r the wh 20.17 internal 20.17 enperaturusing Ta	May 0.8 ea T1 (for 20.91 n rest of 20.13 welling, 0.75 of dwell 20.07 cole dwe 20.39 I temper 20.39 re obtain able 9a	dwe 20 h2,n 0.: ing 1 20 ature 20 ned a	v step: 0.99	Jul 0.43 s 3 to 7 21 rom Ta 20.14 e Table 0.35 llow ste 20.14 A x T1 20.46 n Table 20.46	Au 0.57 in T 21 able 9 20.1 9a) 0.4 eps 3 20.1 + (1 - 20.4 4e,) 20.4 Table	Ig Sep 1 0.81 able 9c) 20.93 0, Th2 (°C) 14 20.13 2 0.74 to 7 in Ta 14 20.1 - fLA) × T 16 20.41 where app 16 20.41 e 9b, so th	0. 20 0. 19 10 11 11 11 12 12 12 12 12 13 14 15 16 17 16 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	98 0.6 0.13 97 0) 9.8 Livir ate 0.1 m=(1 20.2 20.12 1 1 19.41 ng area ÷ (4 19.7 19.7 (76)m and	19.9 20.1: 1 19.1 19.4 19.4 dre-c	1 2 1 1 1 1 calc		(87) (88) (89) (90) (91) (92)

Useful gains, hmGm , W = (94)m	n x (84)m									
(95)m= 453.27 532.96 625.43 70	09.23 666.14	475.13	316.69	331.38	480.12	498.8	443.58	426.97		(95)
Monthly average external tempe	rature from Ta	able 8					-			
(96)m= 4.3 4.9 6.5	8.9 11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal	temperature, I	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1287.31 1245.35 1128.24 94	40.99 723.17	481.3	317.33	333.02	521.27	790.77	1054.8	1279.53		(97)
Space heating requirement for e	ach month, kV	Wh/mont	th = 0.02	4 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m= 620.52 478.73 374.09 16	66.87 42.43	0	0	0	0	217.23	440.08	634.3		
				Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2974.26	(98)
Space heating requirement in kV	Vh/m²/year							Ī	33.84	(99)
8c. Space cooling requirement										
Calculated for June, July and Au	igust. See Tal	ole 10b								
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rate Lm (calculated us	ing 25°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m= 0 0 0	0 0	773.15	608.65	623.69	0	0	0	0		(100)
Utilisation factor for loss hm										
(101)m= 0 0 0	0 0	0.97	0.99	0.97	0	0	0	0		(101)
Useful loss, hmLm (Watts) = (10	0)m x (101)m									
(102)m= 0 0 0	0 0	747.52	600.07	607.19	0	0	0	0		(102)
Gains (solar gains calculated for	applicable we				10)		•			
(103)m= 0 0 0	0 0		1089.27		0	0	0	0		(103)
Space cooling requirement for m set (104)m to zero if (104)m < 3		lwelling,	continuo	ous (kW	h') = 0.02	24 x [(10	03)m – (102)m] x	c (41)m	
(104)m= 0 0 0	0 0	288.95	363.97	272.96	0	0	0	0		
					Total	= Sum(104)	=	925.88	(104)
Cooled fraction					f C =	cooled	area ÷ (4	4) =	1	(105)
Intermittency factor (Table 10b)							1			
(106)m= 0 0 0	0 0	0.25	0.25	0.25	0	0	0	0		_
0 " ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	(1 (404)	(405)	(400)		Total	' = Sum((104)	= [0	(106)
Space cooling requirement for mo		<u> </u>			_	0				
(107)m= 0 0 0	0 0	72.24	90.99	68.24	0 T = 1 = 1	0	0	0		7(407)
						= Sum(107)	=	231.47	(107)
Space cooling requirement in kWl		1	era e e e e	101	` '	÷ (4) =			2.63	(108)
8f. Fabric Energy Efficiency (calcu	ulated only un	der spec	cial cond	itions, se		,				
Fabric Energy Efficiency					(99) -	+ (108) =	=	ļ	36.48	(109)
Target Fabric Energy Efficience	y (TFEE)								41.95	(109)

		User	Details:						
Assessor Name:	Ross Boulton		Stroma	a Num	ber:		STRO	028068	
Software Name:	Stroma FSAP 201	2	Softwa	-				n: 1.0.4.18	
		Propert	y Address:						
Address :	B1M-103-07, Flat Ty	·	•						
1. Overall dwelling dime	ensions:								
		Aı	rea(m²)		Av. Hei	ght(m)		Volume(m	3)
Ground floor			87.88	(1a) x	2	.6	(2a) =	228.5	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1n)	87.88	(4)			-		_
Dwelling volume				(3a)+(3b))+(3c)+(3d))+(3e)+	(3n) =	228.5	(5)
2. Ventilation rate:									
		econdary eating	other		total			m³ per hou	ır
Number of chimneys		0 +	0	= [0	X	40 =	0	(6a)
Number of open flues	0 +	0 +	0] = [0	x	20 =	0	(6b)
Number of intermittent fa	ans			, <u> </u>	3	×	10 =	30	(7a)
Number of passive vents	3			F	0	×	10 =	0	(7b)
Number of flueless gas f	ires			Ė	0	X	40 =	0	(7c)
				_			L		
							Air ch	anges per h	our
Infiltration due to chimne	ys, flues and fans = (6	a)+(6b)+(7a)+(7b))+(7c) =	Γ	30		÷ (5) =	0.13	(8)
	oeen carried out or is intende	d, proceed to (17), otherwise o	ontinue fr	om (9) to (16)			_
Number of storeys in t	he dwelling (ns)							0	(9)
Additional infiltration			_			[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber f			•	uction			0	(11)
deducting areas of openi	resent, use the value correspings): if equal user 0.35	oonaing to the gre	eater wall area	a (atter					
=	floor, enter 0.2 (unseal	ed) or 0.1 (sea	aled), else	enter 0			[0	(12)
If no draught lobby, en	iter 0.05, else enter 0						İ	0	(13)
Percentage of window	s and doors draught st	ripped					İ	0	(14)
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =		ĺ	0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13) +	· (15) =	İ	0	(16)
Air permeability value,	q50, expressed in cub	ic metres per	hour per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabi	lity value, then (18) = [(17	7) ÷ 20]+(8), othe	rwise (18) = (16)			Ì	0.38	(18)
Air permeability value applie	es if a pressurisation test has	been done or a	degree air pei	meability	is being us	sed	L		
Number of sides sheltere	ed							2	(19)
Shelter factor			(20) = 1 - [0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	-		(21) = (18)	x (20) =				0.32	(21)
Infiltration rate modified		i	-				1		
Jan Feb	Mar Apr May	Jun 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		
Wind Factor (22a)m = (2	∠)III - 4						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

Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.41	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38]	
Calculate effect		•	rate for t	he appli	cable ca	se						-	
If mechanica			andiv N (2	3h) - (23s	a) v Emy (e	aguation (N	VSV) othe	nvise (23h) = (23a)			0	(23a)
If balanced with		0		, ,	,	. ,	,, .	•) = (25a)			0	(23b)
		•	•	_					26\m . /	22h) [1 (22a)	0	(23c)
a) If balance (24a)m= 0	o mecha	anicai ve	ntilation	with ne	at recove		7R) (248	$\frac{1}{10} = \frac{1}{10}$	20)m + (. 0	23b) × [0) ÷ 100]]	(24a
()			<u> </u>			<u> </u>			<u> </u>]	(2-14)
b) If balance (24b)m= 0	o mecha	anicai ve	ntilation 0	without	neat red		0 (240)m = (22 0	$\frac{20}{0}$	230)	0	1	(24b
												J	(240)
c) If whole h if (22b)n				-	-				5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural if (22b)n									0.51				
(24d)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57	1	(24d
Effective air												J	
(25)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57	1	(25)
					l		l			l		J	
3. Heat losse													
ELEMENT	Gros area	_	Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I		k-value kJ/m²-l		A X k kJ/K
Windows Type	1				1.59	x1/	[1/(1.35)-	+ 0.04] =	2.04				(27)
Windows Type	2				2.74	x1/	[1/(1.35)-	+ 0.04] =	3.51				(27)
Windows Type	3				10.02	<u>x</u> 1/	[1/(1.35)-	+ 0.04] =	12.83				(27)
Windows Type	4				3.48	x1/	[1/(1.35)-	+ 0.04] =	4.46				(27)
Windows Type	5				1.77	x1/	[1/(1.35)-	+ 0.04] =	2.27				(27)
Walls	68.6	6	23.9	3	44.67	, x	0.15		6.7				(29)
Total area of e	lements	, m²			68.6	=							(31)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	h 3.2	
Fabric heat los							(26)(30)) + (32) =				37.35	(33)
Heat capacity		•	,					((28)	.(30) + (32	2) + (32a).	(32e) =	625.41	(34)
Thermal mass	,		c = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assess	ments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		``
can be used instead						_							
Thermal bridge	`	,		О.	•	<						10.29	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			47.64	(37)
Ventilation hea	at loss ca	alculated	monthly	y				(38)m	= 0.33 × ((25)m x (5))		
			г — —		lun	Jul	Aug	Sep	Oct	Nov	Dec]	
Jan	Feb	Mar	Apr	May	Jun			<u></u>					
	Feb 43.89	Mar 43.64	Apr 42.49	May 42.28	41.28	41.28	41.09	41.66	42.28	42.71	43.17	<u> </u>	(38)
Jan	43.89	43.64					-	41.66		42.71	-		(38)
(38)m= 44.14	43.89	43.64					-	41.66	42.28	42.71	-]]	(38)

Heat loss para	ımeter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.04	1.04	1.04	1.03	1.02	1.01	1.01	1.01	1.02	1.02	1.03	1.03		
	!			!	<u>. </u>	!	!		Average =	Sum(40) ₁	12 /12=	1.03	(40)
Number of day		`			· .								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4.344.4											1.3.5 (1. /		
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		.6		(42)
Annual average Reduce the annual not more that 125	, al average	hot water	usage by	5% if the c	lwelling is	designed i	` ,		se target o		.85		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								· '	!	!			
(44)m= 105.43	101.6	97.76	93.93	90.1	86.26	86.26	90.1	93.93	97.76	101.6	105.43		
		•			100 1/1		·			m(44) ₁₁₂ =		1150.15	(44)
Energy content of													
(45)m= 156.35	136.75	141.11	123.02	118.04	101.86	94.39	108.31	109.61	127.74	139.43	151.42	4500.00	(45)
If instantaneous v	vater heati	ng at point	of use (no	o hot water	storage),	enter 0 in	boxes (46		rotal = Su	m(45) ₁₁₂ =	•	1508.03	(45)
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage		!		ļ	<u>!</u>	Į	Į	Į	<u>!</u>	!			
Storage volum						_		ame ves	sel		0		(47)
If community hotherwise if no	•			•			` '	ora) onto	or 'O' in <i>(</i>	′ 47 \			
Water storage		not wate	ii (uiis ii	iciuues i	HStaritai	ieous cc	ווטט וטווונ	ers) erite	ei O III ((47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufactHot water stor			-										(E1)
If community h	•			ic Z (KVV	ii/iiti G/GC	iy <i>)</i>					0		(51)
Volume factor	_										0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or	` , `	,									0		(55)
Water storage	loss cal	culated t	or each	month			((56)m = (55) × (41)	m ·	1			
(56)m= 0	0	0	0	0 (50) ==	0	0	0	0	0	0	0	51.1	(56)
If cylinder contain												IX II	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	•	•				(:					0		(58)
Primary circuit (modified by					•	. ,	, ,		r tharma	stat)			
(59)m= 0	0	0	0	0	olar war	er neatii			0	0	0		(59)
(00)						<u>`</u>		<u>`</u>			Ŭ		(50)

Combi loss cal	culated	for each	month ((61)m –	(60) ·	365 🗸 (41)m						
(61)m= 0	0	0	0	0 0	00) +	0	0	0	T 0	Ιο	0	1	(61)
	-											J · (59)m + (61)m	(- /
(62)m= 132.9	116.23	119.94	104.57	100.34	86.58		92.07	93.17	108.58	118.52	128.7	1	(62)
Solar DHW input c										1]	(- /
(add additional									· continua	non to wat	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from wa	ater hea	ter				Į.	<u> </u>	Į.	<u> </u>	1	<u> </u>	ı	
(64)m= 132.9	116.23	119.94	104.57	100.34	86.58	80.23	92.07	93.17	108.58	118.52	128.7]	
				ļ			Ou	tput from w	ater heate	er (annual)	112	1281.83	(64)
Heat gains fror	n water	heating,	kWh/me	onth 0.2	3.0] ` 5	35 × (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	 .]	-
(65)m= 33.22	29.06	29.99	26.14	25.08	21.65		23.02	23.29	27.14	29.63	32.18	ĺ	(65)
include (57)r	n in calc	culation of	of (65)m	only if c	vlinde	r is in the	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal ga					,		`	,			,	,	
Metabolic gains	·												
Jan	Feb	Mar	Apr	May	Jur	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 129.78	129.78	129.78	129.78	129.78	129.7	8 129.78	129.78	129.78	129.78	129.78	129.78		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso see	Table 5				•	
(67)m= 20.96	18.62	15.14	11.46	8.57	7.23	7.82	10.16	13.64	17.32	20.21	21.54		(67)
Appliances gai	ns (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), als	o see Ta	ble 5	•		•	
(68)m= 235.13	237.57	231.42	218.33	201.81	186.2	8 175.9	173.46	179.61	192.7	209.22	224.75]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a), also s	ee Table	5	•	•	•	
(69)m= 35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	1	(69)
Pumps and far	ns gains	(Table 5	5a)			•		•		•	•	•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)	•		•	•	•	•	•	
(71)m= -103.82	-103.82	-103.82	-103.82	-103.82	-103.8	2 -103.82	-103.82	-103.82	-103.82	-103.82	-103.82		(71)
Water heating	gains (T	able 5)						•	•	•		•	
(72)m= 44.66	43.24	40.3	36.31	33.72	30.06	26.96	30.94	32.35	36.48	41.15	43.25		(72)
Total internal	gains =				(66)m + (67)n	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	•	
(73)m= 362.68	361.36	348.8	328.04	306.03	285.5	1 272.61	276.5	287.53	308.44	332.52	351.48		(73)
6. Solar gains	s:					_			•	•			
Solar gains are c	alculated	using sola	r flux from	Table 6a	and ass	ociated equa	ations to d	onvert to th	ne applica	ble orienta	tion.		
Orientation: A		actor	Area			lux		g_ 	-	FF		Gains	
_	able 6d		m²		!	able 6a		Table 6b	_	able 6c		(W)	_
Southwest _{0.9x}	0.77	X	3.4	18	x	36.79		0.5	X	0.8	=	35.49	(79)
Southwest _{0.9x}	0.77	X	3.4	18	x	62.67		0.5	x	0.8	=	60.46	(79)
Southwest _{0.9x}	0.77	X	3.4	18	x	85.75		0.5	x	0.8	=	82.72	(79)
Southwest _{0.9x}	0.77	х	3.4	18	x	106.25		0.5	x [0.8	=	102.5	(79)
Southwest _{0.9x}	0.77	X	3.4	18	X	119.01		0.5	X	0.8	=	114.8	(79)

Southwest _{0.9x}	0.77] x	2.49	1 x	140.45	1	0.5	l 🗸	0.0	1 =	112.07	(79)
Southwest _{0.9x}	0.77	╡	3.48] 1	118.15]]	0.5	X	0.8]]	113.97	≓ .
Southwest _{0.9x}	0.77] X	3.48	X	113.91]]	0.5	X	0.8] = _	109.88	(79)
Southwest _{0.9x}	0.77] X	3.48] X] ,	104.39] 1	0.5	X	0.8] = 1 _	100.7	(79)
Southwest _{0.9x}	0.77	X	3.48	X	92.85] 1	0.5	X	0.8] = 1	89.57	(79)
Southwest _{0.9x}	0.77	X	3.48	X	69.27] 1	0.5	X	0.8] = 1	66.82	(79)
<u> </u>	0.77	X	3.48	X	44.07] 1	0.5	X	0.8] = 1	42.51	(79)
Southwesto.9x	0.77	X	3.48] X	31.49] 1	0.5	X	0.8	= 	30.37	(79)
Northwest 0.9x	0.77	X	1.59	X	11.28	X	0.5	X	0.8	=	9.95	(81)
Northwest 0.9x	0.77	X	2.74	X	11.28	X	0.5	X	0.8] = 1	17.14	(81)
Northwest 0.9x	0.54	X	10.02	X	11.28	X	0.5	X	0.8] = 1	21.98	(81)
Northwest 0.9x	0.77	X	1.77	X	11.28	X	0.5	X	0.8	=	5.54	(81)
Northwest _{0.9x}	0.77	X	1.59	X	22.97	X	0.5	X	0.8	=	20.25	(81)
Northwest 0.9x	0.77	X	2.74	X	22.97	X	0.5	X	0.8	=	34.89	(81)
Northwest _{0.9x}	0.54	X	10.02	X	22.97	X	0.5	X	0.8	=	44.74	(81)
Northwest _{0.9x}	0.77	X	1.77	X	22.97	X	0.5	X	0.8	=	11.27	(81)
Northwest _{0.9x}	0.77	X	1.59	X	41.38	X	0.5	X	0.8	=	36.48	(81)
Northwest _{0.9x}	0.77	X	2.74	X	41.38	X	0.5	X	0.8	=	62.86	(81)
Northwest _{0.9x}	0.54	X	10.02	X	41.38	X	0.5	X	0.8	=	80.6	(81)
Northwest 0.9x	0.77	X	1.77	X	41.38	X	0.5	X	0.8	=	20.3	(81)
Northwest 0.9x	0.77	X	1.59	X	67.96	X	0.5	X	0.8	=	59.9	(81)
Northwest _{0.9x}	0.77	X	2.74	X	67.96	X	0.5	X	0.8	=	103.23	(81)
Northwest _{0.9x}	0.54	X	10.02	X	67.96	x	0.5	x	0.8	=	132.37	(81)
Northwest _{0.9x}	0.77	X	1.77	X	67.96	X	0.5	X	0.8	=	33.34	(81)
Northwest _{0.9x}	0.77	X	1.59	X	91.35	X	0.5	x	0.8	=	80.52	(81)
Northwest _{0.9x}	0.77	X	2.74	X	91.35	X	0.5	x	0.8	=	138.76	(81)
Northwest _{0.9x}	0.54	X	10.02	X	91.35	X	0.5	x	0.8	=	177.93	(81)
Northwest _{0.9x}	0.77	X	1.77	X	91.35	x	0.5	x	0.8	=	44.82	(81)
Northwest _{0.9x}	0.77	X	1.59	x	97.38	X	0.5	x	0.8	=	85.84	(81)
Northwest _{0.9x}	0.77	X	2.74	x	97.38	x	0.5	X	0.8	=	147.93	(81)
Northwest 0.9x	0.54	x	10.02	x	97.38	x	0.5	x	0.8	=	189.69	(81)
Northwest _{0.9x}	0.77	X	1.77	x	97.38	x	0.5	x	0.8	=	47.78	(81)
Northwest _{0.9x}	0.77	x	1.59	x	91.1	x	0.5	x	0.8] =	80.31	(81)
Northwest 0.9x	0.77	X	2.74	x	91.1	x	0.5	x	0.8] =	138.39	(81)
Northwest _{0.9x}	0.54	x	10.02	x	91.1	x	0.5	x	0.8	=	177.45	(81)
Northwest _{0.9x}	0.77	x	1.77	x	91.1	x	0.5	х	0.8	j =	44.7	(81)
Northwest _{0.9x}	0.77	X	1.59	x	72.63	x	0.5	х	0.8	j =	64.02	(81)
Northwest _{0.9x}	0.77	x	2.74	×	72.63	x	0.5	x	0.8	=	110.32	(81)
Northwest _{0.9x}	0.54	x	10.02	×	72.63	x	0.5	x	0.8	=	141.47	(81)
Northwest _{0.9x}	0.77	X	1.77	X	72.63	X	0.5	X	0.8	=	35.63	(81)
Northwest _{0.9x}	0.77	X	1.59	X	50.42	X	0.5	X	0.8	=	44.45	(81)
Northwest _{0.9x}	0.77	X	2.74	X	50.42	X	0.5	X	0.8	, 	76.59	(81)
_		_		1		1		1	<u> </u>	ı	L	

Northwe	est _{0.9x}	0.54	X	10.	02	x	50.42	x	0.5	X	0.8	=	98.21	(81)
Northwe	est _{0.9x}	0.77	X	1.7	77	x	50.42	x	0.5	X	0.8	=	24.74	(81)
Northwe	est _{0.9x}	0.77	X	1.5	59	x	28.07	X	0.5	X	0.8	=	24.74	(81)
Northwe	est _{0.9x}	0.77	X	2.7	' 4	x	28.07	X	0.5	X	0.8	=	42.64	(81)
Northwe	est _{0.9x}	0.54	X	10.	02	x	28.07	x	0.5	X	0.8	=	54.67	(81)
Northwe	est _{0.9x}	0.77	X	1.7	77	x	28.07	x	0.5	х	0.8	=	13.77	(81)
Northwe	est _{0.9x}	0.77	X	1.5	59	x	14.2	x	0.5	X	0.8	=	12.51	(81)
Northwe	est _{0.9x}	0.77	X	2.7	' 4	x	14.2	x	0.5	х	0.8	=	21.57	(81)
Northwe	est _{0.9x}	0.54	X	10.	02	x	14.2	X	0.5	X	0.8	=	27.65	(81)
Northwe	est _{0.9x}	0.77	X	1.7	77	x	14.2	X	0.5	X	0.8	=	6.97	(81)
Northwe	est _{0.9x}	0.77	X	1.5	59	X	9.21	X	0.5	X	0.8	=	8.12	(81)
Northwe	est _{0.9x}	0.77	X	2.7	' 4	x	9.21	X	0.5	X	0.8	=	14	(81)
Northwe	est _{0.9x}	0.54	X	10.	02	x	9.21	x	0.5	X	0.8	=	17.95	(81)
Northwe	est _{0.9x}	0.77	X	1.7	77	x	9.21	X	0.5	X	0.8	=	4.52	(81)
Solar g	ains in	watts, ca	alculated	for eac	h month	1		(83)m	n = Sum(74)m	(82)m			1	
(83)m=	90.09	171.6	282.96	431.34	556.84	585			.15 333.56	202.64	111.21	74.96		(83)
Ī						`	3)m , watts			_			1	(0.4)
(84)m=	452.77	532.96	631.76	759.38	862.86	870	.74 823.34	4 728	.64 621.09	511.07	443.73	426.44		(84)
7. Me	an inter	nal temp	erature	(heating	season	1)								
	erature	during h	oating n	eriods ir	tha livi	na 01	raa fram T	- 1. 1 0	TI 4 (0.0)				04	(OE)
Temp	Ciataic	adming m	caully p	crious ii	i uie iivi	ny ai	ea iioiii i	abie 9	, Th1 (°C)				21	(85)
•		_	٠.			_	ea nom r e Table 9a		, Th1 (°C)					(65)
•		_	٠.			see)	ug Sep	Oct	Nov	Dec		(65)
•	ation fac	tor for g	ains for	iving are	ea, h1,m	see	e Table 9a un Jul)	ug Sep	Oct 0.91	Nov 0.96	Dec 0.98	21	(86)
Utilisa (86)m=	Jan 0.98	tor for ga Feb	Mar 0.93	iving are Apr 0.85	ea, h1,m May 0.73	Ju 0.5	e Table 9a un Jul) A 0.5	ug Sep 51 0.74	+	+			
Utilisa (86)m=	Jan 0.98	tor for ga Feb	Mar 0.93	iving are Apr 0.85	ea, h1,m May 0.73	Ju 0.5	e Table 9a un Jul 57 0.44 steps 3 to) A 0.5 7 in 1	ug Sep 51 0.74 Table 9c)	+	+			
Utilisa (86)m= Mean (87)m=	Jan 0.98 interna	Feb 0.96 I temper	Mar 0.93 ature in	Apr 0.85 living are 20.06	ea, h1,m May 0.73 ea T1 (fo 20.55	0.5 Ollow	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94) A 0.5	ug Sep 51 0.74 Table 9c)	0.91	0.96	0.98		(86)
Utilisa (86)m= Mean (87)m=	Jan 0.98 interna	Feb 0.96 I temper	Mar 0.93 ature in	Apr 0.85 living are 20.06	ea, h1,m May 0.73 ea T1 (fo 20.55	0.5 Ollow	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from) A 0.5 7 in T 20.	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C)	0.91	0.96	0.98		(86)
Utilisa (86)m= Mean (87)m= Temp (88)m=	Jan 0.98 interna 18.7 erature 20.05	retor for garage Feb 0.96 I temperate 18.97 during h	Mar 0.93 ature in 19.44 eating p	Apr 0.85 living are 20.06 eriods ir	ea, h1,m May 0.73 ea T1 (for 20.55 or rest of 20.06	0.5 0.5 0llow 20. dwel	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 07 20.07) A 0.6 7 in T 20.	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C)	0.91	0.96	0.98		(86)
Utilisa (86)m= Mean (87)m= Temp (88)m=	Jan 0.98 interna 18.7 erature 20.05	retor for garage Feb 0.96 I temperate 18.97 during h	Mar 0.93 ature in 19.44 eating p	Apr 0.85 living are 20.06 eriods ir	ea, h1,m May 0.73 ea T1 (for 20.55 or rest of 20.06	0.5 0.5 0llow 20. dwel	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 07 20.07) A 0.6 7 in T 20.	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07	0.91	0.96	0.98		(86)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	Jan 0.98 interna 18.7 erature 20.05 ation fac	tor for garage for gara	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92	Apr 0.85 living are 20.06 eriods ir 20.06 rest of do	ea, h1,m May 0.73 ea T1 (for 20.55 or rest of 20.06 welling, 0.68	0.5 0.5 0.5 0llow 20. dwel 20. h2,m	e Table 9a un Jul 57 0.44 e steps 3 to 84 20.94 Illing from 07 20.07 n (see Tab 51 0.36) A 0.5 7 in T 20. Table 9 20. le 9a) 0.4	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07	20 20.06	0.96	0.98 18.65 20.06		(86) (87) (88)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	Jan 0.98 interna 18.7 erature 20.05 ation factors 0.97 interna	retor for garage Feb 0.96 I temperate 18.97 during h 20.05 tor for garage 0.96 I temperate 18.97	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92 ature in	Apr 0.85 living are 20.06 eriods ir 20.06 rest of do 0.83	ea, h1,m May 0.73 ea T1 (for 20.55) rest of 20.06 welling, 0.68 of dwell	Ju 0.5 O.5 5 O.5 O	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 07 20.07 n (see Tab 51 0.36	A 0.5 7 in T 20. Table 9 20. le 9a) 0.4 steps 3	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Tak	20 20.06 0.89 ole 9c)	0.96 19.24 20.06 0.96	0.98 18.65 20.06		(86) (87) (88) (89)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	Jan 0.98 interna 18.7 erature 20.05 ation fac	tor for garage for gara	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92	Apr 0.85 living are 20.06 eriods ir 20.06 rest of do	ea, h1,m May 0.73 ea T1 (for 20.55 or rest of 20.06 welling, 0.68	0.5 0.5 0.5 0llow 20. dwel 20. h2,m	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 07 20.07 n (see Tab 51 0.36	A 0.5 7 in T 20. Table 9 20. le 9a) 0.4 steps 3	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Tak	20 20.06 0.89 ole 9c) 19.22	0.96 19.24 20.06 0.96	0.98 18.65 20.06 0.98		(86) (87) (88) (89)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	interna 18.7 erature 20.05 ation fac 0.97 interna 17.93	retor for garage Feb 0.96 I temperate 18.97 during h 20.05 tor for garage 0.96 I temperate 18.2	mains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92 ature in 18.66	Apr 0.85 living are 20.06 eriods ir 20.06 rest of dr 0.83 the rest 19.26	ea, h1,m May 0.73 ea T1 (for 20.55 n rest of 20.06 welling, 0.68 of dwell	Ju 0.5 O.5 5 O.5 O	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 07 20.07 n (see Tab 51 0.36 c2 (follow s	A 0.5 7 in T 20. Table 9 20. 10. steps 3 5 20.	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Tak 03 19.83	0.91 20 20.06 0.89 ole 9c) 19.22 fLA = Liv	0.96 19.24 20.06 0.96	0.98 18.65 20.06 0.98	0.37	(86) (87) (88) (89)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	interna 18.7 erature 20.05 ation fac 0.97 interna 17.93	tor for garage for g	ains for Mar 0.93 ature in 19.44 leating p 20.05 ains for 0.92 ature in 18.66	Apr 0.85 living are 20.06 eriods ir 20.06 rest of do 0.83 the rest 19.26	ea, h1,m May 0.73 ea T1 (for 20.55 en rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe	Ju 0.5 O.5 5 O.5 O	e Table 9a un Jul 7 0.44 steps 3 to 84 20.94 lling from 7 20.07 n (see Tab 61 0.36 2 (follow s 97 20.05	A 0.5 7 in T 20. Table 9 20. 1 1 + (1	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 42 0.68 to 7 in Table 03 19.83 — fLA) × T2	0.91 20 20.06 0.89 0le 9c) 19.22 fLA = Liv	0.96 19.24 20.06 0.96 18.48 ing area ÷ (4	0.98 18.65 20.06 0.98 17.89		(86) (87) (88) (89) (90) (91)
(86)m= Mean (87)m= Utilisa (89)m= Wean (90)m= Mean (92)m=	interna 17.93 ation factors Jan 0.98 interna 18.7 erature 20.05 ation factors 0.97 interna 17.93	tor for garage fo	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92 ature in 18.66 ature (for 18.95	Apr 0.85 living are 20.06 eriods ir 20.06 rest of dr 0.83 the rest 19.26 er the wh	ea, h1,m May 0.73 ea T1 (for 20.55) n rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe 20.03	Ju 0.5 O.5 O.5 O.5 O.5 O.5 O.5 O.5 O	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 07 20.07 n (see Tab 51 0.36 c2 (follow s 97 20.05	A 0.5 7 in T 20. Table 9 20. 10. 11 + (1 20. 11 + (1 20. 11 20. 11 + (1 20. 11 20. 11 11 20. 11 11 11 11 11 11 11 11 11 11 11 11 11	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Table 03 19.83 - fLA) × T2 36 20.14	0.91 20 20.06 0.89 0.89 19.22 fLA = Liv	0.96 19.24 20.06 0.96	0.98 18.65 20.06 0.98		(86) (87) (88) (89)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply	interna 18.7 erature 20.05 ation fac 0.97 interna 17.93 interna 18.21 adjustn	tor for garage from 18.97 during has 20.05 tor for garage from 18.2 I temperate 18.2 I temperate 18.48 ment to the second second from 18.48	ains for Mar 0.93 ature in 19.44 leating p 20.05 ains for 0.92 ature in 18.66 ature (for 18.95) he mean	Apr 0.85 living are 20.06 eriods ir 20.06 rest of do 0.83 the rest 19.26 er the wh 19.56 internal	ea, h1,m May 0.73 ea T1 (for 20.55 n rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe 20.03 temper	ollow 20. h2,m 0.5 ing T 19.	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 70 20.07 1 (see Tab 61 0.36 72 (follow s 97 20.05 1 = fLA × T 3 20.38 1 e from Tab	A 0.5 7 in T 20. Table 9 20. Steps 3 20. Steps 3 20. Steps 4 4 6, sile 4 6,	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Table 03 19.83 - fLA) × T2 36 20.14 where app	0.91 20 20.06 0.89 0le 9c) 19.22 fLA = Liv	0.96 19.24 20.06 0.96 18.48 ing area ÷ (4) 18.76	0.98 18.65 20.06 0.98 17.89 1) =		(86) (87) (88) (89) (90) (91)
(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m=	interna 17.93 interna 17.93 interna 18.21 adjustn 18.21	tor for garage from the following the follow	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92 ature in 18.66 ature (for 18.95) ne mean 18.95	Apr 0.85 living are 20.06 eriods ir 20.06 rest of dr 0.83 the rest 19.26 er the wh 19.56 internal 19.56	ea, h1,m May 0.73 ea T1 (for 20.55) n rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe 20.03	Ju 0.5 O.5 O.5 O.5 O.5 O.5 O.5 O.5 O	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 70 20.07 1 (see Tab 61 0.36 72 (follow s 97 20.05 1 = fLA × T 3 20.38 1 e from Tab	A 0.5 7 in T 20. Table 9 20. Steps 3 20. Steps 3 20. Steps 4 4 6, sile 4 6,	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Table 03 19.83 - fLA) × T2 36 20.14 where app	0.91 20 20.06 0.89 0.89 19.22 fLA = Liv	0.96 19.24 20.06 0.96 18.48 ing area ÷ (4	0.98 18.65 20.06 0.98 17.89		(86) (87) (88) (89) (90) (91)
Wean (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa	interna 18.7 erature 20.05 ation fac 0.97 interna 17.93 interna 18.21 adjustn 18.21 ace hea	tor for garage from 18.97 during has 20.05 tor for garage from 18.2 I temperate 18.48 hent to the 18.48 ting requesting requestions and the 18.48	ains for Mar 0.93 ature in 19.44 leating p 20.05 ains for 0.92 ature in 18.66 ature (for 18.95 he mean 18.95	Apr 0.85 living are 20.06 eriods ir 20.06 rest of do 0.83 the rest 19.26 r the wh 19.56 internal 19.56	ea, h1,m May 0.73 ea T1 (for 20.55 n rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe 20.03 temper 20.03	Ju 0.5 O.5 5 O.5 O	e Table 9a un Jul 67 0.44 e steps 3 to 84 20.94 elling from 07 20.07 el (see Tab 61 0.36 el (follow see) 97 20.05 el ef LA × T .3 20.38 el from Tab .3 20.38	A 0.5 7 in T 20. Table 9 20. 11 + (1 20. 15	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Table 03 19.83 - fLA) × T2 36 20.14 where apple 36 20.14	0.91 20 20.06 0.89 0le 9c) 19.22 fLA = Liv	0.96 19.24 20.06 0.96 18.48 ing area ÷ (4) 18.76	0.98 18.65 20.06 0.98 17.89 18.17	0.37	(86) (87) (88) (89) (90) (91)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa	interna 18.7 erature 20.05 ation fac 0.97 interna 17.93 interna 18.21 adjustn 18.21 ace hea	tor for garage from 18.97 during has 20.05 tor for garage from 18.2 I temperate 18.48 hent to the 18.48 ting requesting requestions and the 18.48	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92 ature in 18.66 ature (for 18.95 ne mean 18.95 uirement ernal ter	Apr 0.85 living are 20.06 rest of dr 0.83 the rest 19.26 r the wh 19.56 internal 19.56	ea, h1,m May 0.73 ea T1 (for 20.55 n rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe 20.03 temper 20.03	Ju 0.5 O.5 5 O.5 O	e Table 9a un Jul 67 0.44 e steps 3 to 84 20.94 elling from 07 20.07 el (see Tab 61 0.36 el (follow see) 97 20.05 el ef LA × T .3 20.38 el from Tab .3 20.38	A 0.5 7 in T 20. Table 9 20. 11 + (1 20. 15	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Table 03 19.83 - fLA) × T2 36 20.14 where app	0.91 20 20.06 0.89 0le 9c) 19.22 fLA = Liv	0.96 19.24 20.06 0.96 18.48 ing area ÷ (4) 18.76	0.98 18.65 20.06 0.98 17.89 18.17	0.37	(86) (87) (88) (89) (90) (91)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa	interna 18.7 erature 20.05 ation fac 0.97 interna 17.93 interna 18.21 adjustn 18.21 ace hea	tor for garage of the second s	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92 ature in 18.66 ature (for 18.95 ne mean 18.95 uirement ernal ter	Apr 0.85 living are 20.06 rest of dr 0.83 the rest 19.26 r the wh 19.56 internal 19.56	ea, h1,m May 0.73 ea T1 (for 20.55 n rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe 20.03 temper 20.03	ollow 20. h2,m 0.5 ing T 19. elling) 20 rature 20	e Table 9a un Jul 67 0.44 e steps 3 to 84 20.94 elling from 07 20.07 el (see Tab 61 0.36 el (follow see) 97 20.05 el ef LA × T .3 20.38 el from Tab .3 20.38	A 0.5 7 in T 20. Table 9 0.4 1 + (1 3 20. 1	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Table 03 19.83 - fLA) × T2 36 20.14 where apple 36 20.14	0.91 20 20.06 0.89 0le 9c) 19.22 fLA = Liv	0.96 19.24 20.06 0.96 18.48 ing area ÷ (4) 18.76	0.98 18.65 20.06 0.98 17.89 18.17	0.37	(86) (87) (88) (89) (90) (91)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= Set Ti the uti	interna 18.7 erature 20.05 ation fac 0.97 interna 17.93 interna 18.21 adjustn 18.21 ace head to the rillisation Jan	tor for garage from the factor for garage from t	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92 ature in 18.66 ature (for 18.95 ne mean 18.95 uirement ernal ter or gains Mar	Apr 0.85 living are 20.06 eriods ir 20.06 rest of dr 0.83 the rest 19.26 r the wh 19.56 internal 19.56 mperaturusing Ta	ea, h1,m May 0.73 ea T1 (for 20.55) n rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe 20.03 temper 20.03	ollow 20. h2,m 0.5 ing T 19. elling) 20 rature 20	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 07 20.07 n (see Tab 51 0.36 2 (follow s 97 20.05	A 0.5 7 in T 20. Table 9 0.4 1 + (1 3 20. 1	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Table 03 19.83 - fLA) x T2 36 20.14 where apple 36 20.14 e 9b, so the	0.91 20 20.06 0.89 0le 9c) 19.22 fLA = Liv 19.51 ropriate 19.51 at Ti,m=	0.96 19.24 20.06 0.96 18.48 ing area ÷ (4 18.76 18.76	0.98 18.65 20.06 0.98 17.89 18.17 18.17	0.37	(86) (87) (88) (89) (90) (91)
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= Set Ti the uti	interna 18.7 erature 20.05 ation fac 0.97 interna 17.93 interna 18.21 adjustn 18.21 ace head to the rillisation Jan	tor for garage for for for garage for for for garage for for for garage for for for garage for for for garage for for for for for for for for for for	ains for Mar 0.93 ature in 19.44 eating p 20.05 ains for 0.92 ature in 18.66 ature (for 18.95 ne mean 18.95 uirement ernal ter or gains Mar	Apr 0.85 living are 20.06 eriods ir 20.06 rest of dr 0.83 the rest 19.26 r the wh 19.56 internal 19.56 mperaturusing Ta	ea, h1,m May 0.73 ea T1 (for 20.55) n rest of 20.06 welling, 0.68 of dwell 19.72 ole dwe 20.03 temper 20.03	ollow 20. h2,m 0.5 ing T 19. elling) 20 rature 20	e Table 9a un Jul 57 0.44 steps 3 to 84 20.94 lling from 07 20.07 n (see Tab 51 0.36 2 (follow s 97 20.05 1 = fLA × T .3 20.38 e from Tab .3 20.38 ut step 11 o un Jul	A 0.5 7 in T 20. Table 9 0.4 1 + (1 3 20. 1	ug Sep 51 0.74 Table 9c) 92 20.66 9, Th2 (°C) 08 20.07 12 0.68 to 7 in Tab 03 19.83 - fLA) × T2 36 20.14 where app 36 20.14 e 9b, so th ug Sep	0.91 20 20.06 0.89 0le 9c) 19.22 fLA = Liv 19.51 ropriate 19.51 at Ti,m=	0.96 19.24 20.06 0.96 18.48 ing area ÷ (4 18.76 18.76	0.98 18.65 20.06 0.98 17.89 18.17 18.17	0.37	(86) (87) (88) (89) (90) (91)

Useful gains	, hmGm	W = (94)	4)m x (84	4)m									
(95)m= 435.96	502.79	570.38	620.32	589.75	454.36	319.95	327.09	425.12	447.25	420.07	412.74		(95)
Monthly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1277.03	1243.4	1136.79	960.92	749.22	506.7	336.25	351.67	539.56	801.23	1053.76	1268.88		(97)
Space heating	ng require	ement fo	r each n	nonth, k\	Wh/mont	h = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m= 625.76	497.69	421.41	245.24	118.64	0	0	0	0	263.36	456.26	636.97		
		-	-				Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	3265.32	(98)
Space heatir	ng require	ement in	kWh/m²	?/year								37.16	(99)
8c. Space co	olina red	uiremen	nt										
Calculated for	Ĭ	•		See Tal	ole 10b								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rat	e Lm (ca	lculated	using 25	5°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m= 0	0	0	0	0	835.82	657.99	674.36	0	0	0	0		(100)
Utilisation fac	ctor for lo	ss hm											
(101)m= 0	0	0	0	0	0.84	0.89	0.85	0	0	0	0		(101)
Useful loss, I	nmLm (V	/atts) = ((100)m x	(101)m						•			
(102)m= 0	0	0	0	0	702.49	583.66	576.22	0	0	0	0		(102)
Gains (solar	gains ca	lculated	for appli	cable we	eather re	gion, se	e Table	10)					
(103)m= 0	0	0	0	0	1139.47	1080.46	966.84	0	0	0	0		(103)
Space cooling set (104)m to					lwelling,	continue	ous (kW	h') = 0.0	24 x [(10	03)m – (°	102)m]:	x (41)m	
(104)m= 0	0	0	0	0	314.63	369.62	290.62	0	0	0	0		
								Total	= Sum(104)	=	974.87	(104)
Cooled fractio	n							f C =	cooled	area ÷ (4	1) =	1	(105)
Intermittency	- `		 										<u> </u>
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
0				(404)	(405)	(400)	_	Total	' = Sum((104)	=	0	(106)
Space cooling	requirer 0	nent for	montn =	(104)m	78.66	× (106)r	n 72.66	0	0	0	0		
(107)111= 0		0	0	U	70.00	92.4	72.00					0.40.70	(107)
									= Sum(1 <u>0</u> ,7)	=	243.72	= ` ` `
Space cooling	•		•					` ′	÷ (4) =			2.77	(108)
8f. Fabric Ene	· · · · · · · · · · · · · · · · · · ·	```	alculated	only un	der spec	cial cond	litions, s		<i>'</i>				
Fabric Energ	y Efficie	псу						(99) -	+ (108) =	=		39.93	(109)

			User D	Notoile:						
Assessor Name: Software Name:	Ross Boulton Stroma FSAP 201	_		Strom Softwa	are Vei	sion:			0028068 on: 1.0.4.18	
A diducaci	B1M-103-07, Flat T		- i	Address		03-07				
Address: 1. Overall dwelling dim		ype 1-56	A, WIIII	biedon, i	LONGON					
1. Overall dwelling diff	1011310113.		Δre	a(m²)		Δν Ηρ	ight(m)		Volume(m ³	3)
Ground floor					(1a) x		2.6	(2a) =	228.5	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e	e)+(1r	1) [37.88	(4)					
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	(3n) =	228.5	(5)
2. Ventilation rate:										
	heating	econdar neating		other	, –	total		40	m³ per hou	_
Number of chimneys	0 +	0	<u></u>	0] ⁼	0	X	40 =	0	(6a)
Number of open flues	0 +	0	+	0	=	0	x 2	20 =	0	(6b)
Number of intermittent f	ans					0	Χ.	10 =	0	(7a)
Number of passive vent	ts				Ī	0	x -	10 =	0	(7b)
Number of flueless gas	fires				Ē	0	X 4	40 =	0	(7c)
					L					
								Air ch	nanges per ho	our
Infiltration due to chimn	eys, flues and fans = (6	6a)+(6b)+(7	'a)+(7b)+((7c) =	Γ	0		÷ (5) =	0	(8)
If a pressurisation test has	been carried out or is intend	ed, proceed	d to (17),	otherwise (continue fr	om (9) to	(16)			
Number of storeys in	the dwelling (ns)								0	(9)
Additional infiltration	0.05 for atoal as timber	f=====================================	0.05 60				[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber present, use the value corres				•	uction			0	(11)
	nings); if equal user 0.35	portaing to	ino groun	ior man are	a (ano					
If suspended wooden	floor, enter 0.2 (unsea	led) or 0.	.1 (seale	ed), else	enter 0				0	(12)
•	nter 0.05, else enter 0								0	(13)
· ·	ws and doors draught s	tripped		0.05 10.0	(4.4) 4	001			0	(14)
Window infiltration				0.25 - [0.2] (8) + (10)			. (15) -		0	(15)
Infiltration rate	e, q50, expressed in cub	nic motro	c par ba	. , , , ,	, , ,	, , ,	, ,	aroa	0	(16)
If based on air permeab	· • · · •		•	•	•	elle oi e	rivelope	alea	0.25	(17)
·	lies if a pressurisation test ha					is being u	sed		0.23	(10)
Number of sides shelter	red			-					2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter factor			(21) = (18) x (20) =				0.21	(21)
Infiltration rate modified	for monthly wind speed	t t		•		•	•		-	
Jan Feb	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind s	speed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7]	
Wind Factor (22a)m = (22\m ∸ 4									
(22a)m = 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	1	
,									J	

0.27	0.27	e (allowi	0.23	0.23	d wind s	0.2	0.2	(22a)m 0.21	0.23	0.24	0.25	1	
Calculate effe	I -						0.2	0.21	0.23	0.24	0.25]	
If mechanic	al ventila	ition:										0.5	(2:
If exhaust air h	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	wise (23b) = (23a)			0.5	(23
If balanced wit	h heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h) =				0	(23
a) If balance	ed mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a)m = (22	2b)m + (2	23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	ed mech	anical ve	ntilation	without	heat rec	overy (I	MV) (24b)m = (22	2b)m + (2	23b)		-	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24
c) If whole h				•	•								
<u>`</u>		r `		, ,	o); otherv		ŕ		· ` ·	<u> </u>		1	(0.
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]	(24
d) If natural				•	ve input erwise (2				0.51				
24d)m= 0	0	0	0	0	0	0	0.5 1 [(2	0	0.0]	0	0	1	(24
Effective air		rate - er			n) or (24)	c) or (24]	`
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	1	(25
0.02	1 5.52	0.0.	0.0	0.0	1 0.0	0.0	1 0.0	0.0	1 0.0	0.0	1 0.0	J	
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros area	_	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	〈)	k-value kJ/m²-		A X k kJ/K
Vindows Type		(111)	""	l	1.59		۷۷/۱۱۱ <u>۷</u> ۱-(1.35)		2.04	\ <u>\</u>	KO/III -	IX.	(2
Vindows Type					2.74	_	[1/(1.35)+	L	3.51				(2)
Vindows Typ						= .	[1/(1.35)+	L		_			•
Vindows Type Vindows Type					10.02	_		L	12.83				(27
• •					3.48		[1/(1.35)+	Ļ	4.46	=			(27
Vindows Type					1.77	=	[1/(1.35)+	—, ¦	2.27	╡ ,			(27
Valls	68.0		23.93	3	44.67	<u>х</u>	0.15	= [6.7				(29
otal area of e					68.6								(3
for windows and * include the are						ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	h 3.2	
abric heat lo				o ana pan			(26)(30)	+ (32) =				37.35	(33
leat capacity		•	-,					((28)	(30) + (32	2) + (32a).	(32e) =	625.41	
hermal mass	`	,	P = Cm ÷	- TFA) ir	n kJ/m²K				tive Value:	, , ,	(= = 7	100	(35
or design asses	•	•		•			ecisely the				able 1f	100	(0.
an be used inste						·	·						
hermal bridg	es : S (L	x Y) cal	culated ι	using Ap	pendix ł	<						10.29	(30
details of therm		are not kn	own (36) =	= 0.05 x (3	11)			(2.2)	(2.5)				
otal fabric he									(36) =			47.64	(3
entilation he	i		- i				 		$= 0.33 \times ($		i	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	10
	38.88	38.48	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7	37.7		(3
39.28					•		!				•	•	
39.28 Heat transfer 39)m= 86.92		nt, W/K					!	(39)m	= (37) + (3	38)m		- 1	

Heat loss para	ameter (I	HLP), W	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.99	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97		
									Average =	Sum(40) ₁	12 /12=	0.97	(40)
Number of day	<u> </u>	1 `	· ·					-	<u> </u>				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu	upancy,	N								2	.6		(42)
if TFA > 13.		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13	.9)			
if TFA £ 13.5 Annual average	,	ater usad	ne in litre	es ner da	av Vd av	erane –	(25 x N)	+ 36		05	.85		(43)
Reduce the annua	,		,	•	•	_	` ,		se target o		.85		(43)
not more that 125	litres per	person pei	day (all w	ater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 105.43	101.6	97.76	93.93	90.1	86.26	86.26	90.1	93.93	97.76	101.6	105.43		
_						_				m(44) ₁₁₂ =	L	1150.15	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	07m / 3600) kWh/mor	nth (see Ta	ables 1b, 1			
(45)m= 156.35	136.75	141.11	123.02	118.04	101.86	94.39	108.31	109.61	127.74	139.43	151.42		_
If instantaneous v	vator hoati	ina at naint	of uso (no	hot water	r storago)	ontor O in	havas (46		Total = Su	m(45) ₁₁₂ =	= [1508.03	(45)
		· ·	`	ı	· · ·	ı	· · ·	, , , I			1		(40)
(46)m= 23.45 Water storage	20.51	21.17	18.45	17.71	15.28	14.16	16.25	16.44	19.16	20.92	22.71		(46)
Storage volum) includir	ng anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	,					•					<u> </u>		(,
Otherwise if no	•			-			, ,	ers) ente	er '0' in ((47)			
Water storage	loss:		`					,		,			
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro	om watei	r storage	, kWh/ye	ear			(48) x (49)) =		1	10		(50)
b) If manufact			-										
Hot water stor	-			le 2 (KVV	n/litre/da	ay)				0.	02		(51)
If community he Volume factor	•		011 4.3							1	03		(52)
Temperature f			2b							-	.6		(52)
Energy lost fro				ear			(47) x (51)) x (52) x (53) =		03		(54)
Enter (50) or		_	, 1	Jui			(11)11(21)	, (==, (,		03		(55)
Water storage	loss cal	culated f	for each	month			((56)m = ((55) × (41)	m				. ,
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain												хН	(00)
	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
(57)m= 32.01	20.92	32.01	30.96	32.01	30.96	32.01	32.01	30.96	32.01				, ,
Primary circuit	`	,			50 \	(EO) = =					0		(58)
Primary circuit				,	•	` '	, ,		r tharma	otot)			
(modified by		1	ı —		ı —			<u> </u>		'	22.22		(59)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(38)

Combi loss calculate	d for each	month	(61)m –	(60) ± 3	65 v (41	\m						
$\begin{array}{c c} \text{Combinoss calculate} \\ \text{(61)m=} & 0 & 0 \\ \end{array}$	0	0	01)111 =	00) + 3	03 × (41)	0	0	0	Ιο	0	1	(61)
Total heat required for											[(50)m + (61)m	(- /
(62)m= 211.63 186.63		176.52	173.32	155.36	149.67	163.59	163.1	183.01	192.93	206.69	(39)111 + (01)111	(62)
Solar DHW input calculate									1		I	(- /
(add additional lines								· continua	non to wat	or modung,		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from water he	ater	!	ļ.		ļ	ļ	ļ			!	1	
(64)m= 211.63 186.65		176.52	173.32	155.36	149.67	163.59	163.1	183.01	192.93	206.69]	
<u> </u>		•				Out	put from w	ater heate	er (annual)	I12	2158.87	(64)
Heat gains from water	er heating	, kWh/m	onth 0.2	5 ′ [0.85	5 × (45)m	+ (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	-
(65)m= 96.21 85.41	91.14	83.7	83.47	76.66	75.61	80.24	79.24	86.69	89.16	94.57]	(65)
include (57)m in ca	lculation	of (65)m	only if c	ylinder	is in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (se	ee Table 5	5 and 5a):	-								
Metabolic gains (Tab	le 5), Wat	tts										
Jan Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 129.78 129.78	129.78	129.78	129.78	129.78	129.78	129.78	129.78	129.78	129.78	129.78]	(66)
Lighting gains (calcu	ated in A	ppendix	L, equat	ion L9 c	r L9a), a	lso see	Table 5				•	
(67)m= 20.96 18.62	15.14	11.46	8.57	7.23	7.82	10.16	13.64	17.32	20.21	21.54		(67)
Appliances gains (ca	lculated ir	Append	dix L, eq	uation L	.13 or L1	3a), als	o see Ta	ble 5	•	•	•	
(68)m= 235.13 237.5	231.42	218.33	201.81	186.28	175.9	173.46	179.61	192.7	209.22	224.75		(68)
Cooking gains (calcu	lated in A	ppendix	L, equat	ion L15	or L15a), also s	ee Table	5	•	•	•	
(69)m= 35.98 35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98		(69)
Pumps and fans gair	s (Table :	5a)									-	
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. evaporat	ion (nega	tive valu	es) (Tab	le 5)				-				
(71)m= -103.82 -103.83	2 -103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82		(71)
Water heating gains	(Table 5)		-		-	-	-	-	-			
(72)m= 129.31 127.1	122.5	116.25	112.19	106.48	101.62	107.84	110.05	116.52	123.83	127.11		(72)
Total internal gains	=		-	(66)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m		
(73)m= 447.34 445.22	2 431	407.98	384.5	361.92	347.28	353.4	365.24	388.48	415.2	435.34		(73)
6. Solar gains:												
Solar gains are calculate	_					itions to c	onvert to th	ne applica		tion.		
Orientation: Access Table 6		Area m²		Flu	ıx ble 6a	_	g_ Fable 6b	т	FF able 6c		Gains (W)	
								_ '			` '	7
Southwest _{0.9x} 0.7	7 ×	3.4	18	X	36.79	<u> </u>	0.5	x	0.8	=	35.49	(79)
Southwesto.9x 0.7				-	62.67	! <u> </u>	0.5		0.8	=	60.46	(79)
Southwest _{0.9x} _{0.7}			18		85.75	! <u> </u>	0.5		0.8	=	82.72	(79)
Southwest _{0.9x} 0.7		3.4	18	x 1	06.25	! <u> </u>	0.5		0.8	=	102.5	(79)
Southwest _{0.9x} 0.7	7 ×	3.4	18	X 1	19.01		0.5	X	8.0	=	114.8	(79)

Southwest _{0.9x}	0.77	7 x	3.48	l _x	118.15	1	0.5	x	0.8	1 =	113.97	(79)
Southwest _{0.9x}	0.77]]	3.48]]	113.91]]	0.5	l X	0.8]] ₌	109.88	(79)
Southwest _{0.9x}	0.77]]	3.48	l X	104.39]]	0.5	X	0.8]]	100.7	(79)
Southwest _{0.9x}	0.77]]	3.48	l X	92.85]]	0.5	X	0.8] =	89.57	(79)
Southwest _{0.9x}	0.77]]	3.48	X	69.27]]	0.5	X	0.8	! 	66.82	(79)
Southwest _{0.9x}	0.77	X	3.48	X	44.07	<u> </u> 	0.5	X	0.8	! =	42.51	(79)
Southwest _{0.9x}	0.77]]	3.48	l X	31.49]]	0.5	X	0.8] =	30.37	(79)
Northwest 0.9x	0.77	X	1.59) X	11.28) X	0.5	X	0.8	, =	9.95	(81)
Northwest _{0.9x}	0.77	X	2.74	x	11.28	X	0.5	X	0.8	 =	17.14	(81)
Northwest 0.9x	0.54	X	10.02	x	11.28	x	0.5	X	0.8	=	21.98	(81)
Northwest _{0.9x}	0.77	X	1.77	x	11.28	x	0.5	x	0.8	=	5.54	(81)
Northwest _{0.9x}	0.77	X	1.59	x	22.97	x	0.5	x	0.8	j =	20.25	(81)
Northwest _{0.9x}	0.77	x	2.74	x	22.97	x	0.5	x	0.8	j =	34.89	(81)
Northwest 0.9x	0.54	x	10.02	x	22.97	x	0.5	x	0.8	=	44.74	(81)
Northwest _{0.9x}	0.77	x	1.77	x	22.97	x	0.5	x	0.8] <u>=</u>	11.27	(81)
Northwest _{0.9x}	0.77	x	1.59	x	41.38	x	0.5	x	0.8] =	36.48	(81)
Northwest _{0.9x}	0.77	X	2.74	x	41.38	x	0.5	x	0.8	=	62.86	(81)
Northwest 0.9x	0.54	x	10.02	x	41.38	x	0.5	x	0.8] =	80.6	(81)
Northwest _{0.9x}	0.77	x	1.77	x	41.38	x	0.5	x	0.8	=	20.3	(81)
Northwest _{0.9x}	0.77	X	1.59	X	67.96	X	0.5	X	0.8	=	59.9	(81)
Northwest 0.9x	0.77	X	2.74	x	67.96	X	0.5	X	0.8	=	103.23	(81)
Northwest _{0.9x}	0.54	X	10.02	x	67.96	X	0.5	X	0.8	=	132.37	(81)
Northwest 0.9x	0.77	X	1.77	x	67.96	X	0.5	X	0.8	=	33.34	(81)
Northwest _{0.9x}	0.77	X	1.59	X	91.35	X	0.5	X	0.8	=	80.52	(81)
Northwest 0.9x	0.77	X	2.74	x	91.35	X	0.5	X	0.8	=	138.76	(81)
Northwest _{0.9x}	0.54	X	10.02	X	91.35	X	0.5	X	0.8	=	177.93	(81)
Northwest _{0.9x}	0.77	X	1.77	X	91.35	X	0.5	X	0.8	=	44.82	(81)
Northwest _{0.9x}	0.77	X	1.59	X	97.38	X	0.5	X	0.8	=	85.84	(81)
Northwest _{0.9x}	0.77	X	2.74	X	97.38	X	0.5	x	0.8	=	147.93	(81)
Northwest 0.9x	0.54	X	10.02	X	97.38	X	0.5	X	0.8	=	189.69	(81)
Northwest 0.9x	0.77	X	1.77	X	97.38	X	0.5	X	0.8	=	47.78	(81)
Northwest 0.9x	0.77	X	1.59	X	91.1	X	0.5	X	0.8	=	80.31	(81)
Northwest 0.9x	0.77	X	2.74	X	91.1	X	0.5	X	0.8	=	138.39	(81)
Northwest 0.9x	0.54	X	10.02	X	91.1	X	0.5	X	0.8	=	177.45	(81)
Northwest 0.9x	0.77	X	1.77	X	91.1	X	0.5	Х	0.8	=	44.7	(81)
Northwest 0.9x	0.77	X	1.59	X	72.63	X	0.5	X	0.8] = 1	64.02	(81)
Northwest 0.9x	0.77	X	2.74	X	72.63	X	0.5	X	0.8] = 1	110.32	(81)
Northwest 0.9x	0.54	X	10.02	X	72.63	X	0.5	X	0.8] = 1	141.47	(81)
Northwest 0.9x	0.77	X	1.77	X	72.63	X	0.5	X	0.8] = 1	35.63	(81)
Northwest 0.9x	0.77	X	1.59	X	50.42	X	0.5	X	0.8] = 	44.45	(81)
Northwest _{0.9x}	0.77	X	2.74	X	50.42	X	0.5	X	0.8] =	76.59	(81)

Northwest 0.9x	0.54	X	10.	02	x	50.42	X	0.5	x	0.8	=	98.21	(81)
Northwest 0.9x	0.77	x	1.7	77	х	50.42	x	0.5	x	0.8	=	24.74	(81)
Northwest 0.9x	0.77	x	1.5	59	х	28.07	X	0.5	х	0.8	=	24.74	(81)
Northwest 0.9x	0.77	X	2.7	74	x	28.07	X	0.5	x	0.8	=	42.64	(81)
Northwest 0.9x	0.54	X	10.	02	x	28.07	X	0.5	x	0.8	=	54.67	(81)
Northwest 0.9x	0.77	x	1.7	77	х	28.07	x	0.5	x	0.8	=	13.77	(81)
Northwest 0.9x	0.77	X	1.5	59	х	14.2	X	0.5	x	0.8	=	12.51	(81)
Northwest 0.9x	0.77	X	2.7	74	х	14.2	x	0.5	x	0.8	=	21.57	(81)
Northwest 0.9x	0.54	x	10.	02	х	14.2	x	0.5	x	0.8	=	27.65	(81)
Northwest 0.9x	0.77	X	1.7	77	x	14.2	X	0.5	x	0.8	=	6.97	(81)
Northwest 0.9x	0.77	X	1.5	59	х	9.21	X	0.5	х	0.8	=	8.12	(81)
Northwest 0.9x	0.77	X	2.7	74	x	9.21	X	0.5	х	0.8	=	14	(81)
Northwest 0.9x	0.54	X	10.	02	x	9.21	X	0.5	x	0.8	=	17.95	(81)
Northwest 0.9x	0.77	X	1.7	77	x	9.21	X	0.5	x	0.8	=	4.52	(81)
				_									
Solar gains i	n watts, ca	alculated	for eac	h month			(83)m	= Sum(74)m	(82)m			_	
(83)m= 90.09		282.96	431.34	556.84	585		452.	15 333.56	202.64	111.21	74.96		(83)
Total gains -	· internal a	and solar	(84)m =	= (73)m	+ (83	3)m , watts			,	1	ī	7	
(84)m= 537.43	3 616.82	713.95	839.32	941.34	947	7.15 898.01	805.	55 698.8	591.11	526.41	510.3		(84)
7. Mean inte	ernal temp	perature ((heating	season)								
Temperatur	e during h	neating p	eriods ir	n the livi	ng ar	rea from Tal	ole 9,	Th1 (°C)				21	(85)
Utilisation fa	actor for g	ains for I	iving are	ea, h1,m	ı (see	e Table 9a)							
Utilisation fa		ains for I Mar	iving are Apr	ea, h1,m May	TÌ.	e Table 9a) un Jul	Αι	ug Sep	Oct	Nov	Dec]	
		1		I	TÌ.	un Jul	At 0.4		Oct 0.87	Nov 0.95	Dec 0.97		(86)
(86)m= 0.96	Feb 0.94	Mar 0.9	Apr 0.82	May 0.68) 0.5	un Jul 52 0.4	0.4	5 0.68		+]	(86)
Jan	Feb 0.94 nal temper	Mar 0.9	Apr 0.82	May 0.68) 0.5	un Jul 52 0.4 steps 3 to 7	0.4	5 0.68 able 9c)		+]	(86)
(86)m= 0.96 Mean intern (87)m= 18.99	0.94 nal temper	Mar 0.9 ature in 1	Apr 0.82 living are 20.25	May 0.68 ea T1 (fo 20.66	0.5 Ollow 20.	un Jul 52 0.4 steps 3 to 7 89 20.96	0.4 7 in T 20.9	5 0.68 (able 9c)	0.87	0.95	0.97]	
(86)m= 0.96 Mean intern	Feb 0.94 nal temper 19.25 re during h	Mar 0.9 ature in 1	Apr 0.82 living are 20.25	May 0.68 ea T1 (fo 20.66	0.5 Ollow 20.	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta	0.4 7 in T 20.9	5 0.68 (able 9c) 94 20.75 9, Th2 (°C)	0.87	0.95	0.97]	
(86)m= 0.96 Mean intern (87)m= 18.99 Temperatur (88)m= 20.09	Feb 0.94 nal temper 19.25 re during h	Mar 0.9 eature in l 19.7 neating p 20.1	Apr 0.82 living are 20.25 eriods ir 20.11	May 0.68 ea T1 (for 20.66 n rest of 20.11	Juliow 20.	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11	0.47 in T 20.9 able 9 20.7	5 0.68 (able 9c) 94 20.75 9, Th2 (°C)	20.19	0.95	0.97]	(87)
Jan 0.96	Feb 0.94 all temper 19.25 e during h 20.1 actor for g	Mar 0.9 ature in 1 19.7 neating p 20.1 ains for r	Apr 0.82 living are 20.25 eriods ir 20.11	May 0.68 ea T1 (for 20.66 rest of 20.11 welling,	Ju 0.5 ollow 20. dwel 20. h2,m	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table	0.47 in T 20.9 able 9 20.1	5 0.68 Table 9c) 94 20.75 9, Th2 (°C) 11 20.11	20.19	0.95	0.97 18.96 20.11]	(87)
Jan 0.96	Feb 0.94 all temper 19.25 e during h 20.1 actor for g	Mar 0.9 ature in 1 19.7 neating p 20.1 ains for r 0.89	Apr 0.82 living are 20.25 eriods ir 20.11 rest of do 0.79	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64	July 0.5 ollow 20. dwel 20. h2,m 0.4	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32	0.47 in T 20.9 able 9 20.9 9a) 0.3	5 0.68 Table 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62	0.87 20.19 20.11 0.85	0.95	0.97]	(87)
Jan	Feb 0.94 nal temper 19.25 re during h 20.1 actor for g 0.94 nal temper	Mar 0.9 ature in langle ating p 20.1 ains for r 0.89 ature in t	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell	July 0.5 ollow 20. dwel 20. h2,m 0.4 old 10.4 ol	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32	0.4 7 in T 20.9 able 9 20.6 9a) 0.3 eps 3	5 0.68 (able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab	0.87 20.19 20.11 0.85 e 9c)	0.95 19.51 20.11 0.94	0.97 18.96 20.11 0.96		(87) (88) (89)
Jan 0.96	Feb 0.94 nal temper 19.25 re during h 20.1 actor for g 0.94 nal temper	Mar 0.9 ature in 1 19.7 neating p 20.1 ains for r 0.89	Apr 0.82 living are 20.25 eriods ir 20.11 rest of do 0.79	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64	July 0.5 ollow 20. dwel 20. h2,m 0.4	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32	0.47 in T 20.9 able 9 20.9 9a) 0.3	5 0.68 Sable 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 97 19.86	0.87 20.19 20.11 0.85 le 9c) 19.12	0.95 19.51 20.11 0.94	0.97 18.96 20.11 0.96		(87) (88) (89) (90)
Jan	Feb 0.94 nal temper 19.25 re during h 20.1 actor for g 0.94 nal temper	Mar 0.9 ature in langle ating p 20.1 ains for r 0.89 ature in t	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell	July 0.5 ollow 20. dwel 20. h2,m 0.4 old 10.4 ol	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32	0.4 7 in T 20.9 able 9 20.6 9a) 0.3 eps 3	5 0.68 Sable 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 97 19.86	0.87 20.19 20.11 0.85 le 9c) 19.12	0.95 19.51 20.11 0.94	0.97 18.96 20.11 0.96	0.37	(87) (88) (89)
Jan	Feb 0.94 all temper 19.25 e during h 20.1 actor for g 0.94 hal temper 17.77	Mar 0.9 ature in 1 19.7 neating p 20.1 ains for r 0.89 ature in 1 18.41	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest 19.18	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 72 (follow ste 0 20.08	0.47 in T 20.9 able 9 20.9 0.3 eps 3 20.0	5 0.68 Sable 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 97 19.86	0.87 20.19 20.11 0.85 le 9c) 19.12	0.95 19.51 20.11 0.94	0.97 18.96 20.11 0.96	0.37	(87) (88) (89) (90)
Jan	Feb 0.94 all temper 19.25 e during h 20.1 actor for g 0.94 hal temper 17.77	Mar 0.9 ature in 1 19.7 neating p 20.1 ains for r 0.89 ature in 1 18.41	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest 19.18	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 72 (follow ste 0 20.08	0.47 in T 20.9 able 9 20.9 0.3 eps 3 20.0	5 0.68 able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 07 19.86 - fLA) × T2	0.87 20.19 20.11 0.85 le 9c) 19.12	0.95 19.51 20.11 0.94	0.97 18.96 20.11 0.96	0.37	(87) (88) (89) (90)
Jan	Feb 0.94 all temper 19.25 e during h 20.1 actor for g 0.94 hal temper 17.77 hal temper 18.32	Mar 0.9 ature in 1 19.7 neating p 20.1 ains for r 0.89 ature in 1 18.41 ature (fo	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest 19.18 r the wh	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73 ole dwe 20.08	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 72 (follow ste 0 20.08 1 = fLA × T1 33 20.41	0.4 7 in T 20.9 able 9 20. 9a) 0.3 eps 3 20.0 + (1 20.0	5 0.68 able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 19.86 - fLA) × T2 39 20.19	0.87 20.19 20.11 0.85 e 9c) 19.12 fLA = Livi	0.95 19.51 20.11 0.94 18.15 ng area ÷ (4	0.97 18.96 20.11 0.96 17.36 4) =	0.37	(87) (88) (89) (90) (91)
Jan	Feb 0.94 all temper 19.25 e during h 20.1 actor for ga 0.94 hal temper 17.77 hal temper 18.32 tment to th	Mar 0.9 ature in 1 19.7 neating p 20.1 ains for r 0.89 ature in 1 18.41 ature (fo	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest 19.18 r the wh	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73 ole dwe 20.08	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 72 (follow ste 0 20.08 1 = fLA × T1 33 20.41 e from Table	0.4 7 in T 20.9 able 9 20. 9a) 0.3 eps 3 20.0 + (1 20.0	5 0.68 able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 07 19.86 - fLA) × T2 39 20.19 where appre	0.87 20.19 20.11 0.85 e 9c) 19.12 fLA = Livi	0.95 19.51 20.11 0.94 18.15 ng area ÷ (4	0.97 18.96 20.11 0.96 17.36 4) =	0.37	(87) (88) (89) (90) (91)
Jan	Feb 0.94 all temper 19.25 e during h 20.1 actor for gan 0.94 hal temper 17.77 hal temper 18.32 tment to th 18.32 cating required	Mar 0.9 ature in I 19.7 neating p 20.1 ains for r 0.89 ature in t 18.41 ature (fo 18.89 he mean 18.89 uirement	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest 19.18 r the wh 19.58 internal	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73 ole dwe 20.08 I temper 20.08	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 72 (follow ste 0 20.08 1 = fLA × T1 33 20.41 2 from Table 33 20.41	0.47 in T 20.9 able 9 20.0 4 (1 20.0 4 4e, 1) 20.0 20.0 4 (20.0 20.0 4 20.0 20.0 20.0 20.0 20.0 20.	5 0.68 able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 19.86 - fLA) × T2 39 20.19 where appress 39 20.19	0.87 20.19 20.11 0.85 le 9c) 19.12 fLA = Livi 19.52 opriate 19.52	0.95 19.51 20.11 0.94 18.15 ng area ÷ (4) 18.66	0.97 18.96 20.11 0.96 17.36 4) =]	(87) (88) (89) (90) (91) (92)
Jan	Feb 0.94 19.25 19.25 19.25 19.20 19.25 19.20	Mar 0.9 ature in 1 19.7 neating p 20.1 ains for r 0.89 ature in t 18.41 ature (fo 18.89 he mean 18.89 uirement ternal ten	Apr 0.82 living are 20.25 eriods ir 20.11 rest of do 0.79 the rest 19.18 r the wh 19.58 internal 19.58	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73 ole dwere 20.08 temper 20.08	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 72 (follow ste 0 20.08 1 = fLA × T1 33 20.41 2 from Table 33 20.41	0.47 in T 20.9 able 9 20.0 4 (1 20.0 4 4e, 1) 20.0 20.0 4 (20.0 20.0 4 20.0 20.0 20.0 20.0 20.0 20.	5 0.68 able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 19.86 - fLA) × T2 39 20.19 where appress 39 20.19	0.87 20.19 20.11 0.85 le 9c) 19.12 fLA = Livi 19.52 opriate 19.52	0.95 19.51 20.11 0.94 18.15 ng area ÷ (4) 18.66	0.97 18.96 20.11 0.96 17.36 4) =]	(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.96 Mean intern (87)m= 18.99 Temperatur (88)m= 20.09 Utilisation fa (89)m= 0.96 Mean intern (90)m= 17.39 Mean intern (92)m= 17.98 Apply adjus (93)m= 17.98 Set Ti to the the utilisation	Feb 0.94 all temper 19.25 e during h 20.1 actor for ga 0.94 hal temper 17.77 hal temper 18.32 tement to the second on factor for ga e mean interpretation factor for ga 18.32 e mean interpretation factor for ga e mean interpretation factor factor factor for ga e mean interpretation factor f	Mar 0.9 ature in lang p 20.1 ains for r 0.89 ature in t 18.41 ature (fo 18.89 he mean 18.89 uirement ternal ten or gains to	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest 19.18 r the wh 19.58 internal 19.58 mperaturusing Ta	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73 ole dwe 20.08 temper 20.08	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 T2 (follow ste 0 20.08 1 = fLA × T1 33 20.41 e from Table 33 20.41 at step 11 of	0.4 7 in T 20.9 able 9 20.4 9a) 0.3 eps 3 20.0 + (1 20.6 20.6	5 0.68 able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 07 19.86 — fLA) × T2 39 20.19 where appress 20.19 e 9b, so that	0.87 20.19 20.11 0.85 le 9c) 19.12 fLA = Livi 19.52 opriate 19.52 at Ti,m=	0.95 19.51 20.11 0.94 18.15 ng area ÷ (4 18.66 18.66 (76)m an	0.97 18.96 20.11 0.96 17.36 4) = 17.96 17.96 d re-calc]	(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.96 Mean intern (87)m= 18.99 Temperatur (88)m= 20.09 Utilisation fa (89)m= 0.96 Mean intern (90)m= 17.39 Mean intern (92)m= 17.98 Apply adjus (93)m= 17.98 Set Ti to the the utilisation Jan	Feb 0.94 all temper 19.25 e during h 20.1 actor for ga 0.94 hal temper 17.77 hal temper 18.32 tment to the second record record for ga 18.32 e mean interpretation factor for ga e mean interpretation factor for ga e mean interpretation factor for ga e mean interpretation factor for ga Feb	Mar 0.9 ature in lang p 20.1 ains for r 0.89 ature in tale 18.41 ature (for 18.89) he mean 18.89 uirement ternal ten por gains to Mar	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest 19.18 r the wh 19.58 internal 19.58 mperaturusing Ta	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73 ole dwere 20.08 temper 20.08	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 72 (follow ste 0 20.08 1 = fLA × T1 33 20.41 2 from Table 33 20.41	0.47 in T 20.9 able 9 20.0 4 (1 20.0 4 4e, 1) 20.0 20.0 4 (20.0 20.0 4 20.0 20.0 20.0 20.0 20.0 20.	5 0.68 able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 07 19.86 — fLA) × T2 39 20.19 where appress 9 20.19 e 9b, so that	0.87 20.19 20.11 0.85 le 9c) 19.12 fLA = Livi 19.52 opriate 19.52	0.95 19.51 20.11 0.94 18.15 ng area ÷ (4) 18.66	0.97 18.96 20.11 0.96 17.36 4) =]	(87) (88) (89) (90) (91) (92)
Jan (86)m= 0.96 Mean intern (87)m= 18.99 Temperatur (88)m= 20.09 Utilisation fa (89)m= 0.96 Mean intern (90)m= 17.39 Mean intern (92)m= 17.98 Apply adjus (93)m= 17.98 Set Ti to the the utilisation	Feb 0.94 all temper 19.25 e during h 20.1 actor for ga 0.94 hal temper 17.77 hal temper 18.32 tment to the second record record for ga 18.32 e mean interpretation factor for ga e mean interpretation factor for ga e mean interpretation factor for ga e mean interpretation factor for ga Feb	Mar 0.9 ature in lang p 20.1 ains for r 0.89 ature in tale 18.41 ature (for 18.89) he mean 18.89 uirement ternal ten por gains to Mar	Apr 0.82 living are 20.25 eriods ir 20.11 rest of dr 0.79 the rest 19.18 r the wh 19.58 internal 19.58 mperaturusing Ta	May 0.68 ea T1 (for 20.66 n rest of 20.11 welling, 0.64 of dwell 19.73 ole dwe 20.08 temper 20.08	Ju 0.5	un Jul 52 0.4 steps 3 to 7 89 20.96 Illing from Ta 11 20.11 n (see Table 46 0.32 T2 (follow ste 0 20.08 1 = fLA × T1 33 20.41 e from Table 33 20.41 at step 11 of	0.4 7 in T 20.9 able 9 20.4 9a) 0.3 eps 3 20.0 + (1 20.6 20.6	5 0.68 able 9c) 94 20.75 9, Th2 (°C) 11 20.11 8 0.62 to 7 in Tab 07 19.86 — fLA) × T2 39 20.19 where appress 19 20.19 e 9b, so that	0.87 20.19 20.11 0.85 le 9c) 19.12 fLA = Livi 19.52 opriate 19.52 at Ti,m=	0.95 19.51 20.11 0.94 18.15 ng area ÷ (4 18.66 18.66 (76)m an	0.97 18.96 20.11 0.96 17.36 4) = 17.96 17.96 d re-calc]	(87) (88) (89) (90) (91) (92)

Heaful gains has Can W (04) as y (94) as													
Useful gains, hmGm, $W = (94)m \times (84)m$ (95)m = 505.9 565.7 620.34 649.41 597.67 451.7 314.09 320	24.08	437.55	490.28	483.11	483.68		(95)						
Monthly average external temperature from Table 8		.000	.00.20		100.00		` ,						
	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]										
(97)m= 1189.49 1161.28 1066.84 911.1 715.06 489.19 325.11 34	40.78	519.72	761.41	986.19	1174.03		(97)						
Space heating requirement for each month, kWh/month = 0.024 >	x [(97)	m – (95	- `	r e		Ī							
(98)m= 508.59 400.22 332.2 188.42 87.34 0 0 0 0 201.72 362.21 513.63 Total per year (kWh/year) = Sum(98) _{15,912} = 2594.34 (98)													
Space heating requirement in kM/h/m²// year	Total	per year	(kWh/year	r) = Sum(9	98) _{15,912} =		(98)						
Space heating requirement in kWh/m²/year						29.52	(99)						
9b. Energy requirements – Community heating scheme													
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Ta		-		unity sch	neme.	0	(301)						
Fraction of space heat from community system $1 - (301) =$						1	(302)						
The community scheme may obtain heat from several sources. The procedure allo			up to four	other heat	sources; t	he latter	_						
includes boilers, heat pumps, geothermal and waste heat from power stations. See Fraction of heat from Community CHP	e Appen	iaix C.				0.67	(303a)						
Fraction of community heat from heat source 2						0.33	(303b)						
Fraction of total space heat from Community CHP			(3	02) x (303	3a) =	0.67	(304a)						
Fraction of total space heat from community heat source 2			(3	02) x (303	8b) =	0.33	(304b)						
Factor for control and charging method (Table 4c(3)) for communit	ty heat	ting sys	tem			1	(305)						
Distribution loss factor (Table 12c) for community heating system						1.05	(306)						
Space heating						kWh/yea	r						
Annual space heating requirement						2594.34	╛						
Space heat from Community CHP		` , , ,	04a) x (30	, , ,		1814.22	(307a)						
Space heat from heat source 2		(98) x (30	04b) x (30	5) x (306)	=	909.83	(307b)						
Efficiency of secondary/supplementary heating system in % (from	Table	4a or A	ppendix	E)		0	(308						
Space heating requirement from secondary/supplementary system	า	(98) x (30	01) x 100 -	÷ (308) =		0	(309)						
Water heating							_						
Annual water heating requirement If DHW from community scheme:						2158.87							
Water heat from Community CHP		(64) x (30	03a) x (30	5) x (306)	=	1509.7	(310a)						
Water heat from heat source 2		(64) x (30	03b) x (30	5) x (306)	=	757.12	(310b)						
Electricity used for heat distribution	0.01	× [(307a).	(307e) +	(310a)	(310e)] =	49.91	(313)						
Cooling System Energy Efficiency Ratio						0	(314)						
Space cooling (if there is a fixed cooling system, if not enter 0)		= (107) ÷	(314) =			0	(315)						
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from ou	ıtside					112.34	(330a)						
warm air heating system fans													
wann air neannn cyclem lanc						0	(330b)						

pump for solar water heating				0	(330g)
Total electricity for the above, kWh/ye	ar	=(330a) + (330	(b) + (330g) =	112.34	(331)
Energy for lighting (calculated in Appe	endix L)			370.19	(332)
Electricity generated by PVs (Appendi	ix M) (negative quantity)			-208.31	(333)
Electricity generated by wind turbine (Appendix M) (negative of	quantity)		0	(334)
12b. CO2 Emissions – Community he	ating scheme				
Electrical efficiency of CHP unit				32	(361)
Heat efficiency of CHP unit				50.4	(362)
		Energy kWh/year	Emission factors kg CO2/kWh	or Emissions kg CO2/yea	r
Space heating from CHP) (3	807a) × 100 ÷ (362) =	3599.64 ×	0.22	777.52	(363)
less credit emissions for electricity -	(307a) × (361) ÷ (362) =	1151.89 ×	0.52	-597.83	(364)
Water heated by CHP (3	310a) × 100 ÷ (362) =	2995.43 ×	0.22	647.01	(365)
less credit emissions for electricity -	$(310a) \times (361) \div (362) =$	958.54 ×	0.52	-497.48	(366)
Efficiency of heat source 2 (%)	If there is CHP us	ing two fuels repeat (363) to	(366) for the second	fuel 95	(367b)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	= 379.01	(368)
Electrical energy for heat distribution		[(313) x	0.52	= 25.9	(372)
Total CO2 associated with community	v systems	(363)(366) + (368)(372	2)	= 734.14	(373)
CO2 associated with space heating (s	secondary)	(309) x	0	= 0	(374)
CO2 associated with water from imme	ersion heater or instanta	neous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and	water heating	(373) + (374) + (375) =		734.14	(376)
CO2 associated with electricity for pur	mps and fans within dwe	elling (331)) x	0.52	= 58.31	(378)
CO2 associated with electricity for ligh	nting	(332))) x	0.52	= 192.13	(379)
Energy saving/generation technologie Item 1	es (333) to (334) as appl	icable	0.52 × 0.01	= -108.11	(380)
Total CO2, kg/year	sum of (376)(382) =			876.46	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			9.97	(384)

El rating (section 14)

91.16

(385)

			User D	etails: -						
Access Name:	Ross Boulton				. NI	ber:		OTD C	0028068	
Assessor Name: Software Name:	Stroma FSAP 20°	12		Strom: Softwa					on: 1.0.4.18	
Contware Hame.	Ottoma i Orii Zo			Address				VOIOIC	511. 1.0.1.10	
Address :	B1M-103-07, Flat T		i i			30 01				
1. Overall dwelling dime		71	,	,						
			Area	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor			8	7.88	(1a) x	2	2.6	(2a) =	228.5	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	e)+(1n) 8	7.88	(4)			_		
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	228.5	(5)
2. Ventilation rate:										
		econdar heating	у	other		total			m³ per hou	ır
Number of chimneys	0 +	0] + [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0	ī + Ē	0	j = F	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				,	3	x ·	10 =	30	(7a)
Number of passive vents	S					0	x	10 =	0	(7b)
Number of flueless gas t					L		x	40 =		(7c)
Number of flueless gas i	1163				L	0			0	(70)
								Air cl	hanges per ho	our
Infiltration due to chimne	eys, flues and fans = (6	6a)+(6b)+(7	a)+(7b)+(7c) =	Γ	30		÷ (5) =	0.13	(8)
If a pressurisation test has		led, proceed	d to (17), d	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: (J.25 for steel or timber present, use the value correct 				•	uction			0	(11)
deducting areas of open		sponding to	ine great	er wan are	a (aner					
If suspended wooden	floor, enter 0.2 (unsea	iled) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else enter 0								0	(13)
Percentage of window	s and doors draught s	tripped							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	•								0.38	(18)
Air permeability value applie Number of sides sheltere		is been aon	e or a deg	gree air pei	теарину	is being u	sea			(19)
Shelter factor	ou			(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	iting shelter factor			(21) = (18)	x (20) =				0.32	(21)
Infiltration rate modified	for monthly wind spee	d								
Jan Feb	Mar Apr May	Jun	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]	
Mind Factor (CC.)	200						•		_	
Wind Factor (22a)m = $(2^{23})^{m}$	'	1 005 1	0.05	0.00	4	1.00	4 40	4 40	7	
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	J	

		<u> </u>				` 	`	(22a)m		ı	1	I	
0.41 Calculate effe	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38		
If mechanica		_	ale ioi li	пе арріп	cabi c ca	3 C						0	(23
If exhaust air h	eat pump (using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b) = (23a)			0	(23
If balanced with	h heat reco	overy: effic	ency in %	allowing f	or in-use fa	actor (from	Table 4h) =				0	(23
a) If balance	ed mecha	anical ve	ntilation	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		(24
b) If balance	ed mecha	anical ve	ntilation	without	heat rec	covery (N	/IV) (24b)m = (22	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r	nouse ext n < 0.5 ×			•	•				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)r	ventilation			•	•				0.5]			•	
24d)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(2
Effective air	change	rate - er	ter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)					
25)m= 0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25
/indows Type					1.46	=	/[1/(1.4)+ /[1/(1.4)+	L	1.94				(2
Vindows Type	area	(m²)	m	 	A ,n		W/m2 //1 // 1 // \/		(W/I	^) →	kJ/m²-l	`	kJ/K
Vindows Type	e 2				2.52	x1,	/[1/(1.4)+	0.04] =	3.34				(27
Vindows Type	e 3				9.2			;					
					9.2	XII	/[1/(1.4)+	0.04] =	12.2				(2
Vindows Type	e 4				3.2	=	/[1/(1.4)+ /[1/(1.4)+	L	12.2 4.24				•
						x1/		0.04] =					(2
Vindows Type		6	21.99	9	3.2	x1/	/[1/(1.4)+	0.04] =	4.24			7 [(2
Vindows Type Valls	e 5 68.6		21.99	9	3.2	x1/	/[1/(1.4)+	0.04] = [4.24 2.16				(2
Vindows Type Valls Otal area of e	68.6 68.6 elements	, m² ows, use e	ffective wi	ndow U-va	3.2 1.63 46.61 68.6	x1/ x1/ x	/[1/(1.4)+ /[1/(1.4)+ 0.18	0.04] = [0.04] = [= [4.24 2.16 8.39	as given in	paragraph	3.2	(2
Vindows Type Valls Otal area of e for windows and tinclude the area	68.6 68.6 elements I roof windo	, m² ows, use e sides of in	ffective wil	ndow U-va	3.2 1.63 46.61 68.6	x1, x1, x	/[1/(1.4)+ /[1/(1.4)+ 0.18	$0.04] = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$ $= \begin{bmatrix} \\ \end{bmatrix}$ $/[(1/U-valu)]$	4.24 2.16 8.39	as given in	paragraph	37.54	(2 (2 (3 (3
Vindows Type Vindows Type Valls Total area of e for windows and tinclude the area Tabric heat los leat capacity	68.6 68.6 elements I roof windo as on both ss, W/K =	, m² ows, use e sides of in = S (A x	ffective wil	ndow U-va	3.2 1.63 46.61 68.6	x1, x1, x	/[1/(1.4)+ /[1/(1.4)+ 0.18	$0.04] = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix}$	4.24 2.16 8.39			.	
Vindows Type Valls Total area of e for windows and the include the area Tabric heat los	e 5 68.6 elements roof winder as on both ss, W/K = Cm = S(, m² ows, use e sides of in = S (A x (A x k)	ffective wi ternal wall U)	ndow U-va	3.2 1.63 46.61 68.6 alue calculatitions	x1/x1/x x	/[1/(1.4)+ /[1/(1.4)+ 0.18	0.04] = $\begin{bmatrix} 0.04 \end{bmatrix}$ = $\begin{bmatrix} 0.04$	4.24 2.16 8.39 re)+0.04] a	2) + (32a).		37.54	(2 (2 (3 (3 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4
Vindows Type Valls otal area of e for windows and include the area abric heat los	e 5 68.6 elements I roof winder as on both ss, W/K = Cm = S(a parame sments wh	, m² ows, use e sides of in = S (A x (A x k) ter (TMF ere the de	ffective winternal walk U) $P = Cm \div tails of the$	ndow U-va ls and part	3.2 1.63 46.61 68.6 68.6 alue calculatitions	x1/x1/x x	/[1/(1.4)+ /[1/(1.4)+ 0.18 / formula 1. (26)(30)	$0.04] = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$ $= \begin{bmatrix} \\ /[(1/U-valu)] \\ + (32) = \\ ((28) \end{bmatrix}$ Indica	4.24 2.16 8.39 ee)+0.04] a	2) + (32a). : Medium	(32e) =	37.5 ⁴ 652.5	(2 (2 (2 (3 (3 (3 7 (3
Vindows Type Valls otal area of e for windows and include the area abric heat los eat capacity hermal mass or design assess	e 5 68.6 elements I roof winder as on both as, W/K = Cm = S(a parame aments whe and of a det	, m² ows, use e sides of in = S (A x A x k) ter (TMF ere the de tailed calcu	ffective winternal wall U) P = Cm ÷ tails of the plation.	ndow U-va ls and part - TFA) ir constructi	3.2 1.63 46.61 68.6 alue calculatitions n kJ/m²K ion are not	x1/x1/x x	/[1/(1.4)+ /[1/(1.4)+ 0.18 / formula 1. (26)(30)	$0.04] = \begin{bmatrix} \\ 0.04 \end{bmatrix} = \begin{bmatrix} \\ \end{bmatrix}$ $= \begin{bmatrix} \\ /[(1/U-valu)] \\ + (32) = \\ ((28) \end{bmatrix}$ Indica	4.24 2.16 8.39 ee)+0.04] a	2) + (32a). : Medium	(32e) =	37.5 ⁴ 652.5	(2 (2 (2 (3 4 (3 7 (3 (3
Jindows Type Jalls otal area of e for windows and include the area abric heat los eat capacity hermal mass or design assess an be used inste hermal bridge details of therma	e 5 68.6 elements I roof winder as on both es, W/K = Cm = S(exparame examents whe and of a det es : S (L al bridging	, m² ows, use e sides of in = S (A x k) ter (TMF) ere the de tailed calcu	ffective winternal wall U) P = Cm ÷ tails of the plation. Culated to	ndow U-ve ls and part - TFA) ir constructi using Ap	3.2 1.63 46.61 68.6 alue calculatitions kJ/m²K ion are not	x1/x1/x x	/[1/(1.4)+ /[1/(1.4)+ 0.18 / formula 1. (26)(30)	0.04] = [0.04] = [0.04] = [4.24 2.16 8.39 ee)+0.04] a .(30) + (32 tive Values e values of	2) + (32a). : Medium	(32e) =	37.54 652.5 250 3.43	(2 (2 (2 (3 1 1 (3 7 (3 (3
/indows Type /alls otal area of e for windows and include the area abric heat los eat capacity hermal mass or design assess an be used inste hermal bridge details of therma otal fabric he	e 5 68.6 elements I roof winder as on both ess, W/K = Cm = S(a parame esments where ad of a det es : S (L al bridging eat loss	, m² cows, use e sides of in = S (A x k) ter (TMF ere the de tailed calculate x Y) calculate not kn	ffective winternal wall U) P = Cm ÷ tails of the ulation. culated to	ndow U-ve ls and part - TFA) ir constructi using Ap	3.2 1.63 46.61 68.6 alue calculatitions kJ/m²K ion are not	x1/x1/x x	/[1/(1.4)+ /[1/(1.4)+ 0.18 / formula 1. (26)(30)	$0.04] = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix}$	4.24 2.16 8.39 ee)+0.04] at tive Values of values of (36) =	2) + (32a). : Medium TMP in Ta	(32e) = able 1f	37.54 652.5 250	(2 (2 (2 (3 1 1 (3 7 (3 (3
/indows Type /alls otal area of e for windows and include the area abric heat los eat capacity hermal mass or design assess an be used inste hermal bridge details of therma otal fabric he entilation hea	e 5 68.6 elements I roof windo as on both as, W/K = Cm = S(a parame aments whe ad of a det es : S (L al bridging eat loss at loss ca	, m² ows, use e sides of in = S (A x k) ter (TMF ere the de tailed calculated are not kn	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to the cown (36) =	ndow U-vals and part - TFA) ir constructionsing Ap = 0.05 x (3	3.2 1.63 46.61 68.6 alue calculatitions h kJ/m²K ion are not	x1/x1/x x x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.18 / formula 1 (26)(30)	0.04] = [0.04] = [4.24 2.16 8.39 e)+0.04] at a constant of the second of	2) + (32a). : Medium <i>TMP in Ta</i> 25)m x (5)	(32e) = able 1f	37.54 652.5 250 3.43	(2 (2 (2 (3 (3 7 (3 (3
/indows Type /alls otal area of e for windows and include the area abric heat los eat capacity hermal mass or design assess an be used inste hermal bridge details of therma otal fabric he entilation hea	e 5 68.6 elements I roof winder as on both es, W/K = Cm = S(esparame esments whe had of a det es : S (L al bridging eat loss at loss ca	, m² ows, use e sides of in = S (A x k) ter (TMF ere the de tailed calculated are not kn alculated Mar	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to the cown (36) = monthly	ndow U-vels and part - TFA) ir constructi using Ap = 0.05 x (3	3.2 1.63 46.61 68.6 alue calculatitions kJ/m²K ion are not	x1/x1/x x ated using	/[1/(1.4)+ /[1/(1.4)+	0.04] = [0.04] = [0.04] = [(1/U-value) + (32) = ((28) Indicative indicative (33) + (38)m Sep	4.24 2.16 8.39 e)+0.04] a .(30) + (32 tive Values of (36) = = 0.33 × (Oct	2) + (32a). : Medium : TMP in Ta 25)m x (5) Nov	(32e) = able 1f Dec	37.54 652.5 250 3.43	(2 (2 (2 (3 (3 7 (3 (3 7 (3
/indows Type /alls otal area of e for windows and include the area abric heat los eat capacity hermal mass or design assess an be used inste hermal bridge details of therma otal fabric he entilation hea Jan 8)m= 44.14	e 5 68.6 elements I roof winder as on both es, W/K = Cm = S(exparame esments wher ad of a det es : S (L al bridging eat loss at loss ca Feb 43.89	, m² ows, use e sides of in = S (A x k) ter (TMF ere the de tailed calculated are not kn elculated Mar 43.64	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to the cown (36) =	ndow U-vals and part - TFA) ir constructionsing Ap = 0.05 x (3	3.2 1.63 46.61 68.6 alue calculatitions h kJ/m²K ion are not	x1/x1/x x x x x x x x x x x x x x x x x	/[1/(1.4)+ /[1/(1.4)+ 0.18 / formula 1 (26)(30)	0.04] = [0.04] = [0.04] = [(1/U-value)	4.24 2.16 8.39 (a) + (.04] a 2.16 (.00) + (.04] a 2.16 2.16 (.00) + (.04] a 3.10 4.20 (.00) + (.04] a 3.10 (.00) + (.04] a 4.20 (.00) + (.04] a (.00) + (.04] a	2) + (32a). : Medium TMP in Ta 25)m x (5) Nov 42.71	(32e) = able 1f	37.54 652.5 250 3.43	(2 (2 (2 (3 (3 7 (3 (3 7 (3
Vindows Type Valls otal area of e for windows and include the area abric heat los leat capacity hermal mass or design assess an be used inste hermal bridge details of therma otal fabric he entilation hea	e 5 68.6 elements I roof winder as on both es, W/K = Cm = S(exparame esments wher ad of a det es : S (L al bridging eat loss at loss ca Feb 43.89	, m² ows, use e sides of in = S (A x k) ter (TMF ere the de tailed calculated are not kn elculated Mar 43.64	ffective winternal wall U) P = Cm ÷ tails of the plation. culated to the cown (36) = monthly	ndow U-vels and part - TFA) ir constructi using Ap = 0.05 x (3	3.2 1.63 46.61 68.6 alue calculatitions kJ/m²K ion are not	x1/x1/x x ated using	/[1/(1.4)+ /[1/(1.4)+	0.04] = [0.04] = [0.04] = [(1/U-value)	4.24 2.16 8.39 e)+0.04] a .(30) + (32 tive Values of (36) = = 0.33 × (Oct	2) + (32a). : Medium TMP in Ta 25)m x (5) Nov 42.71	(32e) = able 1f Dec	37.54 652.5 250 3.43	(2 (2 (2 (3 4 (3 7 (3 (3

Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.97	0.97	0.96	0.95	0.95	0.94	0.94	0.93	0.94	0.95	0.95	0.96		
Niverban of day			l- 4-)					,	Average =	Sum(40) ₁ .	12 /12=	0.95	(40)
Number of day Jan	Feb	Mar	e 1a) Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
` '		ļ								ļ			
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	ΓFA -13.		.6		(42)
if TFA £ 13.9 Annual average	•	ater usac	ne in litre	s ner da	av Vd av	erane –	(25 x N)	+ 36		05	0.5		(43)
Reduce the annua	al average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		5.85		(43)
not more that 125	litres per	person per	day (all w	ater use, l	not and co	ld) 							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)		•				
(44)m= 105.43	101.6	97.76	93.93	90.1	86.26	86.26	90.1	93.93	97.76	101.6	105.43		_
Energy content of	hot water	used - cali	culated mo	onthly – 4	190 x Vd r	пуптуГ	Tm / 3600			m(44) ₁₁₂ =	L	1150.15	(44)
	136.75	141.11	123.02	118.04	101.86	94.39	108.31	109.61	127.74	139.43	151.42		
(45)m= 156.35	130.73	141.11	123.02	110.04	101.00	94.39	100.31			m(45) ₁₁₂ =	L	1508.03	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		rolar = Su	111(43)112 =	- l	1308.03	(40)
(46)m= 23.45	20.51	21.17	18.45	17.71	15.28	14.16	16.25	16.44	19.16	20.92	22.71		(46)
Water storage	loss:	<u> </u>									<u> </u>		
Storage volum	e (litres)) includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	•			•			` '						
Otherwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
Water storage a) If manufact		aclared l	nee fact	nr ie kna	wn (k\//k	v(qəv).					20		(48)
Temperature f				JI 13 KI10	vvii (icvvi	ı, day).					39		(49)
Energy lost fro				oor			(48) x (49)	١ _			54		
b) If manufact		_	-		or is not		(40) X (49)	, -		0.	75		(50)
Hot water stora			-								0		(51)
If community h	_		on 4.3										
Volume factor			O.							—	0		(52)
Temperature fa											0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (. , .	,					((50) (EE) (44)		0.	75		(55)
Water storage		culated i				i	((56)M = (55) × (41)ı	m 	,			
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
If cylinder contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	/)m = (56)	m where (H11) is fro	m Append	X H	
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit				,	•	. ,	, ,		_				
(modified by					ı —	ı —			ı —	<u> </u>			<i>,</i>
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combiles a	ام مغمان بمام	for ooah		(C4)	(00) - 0	CF (44)	١						
Combi loss of (61)m= 0	alculated	or each	montn ((61)m =	(60) ÷ 3	05 × (41))m 0	0	0	0	0		(61)
							<u> </u>	Ļ	<u> </u>	ļ.		(F0)m + (G1)m	(01)
(62)m= 202.9		187.7	168.11	164.64	146.95	140.98	154.91	154.7	174.33	184.53	198.01	(59)m + (61)m	(62)
Solar DHW inpu						<u> </u>		1					(02)
(add addition									ii continbu	iioii io wale	er rieatiriy)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0]	(63)
Output from	 water hea	ter				ļ	ļ	!		ļ.	!		
(64)m= 202.9		187.7	168.11	164.64	146.95	140.98	154.91	154.7	174.33	184.53	198.01		
						!	Out	put from w	ater heate	r (annual)	12	2056.65	(64)
Heat gains fr	om water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)r	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 89.26	1	84.19	76.98	76.53	69.94	68.66	73.29	72.52	79.75	82.44	87.62]	(65)
include (57	7)m in calc	culation o	of (65)m	only if c	vlinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	<u> </u>		. ,		,						,		
Metabolic ga				,									
Jan	T ,	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 129.7	8 129.78	129.78	129.78	129.78	129.78	129.78	129.78	129.78	129.78	129.78	129.78		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5	•	1	•	ı	
(67)m= 20.96	18.62	15.14	11.46	8.57	7.23	7.82	10.16	13.64	17.32	20.21	21.54		(67)
Appliances g	jains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5		•	•	
(68)m= 235.13	3 237.57	231.42	218.33	201.81	186.28	175.9	173.46	179.61	192.7	209.22	224.75		(68)
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also s	ee Table	5		•	•	
(69)m= 35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98	35.98		(69)
Pumps and f	ans gains	(Table 5	ia)									•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)	-	-				-		
(71)m= -103.8	2 -103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82	-103.82		(71)
Water heatin	g gains (T	able 5)				-	-		-	-	-		
(72)m= 119.9	8 117.76	113.16	106.91	102.86	97.14	92.29	98.51	100.72	107.19	114.49	117.77		(72)
Total interna	al gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m	•	
(73)m= 441	438.88	424.66	401.64	378.17	355.59	340.94	347.07	358.9	382.14	408.86	429		(73)
6. Solar gai	ns:												
Solar gains are		•	flux from	Table 6a		•	itions to c	onvert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a	_	g_ Fable 6b	т	FF		Gains	
					Ta	oie ba	. –	able ob	_ '	able 6c		(W)	,
Southwest _{0.9} x		X	3.	2	x 3	36.79	<u> </u>	0.63	X	0.7	=	35.98	(79)
Southwest _{0.9} x	• • • • • • • • • • • • • • • • • • • •	X	3.:	2	x (62.67	<u> </u>	0.63	x	0.7	=	61.29	(79)
Southwest _{0.9} x	<u> </u>	X	3.:	2	x8	35.75	! <u>L</u>	0.63	x	0.7	=	83.86	(79)
Southwest _{0.9} x		X	3.2	2	x 1	06.25	<u> </u>	0.63	X	0.7	=	103.91	(79)
Southwest _{0.9} x	0.77	х	3.2	2	x 1	19.01		0.63	Х	0.7	=	116.39	(79)

0		1		1		1		1	_	1	Γ	-
Southwest _{0.9x}	0.77	X	3.2	X	118.15]	0.63	X	0.7	=	115.55	(79)
Southwest _{0.9x}	0.77	X	3.2	X	113.91	ļ	0.63	X	0.7	=	111.4	(79)
Southwest _{0.9x}	0.77	X	3.2	X	104.39	_	0.63	X	0.7	=	102.09	(79)
Southwest _{0.9x}	0.77	X	3.2	X	92.85	_	0.63	X	0.7	=	90.81	(79)
Southwest _{0.9x}	0.77	X	3.2	x	69.27	<u> </u>	0.63	X	0.7	=	67.74	(79)
Southwest _{0.9x}	0.77	X	3.2	X	44.07]	0.63	X	0.7	=	43.1	(79)
Southwest _{0.9x}	0.77	X	3.2	X	31.49		0.63	X	0.7	=	30.79	(79)
Northwest _{0.9x}	0.77	X	1.46	X	11.28	X	0.63	X	0.7	=	10.07	(81)
Northwest _{0.9x}	0.77	X	2.52	X	11.28	X	0.63	X	0.7	=	17.38	(81)
Northwest 0.9x	0.54	X	9.2	X	11.28	X	0.63	x	0.7	=	22.25	(81)
Northwest _{0.9x}	0.77	X	1.63	X	11.28	X	0.63	X	0.7	=	5.62	(81)
Northwest _{0.9x}	0.77	X	1.46	X	22.97	X	0.63	X	0.7	=	20.5	(81)
Northwest 0.9x	0.77	X	2.52	x	22.97	x	0.63	X	0.7	=	35.38	(81)
Northwest _{0.9x}	0.54	X	9.2	x	22.97	x	0.63	x	0.7	=	45.29	(81)
Northwest _{0.9x}	0.77	X	1.63	x	22.97	x	0.63	x	0.7	=	11.44	(81)
Northwest _{0.9x}	0.77	X	1.46	x	41.38	x	0.63	x	0.7	=	36.93	(81)
Northwest _{0.9x}	0.77	X	2.52	x	41.38	х	0.63	X	0.7] =	63.74	(81)
Northwest _{0.9x}	0.54	X	9.2	x	41.38	х	0.63	x	0.7] =	81.59	(81)
Northwest _{0.9x}	0.77	X	1.63	x	41.38	x	0.63	x	0.7	=	20.61	(81)
Northwest _{0.9x}	0.77	x	1.46	×	67.96	x	0.63	x	0.7] =	60.64	(81)
Northwest _{0.9x}	0.77	x	2.52	x	67.96	x	0.63	x	0.7	j =	104.67	(81)
Northwest 0.9x	0.54	x	9.2	x	67.96	x	0.63	х	0.7	j =	134	(81)
Northwest 0.9x	0.77	x	1.63	x	67.96	х	0.63	х	0.7	j =	33.85	(81)
Northwest 0.9x	0.77	X	1.46	x	91.35	х	0.63	х	0.7	j =	81.52	(81)
Northwest 0.9x	0.77	X	2.52	x	91.35	x	0.63	х	0.7	j =	140.7	(81)
Northwest 0.9x	0.54	x	9.2	x	91.35	х	0.63	х	0.7	j =	180.12	(81)
Northwest 0.9x	0.77	X	1.63	x	91.35	х	0.63	x	0.7	j =	45.5	(81)
Northwest 0.9x	0.77	X	1.46	x	97.38	x	0.63	х	0.7	j =	86.9	(81)
Northwest 0.9x	0.77	x	2.52	x	97.38	х	0.63	х	0.7	j =	150	(81)
Northwest 0.9x	0.54	X	9.2	x	97.38	x	0.63	x	0.7	j =	192.02	(81)
Northwest 0.9x	0.77	j x	1.63	x	97.38	x	0.63	x	0.7	j =	48.51	(81)
Northwest 0.9x	0.77	X	1.46	x	91.1	x	0.63	x	0.7	j =	81.3	(81)
Northwest 0.9x	0.77	X	2.52	x	91.1	x	0.63	x	0.7	j =	140.32	(81)
Northwest 0.9x	0.54	X	9.2	x	91.1	x	0.63	х	0.7	j =	179.63	(81)
Northwest 0.9x	0.77	X	1.63	x	91.1	x	0.63	х	0.7	j =	45.38	(81)
Northwest _{0.9x}	0.77	X	1.46	x	72.63	x	0.63	x	0.7	j =	64.81	(81)
Northwest _{0.9x}	0.77	X	2.52	x	72.63	x	0.63	x	0.7	=	111.87	(81)
Northwest 0.9x	0.54	X	9.2	x	72.63	x	0.63	x	0.7	=	143.21	(81)
Northwest _{0.9x}	0.77	X	1.63	x	72.63	X	0.63	X	0.7	=	36.18	(81)
Northwest 0.9x	0.77	X	1.46	x	50.42	x	0.63	x	0.7	=	44.99	(81)
Northwest _{0.9x}	0.77	X	2.52	X	50.42	X	0.63	X	0.7	=	77.66	(81)
L		_		,				1				_

Northwest 0.9x	0.54	X	9.2	2	x	50.42	x	0.63	x	0.7	=	99.42	(81)
Northwest 0.9x	0.77	Х	1.6	33	x	50.42	x	0.63	x	0.7	=	25.12	(81)
Northwest 0.9x	0.77	Х	1.4	16	x	28.07	x	0.63	x	0.7	=	25.05	(81)
Northwest 0.9x	0.77	Х	2.5	52	x	28.07	x	0.63	x	0.7	=	43.23	(81)
Northwest 0.9x	0.54	Х	9.2	2	x	28.07	x	0.63	x	0.7	=	55.34	(81)
Northwest 0.9x	0.77	х	1.6	33	x	28.07	×	0.63	x	0.7	=	13.98	(81)
Northwest 0.9x	0.77	x	1.4	16	x	14.2	×	0.63	x	0.7	=	12.67	(81)
Northwest 0.9x	0.77	х	2.5	52	x	14.2	×	0.63	x	0.7	=	21.87	(81)
Northwest 0.9x	0.54	Х	9.2	2	x	14.2	x	0.63	x	0.7	=	27.99	(81)
Northwest 0.9x	0.77	Х	1.6	33	x	14.2	x	0.63	x	0.7	=	7.07	(81)
Northwest 0.9x	0.77	Х	1.4	16	x	9.21	x	0.63	x	0.7	=	8.22	(81)
Northwest 0.9x	0.77	Х	2.5	52	x	9.21	x	0.63	x	0.7	=	14.19	(81)
Northwest 0.9x	0.54	Х	9.2	2	x	9.21	x [0.63	x	0.7	=	18.17	(81)
Northwest 0.9x	0.77	Х	1.6	33	x	9.21	x	0.63	x	0.7	=	4.59	(81)
Solar gains in	watts, ca	lculated	for eacl	h month			(83)m :	= Sum(74)m .	(82)m				
(83)m= 91.3	173.89	286.73	437.07	564.22	592.99		458.1	15 338	205.34	112.7	75.97		(83)
Total gains –	internal a	nd solar	(84)m =	= (73)m	+ (83)m	, watts				,		1	
(84)m= 532.3	612.77	711.39	838.71	942.39	948.58	898.97	805.2	22 696.9	587.48	521.56	504.97		(84)
7. Mean inte	rnal temp	erature ((heating	season)								
Temperature	during h	eating pe	eriods ir	n the livi	ng area	from Tal	ole 9,	Th1 (°C)				21	(85)
													1 ' '
Utilisation fa	ctor for ga	ains for li	ving are	ea, h1,m	(see Ta			()					
Utilisation fa	ctor for ga	ains for li Mar	ving are	ea, h1,m May	(see Ta		Au	· · ·	Oct	Nov	Dec]	
	T	ı		I	r` .	able 9a)	Ι.	g Sep	Oct 0.96	Nov 0.99	Dec 1		(86)
(86)m= 1	Feb 0.99	Mar 0.98	Apr 0.92	May 0.76	Jun 0.55	Jul 0.4	Au 0.47	g Sep		+			
Jan	Feb 0.99	Mar 0.98	Apr 0.92	May 0.76	Jun 0.55	Jul 0.4	Au 0.47	g Sep		+			
(86)m= 1 Mean internation (87)m= 20.02	Feb 0.99 al tempera 20.16	Mar 0.98 ature in I 20.42	Apr 0.92 iving are 20.74	May 0.76 ea T1 (fo 20.94	Jun 0.55 ollow ste 20.99	able 9a) Jul 0.4 eps 3 to 7	Au 0.47 7 in Ta 21	g Sep 7 0.76 able 9c) 20.95	0.96	0.99	1		(86)
Jan (86)m= 1 Mean interna	Feb 0.99 al tempera 20.16	Mar 0.98 ature in I 20.42	Apr 0.92 iving are 20.74	May 0.76 ea T1 (fo 20.94	Jun 0.55 ollow ste 20.99	able 9a) Jul 0.4 eps 3 to 7	Au 0.47 7 in Ta 21	g Sep 0.76 able 9c) 20.95 Th2 (°C)	0.96	0.99	1		(86)
(86)m= 1 Mean interna (87)m= 20.02 Temperature (88)m= 20.11	Feb 0.99 al tempera 20.16 e during he 20.11	Mar 0.98 ature in I 20.42 eating po 20.11	Apr 0.92 iving are 20.74 eriods ir 20.13	May 0.76 ea T1 (for 20.94 n rest of 20.13	Jun 0.55 ollow ste 20.99 dwelling 20.14	Jul 0.4 eps 3 to 7 21 g from Ta 20.14	Au 0.47 7 in Ta 21 able 9, 20.1	g Sep 0.76 able 9c) 20.95 Th2 (°C)	0.96	0.99	19.99		(86)
Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation fa	Feb 0.99 al tempera 20.16 e during he 20.11 ctor for ga	Mar 0.98 ature in I 20.42 eating pe 20.11	Apr 0.92 iving are 20.74 eriods ir 20.13	May 0.76 ea T1 (for 20.94 n rest of 20.13 welling,	Jun 0.55 bllow ste 20.99 dwelling 20.14 h2,m (s	Jul 0.4 eps 3 to 7 21 g from Ta 20.14 ee Table	Au 0.47 7 in Ta 21 able 9, 20.1	g Sep 7 0.76 able 9c) 20.95 7 Th2 (°C) 4 20.13	0.96 20.67 20.13	0.99 20.29 20.12	19.99		(86) (87) (88)
Jan (86)m= 1	Feb 0.99 al tempera 20.16 e during he 20.11 ctor for ga 0.99	Mar 0.98 ature in I 20.42 eating period of the control of the c	Apr 0.92 iving are 20.74 eriods ir 20.13 est of do	May 0.76 ea T1 (for 20.94 n rest of 20.13 welling, 0.71	Jun 0.55 ollow ste 20.99 dwelling 20.14 h2,m (s 0.48	able 9a) Jul 0.4 eps 3 to 7 21 g from Ta 20.14 ee Table 0.32	Au 0.47 7 in Ta 21 able 9 20.1 9a) 0.38	g Sep 7 0.76 able 9c) 20.95 Th2 (°C) 4 20.13	0.96 20.67 20.13	0.99	19.99		(86)
Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (89)m= 1	Feb 0.99 al tempera 20.16 e during he 20.11 ctor for ga 0.99 al tempera	Mar 0.98 ature in I 20.42 eating per 20.11 ains for r 0.98 ature in t	Apr 0.92 iving are 20.74 eriods ir 20.13 est of do 0.9 he rest	May 0.76 ea T1 (for 20.94 n rest of 20.13 welling, 0.71 of dwell	Jun 0.55 ollow ste 20.99 dwelling 20.14 h2,m (s 0.48 ng T2 (Jul 0.4 eps 3 to 7 21 g from Ta 20.14 ee Table 0.32 follow ste	Au 0.47 7 in Ta 21 able 9 20.1 9a) 0.38 eps 3 f	g Sep 0.76 able 9c) 20.95 Th2 (°C) 4 20.13 0.68 to 7 in Table	0.96 20.67 20.13 0.95 e 9c)	0.99 20.29 20.12 0.99	1 19.99 20.12		(86) (87) (88) (89)
Jan (86)m= 1	Feb 0.99 al tempera 20.16 e during he 20.11 ctor for ga 0.99	Mar 0.98 ature in I 20.42 eating period of the control of the c	Apr 0.92 iving are 20.74 eriods ir 20.13 est of do	May 0.76 ea T1 (for 20.94 n rest of 20.13 welling, 0.71	Jun 0.55 ollow ste 20.99 dwelling 20.14 h2,m (s 0.48	able 9a) Jul 0.4 eps 3 to 7 21 g from Ta 20.14 ee Table 0.32	Au 0.47 7 in Ta 21 able 9 20.1 9a) 0.38	g Sep 0.76 able 9c) 20.95 Th2 (°C) 4 20.13 0.68 to 7 in Table 4 20.1	0.96 20.67 20.13 0.95 e 9c) 19.74	0.99 20.29 20.12 0.99	1 19.99 20.12 1 18.76		(86) (87) (88) (89)
Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (89)m= 1	Feb 0.99 al tempera 20.16 e during he 20.11 ctor for ga 0.99 al tempera	Mar 0.98 ature in I 20.42 eating per 20.11 ains for r 0.98 ature in t	Apr 0.92 iving are 20.74 eriods ir 20.13 est of do 0.9 he rest	May 0.76 ea T1 (for 20.94 n rest of 20.13 welling, 0.71 of dwell	Jun 0.55 ollow ste 20.99 dwelling 20.14 h2,m (s 0.48 ng T2 (Jul 0.4 eps 3 to 7 21 g from Ta 20.14 ee Table 0.32 follow ste	Au 0.47 7 in Ta 21 able 9 20.1 9a) 0.38 eps 3 f	g Sep 0.76 able 9c) 20.95 Th2 (°C) 4 20.13 0.68 to 7 in Table 4 20.1	0.96 20.67 20.13 0.95 e 9c) 19.74	0.99 20.29 20.12 0.99	1 19.99 20.12 1 18.76	0.37	(86) (87) (88) (89)
Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (89)m= 1	Feb 0.99 al tempera 20.16 20.11 ctor for ga 0.99 al tempera 19.01	Mar 0.98 ature in I 20.42 eating pe 20.11 ains for r 0.98 ature in t 19.37	Apr 0.92 iving are 20.74 eriods ir 20.13 est of decomposition 0.9 he rest 19.83	May 0.76 ea T1 (for 20.94 n rest of 20.13 welling, 0.71 of dwell 20.07	Jun 0.55 ollow ste 20.99 dwelling 20.14 h2,m (s 0.48 ing T2 (able 9a) Jul 0.4 eps 3 to 7 21 g from Ta 20.14 ee Table 0.32 follow ste	Au 0.47 7 in Ta 21 able 9, 20.11 9a) 0.38 eps 3 i 20.11	g Sep 7 0.76 able 9c) 20.95 Th2 (°C) 4 20.13 0.68 to 7 in Table 4 20.1	0.96 20.67 20.13 0.95 e 9c) 19.74	0.99 20.29 20.12 0.99	1 19.99 20.12 1 18.76	0.37	(86) (87) (88) (89)
Jan (86)m= 1	Feb 0.99 al tempera 20.16 20.11 ctor for ga 0.99 al tempera 19.01	Mar 0.98 ature in I 20.42 eating pe 20.11 ains for r 0.98 ature in t 19.37	Apr 0.92 iving are 20.74 eriods ir 20.13 est of decomposition 0.9 he rest 19.83	May 0.76 ea T1 (for 20.94 n rest of 20.13 welling, 0.71 of dwell 20.07	Jun 0.55 ollow ste 20.99 dwelling 20.14 h2,m (s 0.48 ing T2 (able 9a) Jul 0.4 eps 3 to 7 21 g from Ta 20.14 ee Table 0.32 follow ste	Au 0.47 7 in Ta 21 able 9, 20.11 9a) 0.38 eps 3 i 20.11	g Sep 0.76 able 9c) 20.95 Th2 (°C) 4 20.13 0.68 to 7 in Table 4 20.1	0.96 20.67 20.13 0.95 e 9c) 19.74	0.99 20.29 20.12 0.99	1 19.99 20.12 1 18.76	0.37	(86) (87) (88) (89)
Jan (86)m= 1 Mean internation (87)m= 20.02 Temperature (88)m= 20.11 Utilisation far (89)m= 1 Mean internation (90)m= 18.79 Mean internation (90)m= 18.79	Feb 0.99 al tempera 20.16 20.11 ctor for ga 0.99 al tempera 19.01 al tempera 19.44	Mar 0.98 ature in I 20.42 eating per 20.11 ains for r 0.98 ature in t 19.37 ature (for 19.76)	Apr 0.92 iving are 20.74 eriods ir 20.13 est of do 0.9 he rest 19.83 r the wh	May 0.76 ea T1 (for 20.94 n rest of 20.13 welling, 0.71 of dwell 20.07 ole dwe 20.39	Jun 0.55 collow ster 20.99 dwelling 20.14 h2,m (s 0.48 ing T2 (c 20.13	able 9a) Jul 0.4 eps 3 to 7 21 g from Ta 20.14 ee Table 0.32 follow ste 20.14 fLA × T1 20.46	Au 0.47 7 in Ta 21 able 9 20.19 9a) 0.38 eps 3 i 20.11	g Sep 7 0.76 able 9c) 20.95 Th2 (°C) 4 20.13 0.68 to 7 in Table 4 20.1 - fLA) × T2 6 20.42	0.96 20.67 20.13 0.95 e 9c) 19.74 LA = Livi	0.99 20.29 20.12 0.99 19.19 ng area ÷ (4	1 19.99 20.12 1 18.76 4) =	0.37	(86) (87) (88) (89) (90) (91)
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	(= 1)									
Useful gains, hmGm , W = (94)				1	1		1			(0.5)
` '	753.68 681.27	477.17	316.93	332.05	494.67	557.21	517.11	503.54		(95)
Monthly average external tempor (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							7.1	7.2		(00)
	940.32 723.61	481.4	317.35	333.07	522.03	790	1046.24	1264.02		(97)
Space heating requirement for		Į								, ,
	134.39 31.5	0	0	0	0	173.2	380.98	565.8		
	ļ.		<u> </u>	Tota	l per year	(kWh/year) = Sum(9	8) _{15,912} =	2578.8	(98)
Space heating requirement in k	:Wh/m²/year								29.34	(99)
9a. Energy requirements – Indivi	idual heating s	ystems i	ncluding	micro-C	CHP)					
Space heating:										
Fraction of space heat from sec	condary/supple	ementary	system						0	(201)
Fraction of space heat from ma	nin system(s)			(202) = 1	- (201) =				1	(202)
Fraction of total heating from m	ain system 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of main space heating	g system 1								93.5	(206)
Efficiency of secondary/suppler	mentary heatin	g systen	ո, %						0	(208)
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	⊐ ar
Space heating requirement (cal	lculated above)								
552.03 420.93 319.99	134.39 31.5	0	0	0	0	173.2	380.98	565.8		
$(211)m = \{[(98)m \times (204)] \} \times 100$	0 ÷ (206)									(211)
590.41 450.19 342.24	143.73 33.69	0	0	0	0	185.24	407.46	605.13		
	-	-	-	Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}		2758.08	(211)
Space heating fuel (secondary)	, kWh/month							•		_
$= \{[(98)m \times (201)]\} \times 100 \div (208)$)			,						
(215)m= 0 0 0	0 0	0	0	0	0	0	0	0		_
				Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water heating										
Output from water heater (calculated) 202.95 178.83 187.7		146.05	140.00	154.04	1547	174.00	184.53	100.01		
	168.11 164.64	146.95	140.98	154.91	154.7	174.33	164.53	198.01	70.0	7(216)
Efficiency of water heater (217)m= 87.35 87.02 86.23	84.22 81.34	79.8	79.8	79.8	79.8	84.8	86.71	87.46	79.8	(216)
` '		79.0	79.6	79.0	19.0	04.0	00.71	07.40		(217)
Fuel for water heating, kWh/mon $(219)m = (64)m \times 100 \div (217)m$										
` '	199.6 202.4	184.15	176.67	194.12	193.86	205.59	212.82	226.4		
	•	•		Tota	I = Sum(2	19a) ₁₁₂ =			2451.14	(219)
Annual totals						k\	Wh/year	,	kWh/year	_
Space heating fuel used, main sy	ystem 1								2758.08	
Water heating fuel used									2451.14	7
Electricity for pumps, fans and el	lectric keep-ho	t						'		_
central heating pump:								30		(230c)

boiler with a fan-assisted flue		ſ	45		(230e)
Total electricity for the above, kWh/year	sum of (23	0a)(230g) =		75	(231)
Electricity for lighting				370.19	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission factors kg CO2/kWh	or	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	595.74	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	529.45	(264)
Space and water heating	(261) + (262) + (263) + (264) =	:		1125.19	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	192.13	(268)
Total CO2, kg/year	su	m of (265)(271) =		1356.25	(272)

TER =

(273)

15.43